LMC INTERNATIONAL

Evaluation of the Community Policy

for Starch and Starch Products

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Table of Contents

List of Tables

List of Diagrams

Contents (xiv)

Contents (xv)

Executive Summary

The present Evaluation has two main parts. The first, covering Chapters 1 to 3, describes the structure of the starch industry, both globally and in the Community, and introduces the main policy measures applied to the sector within the Community.

The second part, in Chapter 4 to 7, considers the Questions posed by the Commission for this Evaluation. These focus upon the impact of policy upon the equilibrium in the market; the production channels (the *filière*) from farmer to processor and end-user; upon social and economic indicators of development; and upon the management of the implementation of the measures in the *filière*.

The report finally proceeds to a summary of its conclusions in Chapter 8.

Before introducing the key elements of this Evaluation, it is useful to comment upon the data available on the sector. Both internationally and within the Community, authoritative statistics about the starch industry are rare, in part because starch processors seek to protect their commercial interests by restricting the data that they disseminate. In the EU, however, the Commission regulates important segments of starch production; yet much key information is absent. For example, there is no comprehensive information about starch potato farm areas and yields.

There is also a frustrating lack of long time series of full, detailed foreign trade data relating to the sector, which meant that it has been impossible to derive unambiguous conclusions about important aspects of the Evaluation, such as those about export refunds. In the light of these remarks, it will be no surprise that one conclusion in the final chapter is that the collection and dissemination of data about the sector need to be improved.

CHAPTER 1: THE STRUCTURE OF THE WORLD STARCH MARKET

Table E1 compares starch production by raw material in the EU, the US and the rest of the world. The US accounts for over half of the world's total output, and, in common with other regions of the world, maize is the main base product. However, the Community makes less than half its output from maize, and is the leader in the wheat and potato starch sectors. The only other major starch in the world is tapioca starch, produced mainly in South East Asia.

Table E1: Starch Output by Raw Material in the EU, US and Other Countries, 2000 (million tons)

	Maize	Potatoes	Wheat	Other	Total
EU	3.9	1.8	2.8	0.0	**8.4**
US	24.6	0.0	0.3	0.0	**24.9**
Other Countries	10.9	0.8	1.1	2.5	**15.2**
World	39.4	2.6	4.1	2.5	**48.5**

Source: European Commission (DG Agriculture, Unit C2), United States Department of Agriculture and LMC estimates.

The main reasons for the larger scale of the US than the EU industry are that the US has a very large isoglucose sector, which has captured a substantial share of the domestic sweetener market from sugar, whereas the EU industry is subject to production quotas, and that the US also has a major starch-based ethanol sector, almost 100 times larger than that in the Community. For other starch-derived syrup products, such as glucose, fermentation products and polyhydric alcohols, EU production is 10% larger than that in the US; in native and modified starches, the Community's lead over the US in total output is 25%.

The Community's share of global starch demand rose from 15.0% to 15.3% between 1995 and 2000, and the annual growth rate in the EU was slightly over 4%. Over the next decade, we expect that the EU demand for starch products will grow at an average annual rate of under 3%, expanding the market from 7.4 million tons in 2000 to 9.8 million tons in 2010.

The Community's share of world exports of starch products in 2000 was just over 25%, but whereas it supplied slightly under a third of total native starch exports, and over a third of modified starch exports, it provided only 13% of global glucose and isoglucose exports.

CHAPTER 2: COMMUNITY MARKETS FOR STARCH

Table E2 demonstrates that the composition of Community starch capacity and output is shifting steadily away from maize (whose use has grown very slowly) towards wheat as a base product, with both the absolute output and the share of starch potatoes declining since the imposition of production quotas in 1995/96. The economics of the raw materials has favoured the rapid expansion in the wheat starch share in domestic production.

Diagram E1 illustrates the net costs of wheat, maize and potatoes per ton of starch, after subtracting the value of by-product credits from the agricultural crop costs, and demonstrates the persistence of the economic attractions of wheat, which has very valuable by-products, primarily in the form of vital wheat gluten and wheat bran, while starch potatoes have only negligible by-product credits.

Table E2: EU Starch Output by Raw Material, 1990-2001 (million tons, native starch)

	Maize	Wheat	Potatoes	**Total**
1990	3.2	1.1	1.1	**5.4**
1991	3.5	1.2	1.2	**5.9**
1992	3.5	1.3	1.5	**6.3**
1993	3.4	1.3	1.6	**6.3**
1994	3.4	1.5	1.3	**6.1**
1995	3.6	1.7	1.6	**6.9**
1996	3.6	1.8	1.9	**7.2**
1997	3.7	1.9	1.9	**7.5**
1998	3.8	2.2	1.7	**7.6**
1999	3.7	2.5	1.8	**8.0**
2000	3.9	2.8	1.8	**8.4**
2001	3.9	2.8	1.7	**8.4**

Notes: The wheat figure includes other cereals, such as oats, barley and rice.
         The figures refer to the current Community of 15 member states throughout the period.

Source: AAC, AGPM, UFE and LMC internal database.

Diagram E1: Comparing the Net Costs of Starch Base Products in the Community
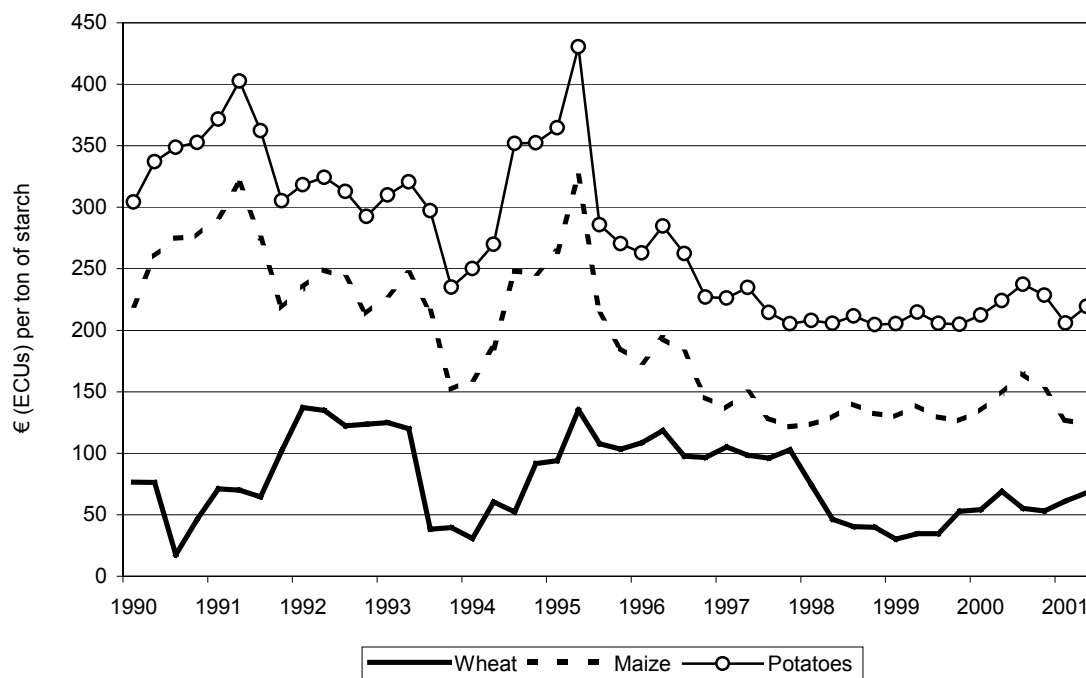
Source: LMC, *Starch and Fermentation Analysis,* various issues, and LMC estimates

Estimates of the composition of starch production in the Community since 1992 are presented in Table E3. The highest growth rate has occurred in the manufacture of modified starches. However, the output of sweeteners (glucose syrups and their derivatives) expanded the most in absolute terms. Even the slowest growing of the three main segments, namely the production of native starches, grew by 25%, rising from 2.0 to 2.5 million tons between 1992 and 2000.

Table E3: Community Starch Production by Type of Starch Product, 1992-2000
(million tons, native starch equivalent)

	Total	Native Starches	Modified Starches	Sweeteners
1992	**6.3**	2.0	1.2	3.1
1993	**6.3**	1.9	1.2	3.1
1994	**6.1**	1.7	1.2	3.2
1995	**6.9**	2.2	1.3	3.4
1996	**7.2**	2.0	1.6	3.7
1997	**7.5**	2.0	1.6	3.8
1998	**7.6**	2.0	1.6	3.9
1999	**8.0**	2.3	1.8	3.9
2000	**8.4**	2.5	1.9	4.0

Sources: LMC estimates based partly upon AAC and European Commission data (DG Agriculture, Unit C2).

CHAPTER 3: POLICY IN THE EU STARCH SECTOR

The policies applied to the starch sector are regulated within the framework of the Common Market Organisation for Cereals. This helps to determine the domestic prices for cereals and starch potatoes, and also sets the area payments made to cereal farmers and their counterpart (direct payments to growers) for starch potato farmers. In addition, it regulates the system of production and export refunds for starch products.

The starch potato sector is covered by the CMO, but many of the measures that govern aspects of starch potato production and processing are specific to the sector. The minimum price paid for potatoes is linked in a fixed relationship to the intervention price for cereals. Until 1999/2000, there was also a fixed relationship between the direct payment to the growers of starch potatoes and the area payment for cereals; but from 2000/01 onwards, potato growers have received more generous compensation than cereal farmers for the Agenda 2000 intervention price cuts.

Since 1995/96, national production quotas have governed starch potato output, and since then, with the exception of the weather-affected 1998/99 crop year, total Community potato starch output has typically been very close to the overall quota.

Quotas were introduced after the failure of earlier warnings from the Council of Ministers that output should be capped voluntarily, after a period of rapid expansion. Table E4 describes the trend in national quotas, and reveals both the initial growth in the German quota (as the reserve, established to allow for irreversible investments and for the effects of modernised East German factories coming on stream, was subsequently incorporated into its quota) and the recent reductions in the national quotas. These reductions were made to the quotas so as to offset the additional budgetary costs caused by the higher level of compensation granted to potato farmers (via direct payments) than to their cereal counterparts for the intervention price cuts that were made under the Agenda 2000 reforms.

Table E4: Potato Starch Quotas and Production Reserve, 1995/96-2001/02 ('000 tons of starch)

	1995/96	1996/97	1997/98	1998/99	1999/2000	2000/01	2001/02
Denmark	178	178	178	178	178	173	168
Germany							
Quota	592	592	696	696	696	677	656
Reserve		105					
Spain	2	2	2	2	2	2	2
France	282	282	282	282	282	274	265
Netherlands	538	538	538	538	538	523	507
Austria	49	49	49	49	49	48	48
Finland	55	55	55	55	55	54	53
Sweden	64	64	64	64	64	63	62
Total Quotas	1,760	1,760	1,864	1,864	1,864	1,814	1,762
Reserve		105					
Combined Total	**1,760**	**1,864**	**1,864**	**1,864**	**1,864**	**1,814**	**1,762**

Source: European Commission (DG Agriculture, Unit C2).

The system of production refunds is an important element of the policy affecting the starch sector. Refunds are provided to starch end-use companies that produce approved products, namely those products that receive little or no import tariff protection from imports of competing products made outside the Community. The refunds are intended to provide local end-users making these approved products with compensation for the difference between the price of the cereals incorporated into EU starch and the price of cereals incorporated in the starch used in the manufacture of approved products in third countries. The production refunds take US Gulf export prices as the relevant world market price for reference, and take account of the freight costs that are incurred to bring US maize into the Community.

Diagram E2 depicts the allocation of production refunds by end-use sector. Just three end-uses dominate: paper products, the group of esterified and etherified modified starches (the so-called esters and ethers), and organic chemicals. The esters and ethers are intermediate products, whose largest single customer is the paper industry, which is therefore, directly and indirectly, the most important recipient of production refunds.

Diagram E2: Production Refunds by End-Use, 2000/01
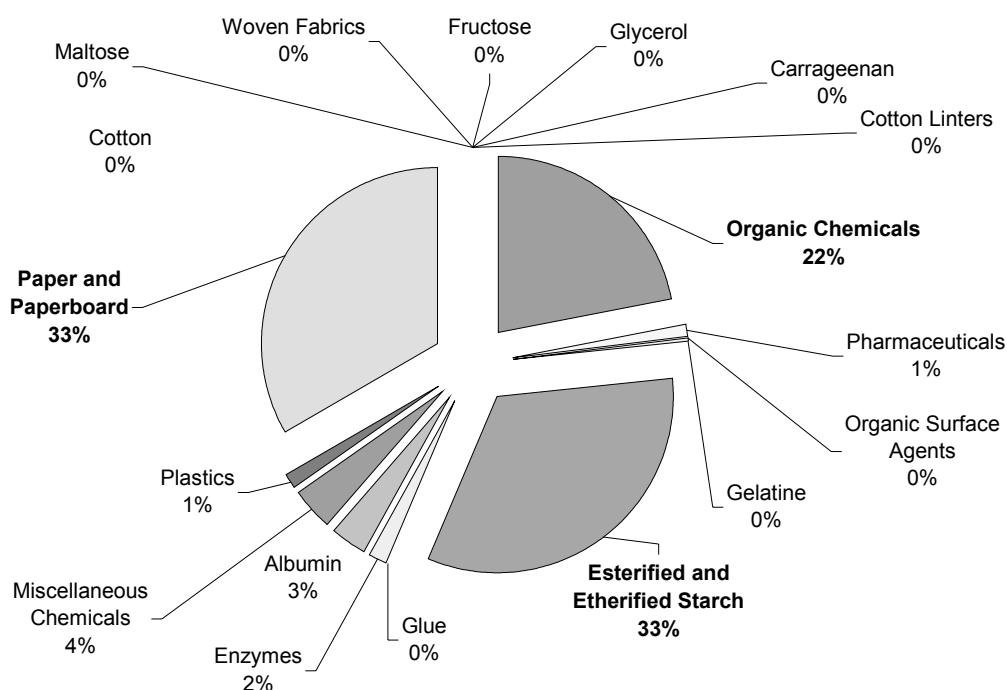
Source: European Commission (DG Agriculture, Unit C2).

Export refunds are provided to compensate for the effect of cereal price differences in the competition that occurs in third country export markets for starch–containing products. The relevant price difference is considered to be that between the f.o.b. prices in EU export ports and in the US Gulf. The categories of products that are eligible for export refunds are the Annex I basic agricultural products, listed in Article 32.3 of the Treaty of Amsterdam, and the non-Annex I more processed products, originally defined in Council Regulation 616/66.

In July 2000, the range of products entitled to non-Annex I export refunds was reduced. A significant change affecting starch products was the removal of the right to residual export refunds (i.e., incremental refunds on top of production refunds) from all approved products, with the sole exception of the category of the esterified and etherified modified starches.

Diagram E3: Production Refund (for All Starches) and Export Refunds for Maize and Wheat Starch, and for Glucose, January 1991-July 2001 (€ per ton)
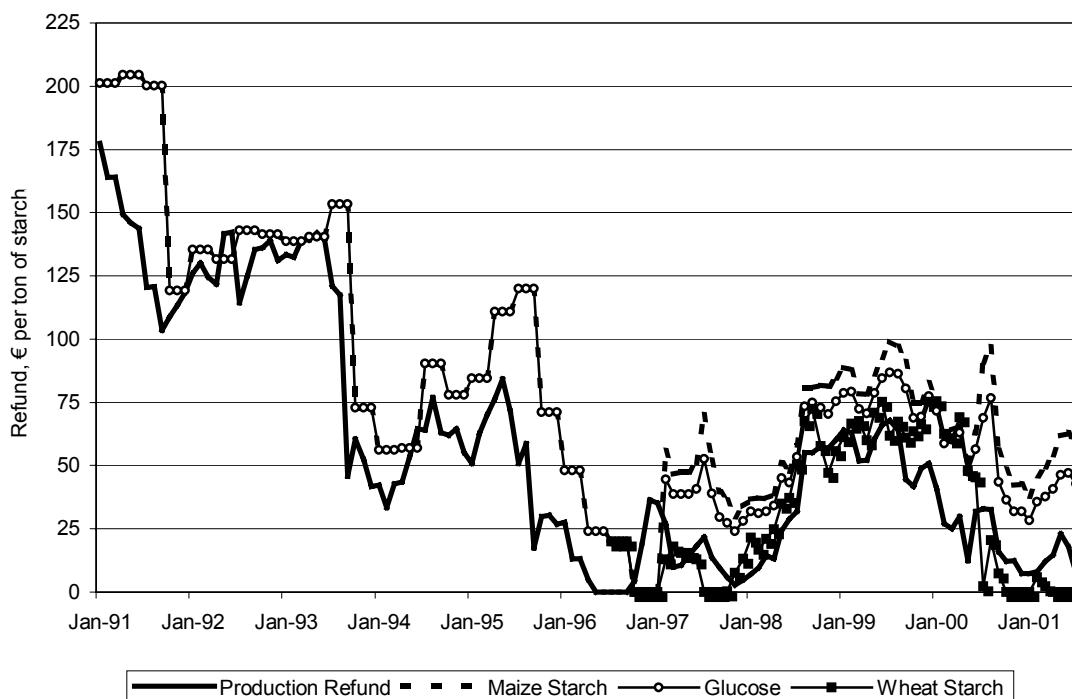
Source: European Commission (DG Agriculture, Unit C2).

Diagram E3 plots the production and export refunds for starch products since January 1991. Production refunds are the same for all base products, but are calculated solely in terms of maize. Separate export refunds are fixed for wheat starch and maize starch (whose refund is applied to potato starch). In addition, the export refund for glucose is derived via a mixed calculation as a weighted average of the refunds for maize and wheat starch. The production refund has always been below the export refunds for maize starch and for glucose, but there have been occasions when the wheat export refund has been below the production refund.

The budgetary cost to the Commission of measures specific to the starch sector is summarised in Table E5. It should be noted that the costs incorporated into the table include the production and export refunds on cereal starches, but take <u>no</u> account of the area payments to which the growers of cereals are entitled, since these payments would be made whether or not the cereals that the farmers harvest are processed into starch, and thus are not viewed as a cost that is specifically attributable to starch production. For starch potatoes, the costs included in the table are those for production and export refunds, as well for specific starch potato measures, in the form of the starch premium payments made to potato starch producers and the direct payments made to starch potato growers.

The total budgetary costs listed in Table E5 were highest in 1993. Between 1994 and 2000, they first fell, before rising and virtually regaining the 1994 level in 2000. (A major reason for the flat cost trend is that area payments for cereals have <u>not</u> been included, since they are not specific to the starch sector; but some non-starch export refunds <u>are</u> included; thus, the values should be viewed only as indicative of trends.) Because of the growing role played by direct payments to potato growers within the overall total, specific payments made to the potato starch sector have risen considerably since 1993, while those on cereal starches have fallen. Also, as intervention prices for cereals have been reduced and brought closer to world market levels, the outlays on production and export refunds have shrunk significantly.

Table E5: The Budgetary Costs of the Measures Specific to the Starch Regime, 1993-2000 (million Euros)

	1993	1994	1995	1996	1997	1998	1999	2000
Total Export Refunds on Annex I Processed Products by Raw Material	**432.34**	**234.90**	**188.00**	**85.94**	**92.18**	**83.96**	**127.24**	**143.02**
of which: Maize	363.02	133.83	81.50	45.62	35.61	26.62	41.98	48.36
Wheat and Other Cereals	69.32	101.07	72.10	18.73	37.71	40.23	55.59	57.17
Potato	-	-	34.40	21.59	18.86	17.11	29.68	37.49
Total Export Refunds on non-Annex I Processed Products by Raw Material	**43.75**	**25.67**	**39.12**	**12.07**	**19.99**	**31.07**	**39.33**	**41.50**
of which: Maize	27.25	17.60	26.84	9.31	15.26	24.22	30.07	28.95
Wheat and Other Cereals	2.51	1.27	0.98	0.14	0.23	0.80	1.65	2.79
Potato	13.98	6.81	11.30	2.61	4.51	6.05	7.62	9.76
Total Production Refunds by Type of Starch	**363.64**	**185.72**	**132.40**	**96.92**	**59.69**	**49.54**	**169.25**	**168.15**
of which: Maize	305.29	95.39	102.60	55.43	33.68	27.99	86.31	94.04
Wheat	14.19	24.94	29.10	13.73	7.60	7.02	27.52	25.52
Other Cereals			0.50	0.46	0.19	0.31	0.50	0.82
Potato	44.17	65.40	0.20	27.30	18.22	14.23	54.92	47.76
Total Specific Potato Starch Expenditures	**51.98**	**100.32**	**182.80**	**177.08**	**208.56**	**204.36**	**182.90**	**193.19**
Potato Starch Premium	36.65	100.32	71.90	36.10	42.41	41.64	37.27	39.10
Direct Payments to Potato Farmers			54.70	140.98	166.15	162.72	145.63	154.09
Other Payments to the Potato Starch Sector	15.34		56.20					
Total Costs by Raw Material	**891.72**	**546.61**	**542.32**	**372.00**	**380.42**	**368.94**	**518.73**	**545.85**
of which: Maize	695.57	246.82	210.94	110.36	84.55	78.84	158.36	171.35
Wheat and Other Cereals	86.01	127.27	102.68	33.06	45.73	48.35	85.25	86.30
Potato	110.13	172.52	228.70	228.59	250.14	241.75	275.12	288.21

Note 1: The only costs included in this table are those considered to be specific to the starch regime. Hence, they exclude area payments to cereal farmers supplying starch processors.
Note 2: The non-Annex I export data were only provided in detail for 1999 and 2000. In the previous years, we have only been able to obtain volume data. We have assumed in this table that the average export refund paid per ton of starch used in non-Annex I products moved exactly in parallel with the export refund on maize starch in the same year.
Note 3: Non-Annex I export refunds have been allocated between maize and wheat on the basis of the division of export tonnages of non-Annex I products as wheat or maize in origin.
Note 4: The official statistics only give two categories for non-Annex I products, wheat and maize, because potato starch receives exactly the same export refund as maize starch. This table assumes that potato starch export refunds for the non-Annex I products are exactly half of the refunds paid on non-Annex I exports of modified starches.
Note 5: The Annex I export refunds for maize and wheat include important non-starch items, notably refunds on compound animal feed (for maize) and on wheat flour and durum wheat semolina (for wheat). These represent a significant proportion of the total export refunds, but the data were not available to enable us to exclude these refunds from the totals.
Note 6: Export refunds for glucose products are all allocated to the maize line in Annex I processed products by convention. Data are not available to allow us to identify them separately.
Note 7: Because of the various qualifications mentioned in the previous Notes to this table, the rows in this table should be interpreted as indicative of the underlying trend, rather than a precise indication of the costs attributable to specific policies applies to the starch sector.

Source: FEOGA and DG Enterprise

CHAPTER 4: THE IMPACT OF POLICY ON THE STARCH MARKET EQUILIBRIUM

The Questions in Chapter 4 in relation to the starch market equilibrium were as follows:

4.1: To what extent did the production refund ensure an outlet for Community starch products among producers of approved products?

4.2: To what extent did the export refunds ensure an outlet for the Community starch products?

4.3: Did the production and export refunds play a significant role in the demand for Community base products?

4.4 Did the amounts of the production and export refunds ensure at a reasonable cost an outlet for the Community starch products?

These Questions raised complex issues, for example, the final question was divided into three further lengthy subsidiary questions about the suitability of a single production refund for all base products; the suitability of the same export refund for maize and potato starches; and the suitability of a single export refund for glucose.

In the case of production refunds, the conclusion that was drawn was that the refunds have broadly maintained the outlets for Community starch products among producers of approved products, since such producers continue to rely overwhelmingly upon domestic starch products for their starch inputs. If one assesses success in terms of maintaining the domestic market shares of local producers of the approved products, the conclusion is often different. For some organic chemicals, such as lysine and citric acid in particular, the share of indirect imports of starch products in the Community market has risen considerably, in the form of rising imports of approved products.

For export refunds, it was concluded that the refunds have also played an important role in helping to maintain outlets for Community starch products. However, although outlets in one of the most important starch-using export sectors — the paper industry — have been maintained, it was felt that the industry does not gain any significant benefit from export refunds. A surprising result revealed by the Comext export data (but which is unclear from the more limited export licence data that were available for the Evaluation) is that there is a clear empirical link between the level of export refunds and the incentives to export starch products, apart from potato starch.

The Evaluation concluded that production and export refunds had a significant effect upon the demand for the main base products, namely maize, wheat and starch potatoes, grown within the Community. Recently, 16% of total maize production, 5-6% of total common wheat output and the entire production of starch potatoes were processed into starch. These proportions translate into a demand for approximately six million tons of maize, five million tons of wheat and nine million tons of potatoes.

The reasonableness of production and export refunds was questioned in a few cases. For example, whereas the appropriate production refund for potato starch was found to be the same as that for maize, it was concluded that the refund for wheat should be determined separately, and would be typically slightly lower. Yet, comparisons of export prices of potato and maize starch implied that potato starch warranted a lower export refund than maize starch. The single export refund for glucose was supported, since it is nearly impossible to distinguish at a reasonable cost the base product used, but it was argued that the 25:75 wheat:maize mixed calculation that determines the refund should be revised to give equal weight to the wheat and maize starch refunds.

CHAPTER 5: THE IMPACT OF POLICY ON PRODUCTION CHANNELS

The main Questions in relation to the policy on production channels were as follows:

5.1: Did the support measures for potato starch contribute significantly to maintaining the potato starch production channel?

5.2: Did the measures for the potato starch sector ensure at a reasonable cost the competitiveness of the Community market for potato starch versus grain starches?

5.3: Did the production and export refunds on starch products contribute at a reasonable cost to maintaining the channels of production and use of native products?

The Evaluation concluded that the support measures for the potato starch sector have made starch potatoes more attractive to farmers than alternative crops and provided profits to processors in most years. There was a degree of excessive investment in the sector in the early 1990s, reflected in a sharp expansion in potato starch capacity. The imposition of production quotas halted further heavy investment in the sector, but evidence of .the continuing attraction of starch potato output is provided by the decision of farmers and processors to produce up to the quota limit, supported by indications that starch potatoes are more profitable than the main alternative crops (in Germany, some growers make specific yearly payments for starch potato delivery rights).

The direct payments to starch potato farmers have created two forms of divergence between the treatment of starch potato and cereal farmers. One is through the higher compensation granted to potato farmers in the Agenda 2000 reforms; the other is that, while the same reforms have harmonised area payments per hectare for cereals and oilseeds, the total direct payments per hectare of starch potatoes will, by 2002/03, typically be €400 higher than the area payments per hectare for the main arable crops.

Among some end-users, there is perceived to be a bias towards export sales and away from local sales of potato starch, noting the contrast between the declining and small share of the domestic starch market supplied by potato starch (16.5% in 2000), and its continuing high share of the total EU export sales of starch products (over 50%).

Industrial users of starch with the highest value added per Euro of production or export refund have the least need for refunds, since starch is a minor cost item. This applies to paper makers, for example. For some organic chemical companies, by contrast, refunds are a cost effective means of securing domestic outlets for local starch. It is recommended that there should be threshold levels for the share of starch costs in the value of end-products, below which production or export refunds would not be granted. Also, there is no reason to treat producers of protected products more generously than the producers of unprotected products in the refunds that they receive when exporting.

The Inward Processing Regime (IPR) is very little used in the Community starch sector, partly because of the restrictions that surround its use. Accordingly, it is not really an alternative under present circumstances to the current system of export refunds.

Including by-product credits in export refund calculations makes a modest difference to estimates of the appropriate level of refunds. It should be noted that the compensation should <u>not</u> aim to bring net wheat costs (net of by-product credits) down to the same level as maize. Its objective is to compensate for differences between base product prices within the Community and in the main competitor countries in export markets. If the net cost of wheat (net of by-product credits) per ton of starch is often lower than the net cost of maize, this is to be regarded as a reflection of the commercial realities of the cost competitiveness of wheat over maize as a starch raw material in the Community.

CHAPTER 6: THE IMPACT OF POLICY ON INCOME AND RURAL DEVELOPMENT

The Questions regarding the impact of policy on income and rural development were:

6.1: Did the grain and potato starch regime contribute significantly to supporting the income of farmers concerned, in particular of the starch potato producers? The role of the production structures will be examined in particular.

6.2: Did the grain and potato starch regime contribute significantly to supporting the income of the rural population in the areas concerned?

6.3: To what extent did the Community policy for the grain and potato starch sector contribute to the economic and social development of the rural areas concerned?

6.4: Did the Community policy for the sector of grain and potato starch contribute at a reasonable cost to the development of the rural areas concerned?

The starch potato regime definitely helped to support the income of starch potato farmers; the major role played in processing by cooperatively owned factories reinforced this conclusion. The policy for cereal starch, however, has no significant influence on the income of cereal farmers in starch producing areas. This is partly because it is impossible to know exactly from which areas domestic cereal starch processors obtain their raw materials. Therefore, it is very difficult to relate the activities of the starch industry to specific income benefits in well defined rural areas. Accordingly, we cannot draw any conclusion whether the measures related to cereal starch production influence the incomes of the rural populations concerned in the production of the grain used by the starch sector.

From the regional data that is analysed in this Evaluation, and which relate to fairly large geographical regions, one cannot draw any firm conclusion either as to whether the presence of a starch potato industry contributes significantly to supporting the income of the rural population, or whether it contributes significantly to the economic and social development in the starch potato producing regions.

The costs of support to the potato starch sector include a degree of deadweight in two main respects. One is in the determination of export refunds, for which potato starch at present receives the same refund as maize starch. However, the analysis suggests that no residual export refund (over and above the production refund) is warranted on exports of native potato starch, by virtue of the premium that potato starch enjoys over native maize starch in the export market. This corresponds to deadweight of the order of €40 per ton on average on exports of potato starch.

The other element of deadweight in the current measures is provided by evidence of some farmers' willingness to pay an annual fee for starch potato delivery rights in Germany, for example, when such payments are absent from cereal or oilseed production costs. This is interpreted as an indicator of the so-called economic rent, or the extra profit, earned on starch potato farming per hectare.

The average sum paid for these delivery rights in Germany has recently been over €300 per hectare. If this is a fair reflection of the situation in the Community as a whole, this represents three quarters of the additional sum (mentioned in the discussion of Chapter 5) of approximately €400 per hectare (€50 per ton of starch) that growers receive in the form of direct payments associated with planting one hectare of starch potatoes, rather than the area payments that they would receive from planting the same hectare to cereals instead.

CHAPTER 7: MANAGEMENT METHODS IN THE SECTOR

The Questions posed about the management methods applied to the sector were:

7.1: To what extent did the starch scale (in French, le barème féculier*) in force contribute to the monitoring of the actual Community potato starch production?*

7.2: Did the technical coefficients in force for the calculation of production and export refunds ensure appropriate compensation of the price differences?

7.3: Did the single amounts of export refunds for maize and potato starch on the one hand, and for various types of glucose on the other hand, ensure appropriate compensation of the price differences?

7.4: Did the management mechanisms and the administrative systems installed in the grain and potato starch sector, in particular the production quota, the fixing of refunds and the monitoring of licences, ensure efficient management of the sector?

There are indications that the starch potato payment scale underestimates the actual starch production that is achieved from the potatoes processed for starch. The precise magnitude of the underestimate is difficult to assess, not only because a great deal of the basic data that are needed to undertake the analysis were not available to us, but also because the analysis would need to draw upon specialised technical knowledge.

Therefore, while the *barème féculier* contributes to the monitoring of Community potato starch output, it does not do so as accurately as it could in terms of the overall analysis of supply/demand balances in the sector. In order to ensure that the production quota meets its intended purpose, we recommend that the Commission undertakes a technical review of the actual starch recoveries that are achieved by starch processors using modern technology and amends the *barème féculier* appropriately.

During the course of interviews with processors and end-users, we encountered no evidence that there is any noteworthy disparity between the administrative technical coefficients applied to the administration of refunds and the empirical values of the coefficients with modern processing techniques.

The introduction of different export refunds for potato and maize starch is judged to be economically judicious, since potato starch commands a sizeable premium over maize starch in the export market, but not inside the Community. It is also considered appropriate to amend the mixed calculation for the export refund for glucose and its products to reflect the greater importance of wheat as a raw material in recent years.

The instrument of management that is most widely criticised in interviews in the sector is the T5 Customs document used for esterified and etherified starches. It is seen as an unnecessary administrative burden. However, the system has been needed in the past to avoid fraud, and the ease with which processors could attempt to circumvent the controls in the absence of the T5 form calls for the continuation of such measures.

When the number of jobs in the public and private sectors related to the administration of the measures of the starch regime is compared with the value added in the starch industry, each full-time job corresponds to €1.68 million of value added in the *filière*. This represents a high ratio of administrative staff to the overall value addition. Once one allows for the full costs of such staff and their non-wage expenses, it is conceivable that as much as 5% of the sector's value added could be absorbed in administrative expenses.

CHAPTER 8: CONCLUSIONS

The conclusions will be summarised under three headings: production refunds, export refunds and specific measures applied to the potato starch sector.

Production Refunds

Regarding the application of a single production refund, the Evaluation concludes that it is still appropriate to set the same refund for maize, potato and minor cereal starches. However, a different refund is appropriate for wheat, and this refund, in common with that for maize, should take account of by-product credits.

We also conclude that the definition of approved products for granting production refunds should seek to avoid deadweight by introducing a requirement that the starch content should exceed a minimum threshold, e.g., 5% of the value of the end-product.

We conclude that by introducing different production refunds for wheat and maize, it should be possible to make the whole refund system more flexible in terms of the pre-fixation period for refunds. It would also have the benefit of making the management of export licences more flexible and reduce the need for bureaucratic intervention.

Export Refunds

In keeping with the discussion of production refunds, it is concluded that the export refund calculations for wheat and maize should take account of by-product credits.

As noted in the context of Chapter 5, it is concluded that there is no reason to treat the producers of protected products more generously than the producers of unprotected products in the refunds that they are entitled to receive when exporting their output.

We favour continuing to use a mixed calculation for determining export refunds on glucose, but to do so by applying equal 50:50 weights (as opposed to the current 25:75 weights) to the refunds on wheat and maize starches.

It is noted that Comext export data for Annex I starch export products suggest that there is an empirical correlation between the level of the export refund and the incentives to export native maize and wheat starches, as well as glucose products. This correlation provides a possible indication that these incentives go beyond the full compensation for price differences in base products. Priority should be given to undertaking an analysis of comprehensive export licence data since 1992 for the main starch product categories to determine whether the correlation found in this Evaluation on the basis of Comext statistics applies also to the export licence statistics. If the correlation is also found in the export licence data, the reason for the correlation should be examined to deduce whether it is related to the method employed to calculate the export refund.

Potato Starch

Whereas the study concluded that maize and potato starch should receive the same production refunds, analysis of recent export price relativities suggests that, unlike the case with native maize starch, native potato starch does not require any residual export refund, over and above the production refund, to compensate for price differences.

We also concluded that the potato starch premium has been needed by processors to compensate them for the innate disadvantages they suffer by virtue of the absence of

valuable by-products from potato processing and the shorter campaigns that they have than other starch processors. Evidence provided by the Dutch potato starch industry revealed that the costs of producing potato starch are considerably higher than those of producing cereal starches, caused by these factors.

We examined the annual accounts of a major starch potato company, and concluded that, with the benefit of the starch premium, this company made a profit in four of the latest five years for which results were available; without the premium, it would have made losses in four out of the five years.

The harmonisation of area payments between cereals and oilseeds is an important new element of the CAP. It is recommended that the direct payments to starch potato growers should be reviewed in relation to this new policy. It is considered significant that there is strong evidence of the profitability of starch potato production in the payments made by some farmers for delivery rights, as mentioned above. These exceeded €300 per hectare per annum in our German sample. This figure is to be compared with the estimate in this Evaluation that the budgetary cost of direct payments to starch potato farmers, when expressed per hectare, will, by 2002/03, give rise to the equivalent of close to €400 per hectare higher revenue for starch potato farmers than the average area payments for cereals or oilseeds.

Approximately 20% (€80) of this higher income per hectare is the consequence of the decision to compensate starch potato growers, via the direct payments, for 75% of the intervention price reductions made under Agenda 2000, instead of the 48.4% compensation made to cereal farmers via higher area payments. The remaining €320 or so extra payment is a direct consequence of the higher starch yields per hectare obtained in starch potato cultivation. It is significant that this is close to the magnitude of the payments made for delivery rights by some German starch potato farmers, and suggests that much of the benefit from direct payments is reflected in the higher profitability of starch potato farming, and in the market's valuation of delivery rights.

We conclude from the analysis of budgetary costs that, if one takes account only of the costs of the potato starch premia and of the divergence created in the compensation arrangements for reduction in intervention prices under Agenda 2000 between (a) the 75% compensation criterion adopted for potato direct payments and (b) the 48.4% compensation applied to cereal area payments since 2000/01, then the net budgetary cost to the Commission of creating one full time job in rural areas as a result of the measures in the starch potato sector is currently in the region of €8,000 per annum.

If, instead, one takes the view that, in view of the policy decision to harmonise the area payments for cereals and oilseeds from 2002/03, the appropriate point of reference for budgetary costs is one that measures these costs per hectare of land, the cost of employment generation via the measures in the starch potato sector is much higher. In this case, our analysis in the final chapter concludes that, taking the area payments for cereals as the point of reference for evaluating the opportunity costs to the Commission's budget of the direct payments to starch potato farmers on each hectare of the crop, the net budgetary cost of creating one full time job in rural areas as a result of starch potato policies will be in the region of €18,000 per annum by 2002/03.

Chapter 1: The Structure of the World Starch Market

This chapter describes the composition of the world starch industry. After a brief outline of the range of starch products, it summarises the composition of global starch output, distinguished by country, raw material and form of starch product. It then examines the growth in demand in major national markets, and concludes with a review of international trade patterns in starch products.

THE NATURE OF STARCH

Starch is a very versatile product, both in its raw materials and in its uses. It is a white, granular, organic chemical produced naturally by all green plants. Native starch is a soft, white, tasteless powder that is insoluble in cold water, alcohol, or other solvents. The basic chemical formula of the starch molecule is $(C_6H_{10}O_5)_n$. A full introduction to starch, its production process and its uses is presented in the Appendix to this chapter.

In Europe, as is also the case on a global basis, starch is derived mainly from cereals, but it is also obtained in significant quantities from tubers. (It is interesting to note that Romance languages, unlike Germanic languages and English, make a distinction between these two types of starch: for example *amidon* for cereal-derived starch and *fécule* for tuber-derived starch in French.) Worldwide, the main sources of starch are maize, wheat, potatoes and cassava (from which tapioca starch is derived).

In its native form, after the first stages of processing, starch has a relatively limited range of uses — notably as a thickener and as a binder — because of a property called retrogradation, which is described further in the Appendix to this chapter. After further processing by chemical or physical modification, starch can acquire high or low viscosities, it can become tolerant to heat or to high or low levels of pH, and it becomes an attractive input into many food and non-food sectors. It may also be broken down into syrups by acid or enzymatic means, and act as a substrate for a large number of fermentation products.

By virtue of this versatility, starches compete with many other products of agricultural origin. They can substitute for simple cereals in some native starch applications, for vegetable oils in the case of some modified starches, for sugar in the case of many starch syrups, for molasses or biomass crops, including cellulose, in the production of ethanol, for dietary fibre in the case of resistant starches and for latex rubber or certain gums in a number of paper products. In the opening pages of this chapter, we shall introduce the leading starches. Descriptions of their production processes and the major starch derivatives are included in the Appendix to this chapter.

Functionality is the key to the use of starches in food applications. No other ingredient provides texture to as many foods as starch does. Whether it is a soup, gravy, sauce, pie filling or custard, starch provides a consistent shelf-stable product.

There are at least as many value added applications for starch in the non-food area, each of which requires very particular functional characteristics. Starches for the paper industry, for textiles, pharmaceutical use and other chemical uses may be acid or alkali treated, and they may also be modified with oxidising agents, salts and different alcohols.

Various elements of the starch molecule may be substituted with a range of other chemicals to produce chemically modified starches classified generally as starch esters

and ethers. These are widely used in both food and non-food applications, for example in the form of cationic starch in the paper industry and in the form of acetylated starch in the food industry. The class of esters and ethers (esterified and etherified starches), as the Customs category CN 3505 10 50 is widely known, plays a major role in Community starch policy, since it's the producers of these particular forms of modified starch receive a sizeable proportion of the Commission's outlays on production and export refunds for starch products.

The use of modified starches in paper products is particularly important. Their main application is to provide greater strength to the basic fibres from which paper is made, and to bind the starch more tightly to these fibres in the presence of other chemicals, so that the wastewater produced in paper production is more environmentally friendly.

The growing demand for biodegradability, which is a property associated with starch derivatives, promises to add to the use of starch in plastic films and sheets, and in conjunction with natural fibres to replace synthetic plastic foams.

THE WORLD STARCH MARKET

In aggregate, the world starch market was estimated to be 48.5 million tons in size in 2000, including not only native and modified starches, but also the large volume of starch that is converted into syrups for direct use as glucose and isoglucose, and as substrates in the form of very high dextrose syrups (known as starch hydrolysates) for fermentation into organic chemicals, including ethanol. The value of the output of this industry is worth in the region of €15 billion per annum.

Within the global industry, the US is home to by far the largest starch industry, with 51% of world production. The Community's industry is second only in size to that of the US, with over 17% of world output, and an annual value of close to €3 billion. The structure of the EU domestic sector is described in more detail in Chapter 2.

Table 1.1 and Diagram 1.1 depict the relative sizes of the starch industries of the EU, US and the rest of the world, distinguishing between the main raw materials processed into starch in these areas. Maize is the main raw material in all three regions listed in the table, supplying over 80% of the global starch market, although the EU is distinctive in relying upon maize for less than half of its starch production. Maize starch manufacture generates just over one ton of by-products for every two tons of starch, and these by-products are, on average, worth more per ton than maize itself, thereby making a significant contribution towards the overall economics of maize starch output. A detailed breakdown of the allocation of EU starch production by raw material and type of starch product is given in Tables A2.28-A2.30 in the Appendix to Chapter 2.

Over 8% of world starch production is derived from wheat, and the Community produces over two thirds of the total global output of this starch, for which the economics of production are influenced very strongly by the by-product credits derived from the sale of high protein vital wheat gluten. The production of wheat gluten in the technology of wheat starch processing is discussed in the Appendix to this chapter.

More than 5% of global starch supplies are obtained from potatoes, and once again the EU is the source for over two thirds of the figure. Other raw materials, notably cassava, contribute just over 5% of world starch output. In the case of both of the two major tubers, potatoes and cassava, processors earn very little indeed from their modest amounts of by-product protein and fibre.

Table 1.1: Starch Production by Raw Material in the EU, US and Other Countries, 2000
(million tons, starch content)

	Maize	Potatoes	Wheat	Other	Total
EU	3.9	1.8	2.8	0.0	**8.4**
US	24.6	0.0	0.3	0.0	**24.9**
Other Countries	10.9	0.8	1.1	2.5	**15.2**
World	39.4	2.6	4.1	2.5	**48.5**

Source: EU Commission (DG AGRI, Unit C2), United States Department of Agriculture (USDA), LMC Internal Database.

The US is almost entirely dependent upon maize for its domestic output, with only 1% produced from other raw materials (notably wheat). The EU is unusual in having a starch industry in which three raw materials (maize, wheat and potatoes) each supply a large share of total starch output.

Outside the US and the EU, there is a significant proportion of starch that is manufactured from cassava (also known as tapioca), especially in South East Asia. Cassava represents the overwhelming share of the category "Other" in the raw materials identified in the diagram, but there is also some output derived from rice, barley, oats, sweet potatoes, sago, etc.

Diagram 1.1: Composition of World Starch Production, 2000
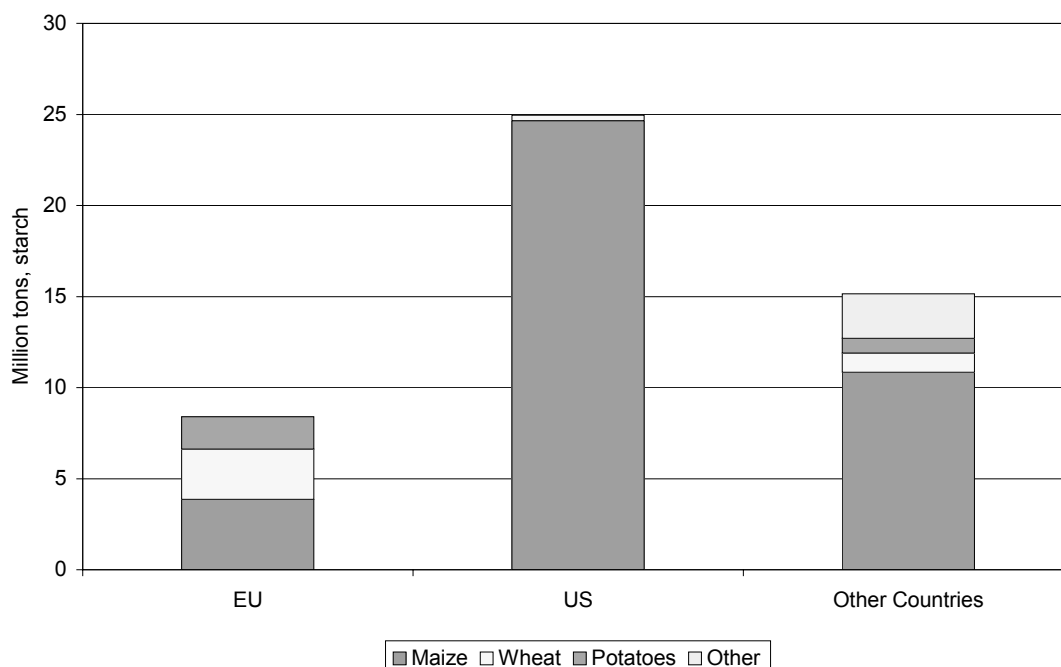
Source: EU Commission (DG AGRI, Unit C2) , USDA, LMC Internal Database.

THE RANGE OF STARCH PRODUCTS

The diversity of the products derived from starch has already been mentioned. In this section, we shall contrast the composition of starch production in the two largest markets, the US and EU. The US starch industry processed 44 million tons of maize last year, over 60% of which was processed into just two products: isoglucose (known in the US as high fructose corn syrup, HFCS) and ethanol. In the 1970s, US government sugar price supports provided an ideal environment for the development of the HFCS sector, which proved very popular to the soft drink industry. The ethanol sector also developed with official government support via Federal and State Government tax rebates, in this case for its role as a renewable oxygenate fuel.

US maize starch processors also benefited from the favourable economics of maize as a raw material. Not only was maize supplied to processors at prices that are widely taken to be the reference for world export market quotations, but processing also generated valuable by-product credits, the most important of which (those from the sale of corn gluten feed) enjoyed prices that were supported by the European Union's CMO for cereals. This occurred because the majority of the US output of corn gluten feed is exported, and it enters the Community duty-free, where it is widely used as a cereal substitute. In effect, the US f.o.b. price of corn gluten feed is derived by deducting the sea freight costs from the price set by its role in Europe as a cereal substitute. The significance of by-products in the overall economics of starch processing is discussed more fully in Chapter 2 and in the Appendix to the present chapter.

The contrast between the relative importance of the different products produced by the US and EU starch processors is revealed in Diagrams 1.2-1.3 and Table 1.2. In the classification, we have distinguished between four main classes of products: native and modified starches, which consist of all the dry starch products that have never passed through a syrup stage (and which are described in greater detail in the Appendix); ethanol, which is derived from the fermentation of starch syrups; isoglucose (in the form of HFCS in the US); and all other syrup-based starch products, which consist of syrups and derivatives of syrups, other than isoglucose and ethanol.

This last category combines glucose syrups and further processed sweeteners, including crystalline dextrose, maltodextrin and also sorbitol, as well as high dextrose syrups that are processed into amino acids and a range of other organic chemicals. Ethanol and isoglucose, although both are also syrup-based, are highlighted separately in view of their considerable importance in the US (and, therefore, global) market.

Ethanol alone accounts for 40% of the entire US starch output; and ethanol and isoglucose together represent 72% of US starch production. The scale of these two sectors dwarfs the native and modified starches, which together represents only 15% of US supply, and the group of other syrup-based starch products, with 13%.

In the Community, the role of ethanol is minuscule by comparison with the US, at a mere 1% of total output, while isoglucose production is capped by production quotas, and represents only 3% of EU starch output. Because these two major end-uses are relatively small starch consumers in the Community, the share of the native and modified starches in total output is very much greater than in the US, at 53% of the total. As a result of substantial exports, its share of domestic sales is lower.

The share of other syrup-based starch products is also very much higher than in the US, at 43%. However, as we shall see in the next section of this chapter, the high shares of these latter two categories arise primarily because the overall EU per capita output for starch products is much smaller than that in the US, and are not the result of

unusually high per capita production of native and modified starches or of syrup-based starch products in the Community.

The data in Table 1.2 indicate that the combined absolute tonnages of EU production of native and modified starches and of syrup-based starch products are somewhat larger than the corresponding quantities in the US.

Table 1.2: Starch Output by Product in the EU and US, 2000 (million tons, starch content)

	US	EU
Ethanol	10.1	0.1
Isoglucose/HFCS	8.0	0.3
Other Syrup-Based Starch Products	3.2	3.6
Native & Modified Starches	3.6	4.5
Total	**24.9**	**8.4**

Source: USDA, EU Commission (DG AGRI, Unit C2), AAC, LMC estimates based on Internal Data.

Diagram 1.2: Composition of US Starch Production, 2000
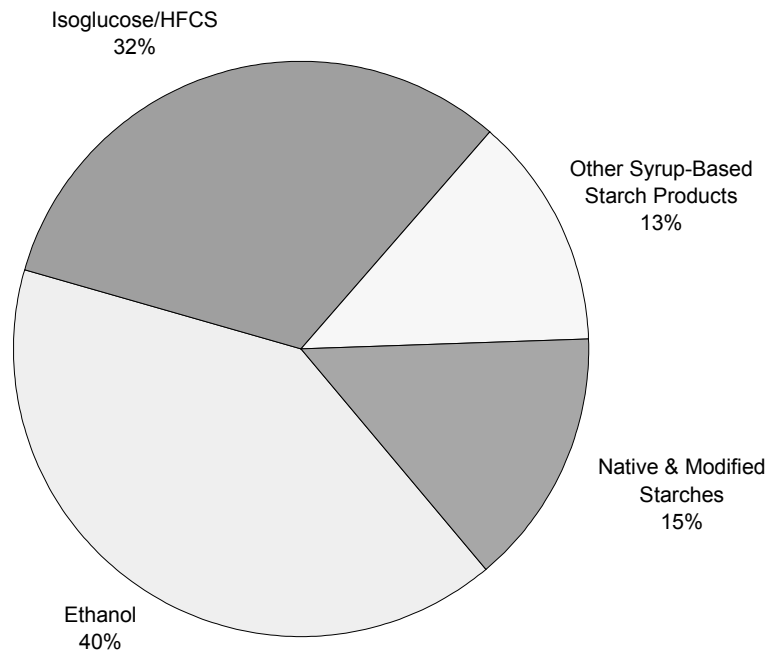
Source: USDA, LMC estimates based on Internal Data.

Diagram 1.3: Composition of EU Starch Production, 2000
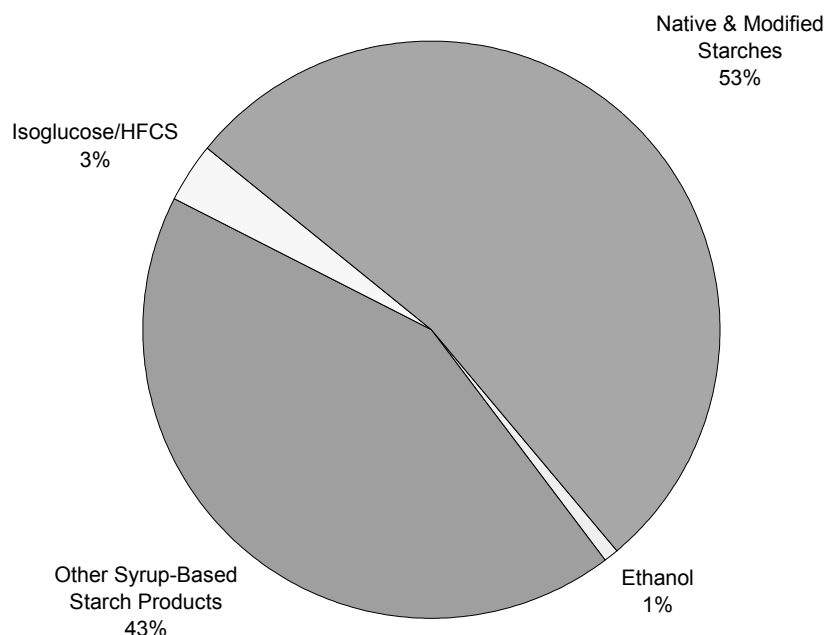
Source: EU Commission (DG AGRI, Unit C2), AAC, LMC estimates based on internal data.

PER CAPITA DEMAND FOR STARCH PRODUCTS

Diagrams 1.4 to 1.5 compare per capita demand in the Community with that in four major starch consuming countries: the two main high income starch using economies, the US and Japan, and the two most populous developing countries, China and India. The worldwide per capita consumption level is given for comparison.

(Throughout this report, the definition of domestic demand that is adopted is one that includes within it the consumption of starch derivatives in the manufacture of more highly processed products, such as organic chemicals, that are subsequently exported. Thus, the exportation of processed starch-containing products is considered to represent starch consumption within the country that produces the processed end-product. This convention corresponds to the normal practice in most countries' statistics. In the Community, however, the exportation of starch-containing products, such as the so-called non-Annex I products, described in Chapter 3, is often considered to represent overseas consumption.)

Since some of the data are difficult to obtain in a disaggregated form, starch demand has been divided into just two main classes of starch products: dry starches (which are defined to include native and modified starches, as well as dry sweeteners, notably crystalline dextrose, crystalline fructose, glucose solids and maltodextrins) and syrups (primarily isoglucose and glucose syrups, but also including liquid sorbitol)[1]. Diagram 1.6 combines the two categories to derive overall per capita starch demand.

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[1] Note that these categories are not divided neatly into the classes listed in Table 1.2. This reflects the considerable constraints imposed by the form in which the international data are published.

The US has the highest per capita demand in every category, and Japan is second to the US and slightly ahead of the EU overall, in part because it is the world's second largest HFCS/isoglucose producer, although the EU has a slightly higher per capita demand for syrups overall. All three of these markets are far ahead of China and India in their per capita consumption levels.

Table 1.3 presents the data used to prepare the three diagrams. The EU has 3.6 times the worldwide average per capita demand for dry starch products, 1.8 times the average for syrups, and 2.4 times the average for starch products as a whole. EU per capita demand is divided fairly evenly between the dry starches and the syrups.

Table 1.3: Per Capita Demand for Starch Products in Major Markets, 2000 (kgs per annum)

	Starch	Syrups	Total
US	12.6	74.8	87.3
Japan	10.4	10.0	20.5
EU	9.4	10.4	19.8
China	0.7	0.4	1.1
India	0.3	0.1	0.4
World Average	**2.6**	**5.8**	**8.4**

Source: USDA, Mitsui Japan, AAC, LMC estimates based on internal Data.

Diagram 1.4: Per Capita Demand for Dry Starch Products, 2000
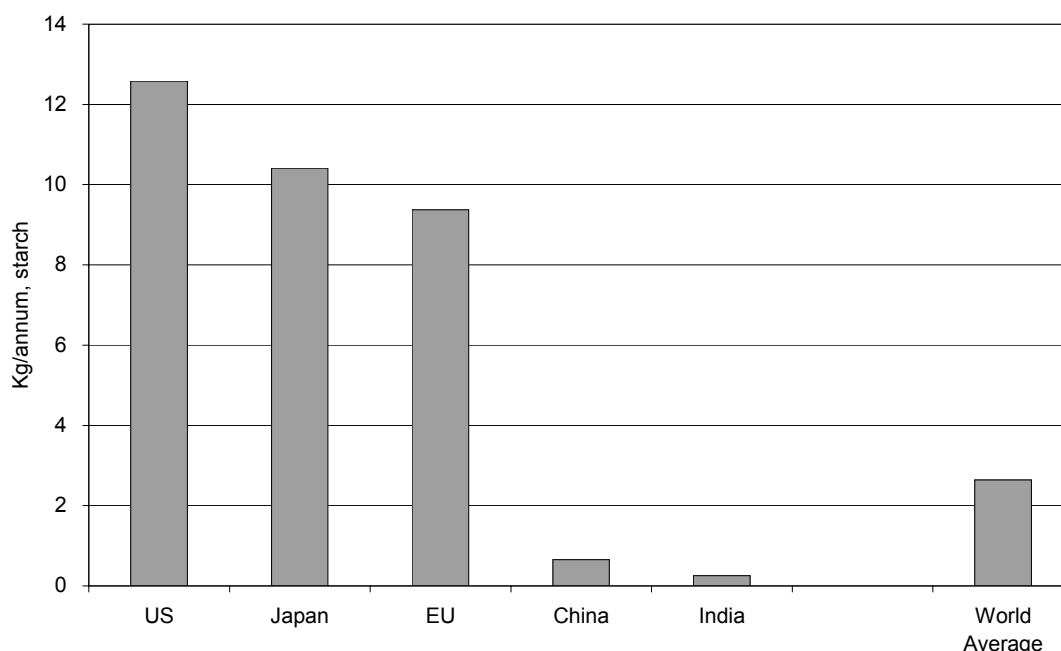
Source: USDA, Mitsui Japan, AAC, LMC estimates based on Internal Data.

Diagram 1.5: Per Capita Demand for Starch Syrups, 2000
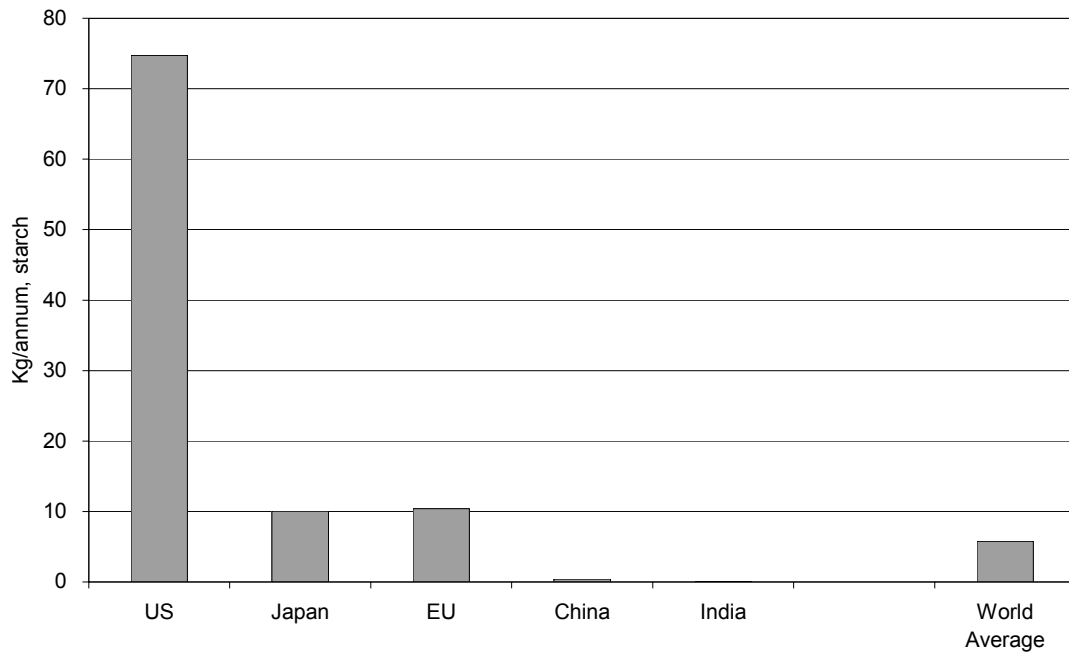
Source: USDA, Mitsui Japan, AAC, LMC estimates based on Internal Data.

Diagram 1.6: Total Per Capita Demand for Starch Products, 2000
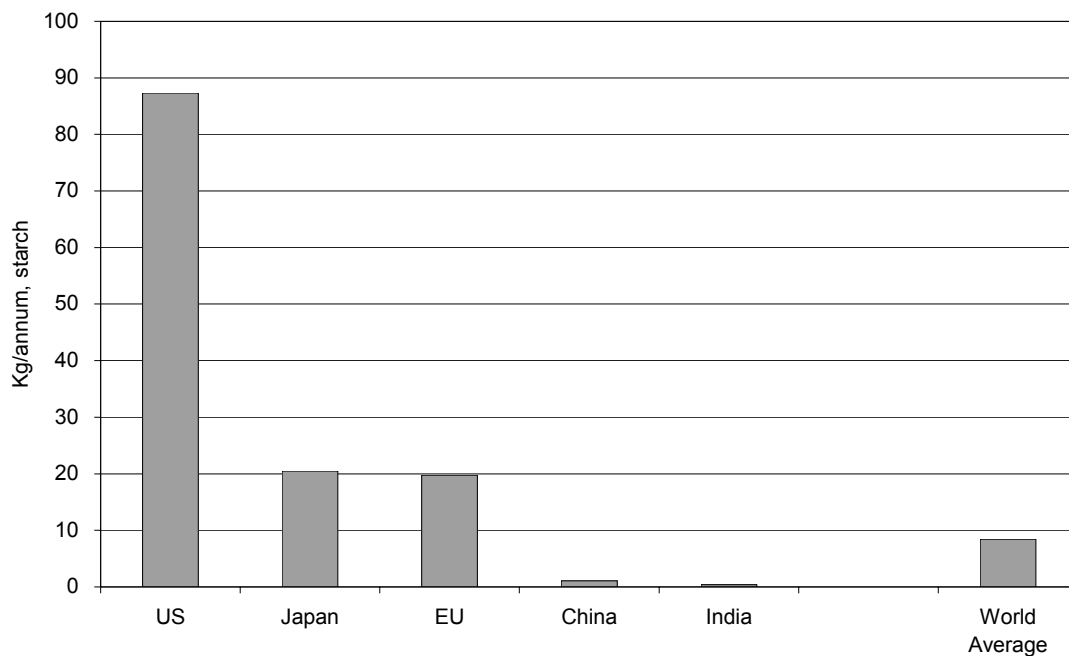
Source: USDA, Mitsui Japan, AAC, LMC estimates based on Internal Data.

THE GROWTH IN STARCH PRODUCT DEMAND, 1995-2000

The starch sector is one in which demand has historically grown at a rate that compares favourably with that of many other agriculturally based products. Diagrams 1.7 to 1.9 compare the demand for dry starch products, syrups and total starch products for the US, EU, Japan and the Rest of the World in 1995 and 2000. The underlying data are provided in Table 1.4.

As in the preceding set of diagrams and the associated table, dry starches include native and modified starches, as well as dry sweeteners, notably crystalline dextrose, crystalline fructose, glucose solids and maltodextrins. Syrups are defined to cover all starch derivatives sold in a liquid form, and thus consist primarily of isoglucose and glucose syrups, as well as liquid sorbitol.

Overall demand for starch products grew at an annual rate of 4.1% for the US, at 4.3% per annum in EU and by 4.0% in the category entitled Rest of the World. Japanese demand expanded by 1.9% per annum. As a result, the world total rose at an average rate of 4.0%.

Demand for syrups grew more rapidly than that for dry starches worldwide, under the lead of the US. The EU has a higher share of the world market in the less dynamic segment of the industry, the dry products, and its proportion of the world market for dry starch products increased from 20.9% to 23.1% between 1995 and 2000. For syrups, however, its share dipped from 12.2% to 11.7% over the same period. For starches as a whole, the EU share rose from 15.0% to 15.3%.

Diagram 1.7: World Demand for Dry Starch Products, 1995 and 2000
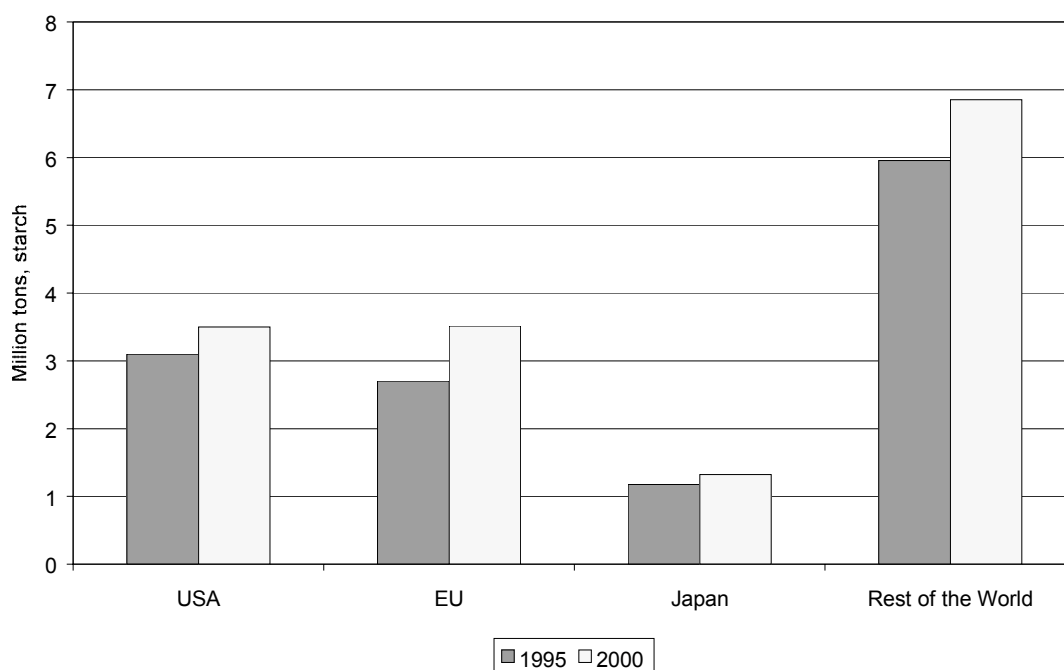
Source: USDA, Mitsui Japan, AAC, LMC estimates based on Internal Data.

Diagram 1.8: World Demand for Starch Syrups, 1995 and 2000
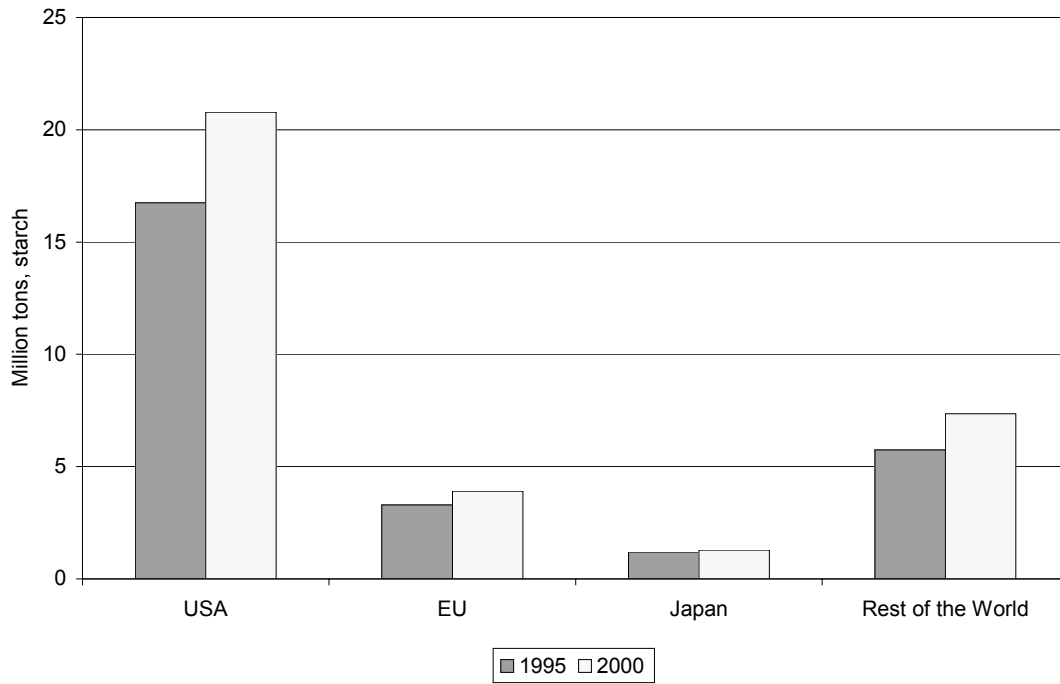
Source: USDA, Mitsui Japan, AAC, LMC estimates based on Internal Data.

Diagram 1.9: Total World Demand for Starch Products, 1995 and 2000
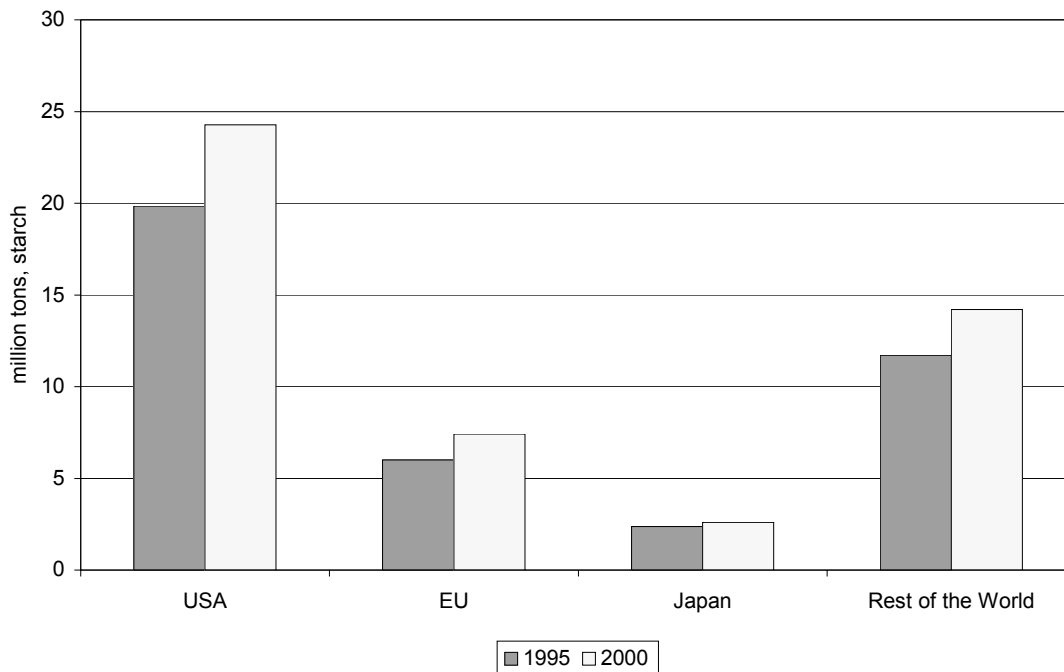
Source: USDA, Mitsui Japan, AAC, LMC estimates based on Internal Data.

Table 1.4: Composition of World Starch Demand, 1995 and 2000 (million tons)

	USA	EU	Japan	Rest of the World	**Total**	*EU Share*
1995						
Dry Starch Products	3.1	2.7	1.2	6.0	**12.9**	*20.9%*
Syrups	16.7	3.3	1.2	5.7	**27.0**	*12.2%*
Total	19.8	6.0	2.4	11.7	**39.9**	*15.0%*
2000						
Dry Starch Products	3.5	3.5	1.3	6.9	**15.2**	*23.1%*
Syrups	20.8	3.9	1.3	7.4	**33.3**	*11.7%*
Total	24.3	7.4	2.6	14.2	**48.5**	*15.3%*

Source: USDA, Mitsui Japan, AAC, LMC Internal Database.

A detailed breakdown of the allocation of EU domestic starch sales by raw material and type of starch product is given in Tables A2.28-A2.30 in the Appendix to Chapter 2.

FOREIGN TRADE

The share of foreign trade in total output is comparatively low for the main starch products: native and modified starches, as well as glucose and isoglucose syrups. In the case of the syrups, the reason is simple; exporting syrups implies exporting a liquid product, which contains a significant amount of water, which raises the unit transport costs per ton of dry matter. In addition, syrups require careful packaging and handling, to avoid fermentation or crystallisation from occurring en route. Consequently, the vast majority of cross-border trade in glucose and isoglucose syrups occurs across land frontiers between neighbouring countries.

The largest single trade routes for syrups involve the United States. These are the two-way flows that take place between Canada and the United States, and the flow from the US to Mexico. The only other important trade flow in syrups is that between Argentina and its immediate neighbours. Within Europe, other than between Member States, the main flow is between the EU and neighbouring Eastern European countries.

For native and modified starches, the trade obstacles created by the danger of deterioration during transportation are much less than for liquids. However, the low unit value of native starches, and the high duties often imposed on these products by the main importing countries, might be expected to act as a deterrent to large scale trade flows, since transport costs are relatively high as a proportion of the products' value.

Table 1.5 reveals that, for the EU, the export volumes of modified starches (based upon data from the official COMEXT trade statistics) are slightly below those of native starches, while glucose and isoglucose shipments are little more than 14% of total export tonnages. Using official trade statistics for all major exporting countries, it emerges that the EU supplied around 32% of world native starch exports in 2000, placing it as the leading supplier of these starches to the world market in competition with Thailand. In contrast, the EU exports around 13% of the total glucose and isoglucose export volumes, but it provided over one third of the world's exports of modified starches in the same year.

Combined US exports of native and modified starches are less than 40% of those of the EU, even though it is a leading producer of modified starches and has a native and

modified starch industry that is similar in size to that of the EU. Most US exports are in the form of starch syrups. A further marked structural difference between the patterns of US and EU foreign trade in starches arises in their imports. In 2000, the US imported around 150,000 tons of native starches, as against only 20,000 tons imported into the EU.

The largest export volumes of starch after those exported by the EU and the US consist of sales of cassava starch, predominantly from Thailand. In 2000, total exports of native and modified cassava starch from Thailand were close to one million tons. Most of this is destined for other Asian countries, and large quantities are consumed in the Japanese paper industry. The EU and the US each import in the region of 30,000 tons per annum of tapioca starch from Thailand.

Table 1.5: Exports of the Main Starch Products, 2000 ('000 tons)

	EU	US	Others	Total
Native Starches	461	153	824	**1,438**
Maize	109	89	25	**222**
Wheat	34	33	19	**85**
Potato	319	3	31	**353**
Cassava	0	0	746	**746**
Other	0	28	3	**31**
Modified Starches	407	176	600	1,182
Glucose and Isoglucose	144	534	400	1,079
Sum of These Categories	**1,013**	**863**	**1,824**	**3,699**

Source: Official national foreign trade statistics; LMC Internal Database.

It should be stressed that the EU data in Table 1.5 are based on the official national foreign trade statistics of the member states. The reported export tonnages are considerably lower than those recorded in export licences. Furthermore, the statistics take no account of the substantial tonnages of starch contained in processed products, notably the non-Annex I products, which are exported, often with the benefit of starch export refunds. However, as we noted above, we decided to use the data from the national statistics in this chapter, in order to ensure consistency in approach when we compare EU volumes with the exports of the US and other countries for which we use the official national foreign trade data as well.

THE OUTLOOK FOR STARCH DEMAND

It is expected that the significant growth experienced in starch demand and starch production during the 1990s will continue during the next decade. If growth continues to follow past trends, the total world output of dry starches will be close to 59 million tons by 2005 and more than 71 million tons by 2010 (see Diagram 1.10).

The absolute growth in the demand for syrups will be 3.5 times bigger than that for dry starches. By 2005, we project that, led by strong increases in fuel ethanol use, starch demand in the US, by far the largest consumer of syrups, will be in the region of 30 million tons and by 2010, it would be approximately 37 million tons.

In the Community, too, we expect that the demand for syrups will grow more rapidly than that for dry starches, in view of the increasing demand from the food, beverage and fermentation sectors. The average growth in the two market segments is projected to be 3.2% and 2.6% per annum, respectively. This would lift total demand for starch in sweeteners in 2010 to 5.3 million tons, and for dry starches to 4.5 million.

Diagram 1.10: Forecasts of World Starch Demand
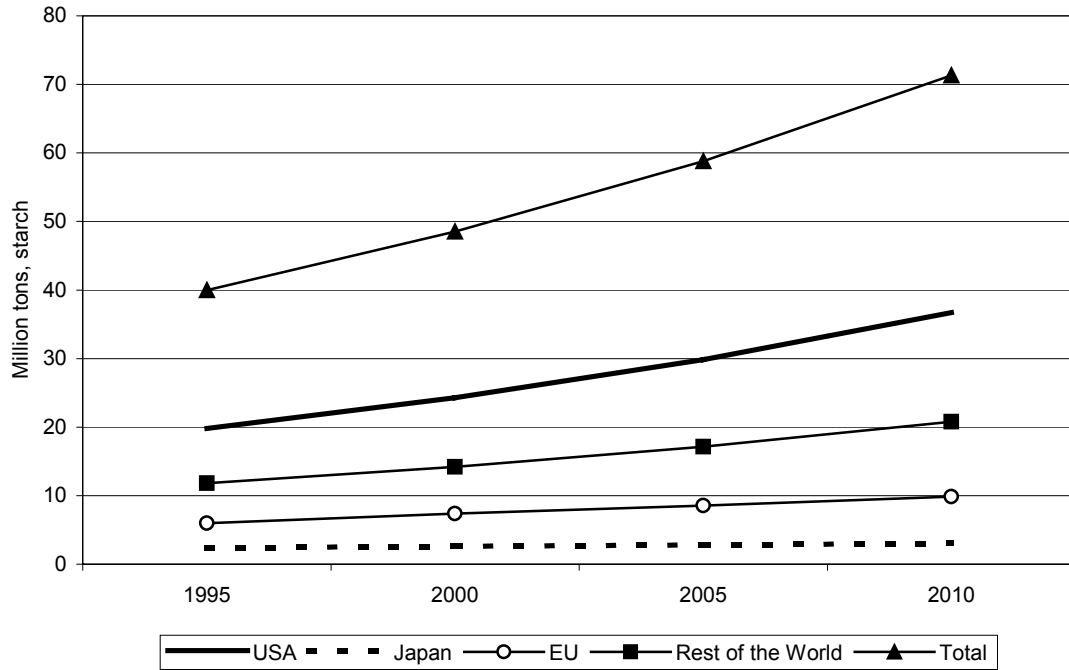
Source: LMC Estimates

Chapter 2: Community Markets for Starch

In this chapter we review the Community markets for starch and starch products. We begin by describing the domestic starch processing industry, in terms of its choice of base products, its capacities and its distribution by country. We then turn to the growth in the production of starch since 1992, and highlight the different trends in the output derived from the three main raw materials: maize, wheat and potatoes.

The distribution of starch factories among Community member states is described, both by country and by raw material. The competitiveness of alternative raw materials for starch production is examined in the next section of the chapter, contrasting the EU with the US. The chapter ends with a consideration of the range of starch products produced by the sector and their main end-users among industrial customers.

THE QUALITY OF THE STATISTICS RELATING TO THE STARCH SECTOR

A general comment to be made in the context of this chapter, but one that applies throughout this Evaluation, is the surprising lack of transparency about many aspects of the statistics regarding the sector. Estimates of starch production and consumption differ, often significantly, from one industry source to another. Part of the problem arises because, as noted in Chapter 1, there are three alternative measures of foreign trade in starch products that are commonly used in discussions. One is the official data published by COMEXT, based upon the trade statistics collected by individual member states; a second is the larger volumes of export data compiled on the basis of export licences, the difference between these two measures being that national statistical agencies often suppress export data if they believe it may give away commercially sensitive information about individual companies. The third measure is one that includes indirect exports of starch in fairly highly processed so-called products of second processing, for which estimates may be derived from the starch tonnages covered by non-Annex I export refunds (explained in Chapter 3).

The complexity of the sector has also made obtaining detailed information about starch processing unusually difficult. Some aspects of its operations are regulated by the Commission; for example, both isoglucose and potato starch production are subject to production quotas. Some sales to the domestic market are followed officially if they receive starch production refunds; while export sales tend to be closely monitored via the systems of export licences and export refunds. However, it occasionally proved surprisingly hard to obtain some of the basic official data that would have been useful to ensure that consistent coverage of the sector extended over the entire period covered by the Evaluation, since 1992, and some official data were only obtained as the final report was being prepared.

Some of the difficulties in data collection arise because there are significant segments of starch activity that are not specifically monitored by the Commission. Apart from the special case of isoglucose, domestic sales of starch products that do not receive production refunds are not reported to the Commission. Therefore, this gap in information obliges one to rely upon estimates derived from industry informants who, for good commercial reasons, do not always want to divulge too many details.

Maybe the most surprising lacunae in data availability concern the potato starch sector. The measures applied to this particular sector are among the most important in policy terms, from the point of view of this Evaluation, yet, consistent historical production statistics for individual member states are not available all the way back to 1992.

Furthermore, other than on a piecemeal basis, from individual starch processing companies, there are no series giving data by member state, or for the Community as a whole, on starch potato areas, outputs and yields on a comprehensive basis for any year. Since one of the important issues that arises in an Evaluation of measures in the starch potato sector is an estimate of the opportunity cost, both for the farmer and for the Community, of starch potato production, in terms of alternative opportunities for farmers in other agricultural activities, the absence of such information is of concern.

STARCH PROCESSING CAPACITY BY RAW MATERIAL

The EU starch industry is, as has already been noted in Chapter 1, more widely diversified in its raw material sources than other starch industries elsewhere. Table 2.1 presents estimates of the distribution of processing capacity by raw material from 1992 to 2001. The data are presented in terms of the starch derived from the raw materials, and cover the current Community of 15 member states for the entire period.

The figures have been prepared on the basis of data provided by cereal and potato starch industry organisations. However, it should be noted that all capacity estimates are subject to a margin of error over the assumptions made about the number of hours of operation each year and the rating of individual factory capacities.

As the Appendix to Chapter 1 explained, potatoes contain the lowest recoverable starch content (of around 17% in dry matter) the remainder being mostly water. Maize, with an assumed average recoverable starch content of 62.5% in the technical coefficients applied to the management of the policy in the sector, has the highest starch content and wheat has an assumed starch content of 50% in terms of its technical coefficient. However, the use of agricultural raw materials for starch production in the European Union is actually largest for potatoes. An estimated 8.3 million tons of starch potatoes were processed into starch in the Community in 2000, which compares with an estimated 6.2 million tons of maize and 5.5 million tons of wheat.

Table 2.1: EU Starch Production Capacity by Raw Material, 1992-2001 (million tons, starch)

	Maize	Wheat	Potatoes	**Total**
1992	3.6	1.4	1.5	**6.5**
1993	3.6	1.4	1.7	**6.6**
1994	3.6	1.4	1.7	**6.7**
1995	3.8	1.8	1.8	**7.4**
1996	3.8	2.0	1.9	**7.7**
1997	3.9	2.1	1.9	**8.0**
1998	3.9	2.5	1.9	**8.4**
1999	3.8	2.7	1.9	**8.4**
2000	4.0	2.9	1.9	**8.8**
2001	4.0	3.0	1.9	**8.9**

Notes: The wheat figure includes other cereals, such as oats, barley and rice.
The figures refer to the current Community of 15 member states throughout the period.

Source: AAC, AGPM, UFE and LMC Internal Database.

The period until 1996 was characterised by a significant expansion in potato starch capacity, as East German factories benefited from modernisation and companies completed their capacity expansions before potato starch production quotas were introduced in 1995/96. In all, potato starch production capacity may have increased by 30% between 1991 and 1996. Since then, some factories have closed, but total capacity is estimated to have been maintained, despite the reduction of over 5% in the production quotas between 1999/2000 and 2001/02.

Maize starch production capacity has barely changed since 1995, after a modest expansion in the early 1990s. There has been some switching of former maize processing capacity to wheat, but this has occurred alongside a number of expansions in the capacities of established maize milling plants.

The most striking growth has been that in wheat starch production capacity. Not only have former maize factories switched their raw materials, but also several new wheat starch processing plants have been built, most notably in France and Germany. The total increase in wheat starch capacity between 1992 and 2001 has been in excess of 100%. (It should be noted that the figures in Tables 2.1 and 2.2 include the capacities in Finland and Sweden for the production of oat and barley starch, and in Belgium for rice starch, which together total approximately 70,000 tons per annum of starch.)

Diagram 2.1 depicts the trends in the percentage distribution of starch production capacity by raw material (where the wheat figures also include the minor raw materials, namely oat, barley and rice). The features to note are the decline in the maize share, which dropped below 50% after 1995; the initial rise in the potato share, until the imposition of production quotas, followed by a subsequent decline; and the growth in the wheat share of the total.

Diagram 2.1: Distribution of EU Starch Production Capacity by Raw Material, 1992-2001
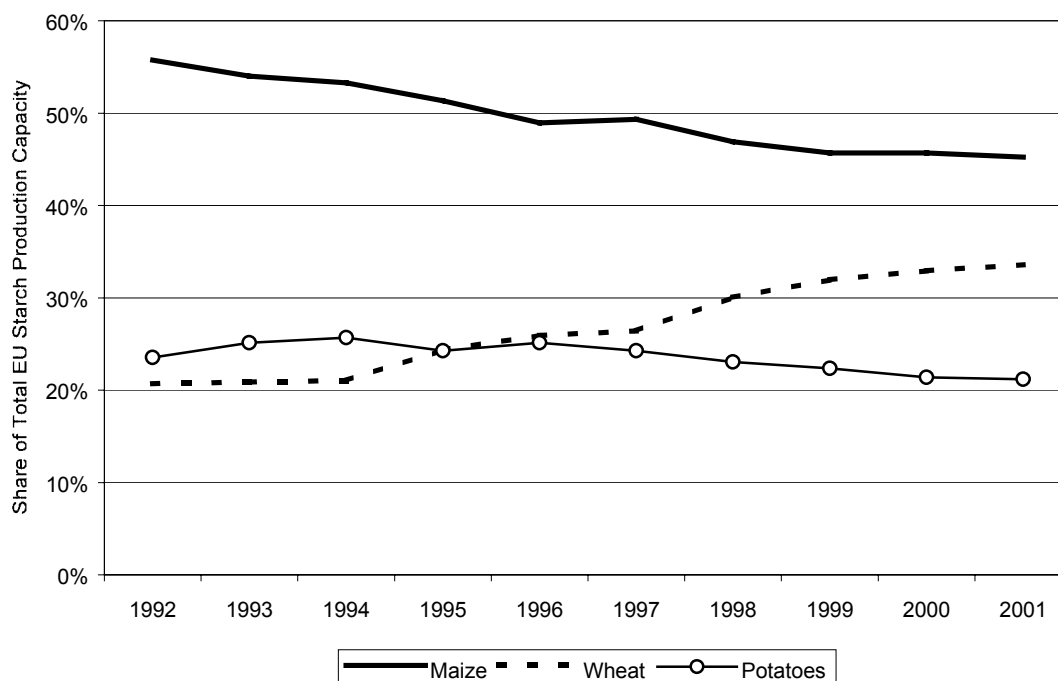
Source: LMC calculations based on internal data.

The precise output of the EU starch industry is surprisingly hard to verify, since, as already noted, official data only monitor those elements of starch production that are regulated by the Commission, namely the production of isoglucose, the tonnages covered by production and export refunds, as well as the volumes produced within the potato starch quota. This excludes all of the starch production that is not eligible for such refunds and is not governed by isoglucose or potato starch production quotas, notably the output of glucose syrups that are destined for use in a wide range of domestic food and beverage products.

A particular area of uncertainty about production volumes concerns the production of glucose syrups that contain less than 10% fructose. These are not regulated under the Isoglucose Regime, but are often blended with higher fructose syrups (such as high fructose inulin syrup, isoglucose and solutions prepared from imported crystalline fructose) to derive syrups with 20% to 30% fructose, which find customers in the beverage sector, in particular.

Another respect in which the production estimates are somewhat hazy is in the case of potato starch, since there is some production that occurs outside the quotas, as well as possible under-recording of the actual starch output that is produced within the framework of the quotas themselves, by virtue of the payment scale that is applied to individual deliveries of starch potatoes to processing factories.

The non-quota production is derived from the recovery of starch from the effluent from potato processing: for the manufacture of frozen chips, for example. However, the indications are that the volumes of starch produced from this source are minor; the estimates that were obtained during the course of this study were that the output of such non-quota potato starch is no more than 10,000-20,000 tons.

These tonnages are not entitled to receive the starch premium (of €22.25 per ton) paid to all processors of potato starch within the quota, and their suppliers of potatoes are not paid the minimum price and direct payments that growers of starch potatoes receive within the framework of the quotas. Users of this non-quota potato starch are not intended to receive production or export refunds on their purchases of such starch, but it would be administratively very complex to ensure that they do not do so at all.

A more significant degree of under-recording occurs, we believe, in recorded potato starch output [1] within the quotas as a result of the workings of the payment scale (the *barème féculier*). The regulations governing the payment to growers for the delivery of starch potatoes also determine the starch output that is computed as being produced from these potatoes.

During the course of the answers to the Questions later in this Evaluation, we present evidence that these formulae under-state the actual final output of potato starch that is obtained from processing potatoes within the framework of the potato starch production quotas. People interviewed during the course of the present Evaluation estimated that such under-statements amount to as much as 100,000 tons, and possibly 150,000 tons of potato starch per annum. This tonnage corresponds to output permitted within the quota, but not recorded officially as quota production, and, for this reason, not included in the overall Community statistics for starch production. Furthermore, since starch consumption is calculated as starch production *minus* net exports of starch, the under-statement also applies to estimates of EU starch use.

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[1] This is discussed in the detailed answer to Question 2.1, later in this report.

This subtle distinction between reported production within the quota and the actual output of starch from quota potatoes requires some explanation. Starch potato farmers receive no additional payment of any sort for the potatoes that generate this extra, unrecorded output; it is merely that the processors are able to extract more starch than is assumed in the payment scale. Also, this additional starch yields no extra starch premium payments for the processors, since the premium payments, like the payments for the potatoes themselves, are based upon the *barème féculier*. However, the processors are free to sell this starch domestically or for export, exactly like all other starch output within the quota, and users receive production or export refunds in just the same way as they do with production within the officially published quota tonnages.

THE PRODUCTION OF STARCH BY RAW MATERIAL

Table 2.2 presents estimates of the growth in starch output by raw material since 1992, updating Commission estimates of production, published in various issues of *Agricultural Situation in the Community*, and adapting those figures to take account of the production in Austria, Finland and Sweden prior to 1995, as well as final official production data for potato starch under quota.

The table reveals that maize starch production has not moved outside a narrow range between 3.4 million and 3.9 million tons during the period from 1992 to 2001. Potato starch output has been somewhat erratic, because of climatic influences, but can be seen to have peaked immediately after the imposition of production quotas, which first affected the 1995/96 marketing year.

The most striking change in Community starch production since 1992 has been the increase in the volume of wheat starch output (which also includes the small contribution from the minor Community starches). It more than doubled between 1992 and 2001, as the cost competitiveness of wheat as a starch raw material was increasingly recognised by processors in the main wheat-growing regions of the Community. Some existing maize processing capacity switched to wheat as a raw material and substantial investments were made in green-field plants.

Table 2.2: EU Starch Output by Raw Material, 1992-2001 (million tons, native starch)

	Maize	Wheat	Potatoes	**Total**
1990	3.2	1.1	1.1	**5.4**
1991	3.5	1.2	1.2	**5.9**
1992	3.5	1.3	1.5	**6.3**
1993	3.4	1.3	1.6	**6.3**
1994	3.4	1.5	1.3	**6.1**
1995	3.6	1.7	1.6	**6.9**
1996	3.6	1.8	1.9	**7.2**
1997	3.7	1.9	1.9	**7.5**
1998	3.8	2.2	1.7	**7.6**
1999	3.7	2.5	1.8	**8.0**
2000	3.9	2.8	1.8	**8.4**
2001	3.9	2.8	1.7	**8.4**

Notes: The wheat figure includes other cereals, such as oats, barley and rice.
The figures refer to the current Community of 15 member states throughout the period.

Source: AAC, AGPM, UFE and LMC Internal Database.

The starch sector's demand for cereals is modest compared with total Community production, which totalled 97 million tons of common wheat and 37 million tons of maize in the marketing year 1999/2000. The sector consumed 5.5-5.6 million tons of wheat in 2000 and 2001, which represented only 5-6% of wheat output, and 6.25 million tons of maize in both years or 16-17% of maize production. While the starch industry's use of cereals is small compared to other uses such as in animal feed, it is nevertheless a value adding use of these agricultural commodities. In addition, the starch industry uses more than eight million tons of starch potatoes, and for these potatoes, there are essentially no other outlets, since they are not suitable for edible or other purposes.

It is valuable to compare the starch sector's demand for base products with the Community's net trade position in the same products, to determine whether the derived demand, at the margin, uses surplus output that would otherwise be exported or sucks in imports. This is not relevant for starch potatoes, but is important for cereals.

Table 2.3 lists the net imports (treating net exports as negative net imports) of maize and wheat into the EU since the 1991/92 marketing year. For wheat, the situation is unambiguous: the derived demand for wheat for starch processing reduces the large export surplus. For maize, the situation is less clear-cut. Back in the mid-1980s, at the time of Spanish and Portuguese accession, the Community was a large net importer of maize. Since 1991/92, it has been, on average, a small net importer[2]. Since the domestic demand for maize for starch processing has been well in excess of five million tons over this period, there can be no doubt without the starch sector's demand for maize for processing, the EU would have been a sizeable structural net exporter of maize in the 1990s.

Table 2.3: Net Imports of Maize and Wheat into the EU, 1991/92-1998/99 (million tons)

	Maize	Wheat
1991/92	2.4	-18.2
1992/93	-1.2	-19.0
1993/94	-1.0	-18.0
1994/95	0.5	-14.4
1995/96	2.5	-10.7
1996/97	1.5	-17.1
1997/98	0.3	-12.7
1998/99	1.5	-12.6

Notes: The figures refer to the Community of 12 member states prior to 1994/95. Negative numbers represent net exports.

Source: Agricultural Situation in the Community, various annual issues.

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[2] The commitment, under the Blair House Accord, to import an annual two million tons of maize and other feed ingredients to compensate the US for the loss of markets following Spain's accession to the Community complicated the position, in the sense that normal Community supply, if one includes the Blair House commitments within the total, should be considered to be almost two million tons higher than production. If this were excluded from the import volume, the EU would be transformed into a net exporter of maize in virtually every year.

THE DISTRIBUTION OF STARCH FACTORIES AMONG MEMBER STATES

Table 2.4: Number of Plants Producing Native Starches in the Community, 2001

	Maize	Maize and Wheat	Potatoes	Wheat, Oats and Barley	Rice	Total
Austria	1	-	1	-	-	**2**
Belgium	-	-	-	1	1	**2**
Denmark	-	-	4	-	-	**4**
Finland	-	-	3	3	-	**6**
France	2	2	3	2	-	**9**
Germany	2	-	8	6	-	**16**
Greece	1	-	-	-	-	**1**
Italy	2	-	-	2	-	**4**
Netherlands	1	2	2	1	-	**6**
Portugal	1	-	-	-	-	**1**
Spain	3	-	-	-	-	**3**
Sweden	-	-	4	3	-	**7**
UK	2	-	-	3	-	**5**
Total	**15**	**4**	**25**	**21**	**1**	**66**

Sources: AGPM, USIPA, UFE, LMC Internal Data.

Table 2.4 describes the distribution of the Community's native starch factories within the member states of the Union. Germany and France have the largest number of factories of all, followed by Sweden and the Netherlands. In all, there are 66 individual starch production plants within the EU[3]. Starch products are produced in 13 of the 15 Member States. Only Ireland and Luxembourg have no industrial starch plants.

The total number of factories has declined since 1992. Some small factories have been closed or rationalised with others, for example, in Eastern Germany, and the new factories that have been built are large in scale and relatively few. Therefore, the average capacity of the surviving plants has increased in all segments (i.e., potato, maize and wheat).

Most of the starch factories are dedicated to a single raw material, but there is an important minority that processes more than one raw material into starch. Diagram 2.2 presents the percentage distribution of starch factories by their base products. It reveals that dedicated potato factories are still the most numerous, with dedicated maize and wheat plants similar in number to one another. The "mixed and others" category, which includes oat, barley and rice starch factories, in addition to those which process more than one raw material, are also still important in number.

It is informative to contrast Diagrams 2.2 and 2.1. Potatoes account for only 21% of total starch processing capacities in member states, as against 37% of the number of

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[3] The number of starch factories that we calculated is significantly lower than the number stated in the report on the production and export refunds for starch products, published by the European Court of Auditors in August 2001. We believe the difference arises because the Court included in their calculations some plants that modify native starches, but do not actually manufacture native starches. As a result, they state that there are 75 starch production plants instead of the 66 indicated in Table 2.4. Furthermore, the report mentions that there are only 23 potato starch production plants. However, the national data that we obtained during the course of this study indicate that there are currently 25 potato starch plants in the European Union.

processing plants. By contrast, dedicated maize starch factories represent only 23% of the overall factory numbers, but 45% of the reported starch capacity; while wheat accounts for 34% of total capacity, as against 26% of the number of plants (counting only the ones dedicated to wheat processing). 14% of plants are "mixed and others".

Diagram 2.2: Distribution of Factory Numbers by Raw Material, 2001
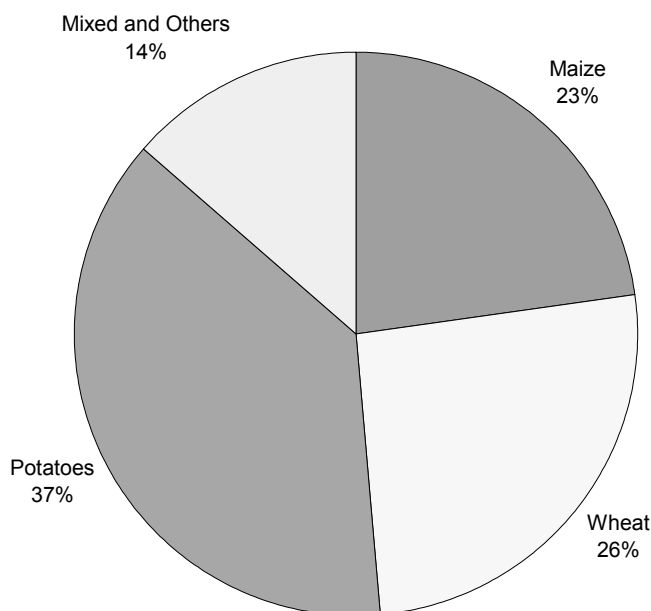
Source: AGPM, UFE, LMC Internal Data.

Data from the German Fachverband der Stärke-Industrie for 1997 implied that the average annual processing capacities of Germany's potato and maize starch factories were both in the region of 385-390,000 tons of raw material, while the average for wheat starch plants was 112,000 tons. When account is taken of the starch content of the different raw materials, the average annual starch production of German maize factories was approximately 270,000 tons, as against 80,000 for potato starch factories and only 65,000 for wheat starch plants. Germany has unusually many small wheat processors; in the Community as a whole, the expansions of recent years have caused the EU-wide average wheat capacity to be substantially larger than that in Germany.

These comparisons demonstrate that the typical maize starch factory is relatively large by EU standards, and should therefore be well placed to exploit economies of scale, although they are still well below the average scale of US corn wet milling plants, among whom several process more than one million tons per annum.

Domestic wheat starch factories are still, on average, smaller than maize processors, thanks to the continued existence of small plants in countries such as Germany. However, the new wheat starch facilities installed in France and Germany, in particular, include some that are similar in size to the larger EU maize plants, but they still lag behind the US industry.

The typical Community potato starch plant is relatively small, and that disadvantages that it faces from its inability to exploit economies of scale are reinforced by the restricted length of the processing season within which it has to hope to cover its fixed

costs. The latter factor is explicitly acknowledged within the payment scale established for starch potatoes, in the form of a 22.25 € per ton potato starch premium paid to processors. This premium was introduced to compensate potato starch producers for two disadvantages: their restricted processing campaigns and their lack of valuable by-products to moderate the cost of starch raw materials.

THE COMPETITIVENESS OF DIFFERENT STARCH RAW MATERIALS

The growth in wheat starch production has its origins in the cost-competitiveness of wheat as a raw material in the Community. Diagram 2.3 plots the net costs, after the deduction of by-product credits, of wheat, maize and starch potatoes as starch raw materials in the EU over the past decade.

Diagram 2.3: Comparing the Net Costs of Wheat, Maize and Starch Potatoes as Starch Raw Materials in the Community
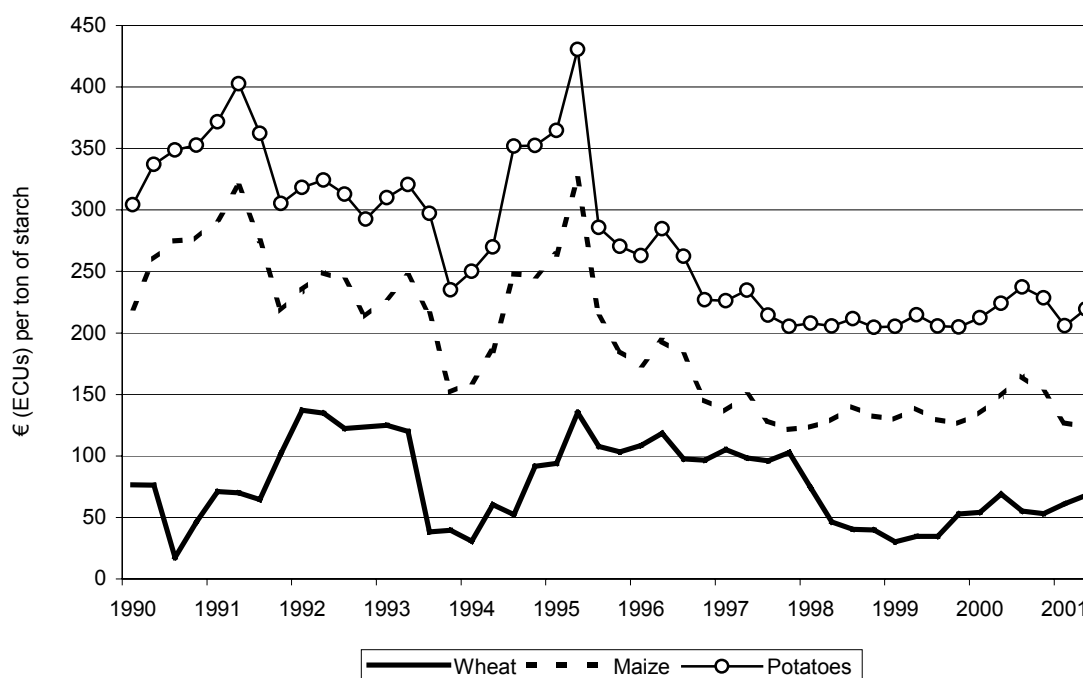
Source: LMC Internal Data.

The net EU raw material costs for the two cereals are computed as the domestic wholesale prices of the relevant cereal (Rotterdam in the case of maize and Rouen milling wheat) minus the credits earned from the relevant by-products (corn gluten feed, corn gluten meal and corn oil for maize, and wheat gluten, bran and wheat protein solubles for wheat), and are then expressed per ton of starch. The net starch potato costs are calculated assuming that the costs of starch potatoes to the processor are on average equal to the maize price, with an adjustment for the starch content of the two crops. The low value by-product feed from potato processing is then deducted.

The Rotterdam price is used for maize because of the port's pivotal role in the calculation of c.i.f. import prices, and because several maize starch factories are nearby. The Rouen wheat price has been chosen not only because this is a major delivery point for wheat, and features in the export refund calculations, but also because there are several large wheat starch plants within a fairly short distance.

It is evident that, within the Community, wheat has consistently been a more cost-competitive raw material than maize, although the gap has gradually narrowed. Because of their lack of valuable by-products, starch potatoes are the highest cost raw materials.

To a large degree, the wheat starch sector is competitive by virtue of its high by-product credits in relation to the cost of agricultural raw materials (Diagram 2.4). The three lines in the diagram measure wheat, maize and potato starch processing by-product credits as a proportion of the cost to the processor of wheat, maize or potatoes, respectively. The by-products taken into account are for wheat, wheat gluten, bran and wheat protein solubles; for maize, corn gluten feed, corn gluten meal and corn oil; and for starch potatoes the residual meal after processing.

Diagram 2.4: The Relative Importance of By-Product Credits in Wheat, Maize and Potato Starch Raw Material Costs in the EU
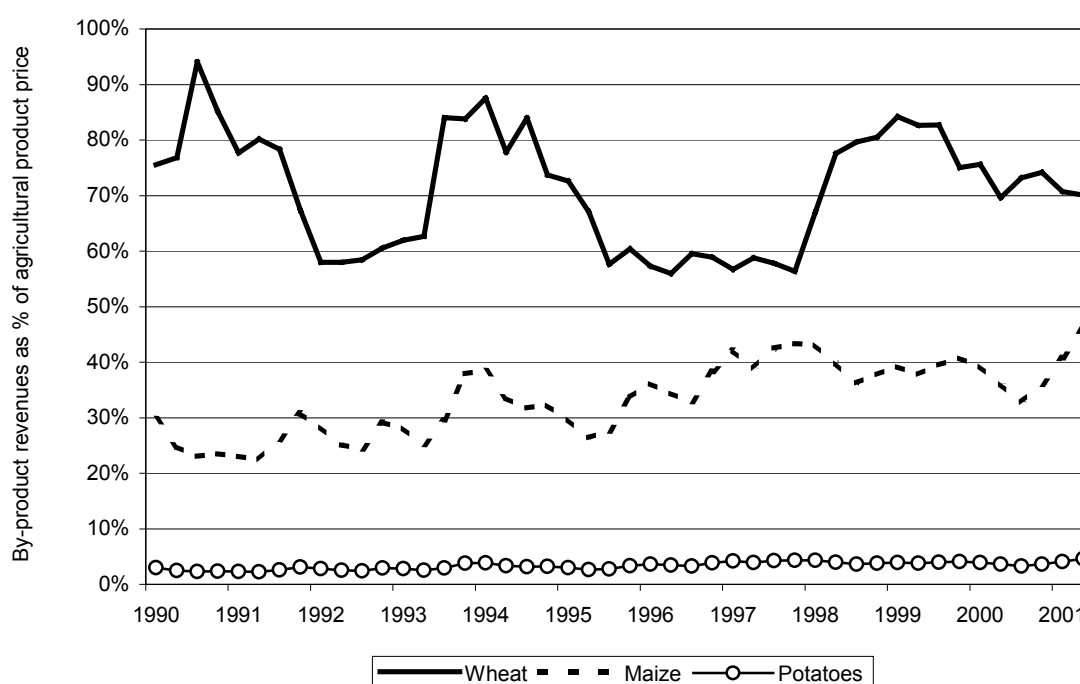
Source: LMC Internal Data.

THE OUTLETS FOR THE OUTPUT OF THE EU STARCH INDUSTRY

The main forms in which the EU industry produces its starch output is described in Table 2.5. Within a rising total, there have been some structural shifts in production. The Appendix to this chapter presents details of the composition of production and sales. Tables A2.1-A2.12 provide a breakdown of the tonnages that have received production refunds; A2.13-A2.27 summarise the tonnages that have received export licences; and Tables A2.28-A2.30 present estimates of the outlets for each starch.

All segments have grown, but growth has been fastest in the output of modified starches, and was also substantial in the case of sweeteners (which includes all syrups, whether or not they are ultimately used as sweeteners; for example, they include high dextrose starch hydrolysates that are the fermentation substrate for a variety of organic chemicals).

Table 2.5: Community Starch Output by Type of Product, 1992-2000 (million tons)

	Total	Native Starches	Modified Starches	Sweeteners
1992	**6.3**	2.0	1.2	3.1
1993	**6.3**	1.9	1.2	3.1
1994	**6.1**	1.7	1.2	3.2
1995	**6.9**	2.2	1.3	3.4
1996	**7.2**	2.0	1.6	3.7
1997	**7.5**	2.0	1.6	3.8
1998	**7.6**	2.0	1.6	3.9
1999	**8.0**	2.3	1.8	3.9
2000	**8.5**	2.5	1.9	4.0

Note: All quantities are measured in native starch equivalents.

Sources: LMC estimates based partly upon AAC and European Commission data (DG AGRI, Unit C2).

FOREIGN TRADE

Some of the Community's starch production is exported. Table 2.6 covers only modified starches and basic Annex 1 starch products (native starches, glucose syrups and maltodextrins) that receive export refunds. Between 1992 and 2000, the exports of native maize starch have fallen, while those of potato starch, glucose and modified starch have risen. Overall, the growth in the reported export volumes has been small.

The data used as the basis for the table are the official COMEXT foreign trade statistics, to be consistent with the approach adopted in Chapter 1. It should be noted, therefore, that the volumes are lower than those implied by export licence returns, and do not include indirect exports of starch in more highly processed products. The discussion of Table A2.31 in the Appendix to this chapter considers the reasons for the differences between the two sets of export data; the most convincing explanation is the suppression by national authorities of trade data in order to protect the commercial confidentiality of local starch companies.

Table 2.6: EU Starch Product Exports by Type of Product, 1992-2000 (million tons)

Calendar year	Native Maize	Native Wheat	Native Potato	Modified Starch	Glucose & Maltodextrin	**Total Starch Equivalent**
1992	0.19	0.03	0.25	0.25	0.13	**0.88**
1993	0.16	0.03	0.25	0.27	0.08	**0.84**
1994	0.11	0.03	0.29	0.27	0.11	**0.86**
1995	0.08	0.03	0.30	0.30	0.09	**0.85**
1996	0.05	0.01	0.28	0.30	0.06	**0.75**
1997	0.08	0.02	0.30	0.34	0.11	**0.91**
1998	0.07	0.03	0.25	0.34	0.10	**0.84**
1999	0.11	0.03	0.29	0.38	0.11	**0.99**
2000	0.11	0.03	0.32	0.41	0.14	**1.08**

Notes: All individual quantities for starch products are measured in commercial weights; the final column is the only one that is measured in native starch equivalents.

The technical coefficients used for convert modified starches and glucose & maltodextrin into native starch equivalents are 1.17 and 1.00 respectively.

Source: COMEXT.

The total value of the sector's production of basic products and modified starches is currently in the region of €3 billion per annum, of which half is in the form of glucose products and a quarter each in the form of native and modified starches. Net exports of the same range of products earn the Community close to €400 million each year.

Once direct exports of starch products are subtracted from production, one derives the availability of these products for the domestic market, as is done in Table 2.7, where the domestic market is defined to include starch products incorporated into processed products that are finally exported from the Community. The volume of direct imports of starch products is small by comparison; it comprises the 15,000 tons of imports in 2000 of native cassava and other minor starches, not produced in the Community and imported mainly for special end-uses; as well as 44,000 tons of modified starches; and nearly 37,000 tons of glucose syrups.

Import Tariffs

Import tariffs on native starches, glucose products and modified starches are mostly high enough to form an effective barrier to the importation of these products in direct competition with local supplies. The only significant imports of native starches are those made from raw materials, notably cassava, that are not available within the Community and have functional properties that are valued in certain applications.

Tariff levels are discussed in Chapter 3. In the Appendix to that chapter details are provided of the Community import tariffs applied to starch products and starch-using end-products. From that Appendix, it will be seen that the most important exception to statement about the high general level of import tariffs applicable to imports of basic starch products is the group of modified starches covered by the Customs Nomenclature category 3505 10 50. This consists mainly of the esterified and etherified starches, and this one CN category represents the largest single class of modified starches in terms of sales in the domestic market. It has also accounted for over 90% of Community imports of dextrins and modified starches from 1990 to 2000.

Outside the Community, the other main starch producing and consuming countries also operate high levels of tariff protection for locally produced starch products. The United States is, at first sight, a fairly sizeable importer and exporter of starch products, but the vast majority of its foreign trade in these products occurs with the other two members of NAFTA, Canada and Mexico, with whom tariff barriers are being phased out steadily.

Vital wheat gluten exports to the US are a major component of EU starch processing exports. However, from 1999 to 2001 the US Government applied a tariff rate quota to restrict imports into the US of Community wheat gluten. A WTO panel ruling declared the tariff rate quota invalid, and the European Council of Ministers, in response, applied an import tariff on imports of corn gluten feed from the US. In 2001, the US Government rescinded the tariff rate quota, and replaced it with specific measures to assist the domestic wheat gluten sector.

The other major producer of starch products outside the Community is Japan. Its protection for the domestic starch sector relies on a combination of import tariffs and special measures to ensure outlets for the domestic starch industry using locally grown raw materials. For example, the local starch industry, processing imported maize, is only permitted duty-free imports of maize if it buys a fixed proportion (currently 1:11) of domestically produced potato starch or sweet potato starch for every ton of maize starch produced from imported maize. These administrative rules provide a high level of effective protection for that quantity of starch that the government decides to ensure continues to be manufactured from local base products.

THE DOMESTIC DEMAND FOR STARCH PRODUCTS

Tables 2.7 and 2.8 reveal that the domestic market for starch products has evolved in a broadly similar way to the total pattern of output for the Community, in the sense that modified starches have recorded the most rapid growth in relative terms, but sweetener sales have advanced most in absolute terms. Tables A2.28-A2.30 in the Appendix to this chapter provide estimates of the breakdown of demand for wheat, maize and potato starches separately.

Table 2.7: Community Starch Demand by Type of Product, 1992-2000 (million tons)

	Total	Native	Modified	Sweeteners
1992	**5.4**	1.5	0.9	3.0
1993	**5.4**	1.5	0.9	3.1
1994	**5.2**	1.2	0.9	3.1
1995	**6.0**	1.7	1.0	3.3
1996	**6.5**	1.6	1.2	3.6
1997	**6.5**	1.6	1.2	3.7
1998	**6.7**	1.7	1.2	3.8
1999	**7.0**	1.9	1.4	3.7
2000	**7.4**	2.1	1.5	3.9

Note: All quantities are measured in native starch equivalents, and include starch exported in processed goods.

Sources: LMC estimates based partly upon AAC and European Commission data (DG AGRI, Unit C2).

Table 2.8: Shares of Community Starch Sales by Type of Product, 1992-2001

	Native	Modified	Sweeteners
1992	28%	16%	55%
1993	28%	16%	56%
1994	23%	17%	59%
1995	29%	16%	55%
1996	25%	19%	56%
1997	25%	19%	57%
1998	25%	18%	57%
1999	27%	20%	54%
2000	28%	20%	53%

Note: All quantities are measured in native starch equivalents.

Sources: LMC estimates based partly upon AAC and European Commission data (DG AGRI, Unit C2).

The growth in sweetener sales has been fuelled by growing demand from both food and non-food sectors. Within the native and modified starch sectors, there has been significant growth in demand from both paper and non-paper customers. Table 2.9 presents estimates of this split, with domestic demand for starch in papermaking averaging close to 40% of the Community market since 1992 for native and modified starches.

Table 2.9: Native & Modified Starch Sales to the Domestic Paper Industry and to Other Sectors, 1992-2001 (million tons)

	Paper	Non-paper
1992	0.9	1.5
1993	1.1	1.3
1994	1.2	0.9
1995	1.2	1.5
1996	1.3	1.6
1997	1.3	1.6
1998	1.3	1.6
1999	1.4	1.9
2000	1.4	2.1

Note: All quantities are measured in native starch equivalents.

Sources: LMC estimates based on interviews with paper companies and internal data.

Table 2.10: Quantities of EU Starch Output Covered by Production Refunds and Export Licences for Annex I Starch Products (excluding Wheat Gluten), 1992-2001 (million tons)

	Production Refunds	Annex I Export Licences
1992/93	2.376	n/a
1993/94	2.393	0.814
1994/95	2.740	1.004
1995/96	3.060	0.543
1996/97	1.960	0.817
1997/98	3.436	0.776
1998/99	2.732	0.823
1999/2000	3.787	0.929
2000/01	2.897	n/a
Average	**2.820**	**0.815**

Notes: All quantities are measured in native starch equivalents.
Austria, Finland and Sweden are not included in the coverage until 1994/95.

Sources: European Commission (DG AGRI, Unit C2).

The growth in domestic starch demand that is described in Table 2.7 is not reflected in the data in Table 2.10 (presented in detail in Tables A2.1-A2.12 in the Appendix to this chapter) summarising both nationally and by end-use sector the starch tonnages that received production refunds. We have some doubts about the accuracy of the reported refunds, since the series behave so erratically. If the refund data are correct, one must conclude either that a declining share of total starch output is eligible for these refunds or that processors have ceased to apply for their full entitlement to such refunds.

The final column of Table 2.10 refers to the export licences granted on the Annex I starch products, and have been translated into native starch equivalents using the standard coefficients. The trend over the period for which data are available is also one of very slow growth, at best.

Chapter 3: Policy in the EU Starch Sector

THE COMMON MARKET ORGANISATION FOR CEREALS

The EU starch sector is administered within the Common Market Organisation (CMO) for cereals, whose objectives and instruments determine the policy measures applied to starch producers and their customers. Since 1992, on average 75% of the starch produced in the EU is derived from cereals (maize and wheat, primarily, but also rice, oats and barley), and as Chapter 2 revealed, the manufacture of starch products currently processes over 5% of the Community's output of common wheat and 16% of its maize production, as well as 100% of the output of starch potatoes. Therefore, the measures applied to the starch sector are important in the overall context of the CMO for cereals in that they are intended to ensure that a major outlet for cereals by allowing the starch industry to purchase its raw materials on terms that are fully consistent with the overall objectives of the CMO, without jeopardising the ability of Community starch producers and their industrial customers to compete with third country suppliers of starch products. The potato starch sector is also regulated within the same CMO on cereals (under Council Regulation 1766/92 of which the detailed rules are laid down in Commission Regulation 1722/93).

The CMO is itself governed by the Treaty establishing the European Community, the Treaty of Rome (revised by the Treaty of Amsterdam), which established the basis for the Common Agricultural Policy under Article 33.1 of the Treaty of Amsterdam (ex Article 39.1 of the Treaty of Rome). The objectives of the Common Agricultural Policy, as set out in Article 33.1, are:

1. To increase agricultural productivity by promoting technical progress and by ensuring the rational development of agricultural production and the optimum utilisation of the factors of production, in particular labour;

2. Thus to ensure a fair standard of living for the agricultural community, in particular by increasing the individual earnings of persons engaged in agriculture;

3. To stabilise markets;

4. To assure the availability of supplies;

5. To ensure that supplies reach consumers at reasonable prices.

In its efforts to meet the second and third of these objectives, the CMO for cereals has provided farmers with guaranteed cereal prices, via intervention prices, which, on average, have the effect of raising cereal raw material costs for starch processors above the relevant world market (border) prices[1] for the same products. The most important of these policy measures are intervention prices and export refunds. In addition, in order to defend intervention prices at levels that are often above world market prices, the Community operates a system of import tariffs, which, although not formally part of the CAP, is essential to its functioning.

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[1] The definition that we apply to world market or border prices in the discussion of cereal prices at the Community's frontiers is the c.a.f. import price in the case of base products imported into the Community, since that represents the price at which outside suppliers are able to deliver their products to the Union. It is the f.o.b. export price in the case of base products exported from the Community, since this is the price that Community exports are able to command on sales to third countries.

Since the MacSharry reforms of 1992, the policies of the CMO that relate to producers' incomes and domestic product prices have allotted a growing role to arable area payments, which were first introduced in 1993/94 (as compensatory payments), while reducing the level of intervention prices. The impact of these reforms upon Community cereal prices is illustrated in Diagrams 3.1 and 3.2. They depict the behaviour of domestic wheat and maize prices since 1991, using Rouen and Bayonne, respectively, as the points of reference, and contrast them with US Gulf f.o.b. quotations.

By virtue of the leading role played by the United States in cereal export markets, US Gulf prices for wheat and maize are commonly used as the indicators of world market values, and indeed they have been used in this manner in the measures adopted towards the starch sector in the Community. In Diagram 3.1, the US Gulf soft (low protein) and the hard (high protein) red winter wheat prices are included, since they are both used as reference prices in aspects of the Commission's measures affecting the starch sector. In Diagram 3.2, Rouen wheat prices have been included for reference, to allow domestic wheat and maize prices to be compared with US maize quotations.

Under the CMO, the cost of importing cereals into the Community is determined by the minimum cost of imports. This is an administered price that is 55% above the intervention price, which the Council of Ministers establishes each year. A variable import duty is applied to cereals, which is, on occasion, zero as it was in 1995/96 and is true at the time of writing. In the cases of wheat and maize, this duty is set equal to the difference between the minimum cost of imports and the c.a.f. cost of grain imported into Rotterdam from the US Gulf[2] (adding US Gulf-Rotterdam freight rates to the US Gulf f.o.b. prices). This duty prevents importers from being able to bring grain into Rotterdam from the US Gulf at a landed price lower than the minimum cost of imports.

Diagram 3.1: Comparing US and EU Prices for Wheat
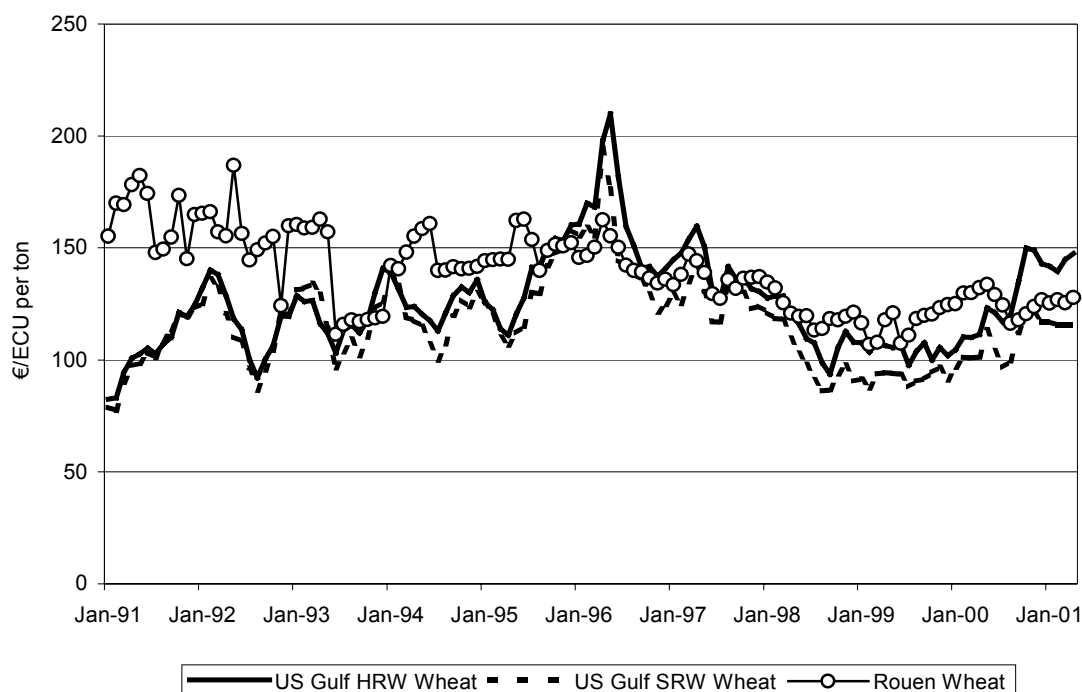
Source: European Commission (DG Agri, Unit C1), LMC Internal Data Base.

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[2] No. 2 soft red winter (SRW) wheat is the reference for wheat and No. 3 yellow maize that for maize.

Diagram 3.2: Comparing US Prices for Maize with EU Prices for Maize and Wheat

US Gulf No. 2 Yellow Maize ▬▬ Bayonne Maize ▪ ▪ ▪ Rouen Wheat —○—
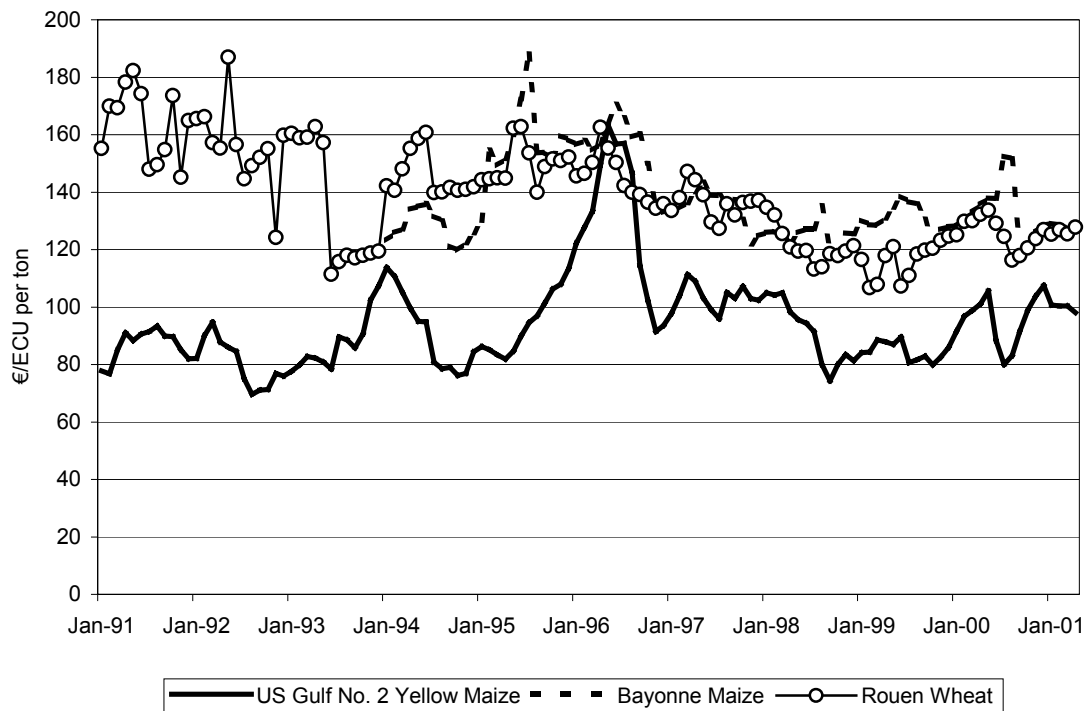
Source: European Commission (DG Agri, Unit C1), LMC Internal Data Base, LMC calculations.

In keeping with the objectives of both the Treaties of Rome and Amsterdam to ensure stability in the markets for agricultural products, the CAP includes measures that compensate exporters of these products for the difference between domestic and export market prices. Exports play an important role in the management of the CMO for cereals, and the Commission uses the export licence system to control the quantities of Community grain that are exported with restitutions, while the magnitude of these restitutions is also an integral part of the management of the CMO. Exports, whose magnitude is determined by the value of restitutions (or occasionally, as in 1995/96, export taxes), influence the supply/demand balance, and hence the price level, within the domestic market. The result of this policy has been that the internal market price of Community cereals is usually (but not always, as demonstrated by the experience in 1995/96) raised above c.a.f. Rotterdam levels, but it is rarely as high as the administratively determined minimum cost of imports.

PRODUCTION AND EXPORT REFUNDS IN THE STARCH SECTOR

Starch processors inside the Community (with the exception of those working on the basis of Inward Processing Relief) are prevented from obtaining cereals at the prices that would prevail in the absence of import tariffs and the CAP measures. Therefore, a series of policies have been introduced within the framework of the CMO, among which production and export refunds form the core, with the objective of preventing Community users and producers of basic starches and starch derivatives[3] from being

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[3] These basic starches and their derivatives, as defined in Annex II of Commission Regulation 87/99, amending Commission Regulation 1722/93 governing production refunds, are primarily native starches, glucose, maltodextrins, dextrins and polyhydric alcohols — see the *Appendix* to this chapter.

disadvantaged in both the domestic and export markets by virtue of the disparity between local prices for base products and those facing competing starch producers and end-users in third countries.

Production Refunds

In the case of competition from imports in the domestic market, in the Community policy is directed almost entirely (with the exception of one category of modified starches, as explained below) towards providing compensation to users, rather than the manufacturers, of basic starches and starch derivatives for the impact of the CMO for cereals upon their raw material costs. The instrument that is employed is the production refund. Council Regulations 1766/92 and 1418/76 (replaced by Council Regulation 3072/95) state that production refunds in the starch sector may be granted in order to:

1. Keep prices competitive in relation to starch produced in third countries and imported as goods in respect of which the import arrangements do not provide sufficient protection for Community producers;

2. Enable the user industries concerned to have access to starch and certain derivatives at a lower price than that which would result from applying the rules of the common organisation of the market in the products in question.

To achieve these objectives, Community policy distinguishes between two categories of products: first, those (approved) products which receive production refunds, intended to compensate end-users of domestic starch products (basic starches and starch derivatives in the terminology of Annex II of Commission Regulation 87/99, amending Commission Regulation 1722/93) for the extent to which local cereal prices (as embodied in their starch product costs) are higher than those paid by their foreign competitors; and second, those products which do not receive any production refunds.

The distinction is one that is derived from the levels of import tariff protection received by the end-users in their product markets. Those manufactured products whose local producers receive production refunds as approved products correspond very closely to those products that are potentially significant users of starch products, as an input, and receive little or no protection via import tariffs from competition from imported end-products. Paper and organic chemicals are the two most important categories of such products. In addition, there is one category of starch products, a major class of modified starches (in Customs Nomenclature 3505 10 50), whose import tariff is much lower than that for other starch derivatives, and which also receives production refunds.

The assumption underlying the exclusion of particular products from the scope of production refunds is that these are either products for which starch is not a significant input, or for which adequate protection is provided via sizeable import tariffs against competing imports that could enter the Community containing starch made from cheaper base products. (For details of current import tariff levels in the Community, see the Appendix to this chapter.)

In essence, the system of production refunds has the primary objective of ensuring a level playing field in terms of competition for EU customers between, on the one hand, domestic manufacturers who use starch products as intermediate inputs and, on the other, overseas suppliers of the same end-products to the Community market, when such imported end-products may have been produced using starch manufactured from cereals bought at lower prices and when these end-product imports may be brought into the Community with low import tariffs.

The production refund system for the major starches is determined in terms of the divergence between domestic maize prices and the c.a.f. imported cost of No. 3 US maize, imported from the US Gulf. It is noteworthy that there is no distinction made in the determination of the refund according to the raw material used in the manufacture of starch, since maize, wheat and potato starches all receive exactly the same refund per ton of starch (as we explain below, oat and barley starch used to receive different production refunds; however, since May 1998, when Council Regulation 1011/98, amending Commission Regulation 1722/93, was implemented, they too have been paid the same maize-based production refunds as all other starches).

The assumption made in the formulation of the policy on production refunds is that the crucial competitors for domestic manufacturers of approved products, such as paper, are US manufacturers of the same products made using inputs derived from their own domestic starch, made from local, i.e., US, maize. The production refund is designed to compensate EU users of starch in the production of approved products fully for the difference between the c.a.f. Rotterdam cost of the maize contained in US starch-using products and the domestic EU cost of the maize contained in the same products manufactured in the Community. Thus, the objective of the production refund is that the net cost of maize (after crediting the value of the refund) in the domestically produced starch-using product should be no higher than the cost of the maize embodied in the imported product from the United States.

To the extent that import tariffs apply to the imported end-product, the Community manufacturer still enjoys a measure of protection in its operations. Furthermore, the rate of effective protection is higher than the rate of nominal protection, since the nominal tariff applies to the full value of the final product, while the refund is meant to ensure that the net base product cost (after refund) incorporated into the end product equals the cost to a foreign competitor. This is consistent with the principle enshrined in the Treaty of Rome of Community preference, and is therefore seen as an intended effect of the method of determining the production refund.

A further assumption in the application of the production refund is that the freight rate on maize in bulk from the US Gulf to Rotterdam is the appropriate freight adjustment to make on imports of the approved products. In other words, it assumes that the freight rates paid on exports of products such as paper, organic chemicals and modified starches, which together account for almost 90% of the production refunds granted in the Community, are the same as bulk rates for maize. To the extent that, in practice, the actual rates on products are higher, this represents a further measure of protection to the recipients of production refunds. Since the production refunds are managed within the CMO for cereals, and are only intended to compensate for the difference in agricultural base product prices in the Community and abroad, the additional protection provided for the industrial end-product by the functioning of the freight market lies outside the framework of the CAP. This additional protection is therefore an unintended consequence of the method employed to determine the production refund.

Export Refunds

The export refunds are also designed, as with the production refunds, to compensate Community companies for the higher domestic base product prices that starch processors face locally as a result of the CMO for cereals. However, in this case, the refunds are intended to bring the f.o.b. cereal costs embodied in exported starch products down to the same f.o.b. levels as the cereal costs faced by US exporters of the same products from the US Gulf. The objective, therefore, of export refunds on starch products and on manufactured goods derived from starch is to compensate

Community manufacturers for higher domestic cereal prices, in such a way that the f.o.b. cost of the cereals contained in the products exported from the EU is the same as the f.o.b. cost of cereals embodied in the US manufactured competing product.

The two major differences between the structures of the production and export refund regulations in their original formulation were that the former covered only starch-using products that receive scant import tariff protection and was based on a comparison of c.a.f. import prices in the Community with EU local market prices for cereals, while the latter covered a very wide spectrum of basic starches, starch derivatives and products manufactured from starch and was based upon a comparison of f.o.b. prices in the US Gulf and the Community.

The assumption behind this particular f.o.b/f.o.b. comparison of prices and its central role in the determination of the export refund is that the cost of the cereal contained in the starch should make embodied f.o.b. cereal costs in starch products exported from the main Community cereal export ports identical to those in exports from the US Gulf.

An implication of this method of determining the export refunds is to grant Community manufacturers a competitive advantage in terms of their base product costs over US competitors in all those export markets for which the freight costs from the EU are lower than the freight costs from the US Gulf. Conversely, it leaves Community manufacturers at a disadvantage in export markets for which the freight costs from the EU are higher than those from the US Gulf.

The export refunds are provided on a wide range of products, within the category of Annex 1 basic agricultural products covered by the CAP, and listed in Article 32.3 of the Treaty of Amsterdam (this Annex was previously known as Annex II of the Treaty of Rome, Article 38.3). Export refunds are also granted on exports of non-Annex 1[4] processed agricultural products that are manufactured using starch derivatives. The actual level of refunds provided on each eligible starch-containing export product reflects the quantity of cereals used in the manufacture of these goods.

In contrast with the rules applied to production refunds, there is a distinction made in the calculation of the export refunds according to the raw material used to manufacture the starch embodied in the end-product. Thus, products made using wheat starch derivatives, for example, receive different export refunds from those that are manufactured using maize starch, with the sole exception of glucose, on which a single export refund is calculated, regardless of the raw material from which a particular batch of glucose has been produced. Products manufactured from potato starch receive the same export refunds as those made from maize starch.

Technical Coefficients

The application of the systems of production and export refunds apply technical coefficients to convert cereals into starch equivalents. These coefficients were intended to reflect industry practice in the manufacture of starch. However, the processing of cereals into starch produces not only starch, but also by-products, which often command higher prices than starch, as was noted in Chapter 2. There is, therefore, an economic aspect, relating to the contribution of by-products to starch processing

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[4] These were known as non-Annex II products in the Treaty of Rome, and were defined in Council Regulation 616/66.

revenues, which needs to be considered in the assessment of the appropriateness of the application of the technical coefficients to the payment of refunds.

The technical coefficients for native maize starch are 1.6 and for native wheat starch 2.0. This means, for example, that every ton of native maize starch requires the processing of 1.6 tons of maize. The "missing" 0.6 tons represents that fraction of the original 1.6 tons of maize which is obtained as by-products.

A user of a ton of maize starch who is entitled to a production or export refund will receive 160% of the refund per ton of maize, as compensation for having to pay indirectly (via the starch price) the higher maize prices prevailing in the Community. However, this formula takes no account of the benefit that EU starch processors receive from the sale of the by-products from starch manufacture, and since these by-products are basic agricultural products, which are included within the scope of the CAP, it must be assumed that this omission was deliberate.

There is, therefore, an important implicit assumption in this aspect of the application of refunds, this is that Community starch processors do not receive any price protection in the domestic market on the sale of by-products. If it turns out upon analysis that they did, then it is arguable that the technical coefficients are set too high if the intention of policy is to compensate for the effect of higher internal cereal prices, since part of the cost of higher cereal prices is offset through higher by-product revenues. The significance of by-product credits in the overall economics of starch processing within the Community is discussed in Chapter 5, in the context of Question 5.3.

DETERMINATION OF THE PRODUCTION REFUNDS FOR STARCH PRODUCTS

In determining the production refund per ton of starch, the Commission calculates how much the price measures included in the CMO cause Community maize prices[5] to be higher than US Gulf prices[6], and then applies the technical coefficient of 1.60 for maize to calculate the increase caused by the CMO to the cost of starch.

If LM_{EU} is the average local market price of maize per ton at the four EU ports and LM_{US} is the landed local c.a.f. price of maize delivered to Rotterdam from the US Gulf, the production refund for native starch is calculated as:

$$(LM_{EU} - LM_{US}) \text{ x } 1.6.$$

On occasion, the Commission applies an upper ceiling to the refund granted under this formula. This ceiling is set at a fixed percentage above the intervention price, with the percentage decided in the light of the Commission's considered opinion about a reasonable maize price in the domestic market, after taking account of the normal balance between supply and demand in a particular marketing year. It has been as high as 125% of the intervention price in the past, but more recently it was set at 110%

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[5] The reference price used to measure Community maize prices is the average of the prices in Bordeaux and Bayonne in France, each with a weight of 37.5%, and in the two Italian towns of Padua (delivered to Venice, assuming a transport cost of 4 € per ton) and Alessandria (delivered to Genoa, assuming a transport cost of 6 € per ton), each of which is given a weight of 12.5% in the reference price. Prior to November 1997, only the two French ports were used in the formula. Until mid-November 1999, the French and Italian ports were each given a weight of 25%.

[6] The world reference price is taken to be the c.a.f. price of No. 3 yellow maize delivered to Rotterdam from the US Gulf.

prior to March 2001, when it was raised to 115%. This ceiling effectively caps the maximum payable production refund.

In the determination of the starch production refunds, the levels are currently established at the end of each month, but they also change during the month if the gap between domestic and c.a.f. imported maize prices, as explained above, changes by more than 5 € per ton.

The reasons for imposing a ceiling and not applying an automatic rule which always applies the prices quoted in the Community for prompt delivery are, we believe, linked both to the objectives of the Treaty of Rome and to the nature of the feedback from the level of the refund to the domestic price level. The Treaty's objectives, listed at the start of this chapter, included the stabilisation of markets, the assurance of the availability of supplies and ensuring that they reach consumers at reasonable prices.

The capping of the refund on those occasions when the domestic prices rise above the price ceiling set in the refund introduces a measure of stabilisation to the domestic market, in the sense of reducing the volatility of refunds. It also helps indirectly to reduce the volatility in the domestic maize price, since it discourages starch processors from bidding domestic prices above the ceiling because they know that their customers will not receive a refund to cover any gap between actual market prices and the ceiling, and thus the processor has to bear some of the shortfall in refunds in such an event.

Without the cap (which also applies to the calculation of the export refunds, and thus potentially affects a significant overall volume of cereals), there is the risk that the feedback from the level of refunds to the internal market price could be positively destabilising, as the processors of starch for end-uses that benefit from production or export refunds compete for local supplies of maize in the expectation that they will be full compensated every time the domestic price increases. A vicious circle could be established whereby processors supplying end-users that receive refunds might bid up the internal price of maize, thereby increasing the refund further, without the processors themselves feeling any commercial pressure to restrain their bids.

Thus, it may be argued that capping the price used for the determination of production refunds (a) helps to stabilise the domestic price, while also (b) assuring the availability of supplies for uses other than the manufacture of products that receive production refunds, and (c) ensures that supplies reach consumers at more reasonable prices than they might otherwise. In all three respects, the instrument of the price ceiling upon the determination of refunds is in keeping with the objectives of the CAP.

Protected versus Unprotected Sectors

The production refund is intended to enable Community starch end users to compete without any disadvantage in respect of cereal costs in unprotected (or, more correctly, little protected) sectors in which imports enter with minimal import tariffs. In the Appendix to this chapter, we list the import tariffs applied to leading starch end-products. There is a very close match between those starch-using products that are shown to have low import tariffs and the Annex I products, the so-called approved products, listed in Commission Regulation 87/99, amending Commission Regulation 1722/93. The list is reproduced in the Appendix to this chapter, and can be seen to include many products manufactured by the chemical industry (most notably, fermentation products), as well as the paper industry, with the pharmaceutical, plastic and textile sectors also well represented. Diagram 3.3 depicts the distribution of refunds by end-use in 2000/01.

Diagram 3.3: Production Refunds by End-Use, 2000/01

Woven Fabrics 0%
Fructose 0%
Glycerol 0%
Carrageenan 0%
Cotton Linters 0%
Maltose 0%
Cotton 0%
Organic Chemicals 22%
Paper and Paperboard 33%
Pharmaceuticals 1%
Organic Surface Agents 0%
Gelatine 0%
Plastics 1%
Miscellaneous Chemicals 4%
Albumin 3%
Enzymes 2%
Glue 0%
Esterified and Etherified Starch 33%
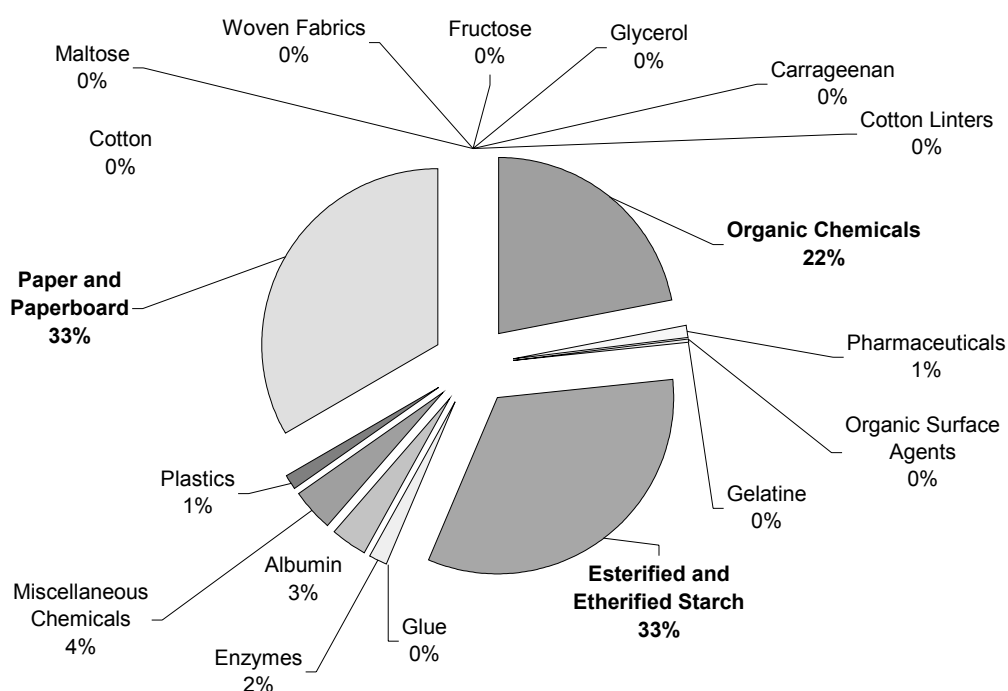
Source: European Commission (DG Agri, Unit C2).

At first sight, the most surprising item included within Annex I of Regulation 87/99, amending Commission Regulation 1722/93, and therefore eligible for production refunds, is CN code 3505 10 50, which consists primarily of esterified and etherified starches, which are among the main categories of modified starches. This category's inclusion is noteworthy partly because other codes within the broader six digit CN 3505 10 (dextrin) category are not eligible for production refunds, but also because the 3505 10 50 represents the only major category of products which is made by starch processors rather than their customers and yet receives production refunds.

The eligibility of CN 3505 10 50 for production refunds has necessitated the establishment of a system involving the issue of Customs document T5 to starch processors to monitor the flow between member states of such esterified and etherified starches, and to verify that they receive only the refunds to which they are entitled. It also seeks to avoid having these modified starches converted into a form such as, for example, native starch or glucose, which then entitles the end-user, too, to claim a production refund, thereby causing the Commission to pay the refund twice.

The basic starches and starch derivatives on which customers (if eligible to obtain production refunds) may claim such refunds are listed in Annex II of Commission Regulation 87/99, amending Commission Regulation 1722/93 and included in the Appendix to this chapter. The main products mentioned in the Annex are native starches, glucose syrups, polyhydric alcohols and dextrins.

(It should be noted at this juncture that the distinction between protected starch-using industries, which are not entitled to production refunds, and unprotected industries, which are eligible for refunds, is, in practice, somewhat similar to one between food and non-food end-use sectors, since food end-use industries tend to be highly protected, while non-food end-uses tend to have low import tariffs. Therefore, a

food/non-food distinction is often used incorrectly, even in official Commission documents, in discussions of the basis for eligibility for production refunds. In practice, however, some food products benefit from refunds, while a variety of non-food products do not do so. Accordingly, this report will always refer to a protected/unprotected distinction in discussing production refunds.)

As noted above, production refunds for starches from all the different base products are set at the same level, which is defined in terms of maize. This means that customers of wheat starch processors (whose raw material price disadvantage vis-à-vis US maize is significantly less than that for maize starch processors; see Diagrams 3.1 and 3.2) receive the same production refund per ton of starch as customers of maize starch processors.

The assumption behind the formula adopted to determine the production refund was that the main alternative overseas source of maize was the United States, which was, and remains, the largest single exporter of maize. The other assumption behind the formula for the production refunds was that maize starch was the predominant source of EU starch, so that the domestic maize price would be the appropriate cereal price to use as the basis for compensating users for higher Community base product prices.

As Chapter 1 demonstrated, maize now accounts for less than half of the total starch produced in the Community, with wheat having made rapid gains in its market share. The discussion in Chapter 2 revealed that wheat typically enjoys a significant net cost advantage over maize as a result of by-product credits; therefore one of the unintended effects of the method of determining production refunds has been the encouragement of the development of production capacity for wheat starch, which is derived from a different base product, whose users are entitled to receive the same production refund as end-users of maize starch.

Barley, Oat and Rice Starches

When Austria, Finland and Sweden joined the Union at the start of 1995, the latter two countries received special provision for barley and oat starch to be covered by a system similar to that applied to other starches. In terms of production refunds, however, the technical coefficient applied to the starches was 2.4, reflecting the lower starch content of these two grains.

Since this facet of the regime was new, it was described in the regulations as experimental, and a quota was established to cap refunds under this arrangement, and the starch equivalent combined total quota for the two grains was set at 59,000 tons, which represented slightly over 140,000 tons of oats and barley.

In May 1998, when Regulation 1011/98, amending Commission Regulation 1722/93, took effect, the special provision for barley and oat starch in the determination of production refunds was ended, and they were incorporated within the scheme that applies to all other starches, whereby all refunds are determined only in relation to maize starch.

Rice starch is manufactured from broken rice by one factory in the Community (in Belgium). The technical coefficient applied to rice starch manufacture is 1.52 on broken rice.

EXPORT REFUNDS FOR ANNEX 1 AND NON-ANNEX 1 PRODUCTS

The objectives of using export refunds as an instrument of the European agricultural policy are not defined explicitly in any of the treaties. However, it is possible to deduce the *raison d'être* of the export refunds from Council Regulations 120/67 and 3448/93, as well as from Commission Regulation 1501/95.

Council Regulation 120/67 refers to the need for export refunds:

1. To stabilise the Community market while ensuring in particular that the price fluctuations on the world market do not influence the prices applied inside the Community. The payment of a refund for exports to third countries is meant to cover the difference between the prices applied outside and those applied inside the Community.

Council Regulation 3448/93 states that:

2. Arrangements must be made for export refunds in order not to penalise producers of the said goods for the prices at which they are obliged to procure their supplies as a result of the Common Agricultural Policy.

Commission Regulation 1501/95, referring to cereals, states that:

3. Given the disparity in the prices at which cereals are offered by the different exporting countries on the world market, account should be taken in particular of the different internal forwarding costs and the refund should be fixed bearing in mind the difference between the representative prices in the Community and the most favourable quotations and prices applying on the world market.

The primary objective of the export refund is to ensure compensation for raw material price differences for exporters who use Community base products in the production of those starches that are defined as basic agricultural products (native starches, glucose, maltodextrin and caramel) and overseas suppliers of the same products. It also provides compensation to end-users who indirectly use base products in the form of starch derivatives as intermediate inputs, and then export the manufactured product. The vital difference between the export and production refunds is that the former is directed towards correcting for raw material price disparities as they affect the export market, while the latter is focused upon correcting for such disparities inside the domestic market.

The Use of US Export Prices as the Reference for Determining Export Refunds

In the determination of the disparity between domestic cereal prices and the prices paid by exporters who compete with EU manufacturers in their sales to third markets, as with the production refund, the assumption that is made in the export refund formula is that the competitor to use for assessing the appropriate compensation is the United States. The US is, as Chapter 1 revealed, the world's second largest exporter of starch derivatives, after the Community, and therefore, to this extent, the choice appears to be appropriate. However, the majority of US exports are destined for Canada and Mexico, fellow NAFTA members, and by far the largest single category of US exports is HFCS (isoglucose).

In native starches, the world's largest exporter is Thailand, whose export volumes in recent years have averaged around 800,000 tons, but its exports are almost entirely of cassava starch. This compares with US exports of only 89,000 tons of native maize

starch in 2000, of which 74% went to its NAFTA neighbours, and only 7,000 tons to the EU (much, if not all of which was specially produced from waxy maize).

The justification for continuing to use the US as the reference for starch export refunds, which was undoubtedly valid when the export refunds were first introduced in 1967, when the Thai cassava starch industry was small, may therefore be questioned. There are, however, two reasons why the choice of the US as the reference may still be appropriate.

The first is that native cassava starch is not viewed as a perfect substitute for the cereal starches produced in the Community, and the prices paid for cassava starch in international trade differ somewhat from those paid for cereal-derived starches. The second is that, by virtue of being derived from a tuber which is perishable and is never traded internationally as a raw material for starch manufacture, it is impossible to determine a representative f.o.b. raw material price to be used as a reference for the determination of Community export refunds.

The Management of the System of Export Refunds

In the implementation of the export refund system, there are, as the next few pages will demonstrate, some significant divergences from the operation of the production refund system. The four most important are the following.

- The calculation of the appropriate compensation, via refunds, differs in the two cases.

- Export refunds vary with the raw material used to manufacture the starch.

- The range of products eligible for export refunds is not the same as that eligible for production refunds.

- Two different structures are employed to administer export refunds (with DG Agriculture managing the refunds for the basic starch derivatives, and DG Enterprise managing refunds for all other starch-based products); while DG Agriculture alone manages the system of production refunds.

The Calculation of Export Refunds

The Calculation for Maize

The export refunds are set, in the case of maize, as the difference between f.o.b. export prices for maize[7] at the same four ports as those used in the determination of the production refund and f.o.b. prices for No. 3 yellow maize in the US Gulf (the so-called f.o.b./f.o.b. or Δf.o.b US/EU price differential for maize). This is designed to be a transparent calculation, reflecting the cost of bringing the net f.o.b. cost of the maize content of EU processors/exporters in their products into line with the f.o.b. cost of the same products exported from the US Gulf. The difference between these two amounts is then used as the reference point for calculating the export refund per ton of maize starch products.

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[7] The fobbing costs at all four ports are currently assumed to be 5 € per ton [refer to question, I couldn't find exactly which one it is].

For each starch derivative that is defined as an Annex I basic agricultural product under Article 32.3 of the Treaty of Amsterdam, the higher EU "starch-in-maize" value (derived from the average of the f.o.b. export prices of maize at the four ports) is reduced to the US Gulf value by multiplying the difference in the two grain costs (namely the difference between the EU and the US Gulf f.o.b. prices) by the appropriate EU transformation coefficient for the product in question. For example, this coefficient is set at 1.60 for native starch and 2.09 for crystalline dextrose.

Thus if PM_{EU} is the average f.o.b. price of maize per ton at the four EU ports and PM_{US} is the US Gulf f.o.b. price of maize per ton, the export refund for native starch is calculated as:

$$(PM_{EU} - PM_{US}) \times 1.6.$$

The Calculation for Wheat

In order to determine the wheat starch export refund rate, the Commission calculates the *Δ*f.o.b US/EU price differential for wheat, which is currently defined as the difference between the average f.o.b. price of wheat in three ports[8] in the Community and the average f.o.b. prices of Hard and Soft Red Winter wheat in the US Gulf. Prior to the end of 1997, only Soft Red Winter wheat was included in the US Gulf price calculation.

During all the interviews with Community wheat starch producers in the course of this study, questions were asked about the grades of wheat used in starch production. None uses high protein (hard) wheat. The explanation that was given was that, unlike their US wheat starch counterparts, EU processors focus upon wheat starch, rather than gluten production. Therefore, they use only common (soft) wheat, and the inclusion of Hard Red Winter wheat in the present formula is difficult to justify in terms of the appropriate compensation for wheat price differences in their operations.

The reason for the inclusion of US HRW wheat in the formula is that the calculation of the export refund is undertaken for a broad range of products manufactured from wheat, and exported under both Annex I and non-Annex I regulations. These products include some that lie within the framework of non-Annex I exports, and which are made from durum wheat. Consequently, the intended effect of the refund formula is to provide compensation that, on average, is appropriate for exports of products made from wheat; but the unintended effect of this formula is to provide less compensation than would be warranted if price differences are to given full compensation in the wheat starch sector, taken on its own.

In setting the export refund, for each starch product, the higher EU "starch-in-wheat" value (computed from the average f.o.b. value of the export prices of wheat at the three ports) is reduced to the US Gulf value by multiplying the difference in the two costs (the difference between the EU and the US Gulf f.o.b. prices) by the appropriate EU transformation coefficient for the product in question, which is set at 2.00 for native starch.

Thus if PW_{EU} is the average f.o.b. price of wheat per ton at the three designated EU ports and PW_{US} is the US Gulf f.o.b. price of wheat per ton, the export refund for native starch is calculated as:

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[8] The three ports are Rouen, France, for *tout venant* wheat; and also Hull, UK, and Hamburg, Germany, both for the average of feed and breadmaking wheat; with a fobbing cost of 5 € per ton in each case.

$$(PW_{EU} - PW_{US}) \times 2.0.$$

The Mixed Calculation

Many EU starch products are now derived from both maize and wheat and, for some products, notably syrups, it is very difficult in practice to determine which cereal is used to manufacture the product. For this reason, in the case of glucose and its derivatives the Commission employs a "mixed" calculation in determining the export refunds. In deriving the export refund for "glucose and products", the Commission assumes that they are all produced in the ratio of 75% from maize and 25% from wheat. However, in its formula, the Commission has chosen — in just this one instance — to apply a technical coefficient of 1.6, rather than one of 2.0, to wheat starch.

The mixed calculation for glucose starts with FOB_m, derived in the manner explained above, as the average Δf.o.b EU/US price differential for maize, and FOB_w as the average Δf.o.b EU/US price differential for wheat. The export refund for glucose is then calculated per ton of glucose as:

$$(FOB_m \times 0.75 + FOB_w \times 0.25) \times 1.6.$$

Diagram 3.4 contrasts the movement in export refunds per ton of starch for maize and wheat starch, as well as for glucose, since 1991, alongside the production refunds. Prior to 1997, there was a single export refund. Since then, export refunds have nearly always been lower on wheat starch than maize starch, but there were very short-lived periods, e.g., in early 2000, when wheat starch received a higher export refund.

Diagram 3.4: Production Refund (for All Starches) and Export Refunds for Maize and Wheat Starch, and for Glucose, € per ton, January 1991-July 2001
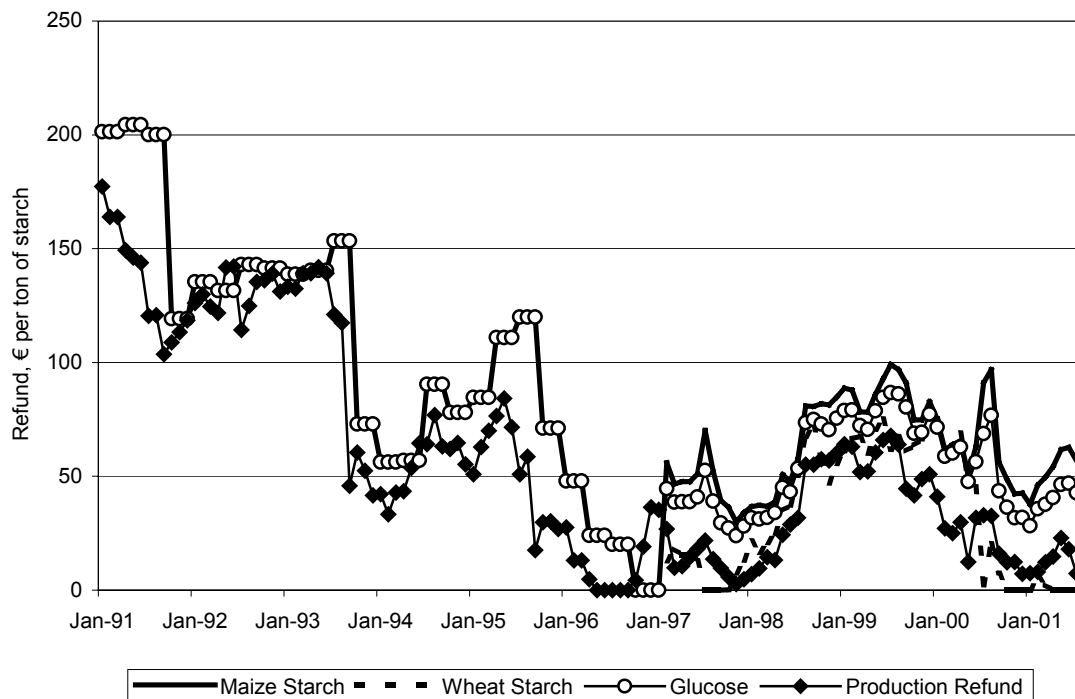
Source: European Commission (DG Agri, Unit C2).

The Commission adopts exactly the same approach to the calculation of the export refunds as it does for the production refund in the application of an upper ceiling to the refund granted under these formulae. As explained earlier in the discussion of production refunds, the ceiling is set at a fixed percentage above the intervention price, with the percentage decided in the light of the Commission's considered opinion about reasonable cereal prices in the domestic market, after taking account of the normal balance between supply and demand in a particular marketing year. Since March 2001, the ceiling has been 115%, and caps the maximum payable export refund.

The intended effects of these ceilings on export refunds are the same as those explained earlier in the context of production refunds, namely helping to stabilise the domestic price, while also assuring the availability of supplies for uses other than the manufacture of products that receive export refunds, and ensuring that supplies reach consumers at more reasonable prices than they might otherwise. In all three respects, the instrument of the price ceiling is in keeping with the objectives of the CAP.

Non-Annex I Products

The export refund system differentiates between, on the one hand, those starches defined as basic agricultural products on which export refunds are calculated directly and, on the other, more highly processed goods derived from starch. This differentiation is always discussed in terms of the agricultural products listed in Annex I of Article 32.3 of the Treaty of Amsterdam (this is the updated version of Annex II of Article 38.3 of the Treaty of Rome), and is summarised in the Appendix to this chapter.

Annex I classifies just five main classes of starches as basic agricultural products: native starch, glucose, maltodextrins, caramels and crystalline dextrose, on which refunds based on the commodity rates must be paid. These refunds apply the standard technical coefficients mentioned above (e.g., 1.60 for native maize starch, 2.00 for native wheat starch, 2.04 for crystalline dextrose, all of which are assumed to be manufactured from maize, and also the mixed calculation for glucose).

All the more processed starch-derived products are viewed as industrial, rather than agricultural, and are grouped together as non-Annex I products, which are administered by DG Enterprise. Under Commission Regulation 1222/94 (which was replaced by Commission Regulation 1520/2000 in July 2000), there were very many products (listed in the Appendix to this chapter) approved as eligible for export with export refunds as non-Annex I products. It is useful, in the light of the changes made in Regulation 1520/2000 to distinguish four categories within the non-Annex I list.

The first category covered by Regulation 1222/94 was products that use starch in their manufacture, and which are not entitled to production refunds (these are the "protected", as opposed to "unprotected products" mentioned in the earlier discussion of production refunds). The second category comprised starch derivatives, notably dextrins and polyhydric alcohols, that appear in the list of starch derivatives[9] whose users are entitled to production refunds. Unlike other such derivatives, for example, glucose, they are not defined as agricultural products in Annex I of Article 32.3 of the Treaty of Amsterdam. The third category was the sole class of modified starches (CN 3505 10 50, the esters and ethers) that is entitled to production refunds. The fourth category comprised other approved products that are entitled to both production and

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[9] These derivatives are listed in Annex II of Commission Regulation 87/99, amending Commission Regulation 1722/93, which is summarised in the Appendix to this chapter.

export refunds, among which organic chemicals are the most important (paper products, it should be noted, are entitled to export refunds only on their native starch inputs, not their modified starch inputs).

The export refund rates for non-Annex I products on their starch content were determined, and are still determined, by multiplying the base rates for agricultural products, such as wheat, maize or glucose, by specific non-Annex I coefficients or, if they do not exist, by pre-agreed manufacturers' yield rates. In the case of certain products, these rates are based on actual factory yields, which are periodically verified.

The Reforms of July 2000

Among the four categories of products entitled to non-Annex I export refunds under Regulation 1222/94, two were also entitled to production refunds. In an important administrative reform, in July 2000, the Commission, in its Regulation 1520/2000, established a new list of processed agricultural products eligible for non-Annex I refunds. This list is more restrictive than the former one in terms of the overall range of products entitled to export refunds. In particular, none of the fourth category identified above (approved products eligible for production refunds) is any longer entitled to receive residual payments to compensate them in their export sales for the gap between production refunds and export refunds (this gap is depicted in Diagram 3.4). The CN 3505 10 50 esters and ethers, however, continue to receive both export and production refunds. In other words, since mid-2000, apart from CN 3505 10 50 modified starch products, all approved products that are entitled to receive production refunds attract no additional refunds when exported.

The management of non-Annex I exports is the responsibility of DG Enterprise, but in terms of the objectives behind the system of export refunds for cereals, as defined in Commission Regulation 1766/92 amended by Regulation 1501/95 and managed by DG Agriculture, the determination of the export refunds for non-Annex I products was, broadly speaking, consistent with that for Annex I agricultural products until 2000. Refunds were based upon the compensation for base product price differences, calculated as appropriate for starch exported within the framework of Annex I (DG Agriculture's responsibility). Since then, a divergence has emerged, in that, with the exception of CN 3505 10 50 modified starches, those products eligible for production refunds are no longer entitled to the residual refund, which represents the difference between the production refund and the export refund per ton of the relevant starch.

The reasons behind the exclusion of all approved products, apart from esters and ethers, from eligibility for export refunds appear to be twofold. First, the Council of Ministers requires the Commission to keep expenditures on export refunds within the limits agreed with the WTO. In the case of non-Annex I exports, total refunds for all the eligible categories of agricultural inputs were capped at €415 million in 2000/01. One response to the need for lower levels of such refunds was to reduce the number of products entitled to these refunds. The approved products must have appeared particularly attractive in this respect since, by excluding them from export refunds, the entire value of their export refunds (and not just the residual amount, bridging the gap between production and export refunds) was removed from total sum calculated for the purposes of compliance with the WTO commitment, but the manufacturers of approved products were still able to receive production refunds in full.

The other reason for removing all but one category of approved products from the entitlement to export refunds was presumably the view that these approved products were already sufficiently well compensated for price differences by the production refunds and normally also enjoyed some further protection from competition from

imports via modest import tariffs. Therefore, their export sales would not be much affected by the loss of the residual refunds.

For CN 3505 10 50, the official reasoning was clearly different. One view was undoubtedly that these esters and ethers form the largest single category of exports of native and modified starches or syrups, and it would appear inconsistent to provide larger refunds on exports of all other native and modified starches, while excluding a category that had been successful in developing export markets.

Using DG Agriculture export licence data for Annexe I products and DG Enterprise export refund data for non-Annex I exports, in 2000 EU exports of modified starches totalled 535,000 tons, native starch equivalents, up from 258,000 tons in 1996, while exports of all the other classes of non-Annex I products combined totalled 462,000 tons, native starch equivalents, in 2000, as against 325,000 tons in 1996. These volumes may be compared with the following export tonnages for the two most important categories of native starches, which for 2000 were 400,000 and 154,000 tons, of native potato and maize starches respectively, up from 293,000 and 101,000 tons of these two categories in 1996.

A further consideration behind the special treatment of CN 3505 10 50 products must have been the unusual nature of esters and ethers as the only intermediate product that receives production refunds. End-users who claim export refunds on their inputs of esters and ethers, using the Customs form T5 mentioned earlier, contend that they view these modified starches in a similar manner to native starches, as inputs, and hence would have found it anomalous after July 200 if they had been entitled to claim export refunds on their use of other starches, but not on this one group of modified starches.

The intended effect of the change of policy in July 2000 was to comply with WTO commitments while having a very minor impact upon the competitiveness of the Community starch-using export industries in third country markets. The policy change may also have been intended to have a similar effect to that of the ceiling on the internal price used to determine refunds, in that it avoided the possibility of domestic base product prices being bid up by starch processors whose end-products would be exported in the knowledge that higher price differences between the internal and export markets would be compensated through the export refunds.

There have also been unintended effects of the policy change, as the discussion of the potentially anomalous situation of different export refunds for users of esters and ethers vis-à-vis other native or modified starches revealed. Because all approved products eligible for production refunds, apart from CN 3505 10 50, are no longer entitled to residual export refunds, exports of protected products, the most important of which are processed foods, now receive higher export refunds than approved (unprotected) products. Thus, since the July 2000 reforms, the level of compensation for price differences provided to exporters of starch-containing products depends upon whether the product in question is, or is not, protected in the internal market, rather than the appropriateness of the compensation itself.

Pre-fixation of Refunds

Companies eligible for production and export refunds are entitled to pre-fix their refunds. In fact, in order to monitor compliance with the Community's WTO commitments, the Commission requires exporters of products that are to be exported with export refunds to pre-fix these refunds.

Many end-users and exporters welcome the scope for pre-fixing refunds, since it enables them to quote fixed prices to customers at home and abroad. The right to pre-fix meets the objective contained in the Treaty of Rome of stabilising markets. However, the functioning of the price pre-fixation system differs between production and export refunds. In the case of production refunds, users may, until the approach of the inter-campaign period (July-September), pre-fix for the full validity of the refunds, which is the current month plus five full calendar months ahead, and the refunds increase in line with the monthly increments in the intervention price.

This flexibility is reduced towards the end of a marketing year, partly because users are not compensated for a reduction in the intervention price if this occurs between the pre-fixing of a refund and its use; but also to avoid the difficulties caused by the lag between the first wheat harvest and the maize harvest three months later. During these inter-campaign weeks, new crop wheat is relatively cheap, but the domestic maize price (which is taken as the basis for determining production refunds) is relatively high. Therefore, as the inter-campaign period approaches and while it lasts, the validity of production refunds is restricted to a maximum of 30 days.

In the case of export licences, under Article 9 of Commission Regulation 1520/2000, the validity of export refund certificates extends to the remainder of the current month plus four further months, except when the end of a budget year approaches, when the validity is reduced to coincide with the budget year. This enables the Commission to keep precise control over the amounts approved for export refunds in order to comply with WTO commitments, which are based upon budget years. However, prior to July 2000, when the final WTO commitments took effect, export refunds were valid from one budget year to the next and, unlike the case with production refunds, export refund holders were provided full compensation for the change in the intervention price.

In the case of export licences for products derived from maize (including glucose, by virtue of the mixed calculation of the export refund), the later harvest of maize than wheat means that certificates for maize derivatives and glucose exports have a validity of only 30 days in the inter-campaign period. Those for native maize starch have a validity that only extends until the 15th September, which is when the refund for the new harvest is determined.

Period of Eligibility of Refunds

During the interviews undertaken for this study, several processors stated that the restriction on the eligibility of export refunds to the "current month plus four", and the greater restrictions as the marketing year draws to a close, put them at a disadvantage in the export market in relation to US exporters who are able to hedge, using the Chicago Board of Trade maize or wheat futures contracts well over one year forward. Processors or end-users in the Community do not have the same scope for hedging over a year into the future by means of pre-fixing refunds. The main alternatives open to domestic companies who would like to hedge their base product price risk are twofold: first, to produce a product with the benefit of the maximum validity of the export refund, and then place the end-product in Customs bond, so that it becomes equivalent to an export from the Community, and may then be stored while the cereal price risk is managed using Chicago futures. This suffers the disadvantage that the financing and storage costs while in bond may be significant.

The second option open to end-users and processors in the Community is to hedge the world price element of their export price risk by using Chicago futures, and then to wait until nearer the time when the export contract is to be honoured before pre-fixing an export refund. If the intervention price and the €/$ exchange rate have moved in the

meantime, this will be reflected in the export refund that is granted. The only hedging risk that remains is the risk that the internal market cereal price premium over the intervention price alters between the time that the contract is signed and the time that the export refund is pre-fixed.

One concludes that one of the unintended effects of the pre-fixation rules is that Community exporters who are eligible for export refunds are at a disadvantage vis-à-vis their foreign competitors in their ability to quote fixed prices for export contracts over six months into the future and then to manage the associated cereal price risk. However, the disadvantage is not large, since there are methods available for managing some of the price risk, but nonetheless they do not provide low cost or fully effective price insurance.

Comparison of Production and Export Refunds

Diagram 3.4, presented above, plots the production refund over the decade and contrasts it with the glucose, maize, potato and wheat starch export refunds over the same period, where all refunds are expressed per ton of starch. For maize, it is evident that the production refund has consistently been lower than the export refund (by a sum that represents the impact of the freight costs on maize from the US Gulf to Rotterdam). For wheat, there have been occasions when the export refund has been lower than the production refund. The glucose refund has always been above the production refund.

The objective of granting the production and export refunds is to compensate for price differences in raw material between the world market and the European market. The outcome as regards maize starch is in keeping with the intentions of the policies on production and export refunds, since the difference between the two compensates starch users for the difference between the c.a.f. and f.o.b. costs of maize from the US, with an adjustment for fobbing costs inside the Community.

For wheat, there are two substantial unintended effects. One is that the production refund on wheat starch is often higher than the export refund. Since the former is intended to compensate for c.a.f. US versus f.o.b. EU price differences, while the latter is intended to compensate for f.o.b. US versus f.o.b. EU differences, it is perverse that the production refund is often the higher of the two. This is a result of the policy to determine production refunds solely on the basis of the economics of maize starch production. This leads to apparent over-compensation for differences in wheat prices between the EU and US, and hence an excessively large incentive to use wheat starch in the manufacture of approved products that are eligible for production refunds. For example, wheat-derived esterified and etherified starches often receive larger production refunds than export refunds, whereas the reverse is the case for the same products made from maize or potato starch. Thus, at times of low wheat export refunds, wheat-derived esters and ethers are likely to be sold to the internal market, displacing similar products made from maize or potatoes onto the export market.

A second unintended effect is that, because the export refund on glucose exports is normally higher than the export refund on wheat starch, wheat starch end-users frequently have an incentive to direct their use of this starch towards glucose exports and away from other wheat starch-derived non-Annex I exports. At the same time, users also have an incentive to divert maize starch used in products that receive export refunds away from glucose and towards other products. Where flexibility to substitute exists, therefore, users often receive strong encouragement under current policy to substitute maize (or potato) starch for wheat starch in export products other than glucose and substitute wheat starch for maize (or potato) starch in glucose for export.

POLICY MEASURES IN THE POTATO STARCH SECTOR

Since 1992, on average, a quarter of the starch produced in the Community has been derived from starch potatoes. This proportion has fallen in recent years (see Diagram 2.1 in Chapter 2), but is still well above 20%. Potatoes in general are not included in the CMO for cereals, but those that are processed into starch have been included in the market organisation for cereals, as stipulated in Council Regulation 1766/92.

Equity between potato and grain producers and processors is a major objective of policy. Council Regulation 1766/92, on the subject of the CMO for cereals, states that:

1.   Whereas potatoes intended for the production of starch are in direct competition with cereals intended for the production of starch, in view of the reform measures envisaged for cereals and to ensure *equal treatment* between the lines of production in question, similar measures should be adopted with regard to potatoes intended for the production of starch.

The justification for treating starch produced from potatoes very much as if it were produced from maize, and thus incorporating it into the CMO for cereals, is based on pragmatic considerations. In many, though it must be stressed not all, applications (as will be seen in the answers to the Questions in this Evaluation), potato starch is viewed as a very close substitute of maize starch. However, the most powerful reason for treating potato starch as if it were maize starch is that there exists no independent price discovery mechanism for starch potatoes. Starch potatoes are not the same as edible or seed potatoes, for example, for which independent domestic and overseas prices may be found, and which could act, in theory, as the basis for determining appropriate levels of compensation to end-users for price differences. Instead, the value of starch potatoes can only really be defined in relation to their end-product, starch.

In this respect, the closest parallel with the situation of starch potatoes is that of sugar beets. In both cases, the crops are perishable, and have a more or less tied outlet in the processing plant. For this reason, in both the starch potato and sugar beet cases, the Commission has established regulations that determine the starch potato and sugar beet prices in a strict, formal manner as a function of the price of the end product (i.e., starch or sugar). These regulations for starch potatoes (Commission Regulation No 97/95 laying down detailed rules for the application of Council Regulation (EEC) No 1766/92 and of Council Regulation (EC) No 1868/94, amended by Commission Regulation 2718/99) stipulate exactly how growers will be paid for the supply of potatoes of a quality that differs from the benchmark of 17% starch content that is used for the purposes of the basic payment scale.

The Instruments of Potato Starch Policy

Potato starch policy consists of four main instruments. First, guaranteed minimum prices to the starch potato farmer, which are tied to the intervention price of maize, establishing the principle of equity between starch potato producers and maize producers. Table 3.1 describes the process of determination of the starch potato minimum price, in which the starting point in the regulation is the calculation of a cereal price, 10% above the intervention price and converted into starch equivalent by multiplying it by the maize starch technical coefficient of 1.60. The prices paid to individual farmers are adapted according to their potatoes' starch content, measured according to the starch scale (the *barème féculier*) that is established under Commission Regulation 97/95.

Table 3.1: Starch Potato Minimum Payments and Processors' Premia, 1992/93-2001/02 (€ per ton)

	1992/93	1993/94	1994/95	1995/96	1996/97	1997/98	1998/99	1999/2000	2000/01	2001/02
Starch potato minimum price										
Cereal intervention price	175.98	139.46	128.72	119.19	119.19	119.19	119.19	119.19	110.25	101.31
10% above the intervention price	193.58	153.40	141.59	131.11	131.11	131.11	131.11	131.11	121.28	111.44
Minimum potato price (at 17% starch content)	61.95	49.09	45.31	41.95	41.95	41.95	41.95	41.95	38.81	35.66
Area payment or direct payment per ton										
Area payment per ton of cereal	-	30.19	42.26	54.34	54.34	54.34	54.34	54.34	58.67	63.00
Direct payment per ton of starch potato	-	9.66	13.52	17.39	17.39	17.39	17.39	17.39	19.75	22.11
Combined payment per ton										
Cereal	193.58	183.59	183.86	185.45	185.45	185.45	185.45	185.45	179.95	174.44
Starch potato	61.95	58.75	58.83	59.34	59.34	59.34	59.34	59.34	58.56	57.77
Ratio cereal/starch potato prices	312.5%	312.5%	312.5%	312.5%	312.5%	312.5%	312.5%	312.5%	307.3%	302.0%

Source: European Commission ((DG Agri, Unit C2 and FEOGA)

Note: It is assumed that both potato and cereal farmers receive a price that is equivalent to 10% above the cereal intervention price. before 1992 This was known as the target price.
For 1992/93, 1993/94 and 1994/95, the green ECU prices have been multiplied by the switchover coefficients in effect on 1st January 1993, 1994 and 1995, respectively.

The second instrument is a direct payment for the farmer, which is a fixed payment per ton of potatoes, providing potato farmers with direct income support linked to (but not the same as) the area payments made to cereal farmers. When the compensatory payments for cereal farmers were first introduced in 1993/94, the compensation principle was applied – per ton, not per hectare – directly to starch potatoes, treating potatoes as equivalent to maize when translated into compensation per ton of starch. Thus, in 1995/96, for example, when the basis for the compensatory payment for cereals was €54.34 per ton, which was then multiplied by the regional reference yield to arrive at the overall area payment to cereal farmers, the corresponding payment to starch potato farmers started on the basis that the compensatory payment per ton of maize starch was €54.34 multiplied by 1.60, the technical coefficient used by the Commission, i.e., €86.94. To convert this into a payment per ton of starch potatoes, this value of €86.94 was divided by 5.0, since 5.0 tons of starch potatoes of the basic quality are assumed to yield one ton of native starch after processing. Thus, the compensatory payment (now known as the "direct payment") to the potato grower was €17.39 per ton of potatoes.

Under the Agenda 2000 reforms, cereal farmers receive compensation (via the area payments), which offsets 48.4% of the declines in intervention prices under the same reforms. For starch potatoes, however, the Council of Ministers decided on political grounds that the direct payments to starch potato farmers should compensate this group for 75% (not 48.4%) of the impact of the Agenda 2000 reduction in cereal intervention prices upon the officially determined minimum starch potato prices .

The third instrument is a special premium to starch processors, in order to compensate potato starch producers for structural disadvantages such as the short processing season for starch potatoes and for the low value of the by-products from potatoes, when compared to cereals. The special premium has been fixed at €22.25 per ton of starch for many years, and is paid one all potato starch production within the quota provided that the manufacturer has paid the minimum price to the potato farmer.

The fourth main instrument of policy in the potato starch sector is the system of potato starch production quotas for individual member states. They first took effect in 1995/96, and were based upon assessments of installed capacities and irrevocable commitments made to install new capacities at that time. The governments of the member states allocate the quotas to local potato starch factories, and these factories control their starch output through annual contracts with individual farmers.

The four policy instruments outlined above introduce three main differences between the measures applies to potato starch and those applied to cereal starches: the starch premium paid to processors; the system of production quotas; and, since 2000/01, the divergence created between the direct payment (formerly known as the compensatory payment) per ton of starch for starch potatoes and maize.

One should mention two other differences that exist between the policies applied to starch potatoes and those for maize. One is that, unlike cereal farmers, starch potato farmers have no obligation to set aside a minimum percentage of their starch potato land. However, starch potato farmers face a different form of output control, in that the production quotas place a limit upon the area that farmers collectively may plant to starch potatoes; thus, individual farmers may only increase their starch potato plantings if other farmers agree to cut back on their areas.

Another difference between the policies towards cereal and potato starch is the way in which the starch potato payment scale has built in complete stability in base product prices, through the fixed link to the intervention price plus 10 % This not only provides

starch potato processors and growers with greater stability than their cereal counterparts, it also provides starch potato processors with an element of competitive advantage over maize starch companies on those occasions when the domestic maize price is more than 10% above the intervention price. For example, if the maize price is 15% above the intervention price, a maize starch producer is obliged to pay 5% more than a potato starch processor on each ton of starch supplied as agricultural raw material (i.e., in maize or potato). This stability has a cost, however, when the domestic maize price is less than 10% above the intervention price, since maize then becomes a cheaper source of starch than potatoes, even before by-product credits are taken into consideration.

Potato Starch Production Quotas

The support afforded by this link between starch potatoes and the CMO for cereals proved attractive to farmers in many parts of the Community. The reunification of Germany was followed by significant investments in modern starch potato processing capacity during the early 1990s. In response to the prospect of further expansion, which would have added substantially to the expenditures on export refunds on exports of native and modified potato starches from the Community, the Council of Ministers adopted Council Regulation 1868/94 in July 1994 to subject potato starch output to production quotas. This was renewed under Council Regulation 1284/98.

The quotas were deemed necessary because an earlier undertaking to restrict output to 1.5 million tons was not adhered to by the five member states (Denmark, France, Germany, the Netherlands and Spain) that, prior to the accession of Austria, Finland and Sweden, were the only ones with potato starch producing capacity. Individual member states were given a choice between fixing the potato starch production quotas on the basis of the average actual production achieved between the 1990/91 and 1992/93 marketing years, or on the basis of 1992/93 alone. In addition, in calculating the size of the quotas, they were allowed to take account of investments made or irrevocably committed to by potato starch producers before the end of January 1994.

The quotas were made somewhat flexible, in the sense that potato starch production in each country is permitted to be up to 5% in excess of its quota in any individual year, provided that the surplus quantity is deducted from the quota available in the following year. Output in excess of 105% of the basic quota must be exported without the benefit of export refunds. The growers of the starch potatoes that contribute to this excess production are not entitled to receive the direct payment to the farmer (which currently represents close to 40% of the overall farmers' revenue); while the factory receives no starch premium of €22.25 per ton, but still is obliged to pay the minimum potato price, indicated in Table 3.1. These penalties act as major deterrents against over-production.

In addition, production within the quota is reserved for starch derived from potatoes that are specifically grown for starch processing. The output from processing surplus eating potatoes or by extracting starch from the effluents from industrial potato processing factories, making products such as frozen chips, are not covered by the quota system. In Chapter 2, we noted that such non-quota production is estimated to be comparatively modest, probably no more than 1% of total output. Processors of these tonnages are not entitled to receive the starch premium, and their potato suppliers are paid neither the minimum price nor the direct payments that growers of starch potatoes receive within the framework of the quotas. Users of this non-quota potato starch should not receive production or export refunds on their purchases of such starch, but in practice it would require considerable administrative costs to undertake the monitoring that would be needed to ensure that they do not do so at all.

Table 3.2 describes the national quotas since their introduction in 1995/96, when they were 1.760 million tons. They were increased by a reserve of 105,000 tons for Germany in 1996/97, reflecting irreversible investment commitments entered into in that country. In 1997/98, this reserve was incorporated into Germany's production quota. The basic production quotas remained unaltered until 2000/01, when they were reduced under the Agenda 2000 reforms as described in Council Regulation 1252/99, amending Regulation 1868/94; and they are being reduced further, as part of the same reforms, in 2001/02.

The Council of Ministers reduced the size of potato starch quotas in order to offset the budgetary costs of the more generous compensation, in the form of direct payments, paid to starch potato farmers than cereal farmers for intervention price reductions under Agenda 2000. The level of the quota cuts was determined so as to preserve budget neutrality in the implementation of the measures in the starch potato and cereal sectors.

Table 3.2: Potato Starch Quotas and Production Reserve, 1995/96-2001/02 ('000 tons)

	1995/96	1996/97	1997/98	1998/99	1999/2000	2000/01	2001/02
Denmark	178	178	178	178	178	173	168
Germany							
Quota	592	592	696	696	696	677	656
Reserve		105					
Spain	2	2	2	2	2	2	2
France	282	282	282	282	282	274	265
Netherlands	538	538	538	538	538	523	507
Austria	49	49	49	49	49	48	48
Finland	55	55	55	55	55	54	53
Sweden	64	64	64	64	64	63	62
Total Quotas	1,760	1,760	1,864	1,864	1,864	1,814	1,762
Reserve		105					
Combined Total	**1,760**	**1,864**	**1,864**	**1,864**	**1,864**	**1,814**	**1,762**

Source: European Commission (DG Agri, Unit C2).

THE INWARD PROCESSING REGIME

The Inward Processing Regime permits processors to import cereals, duty-free, for processing for the re-export market. The end-products from such activities have to be exported outside the Community. The Community Customs Code, which describes the terms on which inward processing procedures may be undertaken, was established in Council Regulation 2913/92 and implemented in Commission Regulation 2454/93. Chapter 3 of the latter regulation provides the details of the procedures to be followed under the IPR.

Table 3.3 summarises the total exports that have been made under the IPR of starch products included in Annex I of the regulations on export refunds. The volumes covered by such exports have been small in relation to the total magnitude of the starch sector. This is because these starch products exported from the Community receive export refunds that compensate them for the higher cost of cereals inside the EU. The peak in IPR exports in 1996 is noteworthy since it occurred during a brief

period when f.o.b. US Gulf prices were actually above domestic prices. As a result, export refunds were suspended. Since the lack of available export refunds is one of the conditions under which IPR is authorised, there was an increase in the use of IPR that year. Recently, there has been another increase in IPR processing on glucose produced in Austria for re-exporting to neighbouring Hungary and Slovakia.

Table 3.3: Exports Under the Inward Processing Regime to Non-EU Destinations of Starch Products Classified as Basic Agricultural Products, 1991-2001 (tons)

		1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	Jan-May 2001
11 08 1100	Native Wheat Starch	3	0	0	0	0	0	0	0	0	0	0
11 08 1200	Native Maize Starch	1	36	1	2	3	2	66	44	67	1,731	1,912
11 08 1300	Native Potato Starch	1,062	0	108	1,107	15	0	0	1	0	0	0
17 02 30 to 90	Glucose & Maltodextrin	62	3,882	11,487	9,457	8,487	17,949	3,372	3,977	9,852	15,589	25,598
	Sum of These Products	**1,128**	**3,918**	**11,596**	**10,566**	**8,505**	**17,952**	**3,438**	**4,022**	**9,919**	**17,320**	**27,510**

Note: These are the starch products classified as basic agricultural products in Annex I of Article 32.3 of the Treaty of Amsterdam.

Source: European Commission (Comext).

Article 557 of the Commission Regulation 2454/93 restricts the potential scope of IPR considerably. It only permits re-exports to be made under inward processing operations provided:

1.   No goods comparable to the good to be processed are produced in the Community (where "comparable goods" means goods falling within the same eight digit CN code);

2.   Comparable goods are not produced in the Community in sufficient quantity;

3.   Comparable goods cannot be made available within a suitable time;

4.   The price (after export refunds) or quality of the comparable goods within the Community would make the commercial operation economically impossible.

Under these rules, there would appear to be little commercial interest in the widespread IPR processing of starch products, because of the availability of a wide range of starch products within the Community, and the eligibility for export refunds when such products are exported to third countries.

POLICIES AFFECTING COMPETING PRODUCTS

Competing products affect the starch sector in two ways: in end-use markets, and as alternative crops for farmers growing cereals or potatoes for starch manufacture. We consider these two forms of competition in turn.

Competition for Chemical End-Uses

The most important competing products in the demand for starch derivatives are other fermentation substrates, such as sugar and molasses, both of which are affected by the CAP. In the paper end-use sector, butadiene sometimes substitutes for starch, but butadiene is entirely outside the framework of the CAP.

Sugar production refunds were introduced in 1986 for chemical end-uses defined under Council Regulation 1010/86 (this list is the same as that defining chemical products eligible for starch production refunds). Until July 2001, the refunds granted for sugar sold for chemical end-uses were calculated every three months on the basis of the weighted average sugar export restitutions granted at the weekly sugar export tenders for the previous two and a half months. From July 2001, the refunds are to be calculated monthly.

From July 1990, the average sugar production refund for chemical end-uses was reduced by a maximum of €84.5 per ton to the world market price (this was understood to reflect the freight and handling advantages that users would enjoy by virtue of not having to bring world market sugar into their factories). For the sixth Sugar Regime (1995/96-2000/01), under the basic sugar regulation (Council Regulation 178/81, consolidated in 2038/99), the Commission was allowed to reduce this deduction from €84.5 to as low as €24.2 per ton. It exercised this right from October 1998 and the refund was reduced by €20 to €64.5 per ton.

Diagram 3.5: EU Sugar Prices in Relation to World Prices for White Sugar
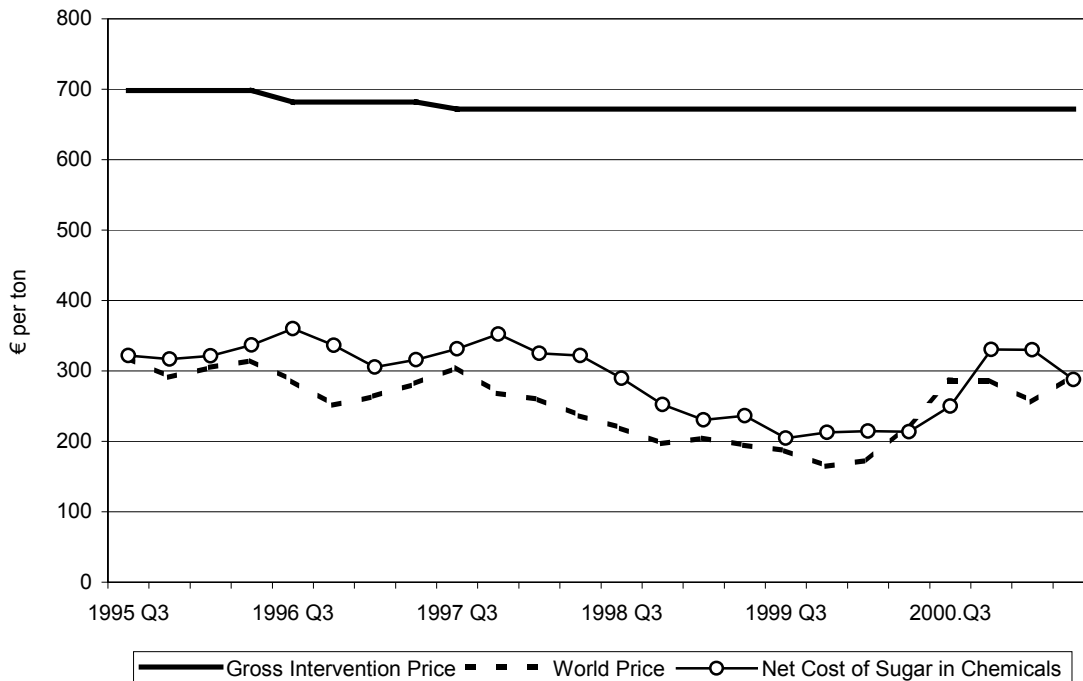
Source: LMC Database and LMC Calculations.

Until now, the production levies applied to Community producers of A and B quota sugar have covered only the cost of the production refunds on chemical uses of sugar for volumes in excess of 60,000 tons per annum. In the latest reforms, associated with the renewal of the Sugar Regime, the exemption of the first 60,000 tons from the commitment to repay production refunds via production levies has been ended.

Therefore, sugar farmers and processors (as well as isoglucose and inulin syrup producers) will bear the full cost of production refunds via their production levies.

The net effect of the sugar production refunds on chemical products is to pull the cost of white sugar to the end-user down very close to world market levels (see Table 3.4 and Diagram 3.5). In the table and diagram, calculated from data published by the French Intervention Board, the London Daily Price (LDP) for white sugar has been used as the world market price.

When world sugar prices are depressed, the net cost of sugar to the chemical industry is competitive with starch as a substrate. The diagram includes the EU net costs of maize per ton of starch, after deducting the production refund. In mid-2000, after the rise in maize prices, there was a period when the sugar price after refunds was very close to the net cost of maize per ton of starch, after subtracting the production refund.

Table 3.4: The Cost of EU Sugar Used for Chemical Products (€/ECUs per ton)

	Gross Intervention Price for White Sugar	Restitutions on Sugar in Chemicals	Net Cost of Sugar in Chemicals	World White Sugar Price (LDP)
1995 Q3	698.1	376.4	321.7	318.4
1995 Q4	698.1	381.4	316.7	291.1
1996 Q1	698.1	376.6	321.5	304.8
1996 Q2	698.1	361.4	336.8	314.7
1996 Q3	681.9	322.0	359.9	285.9
1996 Q4	681.9	345.7	336.3	251.4
1997 Q1	681.9	376.2	305.7	264.0
1997 Q2	681.9	366.2	315.8	282.5
1997 Q3	671.9	340.7	331.2	304.8
1997 Q4	671.9	319.9	352.1	268.2
1998 Q1	671.9	346.9	325.0	259.7
1998 Q2	671.9	349.9	322.0	236.4
1998 Q3	671.9	382.3	289.6	218.8
1998 Q4	671.9	419.6	252.3	197.0
1999 Q1	671.9	441.6	230.3	204.7
1999 Q2	671.9	435.6	236.3	194.4
1999 Q3	671.9	467.4	204.5	187.0
1999 Q4	671.9	459.2	212.7	164.4
2000 Q1	671.9	457.2	214.7	173.2
2000 Q2	671.9	458.2	213.7	224.8
2000.Q3	671.9	422.1	249.8	286.3
2000.Q4	671.9	341.6	330.3	286.3
2001.Q1	671.9	342.1	329.8	255.9
2001.Q2	671.9	384.1	287.8	294.7

Sources: FIRS; LMC Database; and European Commission, Agricultural Situation in the Community.

Isoglucose and inulin syrup, although derived from starch and inulin respectively, are regulated within the framework of the basic sugar regulation. When isoglucose was first regulated, it had its own basic regulation, Council Regulation 1111/77; but from 1981, it

was included in the regulation covering the Sugar Regime, i.e., Council Regulation 1785/81, and inulin syrup was added to the same basic regulation in 1994.

For the purposes of the present Evaluation, starch destined for manufacture into isoglucose will be considered to be part of the Sugar Regime. Nevertheless, it should be noted that there are some consequences for the economics of starch production, since isoglucose is typically manufactured in factories which also produce a range of other starch products, and thus influence their economies of scale and by-product output.

Molasses is another product whose prices are affected by the Sugar Regime, and which competes with starch derivatives in important applications, e.g., fermentation.

In the case of molasses, however, the net effect of the CAP is to raise prices slightly above world market levels when world prices are depressed, since that is when import levies are applied to defend the floor price of €69 per ton on cane molasses imported through Rotterdam. These variable import levies are designed to maintain the domestic molasses price above the minimum level assumed to apply in the calculation of processors' margins in the derivation of the sugar beet price within the framework of the Sugar Regime.

Competition Among Agricultural Crops

Competition is not confined to end-markets. On the agricultural raw material side, too, there are competitors for starch potatoes and cereals as crops for farmers supplying the starch sector. Oilseeds, such as rapeseed and sunflowerseed, are the most important competitors with cereals and starch potatoes for arable land.

As a result of the Agenda 2000 reforms, policy towards the oilseeds sector is becoming increasingly aligned to that for cereals, in the sense that the Community is moving towards one common area payment for both crops, after a long period in which oilseed farmers typically received higher area payments. Oilseeds will, however, still differ from cereals in one important respect, in that they have no intervention price system to protect them from periods of price weakness. However, with intervention prices for cereals falling under the Agenda 2000 reforms, their role is increasingly moving towards one of a safety net, which is less likely to be called upon than in the past.

In one significant respect, as noted above, it may be argued that, while the policies for competing cereal and oilseed crops are becoming more similar, those for cereals and starch potatoes are actually diverging. The Agenda 2000 proposals mean that, after a long time during which starch potato farmers have received direct payments that were designed to be the same per ton of starch to those for cereal farmers, the potato farmers are now receiving higher direct payments.

THE BUDGETARY COSTS OF THE STARCH REGIME

The measures that the Commission implements in its management of the starch sector within the CAP involved a budgetary cost of over €500 million to FEOGA in 2000 (see Table 3.5), and the non-Annex I export refunds on starch products had a budgetary cost of over €40 million to DG Enterprise. The total costs were reduced substantially between 1993 and 1994, and after falling to a low point in 1998, by 2000 were more or less back to their 1994 figure.

The main change of note within the composition of the outlays was a sharp increase in the budget devoted to specific potato starch expenditures between 1993 and 1995, but they have more or less stabilised since the introduction of production quotas in 1995.

The costs allocated by raw material reveal a sharp drop in the budget spent on maize starches from 1993 to 1998, following which it has risen considerably. For wheat and the other cereals, the outlay in 2000 was only €290,000 above the 1993 total (when the Union had only 12 member states).

The trends in cereal starch budgetary expenditures are in sharp contrast to the outlays for potato starch, which have risen more or less uninterruptedly, and have accounted for well over half of the total ever since 1996. However, it should be noted that, since 1996, the major share of the budgetary cost identified as related to potato starch was linked to direct payments, while the corresponding area payments for the cereals are not treated as a specific cost that is connected to the existence of the starch regime.

Table 3.5: The Budgetary Costs of the Starch Regime, 1993-2000 (million Euros)

	1993	1994	1995	1996	1997	1998	1999	2000
Total Export Refunds on Annex I Processed Products by Raw Material	**432.34**	**234.90**	**188.00**	**85.94**	**92.18**	**83.96**	**127.24**	**143.02**
of which: Maize	363.02	133.83	81.50	45.62	35.61	26.62	41.98	48.36
Wheat and Other Cereals	69.32	101.07	72.10	18.73	37.71	40.23	55.59	57.17
Potato	-	-	34.40	21.59	18.86	17.11	29.68	37.49
Total Export Refunds on non-Annex I Processed Products by Raw Material	**43.75**	**25.67**	**39.12**	**12.07**	**19.99**	**31.07**	**39.33**	**41.50**
of which: Maize	27.25	17.60	26.84	9.31	15.26	24.22	30.07	28.95
Wheat and Other Cereals	2.51	1.27	0.98	0.14	0.23	0.80	1.65	2.79
Potato	13.98	6.81	11.30	2.61	4.51	6.05	7.62	9.76
Total Production Refunds by Type of Starch	**363.64**	**185.72**	**132.40**	**96.92**	**59.69**	**49.54**	**169.25**	**168.15**
of which: Maize	305.29	95.39	102.60	55.43	33.68	27.99	86.31	94.04
Wheat	14.19	24.94	29.10	13.73	7.60	7.02	27.52	25.52
Other Cereals			0.50	0.46	0.19	0.31	0.50	0.82
Potato	44.17	65.40	0.20	27.30	18.22	14.23	54.92	47.76
Total Specific Potato Starch Expenditures	**51.98**	**100.32**	**182.80**	**177.08**	**208.56**	**204.36**	**182.90**	**193.19**
Potato Starch Premium	36.65	100.32	71.90	36.10	42.41	41.64	37.27	39.10
Direct Payments to Potato Farmers			54.70	140.98	166.15	162.72	145.63	154.09
Other Payments to the Potato Starch Sector	15.34		56.20					
Total Costs by Raw Material	**891.72**	**546.61**	**542.32**	**372.00**	**380.42**	**368.94**	**518.73**	**545.85**
of which: Maize	695.57	246.82	210.94	110.36	84.55	78.84	158.36	171.35
Wheat and Other Cereals	86.01	127.27	102.68	33.06	45.73	48.35	85.25	86.30
Potato	110.13	172.52	228.70	228.59	250.14	241.75	275.12	288.21

Source: FEOGA and DG Enterprise

Note 1:   The non-Annex I export data were only provided in detail for 1999 and 2000. In the previous years, we have only been able to obtain volume data. We have assumed in our estimates that the export refund paid on non-Annex I products moved exactly in parallel with the export refund on maize starch in the same year.

Note 2:   The division of non-Annex I export refunds between maize and wheat has been made on the basis of the division of export tonnages of non-Annex I products classified as wheat or maize in origin.

Note 3:   The official statistics only give two categories for non-Annex I products, wheat and maize, because potato starch receives exactly the same export refund as maize starch. We have assumed that potato starch export refunds for the non-annex I products are exactly half of the refunds paid on non-Annex I exports of modified starches.

Chapter 4: The Impact of Policy on the Starch Market Equilibrium

QUESTION 4.1

To what extent did the production refund ensure an outlet for Community starch products among producers of approved products?

Note: The original question posed by the European Commission has been restated to avoid certain difficulties concerning the definitions of non-food products and starch products. Please see the Appendix 1 to this question for details.

The Objective of the Question: To examine whether the production refund is necessary to maintain the markets for approved products.

Instrument: The policy instrument that is the subject of this question is the production refund (for this question, abbreviated to refund), which is paid to producers of a range of approved products, when they are processed from starch products. The approved products were defined originally in Annex I to the Council Regulation No 1722/93 and revisions,. These starch products, the basic starches and specified starch derivatives, are defined in Annex II of the same regulation with revisions. (See the Appendix to Chapter 3, Table A3.1 and A3.2, for the most recent version of these Annexes.).

Criteria: The production refund is judged to have been successful if it has been effective in maintaining the use of Community starch products among Community producers of approved products. By "maintained", we mean, in this and subsequent answers to questions, that the use of Community basic starches and starch derivatives in the production of approved products has been held steady or has increased.

In addition, the refund achieved its intended effects if the indirect importation of starch contained in imports of approved products did not increase as a share of the overall direct and indirect EU consumption of starches contained in the approved products.

The refund helped to ensure an outlet for Community starch products if its existence played an important role in determining how the Community's output of approved products was reflected in the Community's demand for domestic starch products.

Indicators: The indicators that will be used to determine whether the production refund has had its intended effect will be, first, trend in the Community's consumption of domestically produced basic starches and starch derivatives in the production of the approved products; second, the share of imports in the domestic market for approved products; and third, an assessment of the sensitivity to the existence of the production refund of the demand for Community starch products on the part of manufacturers of approved products.

FRAMEWORK FOR THE ANALYSIS OF THE QUESTION

The objective of the production refund is to compensate Community producers of approved products for the difference that results from the measures of the Common Market Organisation (CMO) between the Community price of base products and the c.a.f. import cost of the same products. This is deemed to be necessary because the approved products that are eligible for production refunds have little protection in the form of import duties. Council Regulations 1766/92 and 1418/76 state that production

refunds in the starch sector may be granted in order to keep prices competitive in relation to starch produced in third countries and imported as goods in respect of which the import arrangements do not provide sufficient protection for Community producers; and to enable the user industries concerned to have access to starch and certain derivatives at a lower price than that which would result from applying the rules of the common organisation of the market in the products in question.

In this context, and in respect of the criteria listed above, we can identify two main routes through which the measures of the CMO might lead to lost outlets for Community starch products. The first cause of a loss of outlets for Community starch products might be if high local agricultural raw material prices lead to a high cost of starch products, Community producers of approved products (referred to as end-users) may instead turn to cheaper imports of these starch products. In this case, the Community output of approved products is maintained, but the starch products that they use are increasingly imported. The extent to which end-users can do this depends primarily on the level of import duties on starch products, the freight costs of importing starch products, and the availability on the world market of appropriate starch products.

Second, outlets for Community starch products might also be lost if, while using Community starch, end-users are unable to compete with imports of their approved products manufactured from starches derived from base products bought at world market prices. As a consequence, the end-users would lose market share to imports, and Community starch product sales would suffer in parallel. The end-users might contribute to this process by moving their production to third countries. The extent to which this will happen depends primarily on the protection offered to producers of approved products by duties on imports of these products into the Community.

It should be acknowledged that producers of approved products may also be uncompetitive when producing these products in the Community in competition with imports because of factors that are unrelated to raw material cost, for example labour costs, environmental regulations or lack of scale.

The refund is only meant to compensate for the loss of competitiveness for the reasons mentioned in the first two points mentioned above. Correcting for the loss of competitiveness because of other factors is beyond the scope of the refund. We determine whether the refund is successful in compensating for the first two causes of a lack of competitiveness by establishing whether outlets for starch products are being lost in the Community, either because of a declining use of locally manufactured starch in approved products or because of increased imports of starch-containing approved products. Having satisfied ourselves of these facts, we then assess the importance of the refund in these developments in comparison with other factors, such as import duties and availability of starch products from outside the Community.

Analysis of the Question

Defining the Products to be Analysed

Diagram 4.1.1 (the data for which are presented in Table A2.4 in the Appendix to Chapter Two) depicts the distribution of the quantity of basic starch on which the production refund was claimed in producing approved products in the marketing year 2000/01. This allocation of the refund is typical of recent years and demonstrates that the paper, organic chemicals and esterified and etherified starch categories of approved products account for most of the refund.

On average, since 1992 these three classes of products have accounted for 87% of the quantity of basic starches and starch derivatives on which the refund is claimed. This 87% was divided between organic chemicals, 18%, esterified and etherified starch 34%, and paper 35%. In answering this question we shall focus on these, as the most important categories of product on which refunds are claimed. They were the sectors that we studied in field interviews. We describe briefly the type of starch used in each category.

Diagram 4.1.1: The Allocation of the Production Refund by Category, 2000/01
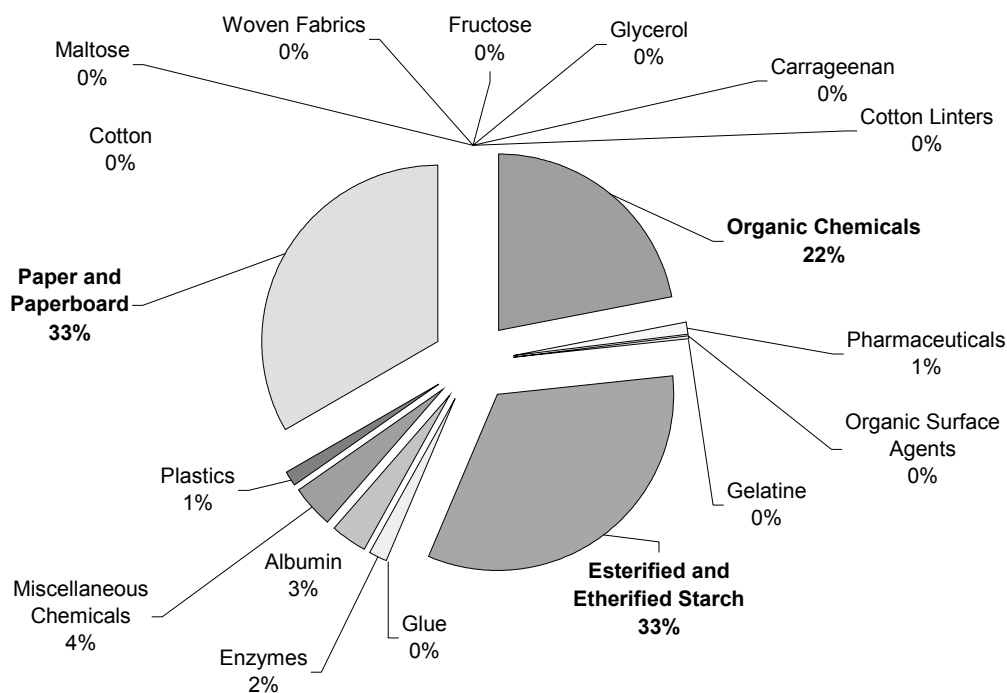
Source: European Commission (DG Agri, Unit C2).

Paper Use of Starch

The paper industry uses basic (native) starch and, particularly in fine paper, a range of modified starches. Cationic starch accounts for a large proportion of the modified starch used in paper. This product is an etherified starch and so is included in CN 3505 10 50, which implies that it is itself an approved product. Consequently, it is important to appreciate that much of the large quantity of starch on which a refund is claimed in the production of esterified and etherified starches (a refund that is claimed by starch processors, rather than end-users) is ultimately destined to be used in the paper industry. Official data have not been available to us to establish this proportion exactly, but during the field visits for this study, major starch processors suggested that the paper industry is the final domestic customer for around 75% of local sales of esters and ethers. Applying this proportion to the data in Diagram 4.1.1, we deduce that the paper industry accounted both directly and indirectly for perhaps 58% of all basic starch on which a refund was claimed in 2000/01. This is made up of 33% claimed directly (predominantly on native starch) and 25% indirectly (which is calculated as 75% of the 33% of refunds used in the manufacture of esterified and etherified starch).

Organic Chemicals' Use of Starch

Interviews with organic chemical companies confirm that those products falling within Chapter 29 of the CN code which use most starch are fermentation products such as citric acid and vitamins. Their production requires mainly glucose in the form of starch hydrolysate for fermentation with various enzymes. A much smaller quantity of native and modified starch is also used in this class of products, for example for making vitamin tablets.

Esterified and Etherified Use of Starch

Starch producers modify native starch by chemical means to produce a range of starch esters and ethers. In the paper industry, the most commonly used of these is the starch ether called cationic starch. In the food industry, the starch ester called acetylated starch and the starch ether called hydroxypropyl starch are among the most commonly used starch esters and ethers. In each case, the starch producer claims the production refund on domestic sales of any of these products. As was mentioned above, the majority of these products, by volume, are produced for the paper industry.

Diagram 4.1.2 presents our best estimates of the allocation of the production refund by the ultimate end use sector. The share held by the food industry consists of the share of esterified and etherified starch upon which a production refund is claimed and which is destined for food use, as mentioned above, plus the share of those other approved products which are used in the food industry. For each of the main outlets for basic starch depicted in Diagram 4.1.2, we have prepared in the next few pages an assessment of the extent to which the production refund has been instrumental in manufacturers' decisions to use Community starch products.

Diagram 4.1.2: The Allocation of Production Refunds by Ultimate End Use, 2000/01

Other
12%

Food
8%

Paper Industry Use of
Esters & Ethers
25%

Organic Chemicals
22%

Paper Industry Other
Use of Starch
33%
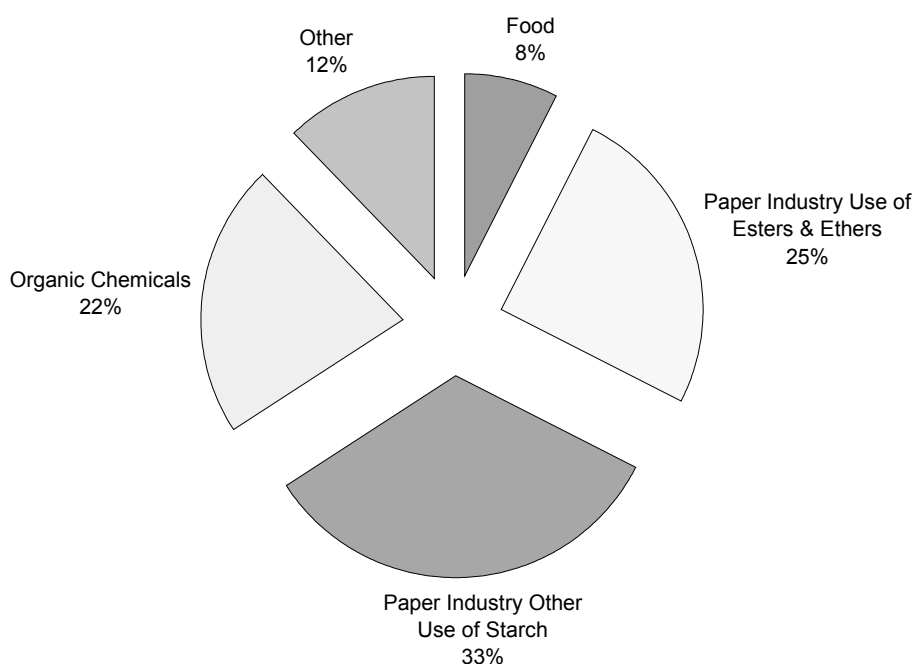
Source: LMC estimates based on interviews.

Determining Whether Outlets for Starch Products have been Maintained Among the Main Categories of Approved Products

We establish first the facts concerning the development of outlets for starch products in Community approved products. Diagram 4.1.3 (the data for which are presented in Appendix 2 to this Question) depicts the evolution of the outlets for starch products in the Community, focusing on the outlets for the main approved products and exports.

The export data consists of Comext data for exports of native starch, modified starch and glucose syrups, including maltodextrin, adjusted to a common starch basis using the technical coefficients applied by the Commission in the payment of production and export refunds, and listed in the Appendix to Chapter 3. What remains of domestic production after subtracting this definition of exports is the domestic use of starch other than from imported starches. These imports are insignificant and will be examined below. The use of starch in the production of paper, esterified and etherified starch and organic chemicals is assumed to equal the quantities of basic starches and starch derivatives on which a production refund is claimed in the production of each of these classes of product.

There are two main reasons for using this definition of starch use. The first is pragmatic. With the exception of paper, it has not been possible to obtain independent data from the relevant industries analysing their use of starch. The second reason is that the use of starch in these industries will definitely be at least as large as the quantities claimed for the production refund, and the evidence obtained in the field visits to the manufacturers of approved products was that the refunds are virtually always claimed, even when they are low, since users have administrative systems in place to do so.

Diagram 4.1.3: The Main Outlets for Starch Products in the Community
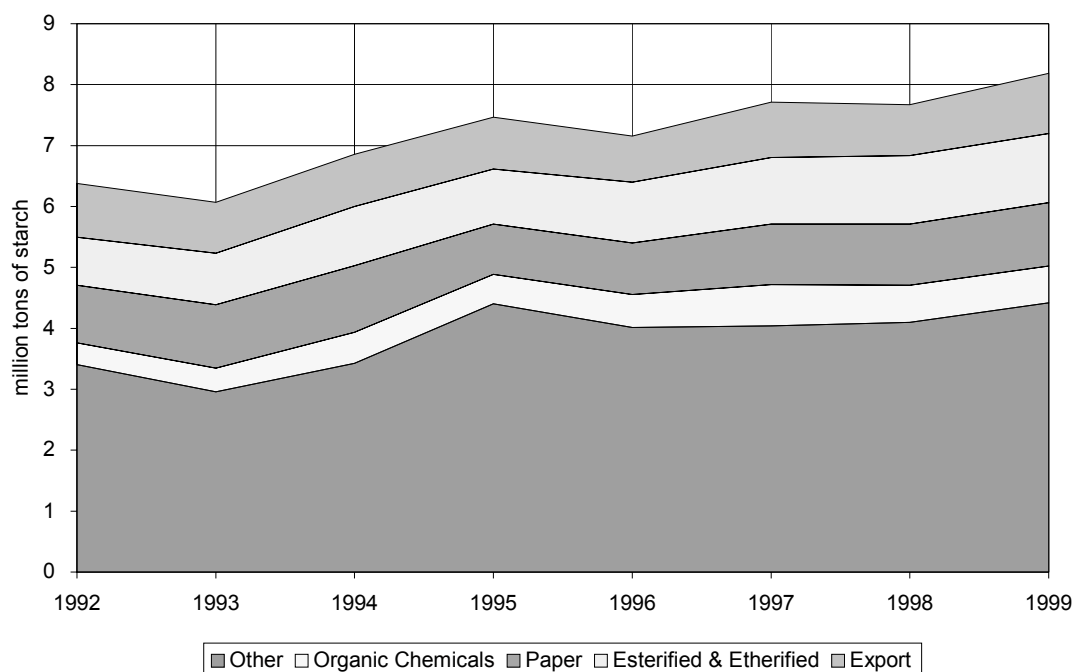
Source: AAC, Eurostat, CEPI, LMC estimates.

The data from which this diagram has been derived (presented in the Tables A(2)4.1.2 and A(2)4.1.3 in Appendix 2 to this Question) establish that the use of starch in each of the main outlets for approved products has been maintained, in the sense defined at the start of the discussion of this Question, since 1993. Within the total, the proportion of starch output used in organic chemicals and in esterified and etherified starch has grown slightly since 1993, while the proportion used directly in paper has fallen slightly.

It would however be misleading to conclude from this evidence that the outlet for starch in paper has not been maintained, since a substantial proportion of the starch used in esterified and etherified starch is destined for the paper industry. In Appendix 2 to this Question the data for the use of starch in paper are presented in Table A(2)4.1.4. These data have been provided by CEPI and demonstrate that paper has maintained its share of total starch use.

We conclude that, based on official data, the outlets for Community starch products in the main categories of approved products have each been maintained in volume terms (i.e., their use of Community starch products has held steady or increased), and each accounts for a fairly stable share of total Community production of starch.

It is possible that, although the volume of each outlet has been maintained, if the price of the starch product has declined over time, then the value of the outlet may not have been maintained. To test this, we require data for both the price and volume of starch sold to each outlet for approved products. Unfortunately, these data have generally been extremely difficult to obtain, mainly because they are considered to be confidential data by the industries concerned. Nevertheless, we have been able to obtain certain data for the paper industry which allows us to analyse this, the main outlet. Since the price data obtained for the paper industry are for wet end and surface sizing starches, which are mainly cationic starches, and thus starch ethers, we are also able to use these data to draw conclusions about the extent to which the value of the outlet for esterified and etherified starch has been maintained. The evolution of the value of the use of starch in the production of paper and of esterified and etherified starch is examined in the Appendix 2 to this chapter.

This analysis reveals that the refund has made an important contribution to maintaining the value of both these outlets for starch. The limited data reveal that there is an inverse correlation between EU prices of paper starches and the refund, presumably because, when the c.a.f. import price of maize is high, and thus the refund is low, the price of esterified and etherified starch is also high. In this way the refund serves to stabilise the price, and thus the value of the market for starch in paper.

We conclude that there is limited evidence that the price of starch products varies inversely with the production refund, presumably due to underlying variations in the world price of maize. Hence, the refund quite effectively serves to stabilise the value of the outlets for starch products in approved products.

The analysis so far considers only domestic production of starch. It is possible that outlets for starch are being lost in other ways, in particular, in the form of imports of starch or of approved products. We now consider these possibilities.

Community Trade in Paper Products

Diagram 4.1.4 depicts the net exports of various types of paper since 1995. The types of paper are defined according to their four digit Customs Nomenclature (CN) codes and these are listed in the Table 4.1.1. Interpretation of the data for the period from 1992 to 1995 is made complicated by the effects of the enlargement of the Community in 1995, which brought two major paper producing nations, Finland and Sweden, into the Union. Finland, in particular, is a major exporter of certain types of paper, and so trends in the net exports of paper from the Community depend to a large degree on whether or not Finland was a member of the Community. This point is explored in the Appendix 2 to this Question.

The diagram establishes quite clearly that the only significant imports of paper into the Community fall under the headings 4801 and 4804, and net imports of each of these categories have grown over time and currently stand at around one million tons in each case. The class of products labelled 4801 include newsprint used in the production of newspapers and 4804 consists of kraft paper, which is used to produce brown paper for wrapping and similar uses. Table 4.1.2 presents data on the typical use of starch in various classes of paper product.

The latter table demonstrates that both newsprint and kraft paper use relatively small quantities of starch. This is incorporated mainly in the wet end of the paper process to bind the fibres together, since neither type of paper requires coating or surface sizing. In the case of kraft paper, the industry reveals that this is a primary source of imported fibre into the EU, which finds its way through recycling into EU paper production. In 1999, total imports of newsprint were 1.88 million tons, while imports of kraft paper were 1.96 million tons. At most, assuming that all the paper included in these imports had a 1% starch content, this would account for imports of starch in paper amounting to a little over 38,000 tons. This is a very small quantity in the context of total starch use. In contrast, the EU is a major net exporter of CN 4810, which is coated paper including fine and graphic papers. This class of paper uses relatively large quantities of starch in its production, as is revealed by Table 4.1.2. In 1999, exports of this class of paper stood at 4.13 million tons which, assuming on average a 4% starch content, amounts to exports containing over 165,000 tons of starch.

This estimate of exports of starch in paper products is in marked contrast to the figures reported by DG Enterprise for the volume of starch covered by export refunds to the paper sector. In the entire period from 1995 to 2000, the starch volumes on which the paper industry received export refunds never exceeded 4,000 tons in a year. However, the total export refund figure reported for modified starches was over 500,000 tons of starch in 2000.

Table 4.1.1: Customs Nomenclature (CN) Codes for Paper Products

Code	Description
4801	Newsprint, in rolls or sheets
4802	Uncoated paper and paperboard, of a kind used for writing, printing or other graphic purposes, and punch card stock and punch tape paper, in rolls or sheets, other than paper falling within heading No 4801 or 4803; handmade paper of paperboard
4803	Toilet or facial tissue stock, towel or napkin stock and similar paper of a kind used for household or sanitary purposes, cellulose wadding and webs of cellulose fibres, whether or not creped, crinkled, embossed, perforated, surface-coloured, surface-decorated or printed, in rolls or sheets
4804	Uncoated craft paper and paperboard, in rolls or sheets, other than that of heading No 4802 or 4803
4805	Other uncoated paper and paperboard, in rolls or sheets, not further worked or processed than as specified in note 2 in Chapter 48 of the Combined Nomenclature
4806	Vegetable parchment, greaseproof papers, tracing papers, and glassine and other glazed transparent or translucent papers, in rolls or sheets
4807	Composite paper and paperboard (made by sticking flat layers of paper or paperboard together with an adhesive), not surface-coated or impregnated, whether or not internally reinforced, in rolls or sheets
4808	Paper and paperboard, corrugated (with or without glued flat surface sheets), creped, crinkled, embossed or perforated, in rolls or sheets, other than paper of the kind described in heading No 4803
4809	Carton paper, self-copy paper and other copying or transfer papers (including coated or impregnated paper for duplicator stencils or offset plates), whether or not printed, in rolls or sheets
4810	Paper and paperboard, coated on one or both sides with kaolin (china clay) or other inorganic substances, with or without a binder, and with no other coating, whether or not surface-coloured, surface-decorated or printed, in rolls or sheets
4811	Paper and paperboard, coated on one or both sides with kaolin (china clay) or other inorganic substances, with or without a binder, and with no other coating, whether or not surface-coloured, surface-decorated or printed, in rolls or sheets
4812	Filter blocks, slabs and plates, of paper pulp
4813	Cigarette paper, whether or not cut to size or in the form of booklets or tubes:
4814	Wallpaper and similar wall coverings; window transparencies or paper
4815	Floor coverings on a base of paper or of paperboard, whether or not cut to size
4816	Carbon paper, self-copy paper and other copying or transfer papers (other than those falling within heading No 4809), duplicator stencils and offset plates, of paper, whether or not put up in boxes:
4817	Envelopes, letter cards, plain postcards and correspondence cards, of paper or paperboard; boxes, pouches, wallets and writing compendiums, of paper or paperboard, containing an assortment of paper stationery
4818	Toilet paper and similar paper, cellulose wadding or webs of cellulose fibres, of a kind used for household or sanitary purposes, in rolls of a width not exceeding 36 cm, or cut to size or shape; handkerchiefs, cleansing tissues, towels, tablecloths, serviettes, napkins for babies, tampons, bed sheets and similar household, sanitary or hospital articles, articles of apparel and clothing accessories, of paper pulp, paper, cellulose wadding or webs of cellulose fibres
4819	Cartons, boxes, cases, bags and other packing containers, of paper, paperboard, cellulose wadding or webs of cellulose fibres; box files, letter trays, and similar articles, of paper or paperboard of a kind used in offices, shops or the like
4820	Registers, account books, note books, order books, receipt books, letter pads, memorandum pads, diaries and similar articles, exercise-books, blotting-pads, binders (loose-leaf or other), folders, file covers, manifold business forms, interleaved carbon sets and other articles of stationery, of paper or paperboard; albums for samples or for collections and book covers, of paper or paperboard
4821	Paper or paperboard labels of all kinds, whether or not printed
4822	Bobbins, spools, cops and similar supports of paper pulp, paper or paperboard (whether or not perforated or hardened)
4823	Other paper, paperboard, cellulose wadding and webs of cellulose fibres, cut to size or shape; other articles of paper pulp, paper, paperboard, cellulose wadding or webs of cellulose fibres

Source: Taric Database of the European Commission (DG Trade).

Diagram 4.1.4: Net EU Exports of Paper Products from Chapter 48, 1995-1999

million tonnes

4-digit CN Code

■ 1995 □ 1996 ■ 1997 □ 1998 ■ 1999
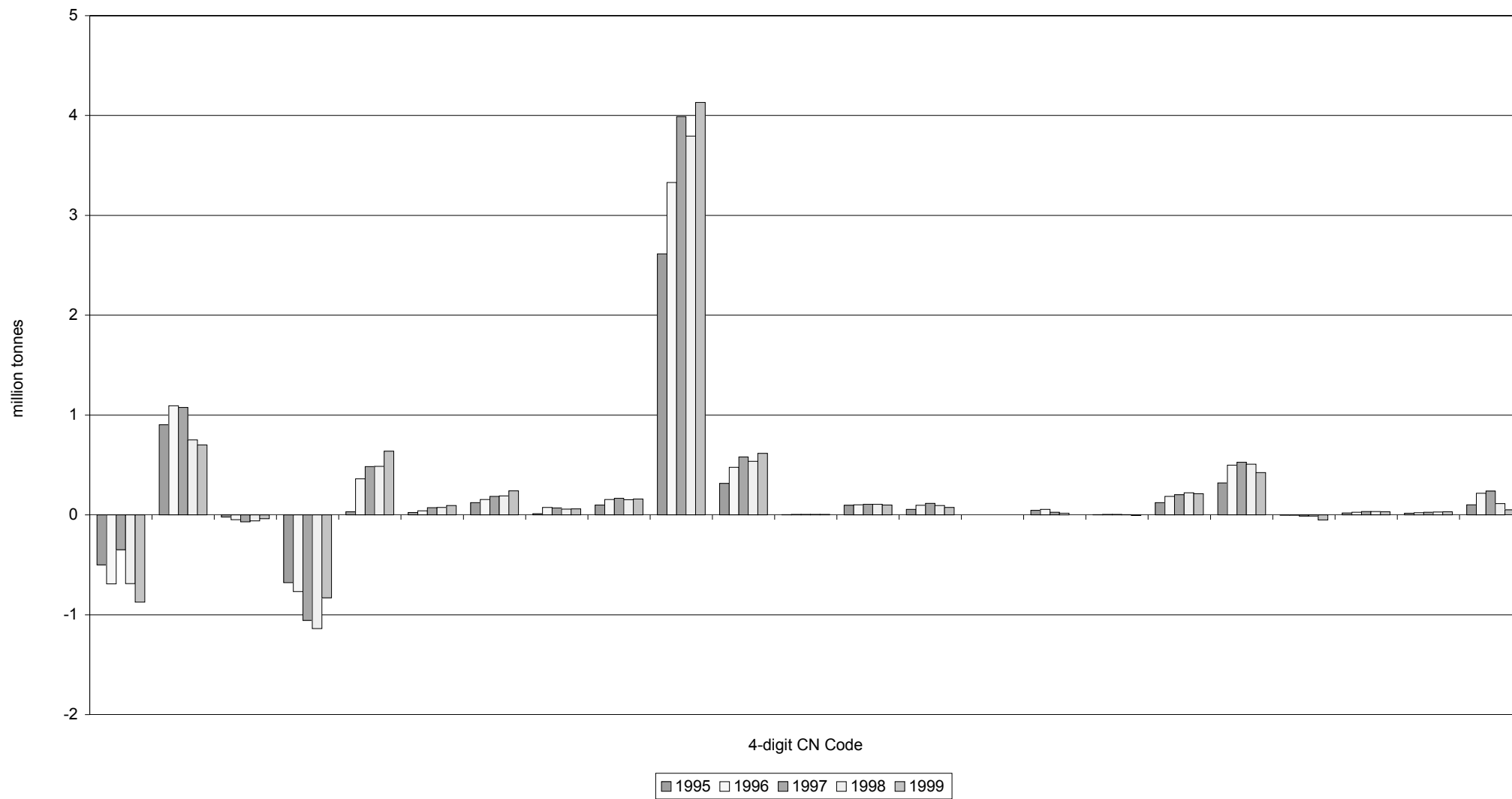
Source: Comext.

Table 4.1.2: Starch Use in Various Types of Paper

Type of Paper	Description	Use	Starch Use (%)
Newsprint	Mainly recycled fibre, mechanical pulp or sulphate pulp	Newspaper production	0-1
Super-calendered	Uncoated paper from mechanical, chemical and de-inked pulp and filler. Calendered to give glossy printing surface.	Magazines, catalogues and advertising material	1-2
Coated Mechanical	Mechanical pulp coated paper	Special and general interest magazines	1-4
Coated fine paper	Bleached chemical pulp, coated with pigmented layer	Printing writing and office paper	4-5
Uncoated fine paper	Bleached chemical pulp	Printing writing and office paper	2-4

Source: LMC estimates, derived from interviews with paper and starch producers.

Community Trade in Organic Chemicals

Next we examine imports of selected organic chemicals to determine whether outlets for starch products are being lost to this sector. The net imports of these products constitute relatively modest quantities. Diagram 4.1.5 depicts the net imports of two of the most important fermentation products produced from starch: citric acid and vitamin C. The data for citric acid suggest that net imports have fallen from a high level of around 90,000 tons in the early and mid-1990s to a lower level of under 30,000 tons in 1996, from which they have risen again.

This pattern is unusual. There are two factors that might explain this behaviour. First, in 1995, Austria gained accession to the EU and a major producer and exporter of citric acid, Jungbunzlauer, has a production plant in Austria, which would be recorded in the Community-wide trade data as a reduction in net imports. Furthermore, between 1995 and 1996, the world price of maize soared to record high levels due to an extended drought in the US. Since the EU produces a substantial quantity of citric acid from molasses, mainly in Ireland and in Belgium, this was a time when the EU emerged as a relatively low cost source of citric acid, at least when produced from molasses.

For lysine, the Community has become a steadily increasing net importer. Net imports were almost 110,000 tons in 2000, up from 13,000 tons in 1990.

Diagram 4.1.5: Net Imports of Lysine, Citric Acid & Vitamin C into the Community
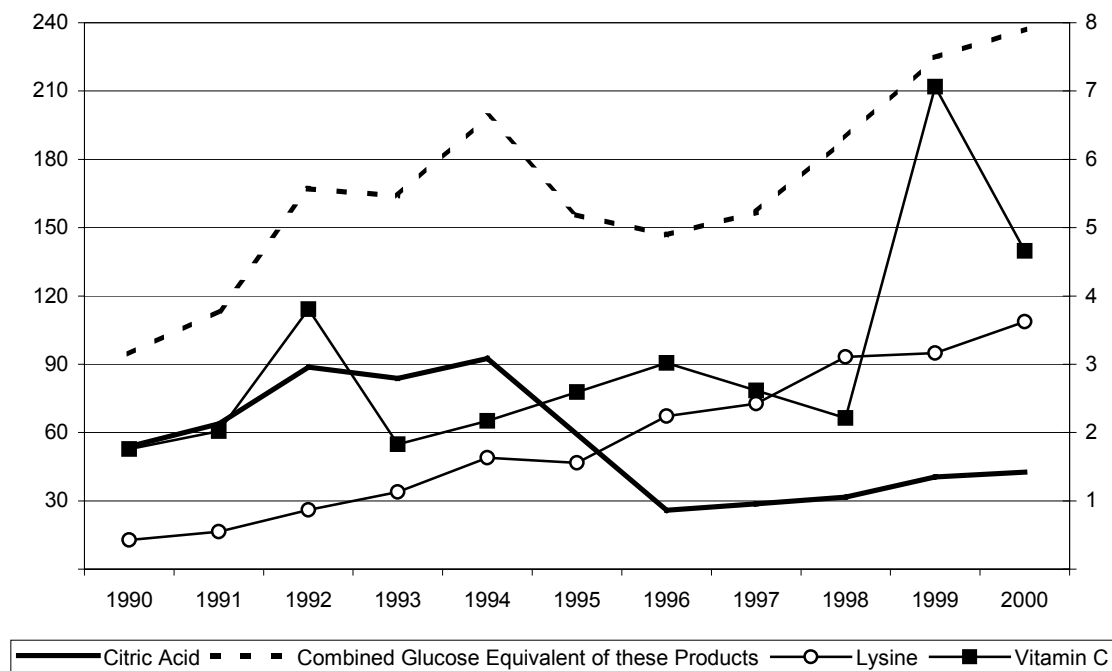
Source: Comext.

For this analysis we used official Comext data, even though they might not be as complete as export licence data. However, they were only information available to us, and suggest that a rising volume of imports of fermentation products is coming into the EU, at least as represented by these three main examples of these products.

Vitamin C requires, on average, 4.5 tons of dextrose to produce one ton, while citric acid requires, on average, 1.25 tons of dextrose for one ton of acid; the ratio for lysine is 1.5 tons. Hence, net imports of citric acid amounted to a lost outlet for approximately 54,000 tons of glucose in 2000, and net imports of vitamin C a further lost outlet for

21,000 tons; for lysine the loss of dextrose sales was 163,000 tons, making the combined total 237,000 tons of glucose (see Diagram 4.1.5). Since the 2000 refund data state that the domestic use of starch in organic chemicals was 610,000 tons, over a quarter of the total direct and indirect domestic starch use in organic chemicals is currently being imported in the form of starch contained in final product imports.

Community Trade in Esterified and Etherified Starch

Diagram 4.1.6: Net Exports of Modified Starches from the Community
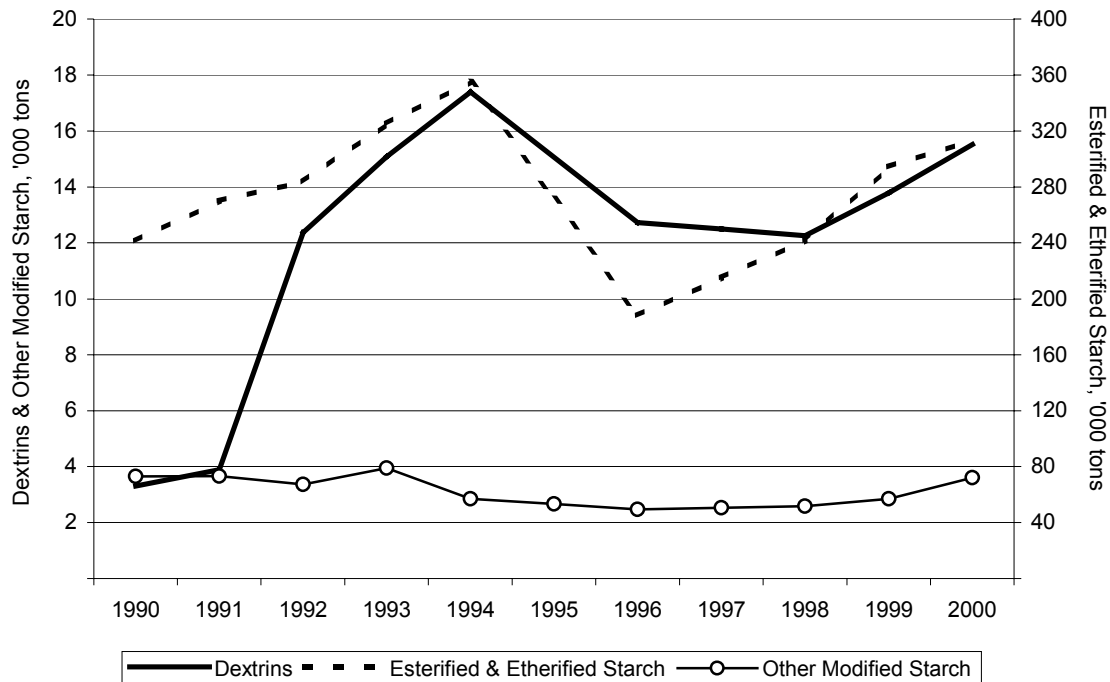
Source: Comext

The data for net exports of the three classes of modified starch in Customs category CN 3505 10 are presented in Diagram 4.1.6. The diagram includes one approved product, which thus received production refunds; this is the category of esters and ethers, CN 3505 10 50. The dip in net exports of esterified and etherified starch coincided with the enlargement of the Community. Since Finland is a major user of these starches, it was to be expected that net exports would fall after it joined in 1995. However, it is clear that, for each class of modified starch product, the EU is a major net exporter, particularly of esterified and etherified starches for which net exports were over 300,000 tons in 2000, according to Comext. There are no significant lost outlets for Community starch products in the form of imports of esterified and etherified starch, since such imports were 41,000 tons in 2000, as against 46,000 tons of imports back in 1989 and Comext's export figure of 354,000 tons for the same year.

Total EU exports of modified starches in 2000 were 450,000 tons in the COMEXT statistics. Once one allows for the technical coefficient of 1,.824 (being 1.6 as the maize coefficient and 1.14 to translate modified starch into starch) to convert modified starches into maize for the purposes of export refunds, this is very close to the total of 855,000 tons, maize equivalent, reported by DG Enterprise as exports of modified starches from the Community with export refunds.

Other Products

Finally we analyse the import data for the main remaining group of starch products, the native starches. Diagram 4.1.7 depicts imports of the five CN categories of native starches: wheat starch, maize starch, potato starch, tapioca starch and other starches. It is clear that, after a peak in the early 1990s, imports of potato starch have dropped dramatically in the latter half of the decade to virtually zero. Likewise wheat starch and other starch (rice starch) imports are, even though increasing slightly, negligible.

In contrast, imports of native maize and, in particular, tapioca starch are considerably higher and are still rising. The tapioca starch imported into the Community originates almost entirely from Thailand and the native maize starch is mainly imported in the form of special products, such as waxy maize starch, from the US. The imports of these two special native starches, the main one of which is not produced within the Community, are expected to rise further in the coming years. However, imports of those native starches that compete with locally produced equivalents represent only a minuscule proportion of the domestic market for these starches.

Diagram 4.1.7: Imports of Natives Starch into the Community
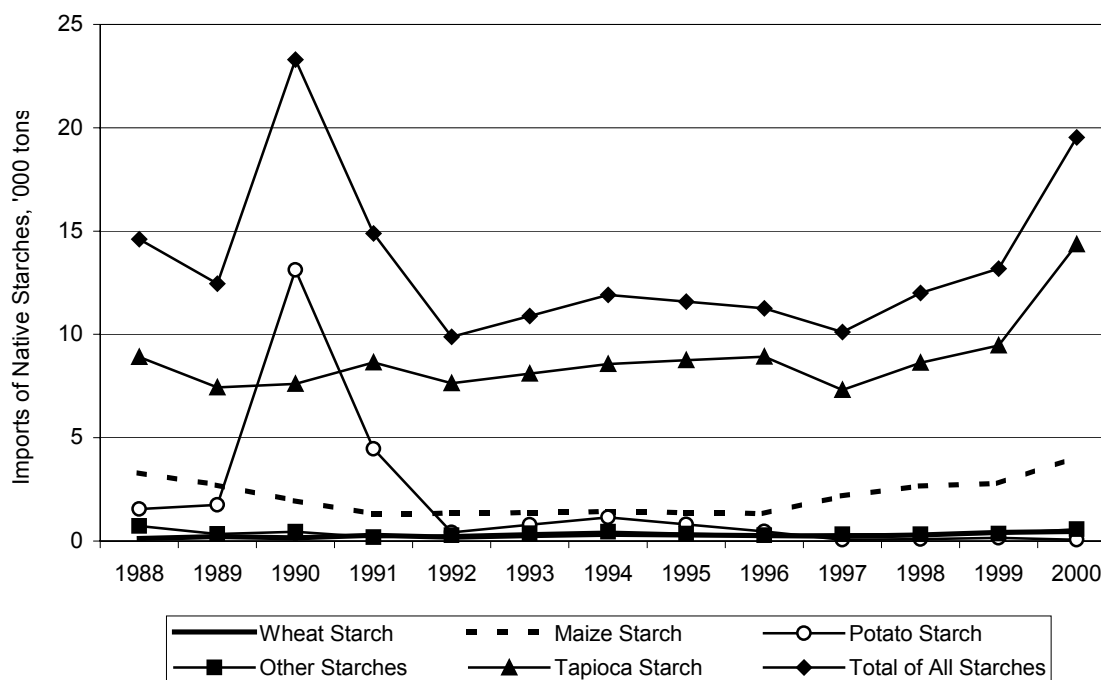
Source: Comext

We conclude this section as follows:

The main outlets for Community starch products among the principal classes of approved products (paper, organic chemicals and esterified and etherified starch) have been maintained since 1992 in the sense that the use of starch in these sectors has been stable, or has risen, both in absolute terms and as a share of overall Community starch production (see Diagram 4.1.3).

These outlets have been further maintained in the case of paper and esterified and etherified starch in the sense that indirect imports of starch into the Community in the form of these products are negligible.

Only in the case of organic chemicals is there strong evidence that outlets for Community starch products are being lost (i.e., not being maintained) in the form of increased imports of the main classes of starch-using organic chemicals. In addition, during interviews undertaken for this Evaluation, several organic chemical companies referred to the relocation of organic chemical capacity outside the Community, which is tending to reduce the share of the market supplied from locally processed starch. The relocation occurs for many reasons, among which the share of starch in total costs is often just a small element.

The Importance of the Refund in Maintaining Outlets for Starch Products

Having assessed the extent to which the main outlets for starch products among producers of approved products (i.e., those eligible for production refunds) are being maintained, it remains to be demonstrated that the production refund is playing an important role in maintaining these outlets. The data available to us are insufficient to establish any statistical relationship between the stability of the outlets for starch products and the level of the production refund. We thus have to rely on more indirect evidence of the importance of the production refund. We do this by drawing a distinction between the use of starch in the paper industry and its use in the organic chemicals industry, a distinction that has been established above. We begin by presenting information on the import tariffs on these products.

Import Tariffs on the Main Classes of Approved Products

Table 4.1.3 summarises the base import tariffs applied on the main approved products eligible for a production refund[1]. Generally these tariffs are less than 10% and are much less, in percentage terms, than the tariffs on native starch. It is interesting to note that the rate applied to organic acids is generally higher than that on paper products or that on esterified and etherified starch, although among the organic chemical products there are substantial imports of citric acid and lysine, for example. On the other hand, exports of esterified and etherified starches are ten times higher than imports of the same products, which suggests that, at least in their case, the combined impact of production and export refunds may be to stimulate Community production to a greater extent than intended when the policy was formulated.

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[1] See Table A3.4 in the Appendix to Chapter 3 for a more detailed list.

Table 4.1.3: Base Import Tariffs on Selected Classes of Approved Products Eligible for a Production Refund

CN Chapter	CN Code	Approved Products	Range of Duties
Chapter 48	48	Paper	Up to 3.6%
Chapter 29	29	Organic Chemicals	Up to 8.5%
	29 18 11	Organic Acids	Up to 8.5%
	29 36	Vitamins	0%
	29 41	Antibiotics	Mostly 0%
Chapter 35	35 05 10 50	Esterified and Etherified Starch	7.7%
	35 05 10 50 20	Hydroxyethyl waxy maize starch	Duty suspended

Source: EU Commission (Comext).

The Importance of the Production Refund to the Paper Industry

Data are not available to determine how much of the starch used by each sector producing approved products is claimed in the form of a refund. Therefore, unfortunately, we are unable to determine whether the refund is becoming more important to end users of starch in terms of the proportion of starch use on which they claim a refund. In Appendix 2 to this chapter, we present an argument for the paper industry which suggests that, at least for this important starch user, this might be true. The same argument also suggests that this industry is using increasing amounts of etherified starch in the form of cationic starch, and this is supported by what has been said by the industry in interviews. We may summarise this evidence as follows:

The Community paper industry is increasingly export oriented, particularly in high quality graphic papers, and this is despite the low level of tariffs on imports of paper into the Community. There exists some competition from butadiene-derived products, so there is a possibility for substitution, which is however discouraged by the refunds.

There is evidence to support the claims of the paper industry that it uses increased quantities of starch ethers, in the form of cationic starch, and these are supplied mainly by Community processors, despite low tariffs on imports of competing esterified and etherified starch. It would be wrong, however, to conclude from this that the production refund is the main reason why the paper industry continues to use Community starch products. The EU paper industry, particularly in the Nordic countries, produces high quality graphic papers that use large quantities of cationic starch, and the EU is the leading producer of this starch. The US paper industry, in contrast, uses large quantities of hydroxyethylated starch, which would lead to problems in the EU industry, which has more environmentally friendly closed water systems. If the EU industry were to import its cationic starch needs, they would have to be supplied from the US, in the form of maize starch, or more probably from Thailand in the form of tapioca starch, since tubers (potato and cassava) are preferred sources of starch for paper makers.

In Appendix 2 to this Question, we present recent indicative prices of starch purchased within the Community and from Thailand. At present, the market for tapioca derived paper starches is small, and the price of these starches is not very competitive, once freight and tariffs have been accounted for. It is significant, in this context, that the 22,500 ton Thai tariff rate quota to bring native cassava starch into the Community at a tariff of €66 per ton, as against the usual €166 rate, is not filled.

Paper producers in the Community complain about a lack of potato starch available to the domestic market over the last two years. They blame the export refund which, they say, gives EU starch processors too great an incentive to export potato starch, leaving the domestic market short of supplies. They claim that the system is distorted when potato starch is being exported at the same time that they have to import tapioca starch, although, according to the trade data, the extent of the latter is limited.

Our conclusion is as follows:

Starch use in the paper industry may be divided, broadly, into the use of native starch and esterified and etherified starch (mainly cationic starch). The later is reviewed below. Outlets for native starch in the Community are protected by substantial import duties. It is thus difficult to maintain that the refund has been instrumental in ensuring the outlet for native starch use in paper. Furthermore, in paper, native starch use accounts for only 1% of the weight of paper, and constitutes a very small element of total production costs. Therefore, the reasonable conclusion to draw is that the growth of the outlets for starch other than etherified and etherified starch in paper has been driven by factors internal to the paper industry, rather than the existence of the refund.

The Importance of the Production Refund to Esterified and Etherified Starch Production

Starch esters and ethers are used domestically mainly in the paper industry, with the remainder mainly used in processed foods. Since we have established above that the paper industry has suffered little loss of domestic markets to imports, despite low duties, and since the processed food sector is generally protected by tariffs, the main way in which outlets for esterified and etherified starch might be lost would be if these modified starches were imported directly by paper and food manufacturers. The evidence above suggests that this is not happening. We investigate here whether this is due to the compensation offered by the production refund.

The industry has not made available to us data on the prices of various starch products, and so for the most part we have had to rely on trade unit values. Appendix 2 to this chapter presents details of the evolution of these prices, and assesses their reliability. Diagram 4.1.7 below illustrates the empirical relationship between EU prices of esterified and etherified starch and the prices of imports of the same products.

Diagram 4.1.8 : EU and Import Prices for Esterified and Etherified Starch
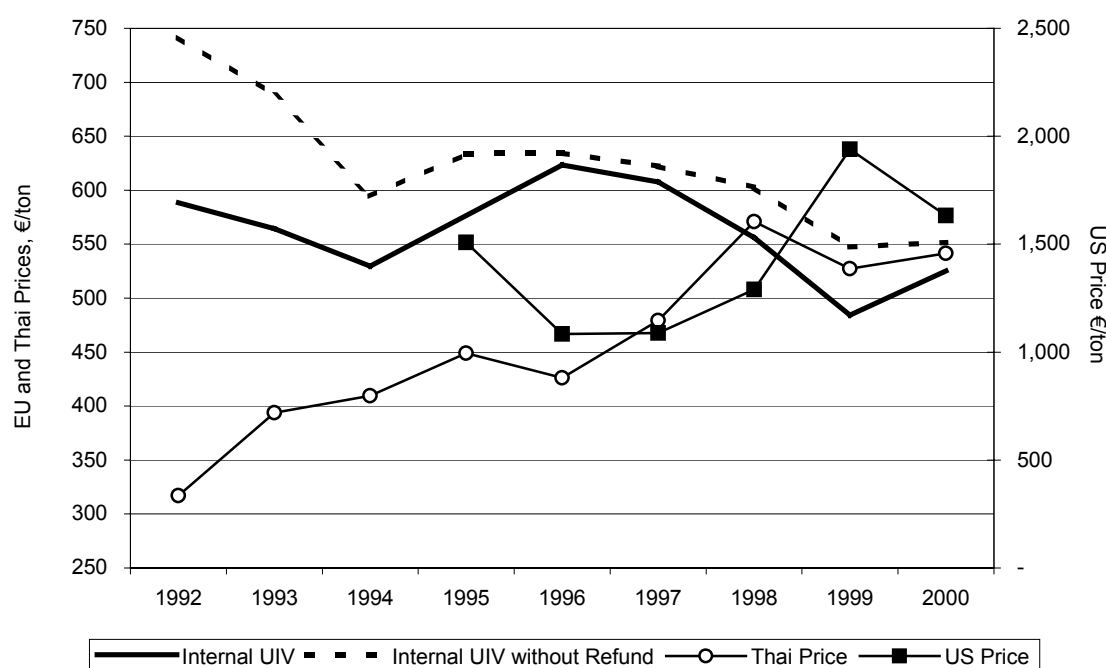
Source: EU Commission (Comext)

Note: UIV: Unit Import Value

The Thai and US prices, as is explained in the Appendix, are derived from import unit values of imports of 3505 10 50 products into the EU from these countries. The US and Thailand together account for more than 75% of total Community imports of esterified and etherified starch, which amounted to just over 40,000 tons in 2000. Thailand takes slightly more than one half of total imports on average. It is clear from the diagram that US imports are of speciality products. The industry states that these are generally in the form of premium waxy maize starches. However, Thai imports are priced much more competitively and appear to compete effectively with EU products on price. The production refund is added to the EU price for comparative purposes, as explained in the Appendix, to establish what domestic prices might have been without the refund. Imports from Thailand and the US have, in general, to pay a 7.7% import tariff on their c.i.f. landed cost, and this increases slightly the average price depicted above (by 40 €/ton for Thai starch at current prices).

There is no doubt that tapioca starches are good substitutes for potato esterified and etherified starches, and are perceived as better quality starches than maize esters and ethers. We were told during interviews that it is mainly problems with the availability of these products, and the difficulty of obtaining technical product support from suppliers in Thailand that prevents EU end users from importing more of these starches. However, some leading European starch processors now have cassava starch operations in Thailand, and therefore these reported problems may lessen soon.

We conclude that the prices of competing products for Community esterified and etherified starches, especially from Thailand, have been sufficiently low, particularly in the early 1990s, that the production refund has played a significant role in securing outlets for EU products. However, other factors are important, such as the difficulty of obtaining product development services and after sales support for these imports. The

import tariff does little to detract from the competitiveness of Thai imports, although it is becoming increasingly important in the face of a declining refund.

The Importance of the Production Refund to the Production of Organic Chemicals

The data above established that the outlet for starch products in organic chemicals has been maintained, at least in the sense that, domestically, this use of starch has kept pace with the overall production of starch. However, there is evidence that the Community is open to competitive imports of certain organic chemicals and that starch is being imported indirectly in this form. Tables 4.1.4 and 4.1.5 present data on the prices of various organic chemicals. These have been derived from unit import values using the US and China as third country origins for comparison. The EU prices are averages of import values for internal trade between the main Member States producing these products, namely France, Germany and Belgium.

Table 4.1.4: Unit Import Values for Sorbitol (€/kg)

	Liquid Sorbitol			Powdered Sorbitol	
	EU	US	China	EU	US
1998	0.58	1.21	1.00	1.40	1.29
1999	0.49	0.56	0.55	1.32	1.22
2000	0.47	0.64	n/a	1.27	1.42

Source: EU Commission (Comext).

The US exports a small quantity of powdered sorbitol to the EU. The main trade in sorbitol is in the liquid product, and this is derived almost entirely from within the EU. China is a minor player in this trade, exporting just tens of tons of this product. The EU is clearly competitive in sorbitol and internal prices are considerably lower than imported prices for the main liquid product.

Table 4.1.5: Unit Import Values for Citric Acid, Vitamin C and Penicillin (€/kg)

	Citric Acid			Vitamin C			Penicillin	
	EU	US	China	EU	US	China	EU	China
1998	1.17	3.37	0.76	6.45	8.26	4.84	45.77	24.63
1999	0.98	2.89	0.78	5.81	7.35	4.68	52.56	26.89
2000	0.97	2.27	0.87	6.14	7.95	5.07	59.74	34.03

Source: EU Commission (Comext)

The picture is quite different for other organic chemicals. Chinese prices for citric acid are regularly 20% or more below EU prices, so that even after applying the import tariff, which is currently 8.5%, China is a very competitive supplier of citric acid to the Community. Indeed, Chinese imports into the EU, which were 40,000 tons in 2000, match the volumes shipped from some member states with their own production capacity. The US supplies only very small quantities of premium grades of citric acid to the EU.

The situation is remarkably similar for vitamin C and for penicillin. China supplies these products at a considerable discount to EU prices, particularly in the case of penicillin, and exports from China to the EU are comparable with sales within the EU of the main producing countries.

In Appendix 2 to this chapter we calculate the protection afforded these products by tariffs and by the production refund. This advantage is significant in the case of sorbitol; tariffs and the refund are of benefit in the case of vitamin C and citric acid, but of little benefit for penicillin.

We conclude that certain sectors for organic chemicals are under threat from low cost supplies of these products, especially from China. The refund, by mitigating some of the effects of raw material cost price differences, seems to have been of only limited benefit in maintaining the outlets for these products in the EU, since it is insufficient to offset fully the price differences between EU and Chinese products.

However, there is no evidence that the refunds fail to compensate for base product price differences, as they are intended to do. Therefore, one concludes that other factors, beyond mere raw material cost differences, explain the competitiveness of Chinese producers in these markets. This conclusion is reinforced by the observation that China is a net importer of sorbitol, with the Community its largest single overseas supplier, yet it is a sizeable net exporter to the Community of vitamin C (which is manufactured from sorbitol). If raw material or intermediate costs alone were the main determinant of competitiveness, it would be virtually impossible for China to have developed this unusual import-export trade in sorbitol and vitamin C.

The Importance of the Production Refund in the Competition Between Glucose and Sugar in Approved Uses

There is a special consideration in the case of the production refunds provided on glucose products, which is the nature of the competition with sugar, which is entitled to refunds for chemical uses in approved products. In this instance, two alternative raw materials may compete for the same customers.

In Diagram 4.1.9, we have compared the cost of the base products used to manufacture glucose (assuming that the 75:25 split between maize and wheat that is assumed in the export refund calculations is a fair reflection of the actual choice of base product in glucose manufacture) with the net cost of sugar, after the payment of the chemical refund. For glucose, we have included the cost of base products, per ton of glucose, both with and without the production refunds.

This comparison, it should be stressed, considerably understates the competitiveness of sugar, since it does not include any allowance for the processing margin over and above the raw material costs in glucose manufacture (though these will be offset somewhat by the by-product credits earned on maize and wheat processing).

It is evident from the diagram that production refunds have often been very important, especially in the first half of the 1990s, in ensuring the ability of starch-derived glucose to compete with sugar in chemical uses. It is, however, also evident, that there have been periods when sugar was very competitive indeed as a raw material, since world sugar prices were very low in 1999 and 2000.

The sugar refunds are intended to compensate users for price differences between Community and world market prices, and thus have the same basis as the starch and glucose production refunds. Since it is not the objective of the starch and glucose refunds to compensate for the differences between world market cereal prices and world market sugar prices, we see no justification for amending the production refund system to bring starch and sugar costs more closely into line with one another in the manufacture of approved products. Rather, we would merely note that sugar is often very competitive as a substrate in such uses.

Diagram 4.1.9: Comparing the Net Cost of Cereals Processed into Glucose for Approved Uses with the Net Cost of Sugar in Chemical Uses
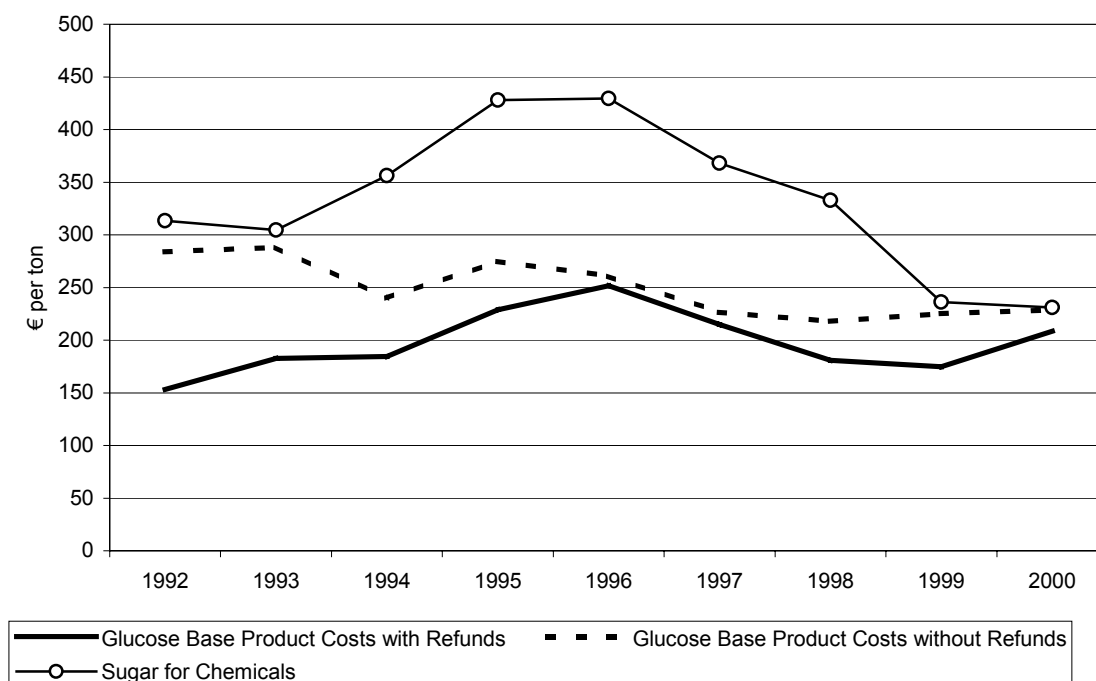
Source: LMC estimates derived from European Commission (DG Agri, Unit C2)

Overall Conclusion

We conclude that the production refund has broadly speaking helped to maintain the outlets for Community starch products among producers of approved products, since such producers continue to rely overwhelmingly upon domestic starch products for their starch inputs.

If, however, one assesses success in terms of the maintenance of the domestic market shares of local producers of the approved products, the conclusion is different. The example of organic chemicals in particular reveals that the share of indirect imports of starch products in the Community market has risen considerably, in the form of rising imports of approved products.

The production refund has not been sufficient to maintain domestic producers' shares of the local markets for organic chemicals such as citric acid, penicillin and lysine, but it is significant that the analysis of the composition of input costs and the role of starch in the overall economics of their production demonstrates that there are cases in which, even if production refunds were much larger and brought the net cost of starch down to zero, it would still be impossible for EU producers of approved products to compete with the landed, duty-paid cost of competing imports. At most, the production refunds will have moderated the competition from imported approved products.

QUESTION 4.2

To what extent did the export refunds ensure an outlet for the Community starch products?

Objective of the Question: To examine whether the export refund is necessary to maintain the markets for starch products exported in the form of either Annex I or non-Annex I products[2].

Instrument: The export refund for starch products[3], which may be claimed on Annex I starch products and non-Annex I products manufactured from starch products, where Annex I and non-Annex I refer to the categories defined in Article 32.3 of the Treaty of Amsterdam.

Criteria: The export refund is judged to have been successful if it has been effective in maintaining the use of Community starch products in exports of products eligible for an export refund (EXR products). By maintained, we mean that the use of Community basic starches and starch derivatives contained in exports of EXR products has been held steady or has increased.

In addition, the refund achieved its intended effects if the use of imported starches in the manufacture of EXR products for export did not increase as a share of the overall consumption of starches contained in exports of EXR products.

The refund helped to ensure an outlet for Community starch products if its existence played an important role in determining the relationship between the Community's exports of EXR products and the Community demand for domestic starch products.

Indicators: The indicators that will be used to determine whether the export refund has had its intended effect will be trend in the Community's consumption of domestically produced starch products contained in exports of EXR products; the share of imports in the starches used in the production of EXR products for export; and an assessment of the sensitivity to the existence of the export refund of the demand for Community starch products on the part of manufacturers of EXR products for export.

FRAMEWORK FOR THE ANALYSIS OF THE QUESTION

The objective of the export refund is to compensate Community producers of EXR products on their export sales for the difference that results from the measures of the Common Market Organisation (CMO) between the Community f.o.b. price of base products and the f.o.b. price of the same base products facing competing exporters of EXR products. This is deemed to be necessary because Community exporters of EXR products compete in third country export markets with producers with access to base products at f.o.b. world market prices.

Council Regulation 120/67 states that export refunds were needed to stabilise the Community market while ensuring in particular that the price fluctuations on the world

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[2] For brevity, in this question, Annex I and non-Annex I products are referred to collectively as products eligible for an export refund, or EXR products. Note that the definition of non-Annex I products changed in July 2000 when the Commission decided that products eligible for a production refund, with the exception of CN 3505 10 50, were no longer eligible for an export refund.

[3] For a discussion of the refund and for a definition of Annex I and non-Annex I products, please refer to Chapter 3 and its Appendix.

market do not influence the prices applied inside the Community. The payment of a refund for exports to third countries is meant to cover the difference between the prices applied outside and those applied inside the Community.

Council Regulation 3448/93 instructed that arrangements must be made for export refunds in order not to penalise producers of these goods for the price level at which they are obliged to procure their supplies as a result of the Common Agricultural Policy.

Commission Regulation 1501/95 laid down the factors to be taken into account in determining export refunds in relation to cereals, when it stated that, given the disparity in the prices at which cereals are offered by the different exporting countries on the world market, account should be taken in particular of the different internal forwarding costs and the refund should be fixed bearing in mind the difference between the representative prices in the Community and the most favourable quotations and prices applying on the world market.

In parallel with the production refund, and in respect of the criteria above, one can identify two main routes through which the measures of the CMO might lead to lost outlets for Community starch products:

The first cause of a loss of outlets for Community starch products might be if high base product prices lead to a high cost of domestic starch products, Community producers of EXR products (referred to as end-users) may instead turn to cheaper imported starch products. In this case, the Community exports of EXR products are maintained, but the starch products that they use are increasingly imported. A distinction may be made in this regard between protected and unprotected products, as defined in the discussion of production refunds in Question 4.1 Basic starches and most starch derivatives are protected products on which import tariffs are very effective in deterring imports. The only significant unprotected starch derivative is the class of esterified and etherified starches (CN 3505 10 50). However, as we have seen in Question 4.1, the Community is a very substantial net exporter of these products, and so the likelihood of imports of such starch products for use in the manufacture of EXR products is negligible.

The production of EXR products for export under the Inward Processing Regime (IPR) is a possible means whereby Community exporters of EXR products might be able to use imported starch products without having to overcome high import tariff barriers. The data presented in Chapter 3 demonstrated that IPR authorisations for starch products are at very modest levels. This is not surprising in view of Article 557 of the Commission Regulation 2454/93, which only permits re-exports to be made under inward processing operations provided no goods comparable to the good to be processed are produced in the Community (where "comparable goods" means goods falling within the same eight digit CN code); comparable goods are not produced in the Community in sufficient quantity; comparable goods cannot be made available within a suitable time; and the price (after export refunds) or quality of the comparable goods within the Community would make the commercial operation economically impossible.

A second potential loss of outlets for Community starch products might occur if exporters of EXR products, while continuing to use Community starch, are unable to compete effectively with exports of the same products from other countries, whose starches are derived from base products bought at world market prices. This would be seen directly as a loss of the Community's share of the world export market for these EXR products, and a parallel reduction in the use of domestic starch with the benefit of export refunds. The producers of EXR products in the Community might contribute to this process by moving their production to third countries.

Exporters of EXR products may also be uncompetitive in the export arena because of factors unrelated to base product costs, for example labour costs, environmental regulations or lack of scale. The export refund is not intended to compensate for the loss of competitiveness on these grounds.

For consistency with the analysis undertaken in Chapters 1 and 2, we use Comext foreign trade data to analyse trends in exports of EXR products.[4] We have also used the information provided by DG Enterprise on the broad categories of non-Annex I exports of starch-containing products and by DG Agriculture (Unit C2).

The issue of which source of trade data should form the basis of an analysis of exports is a difficult one. The data for export licences is, in principle, a better data set because it does not suffer from the restrictions of Comext data, namely that Member States in which there is one producer of an export may have their data suppressed, or included in a "Secret" category to protect the producer's commercial interests. We discuss this issue in Chapter 2 and its Appendix.

THE DEVELOPMENT OF EXPORT OUTLETS FOR ANNEX I PRODUCTS

The Appendix to Chapter 3 lists the range of products included in Annex I. These are products covered by the Common Agricultural Policy and include cereal products of first processing, namely native starches and all forms of glucose and maltodextrin, as well as caramel and wheat gluten. The other wide range of agricultural products included in Annex I do not concern us here. It should be remembered that the data that we mention below might lag by up to four months in the feedback from prices to reported exports, since four months is the validity of export licences; where the four month period straddles two years, some potential confusion may arise.

Native Starches

Diagram 4.2.1 summarises the Comext export data from 1992 to 2000 for native starch. Exports of rice starch are negligible. Consequently, we restrict our attention in the discussion to maize, potato and wheat starch exports, among which potato starch export volumes are the largest, followed by maize starch. In Diagram 4.2.2, we compare the Annex I data that we have obtained (which go back only as far as 1995) for native wheat and maize starch with the Comext data. Cereal starches were selected because they have been more prone to fluctuations than potato starch. It is evident that the gap between the two sets of data is much larger for maize starch than for wheat; also, there was a curious sharp drop in Annex I maize starch exports in 1999, when the Comext data actually rose significantly, and overtook the Annex I figures briefly.

Maize Starch

The most noticeable feature of the Comext data in Diagram 4.2.1 is that, while exports of potato starch are increasing, exports of maize starch fell steadily between 1992 and 1996, before recovering somewhat towards the end of the 1990s (apart from 1999, this trend is fully borne out by the data for Annex I export licences, too). In addition, the world price of maize increased considerably during 1996 due to a drought in the US, and as a consequence the export refund was very low, and, for a while, zero. This period is thus revealing in that it allows us to investigate how competitive EU exports of

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[4] Note that the total volumes of export licences issued for Annex I products are consistently higher, often much higher, than the quantities recorded by Comext. This is explained in the Appendix to Chapter 2.

native maize starch were at a time when, based on agricultural raw material cost, the EU was exporting on terms that were very close to those for other exporters.

Diagram 4.2.1: Exports of Native Starch from the EU
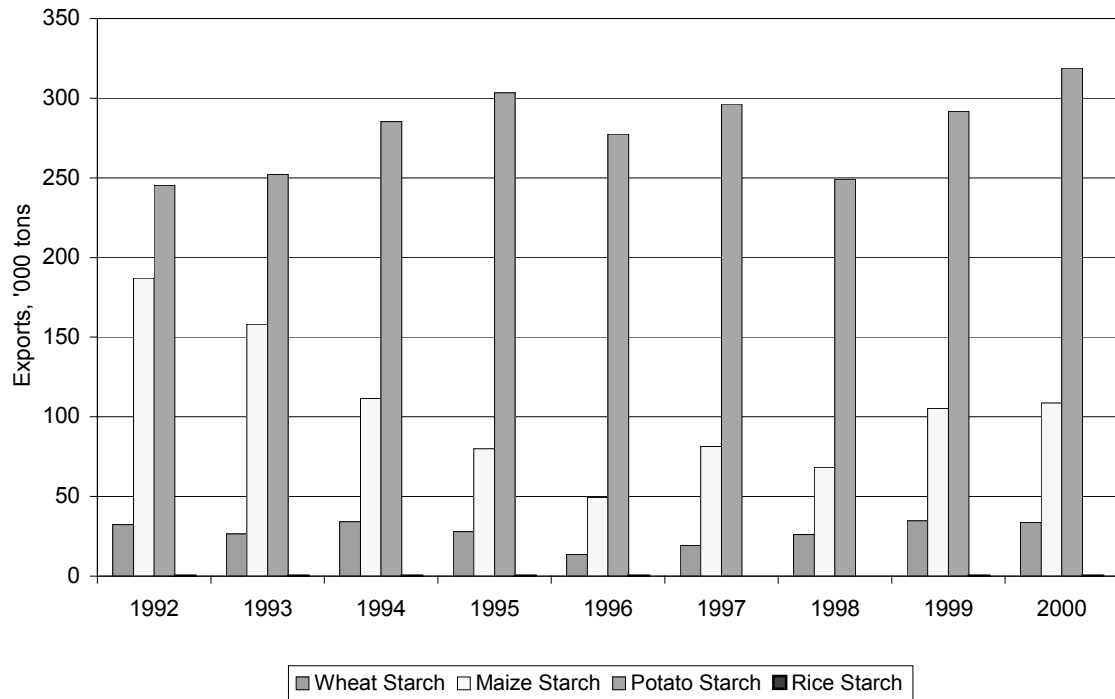
Source: European Commission (Comext).

Diagram 4.2.2: Comparing Exports of Maize and Wheat Native Starch Under Annex I with the Comext Statistics
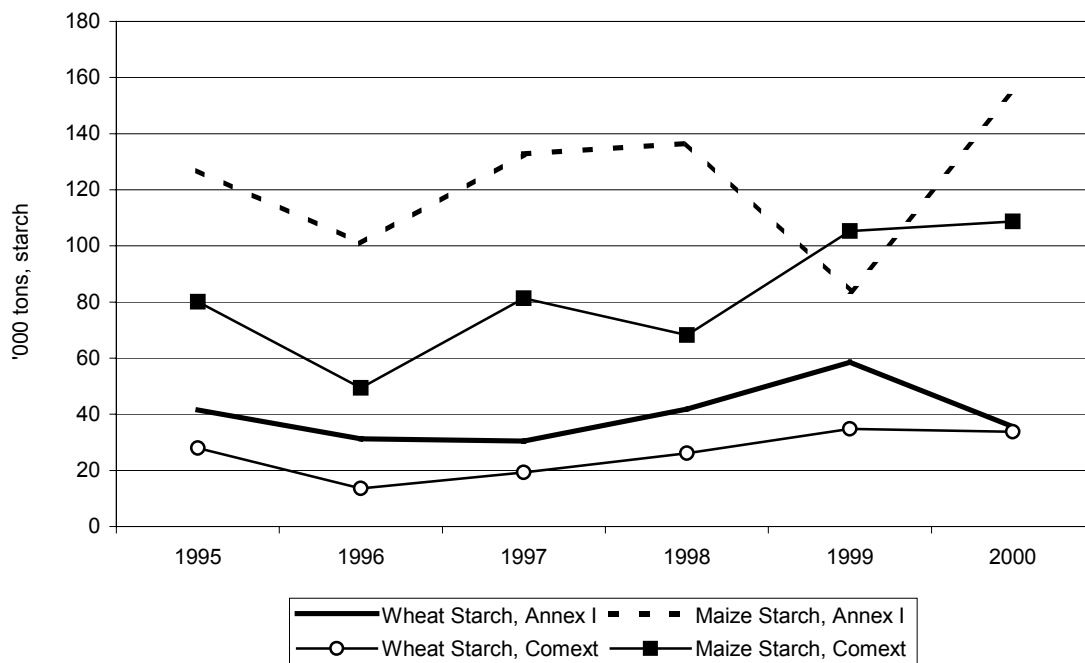
Source: European Commission (Comext, and DG Agri, Unit C2)

Diagram 4.2.3 presents data on exports of maize starch from the US and compares these with EU export volumes and the size of the export refund. The US and the EU are the world's leading exporters of native maize starch. Any effects of high maize prices upon export volumes are likely to be experienced by both of them. From the diagram, three main trends are apparent over the 1990s.

1. The US increased its exports of maize starch to a peak of over 120,000 tons in 1997. They have subsequently stabilised at around 90,000 tons.

2. EU exports declined rapidly in the mid 1990s, losing ground to the US and only recently have these recovered somewhat to overtake the US again in 1999.

3. The price of maize has increased until 1996, and then fell back. This corresponded to a reduction, and then an increase in the export refund.

The fortunes of EU exporters would seem, empirically, to be closely correlated with the level of the refund, which is in turn driven by other factors such as the US maize price, the US-Euro exchange rate and the level of the intervention price in the Community. This is at first sight strange. If the export refund compensates EU exporters of EXR products to the extent that they have access to maize at a net f.o.b. price equivalent to f.o.b. Gulf US maize prices, one might expect their export performance, in comparison to that of the US, to be reasonably independent of the level of the refund. Clearly this is not the case.

Diagram 4.2.3: Comparing US and EU Exports of Native Maize Starch with the Maize Starch Export Refund and the US Price of Maize
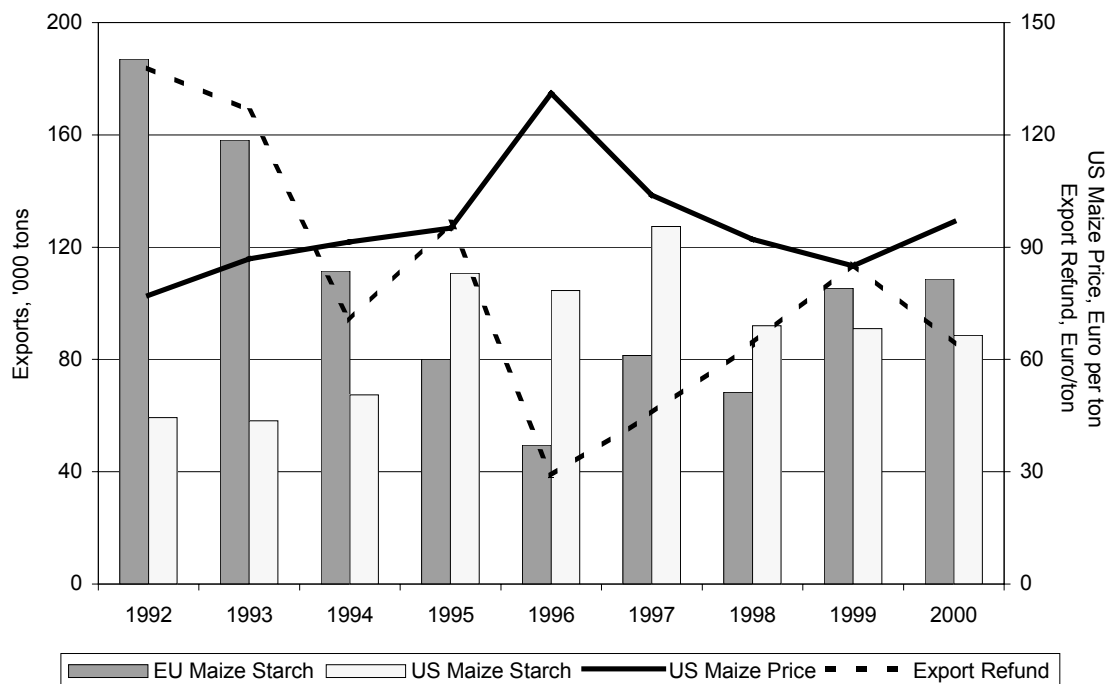
Source: European Commission (Comext), USDA, US Trade Statistics.

This picture is complicated by freight and other factors because the EU and the US tend to export to different destinations. The Appendix presents some data on the pattern of exports from both of them. Over the period when US exports grew, US exports were increasingly targeted at the Far East and thus came into direct

competition with a substantial proportion of EU exports. Since that period, US exports have been destined mainly for fellow NAFTA member states, and NAFTA now accounts for around 80% of US exports of maize starch. Since the export refund compensates EU producers for their f.o.b. base product price differences vis-à-vis US Gulf f.o.b. prices, the freight advantage enjoyed by US exporters to Canada and Mexico and the preferential trade arrangements that the US has its NAFTA trade partners give the US a competitive advantage in those neighbouring markets. Consequently, there is now little direct competition between US and EU exports of maize starch.

The high US maize price in 1996 provides an interesting perspective on the effectiveness of the export refund in securing outlets for EU exports of maize starch. In 1996, EU exports of maize starch fell to their lowest level in the 1990s. In that year, internal maize prices in the EU and f.o.b. US Gulf maize prices were very similar, which is why the annual average export refund was only €29 per ton (the refund was zero for part of the year). At the same time, the use of Inward Processing Relief by EU processors remained miniscule (a mere two tons of native maize starch were processed under IPR in 1996). The absence of export refunds is one of the conditions under which exports may be made under the IPR, and yet the absence of such refunds generated no increase in applications for exports of native maize starch under the IPR.

To summarise the analysis, at times when the export refund is high, the Comext export data imply that EU processors process larger volumes of maize for export as native maize starch with the export refund. When the refund is low, smaller volumes are processed for export with the benefit of export refunds. This suggests the following conclusion:

The export refund improved the profitability of maize processing for export, and thus must have affected EU processors' decisions to export Community native maize starch and in this sense has maintained outlets for Community maize starch. However, the Comext data suggest that there is some form of link between the level of the refund and export volumes of native maize starch, separately from the full compensation for price differences in base products.

This link is not evident from the Annex I export licence data, which we have been provided only for the period since 1995. Nevertheless, the Comext data, covering the entire period since 1992, provide a basis for believing that there are factors other than the direct compensation for price differences that influence the incentives for exports of native maize starch, and that these incentives have historically been strong when the gap between domestic and world market prices of maize has been wide.

Potato Starch

The contrast between the trends in the exports of native maize and potato starch, discernible from Comext data, is striking. Potato starch exports tended to grow during the 1990s and were at their peak in 2000 (see Diagram 4.2.4). This pattern was influenced by the introduction of production quotas for potato starch in 1995/96, following which production has been relatively stable. This may explain why the world maize price and the export refund have had no clear impact upon exports of potato starch. The main influence appears to be the size of the starch potato harvest, as reflected, for example, in lower exports in 1998 when there was a poor crop.

Diagram 4.2.4: Native Potato Starch Exports and the Export Refund
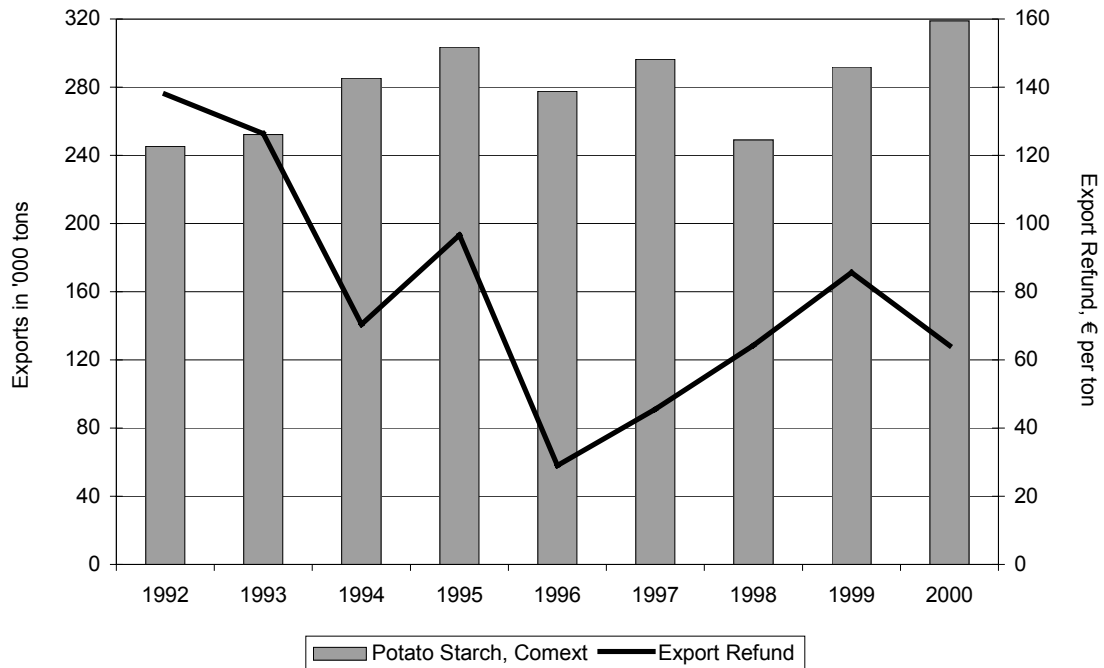
Source: European Commission (Comext, and DG Agri, Unit C2)

Diagram 4.2.5: Potato Starch Prices and the World Cost of Starch in Maize
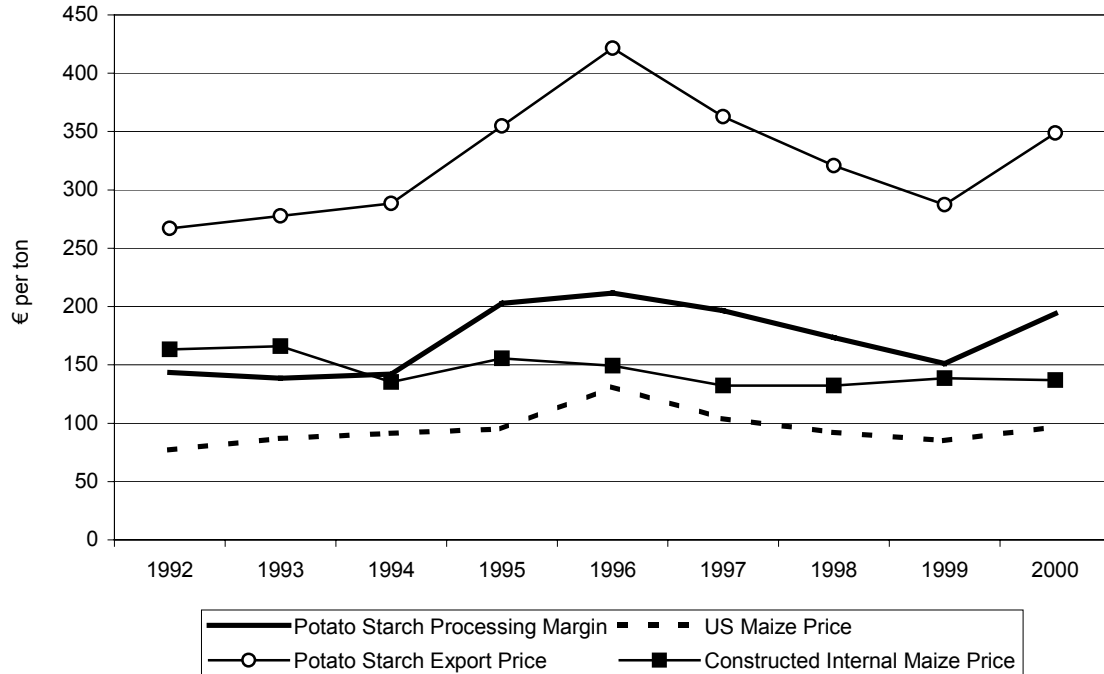
Source: European Commission (Comext), USDA.

This relationship between maize prices and potato starch exports is investigated in Diagram 4.2.5. This depicts the US f.o.b. Gulf maize price alongside the export price of potato starch (calculated at the unit value of exports to third countries, using Comext

data). The line labelled potato starch processing margin is the difference between the potato starch export price and the f.o.b. US Gulf cost of starch in maize, derived by multiplying the US maize price by the technical coefficient of 1.6. The line described as the constructed internal maize price represents the f.o.b. price of maize in the EU, which is derived as the US Gulf price *minus* the maize starch export refund divided by the technical coefficient of 1.6.

The diagram demonstrates that potato starch export prices rose and fell more sharply than the world price of maize (expressed per ton of starch); therefore the margin between the price of potato starch and the price of starch in US maize (which, because of the very close link between starch potato and maize pricing in the Community, is the approximate reference cost for potatoes for export in the form of starch) was at its peak in 1996, when US maize prices were at their highest level.

There is no apparent relationship between volume of native potato starch exports and either the export refund or the derived potato starch processing margin. The absence of any systematic relationship applies regardless of which of the two sources of export data (Comext or the Annex I export licence statistics) one uses, as Diagram 4.2.6 reveals. The diagram also demonstrates, once again, that the two sources convey very different impressions as to the trends in export volumes, which undermines one's faith in any firm conclusions drawn from the analysis of starch sector export statistics.

Diagram 4.2.6: Comext and Annex I Native Potato Starch Export Data and the Export Refund
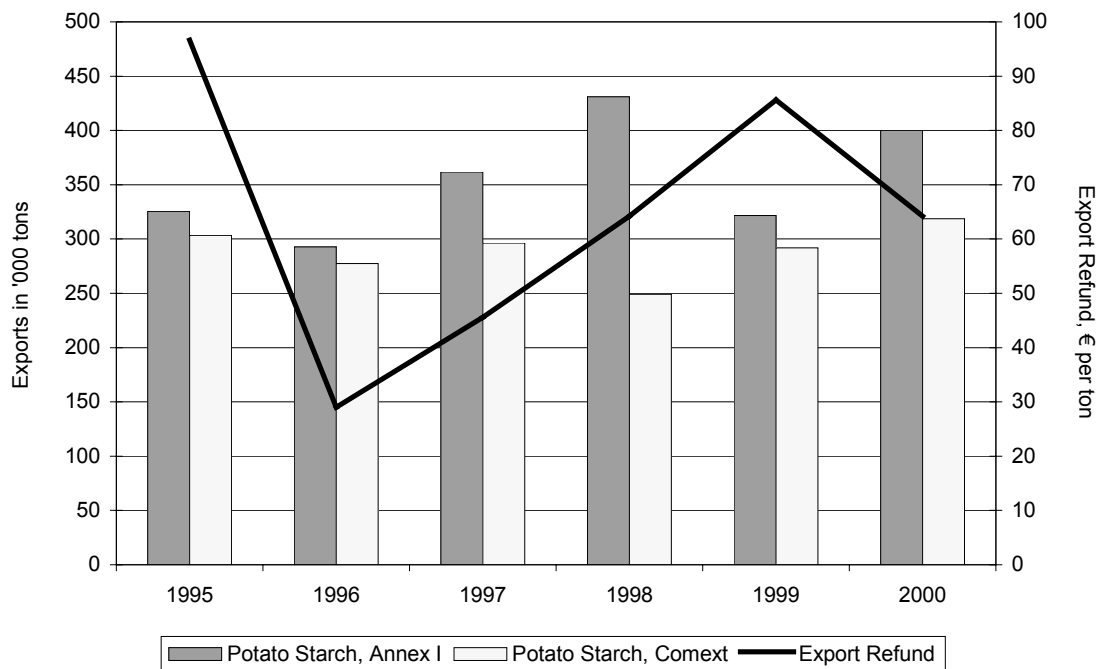
Source: European Commission (Comext, and DG Agri, Unit C2)

The stability of the quota should reduce the importance of the export refund in securing outlets for potato starch. This is because Community producers of potato starch have a fairly stable tonnage of output to sell, since — unlike the case with so-called C sugar in the Sugar Regime — there is no provision for growers or processors to make a deliberate decision to produce potato starch entirely at their own risk for export, and in

excess of the 5% margin that is allowed over and above the quota to take account of an unusually good crop. Therefore, there is a trade-off to be made in the allocation of a relatively constant and predictable amount of production between local and export sales, and it would be surprising if processors were to switch sales sharply between the two markets, although there is a suggestion from both the Comext and Annex I licence data that exports of native potato starch have risen in recent years.

The data presented above do not imply any clear-cut relationship between the level of the export refunds on native potato starch and the exports of such starch. However, the data do suggest that exports have tended to rise during a period when total output has been capped by production quotas, even though there is evidence (from Diagram 2.4.5) that native potato starch exports have been somewhat less profitable in recent years than they were in the mid-1990s.

This weak indication of an underlying upward trend in native potato starch exports may be testament to greater apparent profitability of export sales, with the benefit of export refunds, than of sales to the domestic market. This would fit in with the view expressed more than once in interviews with paper companies that they felt that the availability of potato starch in the domestic market was held back by a desire by the processors to export their output.

Wheat Starch

Diagram 4.2.7 appears to be very similar in its general pattern to Diagram 4.2.3, except that the export volumes for wheat starch are much smaller than those for maize starch. Nevertheless the picture is clear: the US has increased steadily its exports of wheat starch during the 1990s, while EU exports (the Comext and export licence data depicted from 1995 onwards in Diagram 4.2.2 displayed the same basic pattern) have moved roughly inversely with the world price of wheat, as was the case with Comext native maize starch export data.

Diagram 4.2.7: Comparing EU and US Exports of Native Wheat Starch
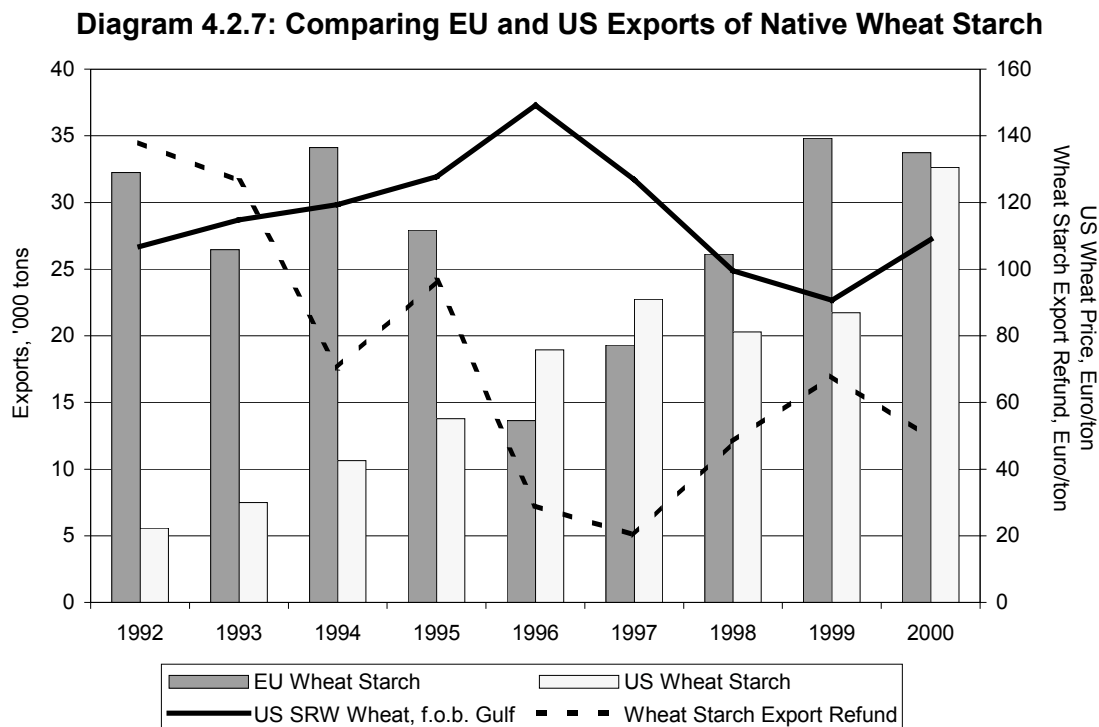
Source: USDA, European Commission (Comext).

However, the data in Diagram 4.2.7 conceal another trend which is demonstrated in the Appendix to this chapter. Whereas, in the case of maize starch, an increasing proportion of US exports were to NAFTA, a region in which the EU is not competitive with the US as an exporter for the reasons mentioned above, US exports of wheat starch are increasingly to Asia, and this region is also the EU's main market for exports of native wheat starch. The logic for the calculation of the export refund on the basis of a comparison of f.o.b. wheat prices in the US Gulf and in selected Community ports is thus compelling in the case of wheat starch, since they mainly compete in the same regional end-market.

Community exports of wheat starch are on the whole more stable than those of maize starch, using the Comext data. The decline in maize starch exports between 1992 and 1995 was not anything like as evident for wheat starch. There was a sharp drop in wheat starch exports in 1996, which coincided with the rapid increase in world wheat prices. The US was not affected in the same way, and exports continued to increase throughout the period of high prices. As in the case of maize, these contrasting export performances in 1996 give an interesting insight into the effectiveness of the refund.

The export refund is meant to compensate for the difference between EU internal f.o.b. wheat prices and US Gulf f.o.b. levels. Since this is always the case, the actual level of the US Gulf wheat price should not affect the relative competitiveness of EU and US exports of wheat starch: both, in effect, should be using f.o.b. US Gulf wheat prices as the basis of their wheat starch export decisions. Yet, EU exports declined when there was truly a level playing field between the EU and the US, i.e., when EU internal f.o.b. wheat prices were comparable with US Gulf f.o.b. wheat prices, as they were in 1996.

Part of the explanation of this contrasting behaviour is that, whereas for the EU wheat starch industry, starch is the main source of revenues, and vital gluten is seen as a valuable by-product, for the US wheat processing industry, the situation is reversed, and wheat starch is seen more as a by-product of vital gluten manufacture[5], and wheat with a high gluten content is preferred for separation into starch and gluten over the common (soft) wheat in the Community, which yields a higher starch: gluten ratio. Therefore, it is conceivable that US exports are determined more by the rising trend in local vital gluten output, which gives rise to higher wheat starch production as a by-product, rather than the local price of wheat.

A further explanation of the fall in EU exports in 1996 might have been that processing margins declined in the Community. The data on domestic wheat starch processing margins are presented in Diagram 4.2.8, which plots the price of wheat starch exports, derived from unit values of exports from the EU to third countries. The wheat price in the diagram is the US Gulf f.o.b. SRW wheat price expressed in € per ton. The margin is calculated as the wheat starch price *minus* the price of wheat multiplied by the technical coefficient of 2.0 to reflect the export refund calculation of the cost of starch in wheat. The data reveal that margins were negative except during the period when wheat prices rose dramatically, when wheat starch prices followed suit[6]. These data, in conjunction with those presented above, constitute evidence that the export refund played some role in maintaining export outlets for wheat, since margins are low even

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[5] The US International Trade Commission Publication 3407, April 2001, entitled "Wheat Gluten: Extension of Action", noted on page III-4: "Wheat gluten …. represents the majority of combine wheat gluten/wheat starch sales revenue ."

[6] Note, this margin should not be taken to be the actual gross margin on raw material cost, since no account has been taken of by-product values. It presents only the relationship between starch prices and f.o.b. US Gulf raw material costs.

when the refund is taken into account. However, this does not explain the behaviour of EU wheat starch exports during the time of high world wheat prices.

Diagram 4.2.8: The Prices of Wheat and Wheat Starch
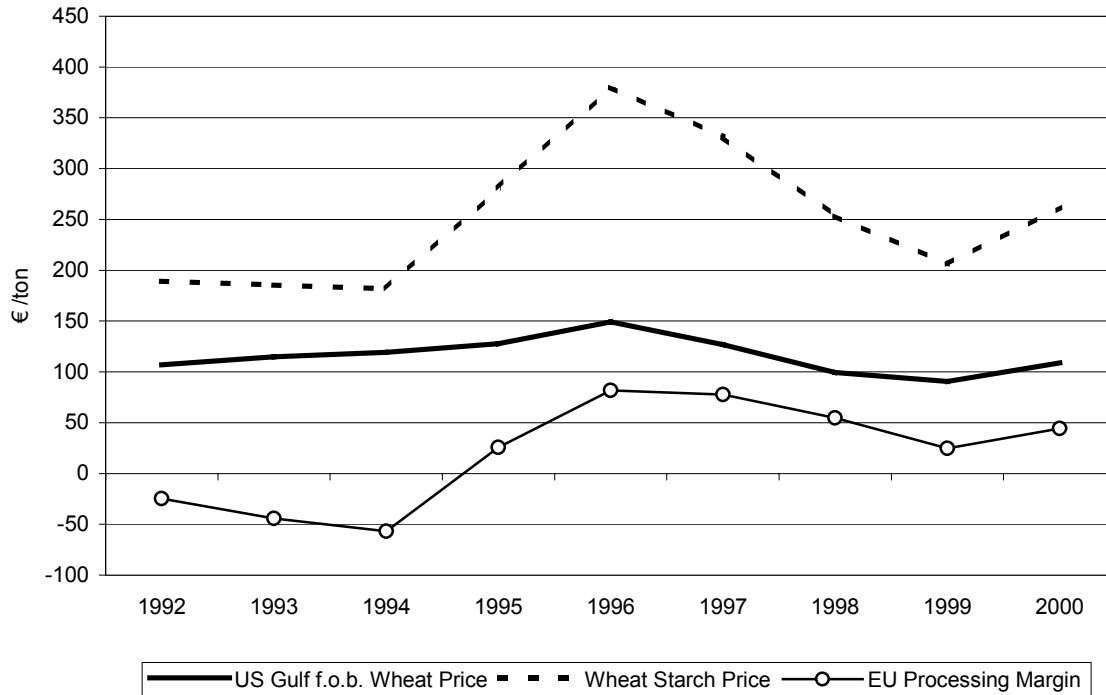
Source: USDA, European Commission (Comext).

It is strange that when, according to the data, there was most favourable relationship for Community starch exporters between their raw material price, after refunds, and the starch export price, namely in 1996 when the processing margin was at its widest level, wheat starch exports fell. In addition, this was a time when EU wheat costs were, for a while, on a par with those in the world market. The inverse relationship between the size of the refund and the volumes of native wheat starch exported with the benefit of the refund is similar to that observed in the case of native maize starch, where Comext data are used for the analysis. As with maize starch, it is also significant that no apparent use was made of Inward Processing Relief by EU processors in 1996, even though the absence of export refunds is one of the conditions under which exports may be made under the IPR.

Our conclusion is that the export refund enhanced the profitability of native wheat starch exports, which influenced EU processors' decisions to export Community native wheat starch. In this sense, the refund has maintained outlets for Community output. However, both the Comext and Annex I export licence data suggest a link between the level of the refund and the incentives to export native wheat starch, over and above the full compensation for price differences in base products, which is the basis for the calculation of the export refund. These extra incentives have been strongest when the gap between domestic and world market prices of wheat has been at its widest.

Glucose and Maltodextrin

The other main starch product included in Annex I is glucose, including maltodextrin. Diagram 4.2.9 depicts the trend in total extra-EU exports of glucose and maltodextrin products with CN code 1702, as well as exports of CN 2106 glucose or maltodextrin syrups, from Comext data. The contrast between Comext and Annex I export licence statistics since 1995 is presented in Diagram 4.2.10, from which it emerges that the Comext statistics cover only around half of the export licence tonnage, but that both have been on a rising trend.

The pattern depicted in Diagram 4.2.9 is now familiar, and resembles those for exports of maize starch and wheat starch, with exports lowest when refunds were lowest.

Glucose and maltodextrins exporters differed from both maize and wheat starch exporters in that the use of Inward Processing Relief by EU processors rose from 8,500 to 17,400 tons between 1995 and 1996, before falling back to 3,400 tons in 1997. This provides some evidence that when refunds are low, it is economically attractive for glucose exporters to switch from the use of export refunds to IPR. However, even when IPR tonnages are added to the exports made with the benefit of export refunds, there was a significant fall in total Community glucose exports in 1996.

Yet again, as with native maize and wheat starch, we draw the conclusion that, by enhancing the profitability of glucose exports, the export refund had an impact upon EU processors' decisions to export glucose products, and so helped to maintain outlets for Community output. However, both the Comext and Annex I export licence data reveal an empirical link between the level of the refund and the incentives to export glucose products, over and above the full compensation for price differences in base products. These extra incentives have been strongest when the gap between domestic and world market prices of cereals have been greatest.

Diagram 4.2.9: Exports of Glucose Products and the Export Refund for Glucose
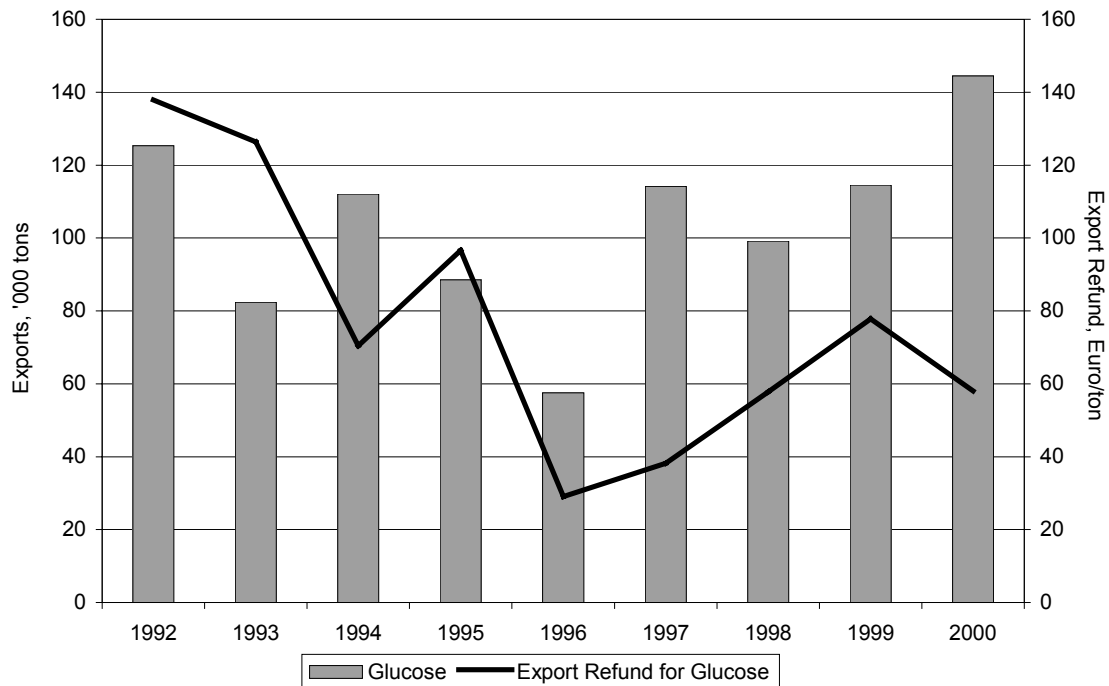
Source: European Commission (Comext).

Diagram 4.2.10: Comext and Annex I Glucose Product Export Data and the Export Refund
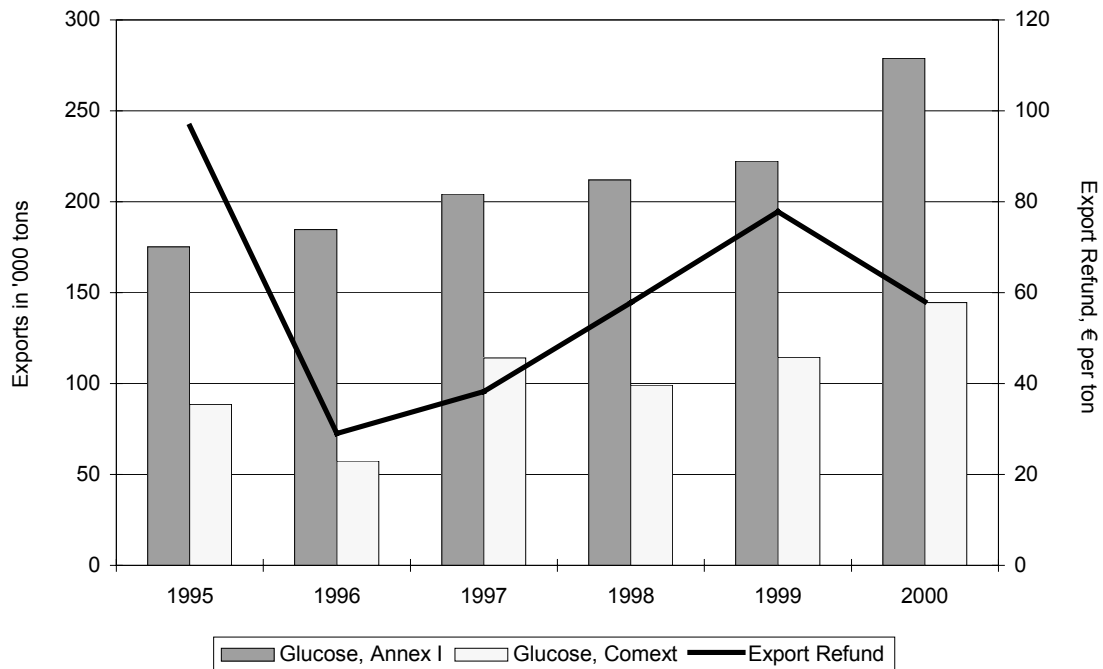
Source: European Commission (Comext, and DG Agri, Unit C2)

THE DEVELOPMENT OF EXPORT OUTLETS WITHIN NON-ANNEX I PRODUCTS

The Appendix to Chapter 3 revealed that the list of products eligible for export refunds under the non-Annex I regulations is larger than the list of products on which a production refund can be claimed. Nevertheless, at least one very important category of approved products that receives production refunds has not been entitled to non-Annex I export refunds; this is the category of modified starch use by the pulp and paper industry, which is the largest single end-user of modified starches.

A further important feature of the entitlements to non-Annex I export refunds is the way in which the scope of the refunds was reduced in July 2000. Until that date, the export refund on exports of approved products (other than modified starch use by the paper sector, as just mentioned) was entitled to be claimed as a supplement to the production refund. Since that date, only the esters and ethers (in Customs code CN 3505 10 50) among the long list of non-Annex I products that are eligible for production refunds in the domestic market is also entitled to claim the full export refund when exported outside the Union. All the other approved products receive only the production refund, even when they are exported, therefore, they are now treated in the same way that the use of modified starches in paper making has always been treated in this respect.

Apart from the esters and ethers, the only products that now receive the non-Annex I export refunds are products that are not approved products in the definition of production refunds, and whose producers are therefore protected in the domestic market. Diagram 4.2.11 illustrates the growth by end-use in exports of starch in non-Annex I products before the new tighter rules took effect. The data, obtained from DG Enterprise, are based upon applications for export refunds for starch in the relevant products, and thus exclude any starch that may have had an entitlement to refunds, but for which such refunds were not sought.

Diagram 4.2.12 presents statistics covering the composition of export refunds by base product. Since maize and potato starch receive exactly the same refunds, they are grouped together in the raw data, which means that the only distinction made in the diagram is between wheat, on the one hand, and maize or potato, on the other.

From Diagram 4.2.11, it is evident that minimal amounts of export refunds are provided for paper exports (for which only native starch inputs are eligible for refunds). The two main categories for which starch-based non-Annex I refunds are paid are organic chemicals and modified starches. The combined tonnages receiving these refunds were at their low point in 1996, and have since increased by over two thirds.

A striking feature of the breakdown given by base product in Diagram 4.2.12 is the very low level of refunds provided for wheat. Over 98% of this small volume of refunds is in the category of modified starches and a mere 1% or so in the manufacture of organic chemicals, a remarkable outcome, given the large volume of syrups that are derived from wheat are then used in the manufacture of organic chemicals.

The most convincing explanation for this puzzling feature of the apparent use of wheat starch export refunds is that wheat starch receives the same production refund as maize starch, but a lower export refund; therefore, to the maximum extent possible, end-users may choose to allocate their wheat starch use to sales made on the domestic market and their maize starch use to export sales of end-products.

Diagram 4.2.11: Non-Annex I Exports by End-Use
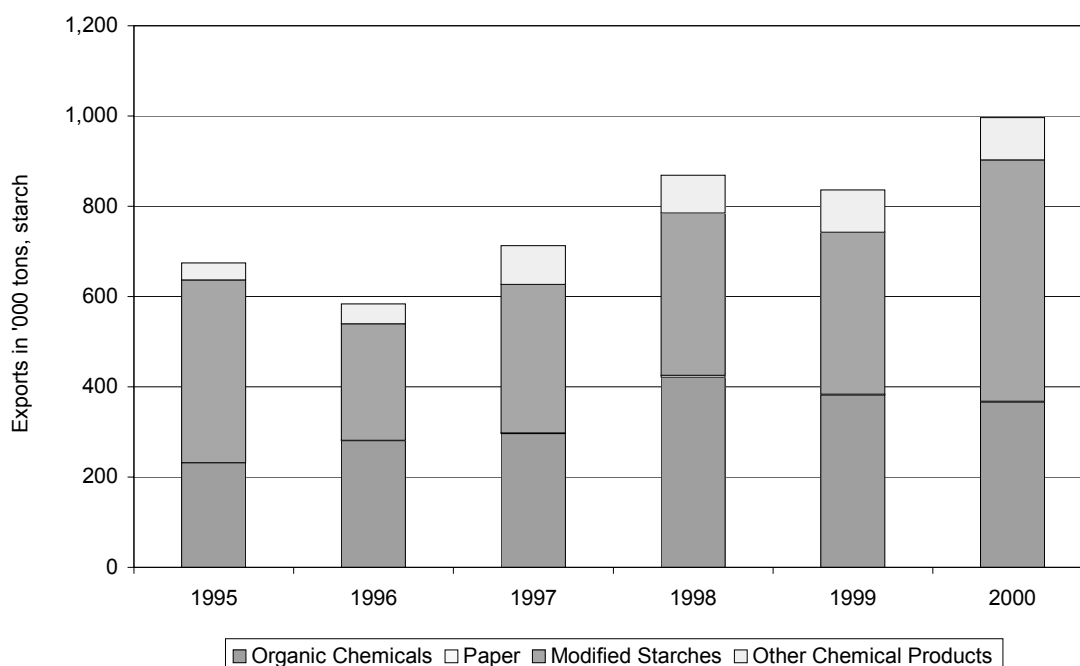
Source: European Commission (DG Enterprise)

Diagram 4.2.12: Non-Annex I Exports by Base Product, and the Export Refund
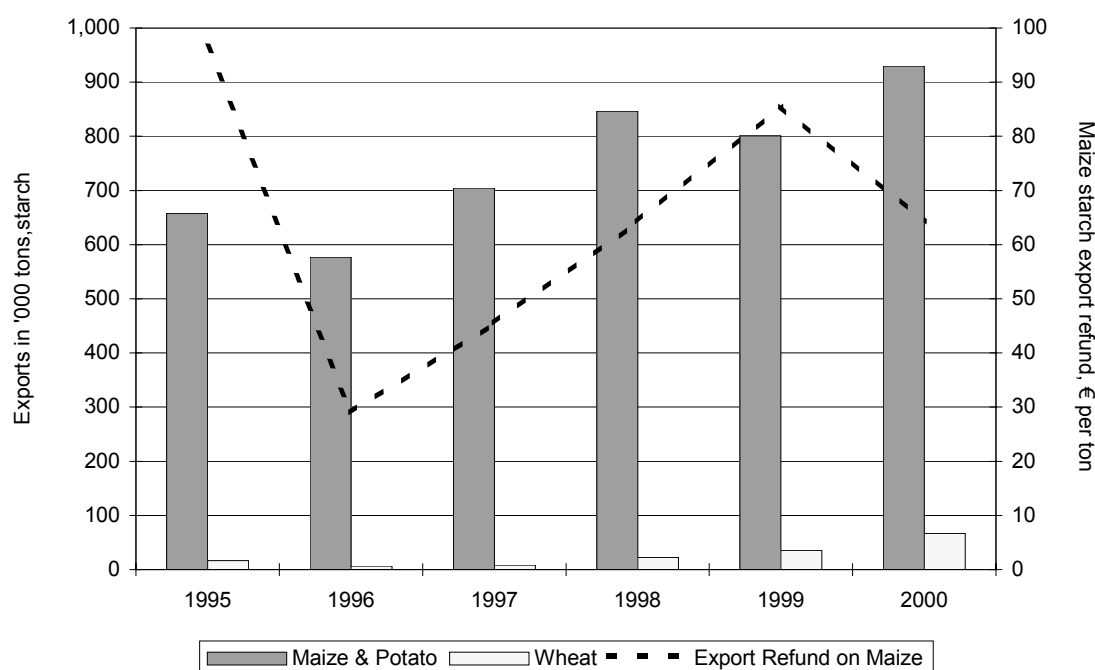
Source: European Commission (DG Enterprise)

The surprisingly low reported level of wheat used in the manufacture of exported starch products suggests that end-users take maximum advantage of their flexibility to define maize as their raw material for the purposes of export refunds.

Yet again, in common with the conclusions outlined above for native maize and wheat starches and glucose, we believe that, by enhancing the profitability of non-Annex I exports, the export refund must have helped to maintain export outlets for Community products. However, there is again a very evident empirical link between the level of the refund and the incentives to export non-Annex I products, since non-Annex I exports of starch in products are correlated in Diagram 4.2.12 with the level of the export refund.

Exports of Paper Containing Starch

The paper industry, as we explained in the discussion of Question 4.1, is the largest single outlet for native and modified starch. The EU paper industry, and particularly the industry in the Nordic countries, is highly export oriented, and so one would expect that a considerable volume of starch is exported in paper. This is explored in Diagrams A4.2.1 and A4.2.2 in the Appendix . The main categories of exports of paper from the EU, with exports exceeding one million tons, are CN codes 4801, 4802, 4804, 4805 and especially 4810. These are, respectively, newsprint, uncoated paper, uncoated kraft paper, other uncoated paper and coated paper. Table 4.1.1 in Question 4.1 lists the starch content of various types of paper and, using this classification, we have estimated the starch content of exports of paper.

Many categories of paper contain little or no starch. For example, although production of newsprint is large, this type of paper is of a low quality and is not coated and so contains little starch. The analysis reveals that most starch is exported in the form of

coated papers and we estimate that, in 1999, as much as 200,000 tons of starch were exported in this form.

What is more, this outlet for starch has been growing rapidly. Our estimates take no account of the changing pattern of starch use in paper since we have no data to describe this. However, conversations with paper producers[7] reveal that the main category of exports, coated papers, is increasingly using high quality cationic starches to solve increasingly sophisticated technical problems. Mainly, these are the problems of retaining starch in the waste water to improve production in closed water processes and binding new, brighter fillers and pigments, for example precipitated calcium carbonate. The entry of Finland and Sweden into the Community in 1995, and to a lesser extent Austria, has accelerated this process since these countries are major exporters of high quality coated papers.

Diagram 4.2.13 compares our estimates of the total volume of starch exported in paper products with the actual tonnages of starch that received non-Annex I refunds on paper products. The difference presumably represents the use of modified starches in these exports, since such starches are not entitled to claim export refunds. The proportion of the starch exported in paper and which receives starch export refunds is minuscule, exceeding 1% of the total starch incorporated into these exports in only one year.

Diagram 4.2.13: Estimates of Total Starch Use in Paper Exports and the Cost of the Starch Export Refund for These Exports
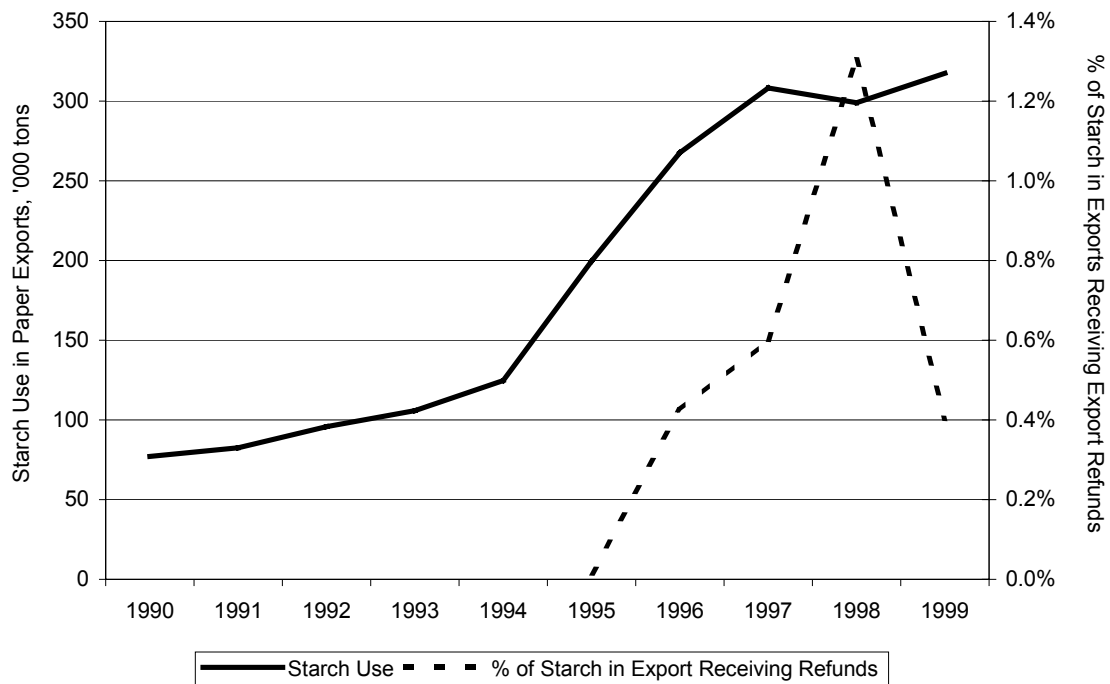
Source: LMC estimates, derived from European Commission (Comext and DG Enterprise).

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[7] Interviews with paper producers, July 2001.

It is clear from the pattern of exports that they are affected very little indeed by the value of the refund. Our conversations with paper producers gave us the impression that the refund, and particularly the export refund, is not the critical factor driving this outlet. Rather, the EU is increasingly the leading producer of high quality graphic papers, occupying this niche in an increasingly competitive market in which lower quality papers are produced domestically in third countries. The EU has been able to adopt this position because of its investment in the largest and most efficient paper machines.

Access to low cost raw materials is one part of the competitiveness of the EU paper producers, but we estimate that the cationic starch cost in high quality graphic paper, in which starch use is as much as 5% of the weight of paper is currently of the order of 3% of the value of paper[8]. It seems extremely unlikely that the absence of the refund has any major effect on the behaviour of paper producers, and thus little effect in maintaining outlets for starch in exports of paper.

The main contention of paper producers, particularly over the last two years, has been that the export refund for native starch has given too great an incentive for starch to be exported for food and other uses abroad at the same time that potato starch quota reductions have started to lead to less potato starch being produced in the Community. Potato starch is the preferred starch of paper producers in the wet end of their operations and, rather than the competitiveness of the raw material, the main concern of paper producers is that there is insufficient availability of native potato starch in the domestic market to meet the expansion they anticipate in production of high quality papers[9]. This position is partly a reflection of the particular commercial concerns of paper producers, namely their understandable desire to obtain raw materials at low cost. However, we consider this position to be a reasonable reflection of the state of the Community market, as Diagram 4.2.14 demonstrates.

In this diagram, we have derived unit export values for native maize and potato starches on both intra-EU and extra-EU trade, and then compared the two price series to calculate the difference between their values in the local and international markets. We contrasted these price differences with the actual difference between the production and export refunds for these products, on the assumption that a domestic customer is a producer of approved products.

If in the comparison in Diagram 4.2.14, the gap between the intra-and extra-EU prices is <u>smaller</u> than the difference between the export and production refunds, then it would be more attractive for the native starch in question to go for export sale than for domestic sale; if, however, the gap between the intra-and extra-EU prices is <u>larger</u> than the difference between the export and production refunds, then it would be more attractive for the native starch in question to stay inside the domestic market. On average, native potato starch falls into the first category, while native maize starch falls into the second category.

This explains why it is more profitable, at the margin, for native potato starch to flow out of the Community than to remain locally. However, this does not explain why the two gaps (between the intra-and extra-EU prices and between export and production refunds) do not move into balance. Our answer is that, outside the EU, potato starch is

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[8] Paper industry data, from interviews in July 2001.

[9] As we note in the discussion of Question 4.1, imports of tapioca starch into the Community are increasing, although these are still at a low level and fail to fill the Thai tariff rate quota of 22,500 tons.

viewed very much as a niche, premium product, which accounts for only 2-3% of non-EU starch supplies. Therefore, a premium is able to persist by virtue of the starch's relative scarcity. Inside the Community, by contrast, potato starch accounts for over 20% of total starch output, and, even after allowing for exports, it represents over 16% of the total domestic market for starch products. Accordingly, it is much harder to sustain a premium for niche uses internally.

The question may then be asked, why is not more potato starch exported? Among the possible answers are the following: first, it would be politically difficult for the potato starch sector to argue in favour of measures to support the potato starch sector if important domestic users are deprived of access to the product and if the support is viewed as being directed towards providing subsidies to foreign consumers of potato starch, as might appear to be the case if exports were much larger. Second, there is a difference between the average and marginal revenues from potato starch sales in the domestic and export markets. It may quite possibly be optimal, in terms of marketing strategy, to maintain domestic sales if the demand curve for potato starch in the Community market is fairly elastic (i.e., the marginal revenue is not much below the average revenue), while the demand for potato starch outside the Community may be fairly elastic, so that the marginal revenue is significantly below the average revenue on such sales.

Diagram 4.2.14: Differences Between Domestic and Export Prices of Native Maize and Potato Starches vis-à-vis the Gap Between Production and Export Refunds
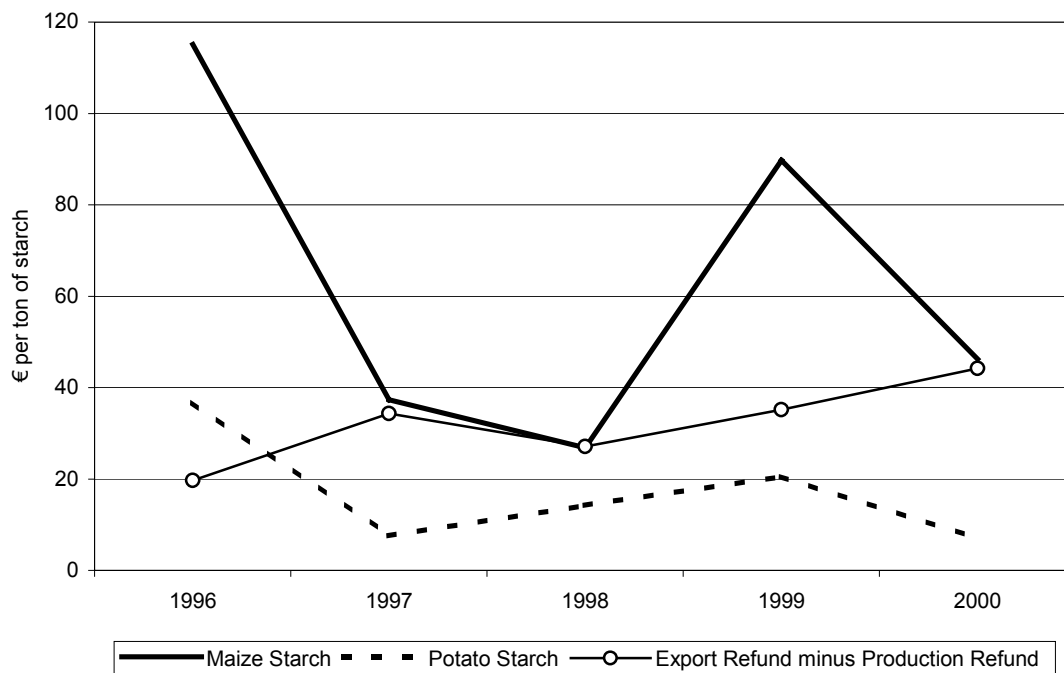
Source: LMC estimates, derived from European Commission (Comext) data.

In conclusion, exports of starch in paper have been growing at a substantial rate and this is an important outlet for starch in total exports. However, this has occurred without the benefit of the export refund on 99% or more of the starch used to manufacture the paper that is exported. Therefore, the refund has played no role in maintaining this outlet which, instead, is being driven by the dynamics of the paper industry. Rather, the security of this outlet is most threatened by the perception on the part of paper makers

that there is a lack of availability at certain times of sufficient potato starch to meet the needs of Community paper producers. They contend that the diversion of potato starch to the export market is an indication that the export refund on potato starch may be set at too high a level to satisfy the domestic demand for indirect export outlets for this starch in exports of paper products.

Exports of Organic Chemicals

Another important category of exports of non-Annex I products containing starch is organic chemicals. As we have mentioned, glucose is not suited to being shipped over large distances, but many products that can be fermented from very high dextrose glucose syrups are suitable for trade. As in Question 4.1, we focus on citric acid and vitamin C which are two of the more important exported fermentation products, at least in the volume and value of output produced and traded. Another important export category of organic products is polyhydric alcohols, such as sorbitol, which are produced from glucose syrups. Unfortunately, trade statistics tend to be very unreliable as a source of data on exports of polyhydric alcohols, since there are few producers in the EU and the data are suppressed by Comext to protect their commercial interests.

Unlike paper, Community exporters of fermentation products compete in a world market which is supplied by exports that are sold at low prices, notably from China. The Chinese fermentation industry has grown considerably during the 1990s and is now the main competitor for exporters of these products. The EU is a large importer of Chinese fermentation products, except for sorbitol, a product for which the EU is the world's leading producer, and which China imports from the Community.

Diagram 4.2.15: Exports of Citric Acid and Vitamin C
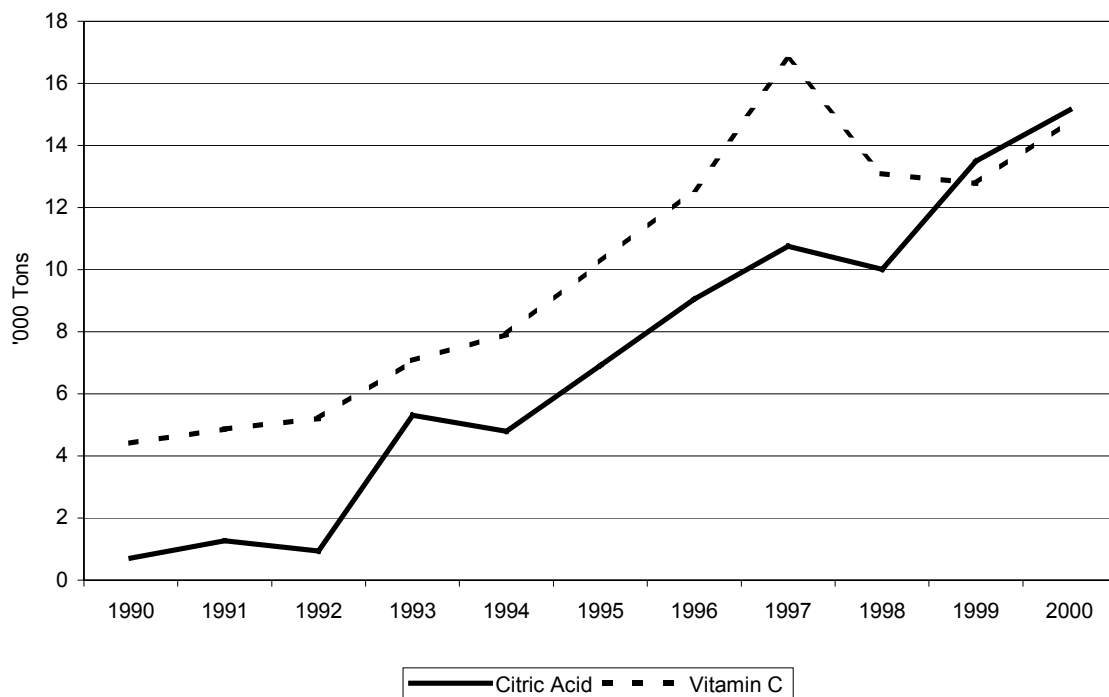
Source: European Commission (Comext).

Diagram 4.2.15 illustrates the trends in Community exports of citric acid and vitamin C, using Comext data. Domestic production of citric acid is approximately 300,000 tons, of which just over one half is derived from starch, with the remainder produced from molasses. Exports, including "secret" trade of approximately 10,000 tons, are not a significant proportion of overall output. The situation for vitamin C is different. EU production is approximately 35,000 tons, and exports constitute a significant proportion of overall output.

The organic chemical industry has not been prepared to provide data on starch prices, and so it is difficult to establish the full value of the export refund to export outlets for starch in organic chemicals. Instead, we have derived estimates of prices from trade unit values presented in Table 4.2.1 below.

There has been a sharp decline in the price of all the main organic chemicals listed in Table 4.2.1, and the prices of Chinese exports are between 20% and 30% lower than the price of their EU counterparts. We attempt to quantify the importance of the export refund by calculating its affect on the competitiveness of EU exporters of organic chemicals in Table 4.2.2. The gross margin on base products costs is calculated as the Chinese price (where available) of the organic chemical minus the price of maize starch multiplied by the typical starch content of each organic chemical (e.g., 1.2 for citric acid). Therefore, the gross margin on citric acid in 2000 was estimated to be 908−323×1.2 = 520.

The point of this exercise is to determine the gross margins for EU exporters when exporting at Chinese price levels, which are a reference price on the world market for bulk shipments of these products. The table demonstrates that margins have fallen during the second half of the 1990s on each major organic chemical, with the exception of sorbitol, for which margins increased briefly between 1996 and 1998. In the case of vitamin C, for which the starch content is high, the value of the refund is multiplied by a factor of 4.5, and this makes a difference to the competitiveness of Community exports of these products.

Table 4.2.1: The Price of Various Organic Chemicals and Native Starch (€ per ton)

Price	1996	1997	1998	1999	2000
Citric Acid					
China	1,148	1,064	992	931	908
EU	1,318	1,285	1,244	1,280	1,272
Vitamin C					
China	7,053	5,548	5,173	4,984	4,569
EU				6,376	6,307
Sorbitol	920	929	879	837	789
Raw Material Cost					
EU Wheat Starch	383	309	269	238	278
EU Maize Starch	419	338	301	322	323
Wheat Starch Export Refund	*13*	20	48	68	49
Maize Starch Export Refund	29	46	64	86	64

Notes: The prices for fermentation products are US import unit values on imports from the designated country of origin. The sorbitol unit value is the average of all US import unit values. Native starch prices are average import unit values for intra EU trade between France, Germany and the main Member States. The italicised wheat starch refund is estimated from the maize starch refund.

Source: European Commission (Comext) and US foreign trade statistics.

Table 4.2.2: The Gross Margins on Raw Material Cost and the Effect of the Export Refund on the Competitiveness of EU Exports Compared to Chinese Exports (€ per ton)

Without Refund	1996	1997	1998	1999	2000
Citric Acid	645	658	631	544	520
Vitamin C	5,167	4,028	3,821	3,534	3,117
Sorbitol	211	358	371	292	244
With Refund					
Citric Acid	680	713	708	647	597
Vitamin C	5,297	4,233	4,110	3,919	3,406
Sorbitol	260	435	480	437	352
Effect of Refund on Price Differential					
Without Refund					
Citric Acid	205	276	329	452	441

Note: Starch content of one kg of product of each organic chemical taken to be: citric acid — 1.2; vitamin C — 4.5; sorbitol — 1.52.

Source: LMC estimates.

The last four rows of the table quantify the effectiveness of the refund in improving the competitiveness of EU producers by calculating the differential between the Chinese export price of the main organic chemicals and the EU price, both with and without the value of the refund. We assume that in this competitive environment EU exporters pass on the full discount of the refund so that the export prices are lower by a factor which is the export refund multiplied by the starch use of the product (e.g., for vitamin C in 2000, a factor of 64×4.5 must be added to the EU export price in the absence of the refund). Without the refund, in 2000, the EU vitamin C price, by this calculation, would be nearly 50% higher than the comparable Chinese price. With the refund it was still 38% above the Chinese price.

We conclude that, due to the high starch content of many of the main organic chemicals, and the strong price competition faced by EU exporters of these products in world markets, the export refund has been effective in maintaining the export outlets for these products. This is true, despite the growing competitive threat posed by Chinese exports in particular, and the decisions by several Community producers and exporters of these products to develop production capacity outside the Community, in some instances, closing factories within the Community.

Exports of Esterified and Etherified Starch

Community exports of esterified and etherified starch form most of the exports of modified starch in the data presented in Chapter 1. This is the largest category in the exports of modified starch for other countries as well. Chapter 1 establishes that the EU is a major exporter of these and other modified starches, and net exports of starch from the Community were presented in Diagram 4.1.6 in Question 4.1 These data establish that there has been strong growth in exports of these products.

Diagram 4.2.16: The Export Price of EU Esterified and Etherified Starch, With and Without the Refund, Compared with Thai Export Prices (€/ton)
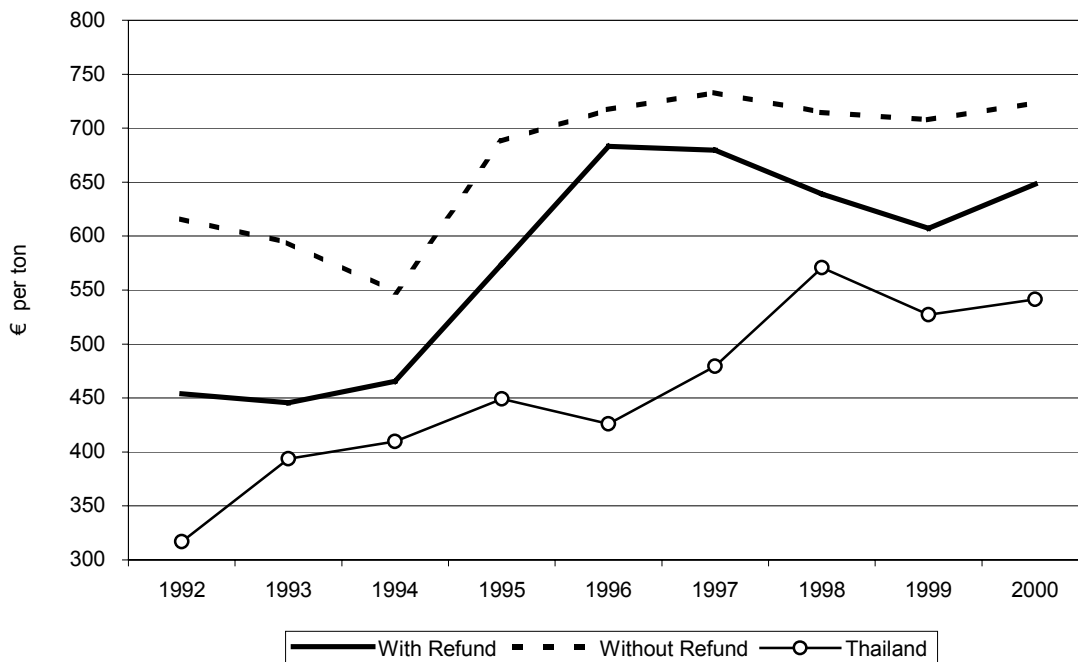
Source: European Commission (Comext)

Diagram 4.2.16 depicts the relationship between the price of EU exports of esterified and etherified starch, both with and without the refund, and the price of Thai esterified and etherified starch. The EU price is derived from the unit value of exports to third countries, while the Thai price is the import price into the EU, which is taken to be representative of Thai export prices. The maize starch export refund, multiplied by the coefficient 1.174 (which is the use of starch assumed by the Commission in esterified and etherified starch), is added to the EU export price to see what level export prices might have been at in the absence of the refund. This assumes that exporters incorporate the refund fully into their prices.

The data suggest that, particularly in the early 1990s, the refund made a substantial difference to the competitiveness of EU products on the world market. When the refund fell in 1996, with the increase in world maize prices, EU prices increased, and a gap opened up between EU and Thai prices. It is difficult to determine from these data the origin of the increase in price in 1996 and what importance should be attached to this. Since the refund should compensate for differences in raw material prices, at least for cereal derived starches, it is possible that exporters of esterified and etherified starches are able to maintain margins in the face of raw material price increases. Whatever, the reasoning, the data establish that:

The export refund has been successful, particularly in the early 1990s when EU raw material prices were high, in compensating EU producers for differences in base product costs. The evidence is that exports of esterified and etherified starch have grown strongly despite these differences in raw material prices and it is reasonable to determine that the refund has been an important part of this. In particular, exports to Asia of esterified and etherified potato starch have grown strongly, in competition with US maize starch but mainly with local Thai tapioca starches. The Community industry considers that the export refund has played an important role in this trade.

QUESTION 4.3

Did the production and export refunds play a significant role in the demand for Community base products?

Objective of the Question: To examine whether the demand for Community base products for use in the manufacture of starch products that are sold with the benefit of production and export refunds accounts for a significant proportion of the total demand for these base products, and whether the refunds themselves give rise to a sizeable share of this demand.

Instruments: The production and export refunds, and the Common Market Organisation for cereals.

Criteria: The quantities of the base products that are marketed with the benefit of the two classes of refunds will be considered to be significant if they represent either a sizeable proportion (which we interpret as being over 5%) of the total production of the base product in question, or if the refunds account for a sizeable volume of the base product (which is interpreted as the equivalent of at least 0.5 million tons of starch).

The refunds will be considered to play a significant role in the demand for base products if the quantities of base products marketed with the benefit of the refunds are themselves significant, using the criteria outlined in the previous paragraph, and the availability of refunds is identified as a major source of the total demand for base products that benefits from refunds.

In the absence of detailed micro-economic analyses of starch production decisions, we have had to rely upon qualitative measures of the sensitivity of the demand for starch and its derived demand for base products. To reflect the qualitative nature of the measures of demand sensitivity, we have applied ordinal measures to our analysis of sensitivity of alternative basic starch products to the provision of refunds. We have deemed the role of the refunds to be <u>significant</u> if the weighted average ordinal value, obtained by averaging different end-uses over all basic starch products and using the tonnages that are used in different end-uses as the relevant weights, is greater than the mid point of the ordinal scale that we employ.

In other words, if the ordinal scale runs from 1 to 3 for three different end-uses that receive refunds, where 1 is low and 3 is high, the role of the refunds will be considered significant if the weighted average measure calculated from this scale is greater than 2.

Consider the example where end-use A uses 5 tons of starch, end-use B 10 tons and end-use C 10 tons, while A has a low sensitivity of demand to the availability of refunds, which implies an ordinal scale of 1; B has a moderate sensitivity of demand, represented by ordinal scale 2; and C a high sensitivity, represented by an ordinal scale 3. Then the weighted average value = (5 x 1 + 10 x 2 + 10 x 3)/5 + 10 + 10) = 55/25 = 2.2. This is higher than 2, the mid-point of the ordinal scale in this case, and the role of refunds is considered significant.

Indicators: The indicators that will be used to determine whether the criteria have been met are the quantities of base products that are processed into starch and which benefit from production and export refunds; these quantities as a proportion of total Community production of the same base product; and the ordinal scales of the sensitivity of the demand for base products in starch manufacture to the availability of refunds.

THE QUANTITIES OF BASE PRODUCTS USED IN THE PRODUCTION OF STARCH THAT RECEIVES PRODUCTION AND EXPORT REFUNDS

The quantities of wheat, maize and starch potatoes processed into starch that received production and export refunds are summarised in Tables 4.3.1-4.3.3. In each table, we have listed total output in the 15 Member States of the Community from the 1991/92 to 1999/00[10] marketing years; estimates of the starch sector's demand for the base products; the quantities of the starch sector's demand that correspond to the production of starches which receive export and production refunds (for 1993/94-1999/00 and 1992/93-1999/00, respectively) and the proportions which these tonnages represent of the total Community production of the base products. Diagrams 4.3.1 and 4.3.2 depict the recent changes in the proportions of the tonnages covered by the two classes of refunds in the total EU output of the three raw materials[11].

The allocation of the production refund tonnages by base product has been obtained directly from the detailed returns submitted to the Commission. The allocation of the export refund tonnages has been derived in part from the Annex I export licences issued by DG Agriculture for native starches, glucose, maltodextrins and caramel, by applying our own estimates of the proportions in which different base products are used to manufacture these derivatives. We have also received information on the main categories into which non-Annex I starch refunds are allocated. Since maize and potato starch totals are treated as one single category, we have assumed that potatoes were the base product for exactly half of the combined maize and potato modified starch exports made within the framework of non-Annex I.

Comparable tables have not been prepared for barley, oats and rice, since the total combined quantity of these base products that is processed into starch is not large, at approximately 150,000 tons. A production quota has established for barley and oat starch, which is 59,000 tons per annum, or close to 140,000 tons of cereal.

Table 4.3.1: The Share of Community Common Wheat Output that Received Production and Export Refunds for Starch Products, 1991/92-1999/00 (million tons of wheat)

	EU-15 Wheat Output	Use in Starch	of which with: Export Refund	Production Refund	Proportion Used in Starch	Proportion Receiving Refunds on Export	Proportion Receiving Refunds on Production
1991/92	77.8	2.4			3.1%		
1992/93	78.7	2.6		0.9	3.3%		1.1%
1993/94	77.3	2.5	0.3	0.7	3.2%	0.4%	0.8%
1994/95	77.5	2.9	0.3	0.8	3.7%	0.4%	1.1%
1995/96	80.6	3.3	0.2	0.9	4.1%	0.2%	1.2%
1996/97	91.2	3.6	0.2	0.6	3.9%	0.2%	0.6%
1997/98	87.6	3.8	0.2	1.0	4.3%	0.2%	1.2%
1998/99	94.5	4.3	0.2	0.6	4.5%	0.3%	0.6%
1999/00	89.3	5.0	0.3	1.1	5.6%	0.4%	1.3%

Note: The figures relate to the current 15 member states throughout.

Sources: European Commission (DG Agri, Unit C2, DG Enterprise); AAC; LMC estimates.

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[10] 1992/93 was the first year for which DG Agriculture, Unit C2, could supply disaggregated production refund data. 1993/94 was the first year for which DG Enterprise could provide non-Annex I refund data.

[11] The production refund disaggregation is incomplete for 1998/99, and there seems to be an error in the 1996/97 data. Hence the detailed figures for those years are underestimates.

For common wheat (i.e., excluding durum wheat), the quantities that receive starch product export and production refunds individually, and collectively, fall far short of the 5% share of total output that has been selected as being the criterion for being significant. However, the combined tonnages that are covered by the two refunds average close to one million tons, although there may be some double-counting on exports of approved products entitled to production refunds.

Conclusion: The total tonnage of wheat contained in starch products that receive either production or export refunds represents a significant proportion of total Community output of common wheat.

Table 4.3.2: The Share of Community Maize Output that Received Production and Export Refunds for Starch Products, 1991/92-1999/00 (million tons of maize)

	EU-15 Maize Output	Use in Starch	of which with: Export Refund	Production Refund	Proportion Used in Starch	Proportion Receiving Refunds on Export	Production
1991/92	28.6	5.6			19.6%		
1992/93	31.1	5.6		1.9	18.0%		6.2%
1993/94	31.8	5.5	1.1	2.1	17.3%	3.5%	6.6%
1994/95	29.5	5.4	1.4	2.4	18.3%	4.7%	8.2%
1995/96	30.3	5.8	1.1	2.8	19.2%	3.7%	9.4%
1996/97	35.5	5.7	1.2	1.8	16.1%	3.5%	5.0%
1997/98	39.5	5.9	1.3	3.1	14.9%	3.4%	7.9%
1998/99	36.2	6.0	1.6	1.6	16.6%	4.5%	4.5%
1999/00	37.5	5.9	1.6	3.2	15.7%	4.3%	8.4%

Note: The figures relate to the current 15 member states throughout.

Sources: European Commission (DG Agri, Unit C2 and DG Enterprise); AAC; LMC estimates.

For maize, the production refund consistently exceeds the 5% share of total output that is considered significant, and also comfortably exceeds the one million ton threshold level. The export refund on both Annex I and non-Annex I exports covers a quantity of maize that averages around 4% of total Community production, and corresponds to over 1.5 million tons of maize in recent years.

Conclusion: The tonnage of maize contained in starch products that receive production refunds represents a significant proportion of Community output; the tonnages benefiting from export refunds are also significant.

Starch potatoes are grown only to manufacture starch. Therefore, it comes as no surprise to discover that proportions of starch potato production that receive production and export refunds are both normally well above the 5% share taken to be significant. The quantity of potatoes that is incorporated into products receiving production refunds has always been ahead of the 2.5 million ton level that is considered significant. The export refund normally covers just over 2.5 million tons of potatoes, too.

Conclusion: The starch potato output contained in products benefiting from production and export refunds is a significant proportion of Community output.

Table 4.3.3: The Share of Community Starch Potato Output that Received Production and Export Refunds for Starch Products, 1991/92-1999/00 (million tons of potatoes)

	EU-15 Starch Potato Output	Use in Starch	of which with: Export Refund	Production Refund	Proportion Used in Starch	Proportion Receiving Refunds on Export	Production
1991/92	7.4	7.4			100.0%		
1992/93	8.0	8.0		3.7	100.0%		46.0%
1993/94	6.4	6.4	2.7	3.8	100.0%	42.1%	59.6%
1994/95	7.9	7.9	2.8	3.9	100.0%	35.2%	49.7%
1995/96	9.3	9.3	2.1	4.0	100.0%	22.9%	42.7%
1996/97	9.3	9.3	2.6	2.7	100.0%	27.3%	29.3%
1997/98	8.3	8.3	2.7	4.8	100.0%	32.4%	57.5%
1998/99	9.0	9.0	2.6	2.6	100.0%	29.0%	28.5%
1999/00	8.8	8.8	2.8	6.1	100.0%	31.8%	68.4%

Note: The figures relate to the current 15 member states throughout.

Sources: European Commission (DG Agri, Unit C2, DG Enterprise) ; AAC; LMC estimates.

Diagrams 4.3.1 and 4.3.2 illustrate the trends in the proportions of the total Community output of maize, wheat and starch potatoes that received production and export refunds. In both diagrams, the proportions for starch potatoes are plotted on the left axis, while those for maize and wheat are plotted on the right axis.

Diagram 4.3.1: Proportion of Base Product Output Receiving Starch Production Refunds, 1992/93-1999/00
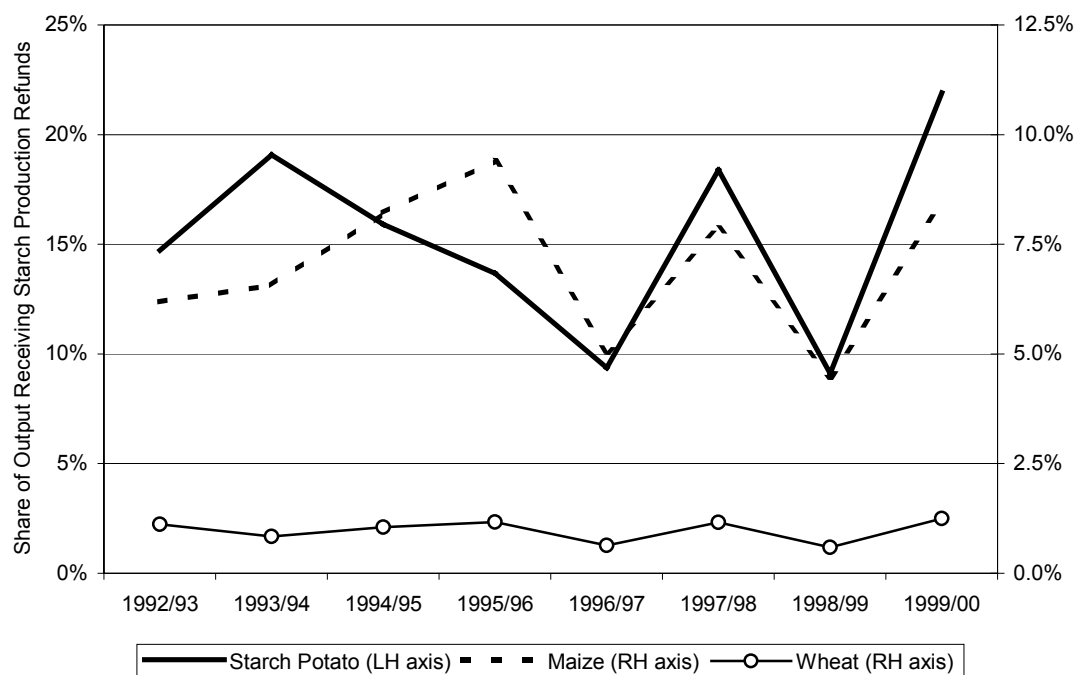
Source: European Commission (DG Agri, Unit C2 and DG Enterprise), LMC calculations.

Diagram 4.3.2: Proportion of Base Product Output Receiving Starch Export Refunds, 1993/94-1999/00
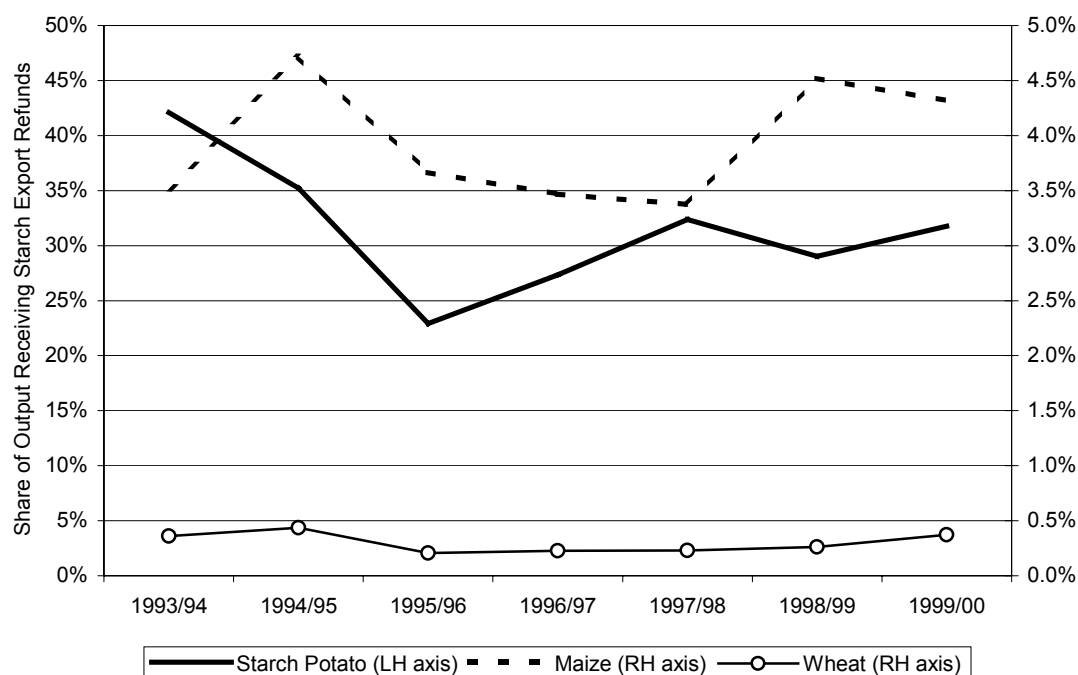
Source: European Commission (DG Agri, Unit C2 and DG Enterprise), LMC calculations.

THE SIGNIFICANCE OF PRODUCTION AND EXPORT REFUNDS IN THE DEMAND FOR COMMUNITY BASE PRODUCTS

The preceding discussion has demonstrated that production and export refunds (particularly the former) generate a significant demand for wheat, maize and starch potatoes, using the relatively demanding criteria adopted in this respect. Deciding whether the refunds themselves were essential in generating a significant proportion (interpreted as being at least half) of this demand for base products, or whether they represented a deadweight cost, relies upon an assessment of the price sensitivity of the demand for production and export refunds.

In answering this question, we first estimated the allocation of the quantities of wheat, maize and potato starches that received production and export refunds (in the latter case, we have received separate data covering Annex I and non-Annex I products). For production refunds, the quantities were distributed between the three main end-uses: organic chemicals; esterified and etherified starches (Customs code CN 3505 10 50); and all other end-uses, among which paper is the most important. For the Annex I export refunds, just two categories of basic starch products were used: native starches and glucose (including maltodextrins and caramel in the latter category); for the non-Annex I export refunds, the same end-uses were used as for the production refunds.

Production Refunds

Regarding production refunds, our assessment is that the organic chemical sector's use of domestic starch products is highly sensitive to the availability of production refunds. The fermentation sector faces strong competition from imports in several

segments of the market, even with production refunds to compensate it for base product price differences. Thus, the ordinal value attached to the sensitivity of this end-use's demand for domestic starch to the existence of production refunds is put at 3.

The category of esters and ethers is at the other extreme. The largest end-user of these modified starches is the paper sector, and environmental considerations mean that the main competing imported products (hydroxyethylated starches), which would be likely to be supplied from the US, are not acceptable as alternatives to local cationic starches. Therefore, the ordinal value attached to the sensitivity of the demand for domestic starch in esters and ethers to the existence of production refunds is put at 1.

The other end-uses that receive production refunds include a wide range of products, again with paper prominent. The ordinal value attached to this group of customers is 2.

The results of applying these ordinal measures are presented in detail in Tables A4.3.1-A4.3.3 in the Appendix to this Question. The conclusions may be deduced from Diagram 4.3.3, in which the weighted average values of the ordinal measures are plotted separately for wheat, maize and potato starches.

It is apparent from the diagram that the production refunds for both maize and wheat starches are considered to play a significant role in the demand for these two base products, since the average value of our ordinal index for both these starches is around 2.0. For potato starch, however, the ordinal index is below 1.5, because of the large volume of production that is used in esters and ethers. Therefore, we conclude that the production refund on potato starch had only a minor influence upon the volume of potato starch used in the domestic market.

It should be noted that the situation with regard to potato starch is quite different from that for the two cereals in one major respect. Unlike wheat or maize, the starch production refunds affect a very substantial proportion of total starch potato output; therefore, even a minor influence in the sense of Diagram 4.3.3 still implies that the production refunds play a significant role in the demand for the base product. (Significant in this context is assumed to mean that the quantities of starch potatoes whose sales were sensitive to the availability of the production refund were significant in the sense defined in the criteria listed at the start of the discussion of this Question.).

Diagram 4.3.3 reveals that, using the ordinal scale, the sensitivity measure for starch potato demand in relation to the production refund is only 1.4. This is as if 20% or so of the volume of potato starch products eligible for production refunds were highly sensitive (an ordinal scale of 3) to the provision of refunds, while the remainder had little sensitivity at all (an ordinal scale of 1).

We estimate that almost half of all starch potato output is processed into products that receive production refunds; therefore, if one focuses solely upon the 20% of the production refund tonnage that could be considered as if it were highly sensitive to the availability of the refund, it follows that, for close to 10% of total starch potato output, the production refunds were essential in generating this demand for base products.

As such, this would meet our initial criterion for the significance of refunds, namely that the quantities of the base products marketed with the benefit of refunds is significant if they represent over 5% of the total production of the base product in question.

Therefore, we conclude that for starch potatoes, as well as maize and wheat, production refunds play a significant role in determining the demand for base products.

Diagram 4.3.3: The Sensitivity of Starch Demand to Production Refunds, 1992/93-2000/01 (Where the Sensitivity Scale Runs from 1 to 3)
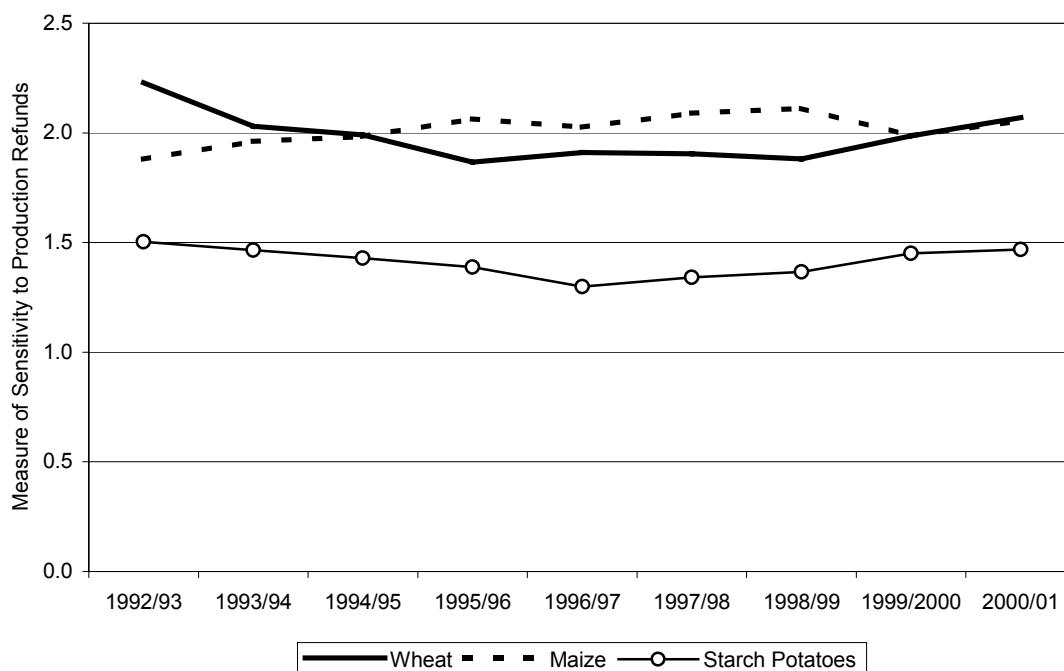
Source: European Commission (DG Agri, Unit C2 and DG Enterprise), LMC calculations.

Export Refunds

We have applied a similar approach to the evaluation of whether the system of export refunds has a significant impact upon the demand for base products. Once again, an ordinal approach has been adopted, and the results are depicted in Diagram 4.3.4. However, in this instance, there are only two rankings for Annex I exports: one for native starches, and the other for glucose, maltodextrins and caramel. For the non-Annex I exports, we have applied exactly the same rankings as those just described for production refunds. The details of the calculations underlying the diagram are provided in Tables A4.3.4-A4.3.9 in the Appendix to this Question.

Wheat and Maize

In our analysis of the sensitivity of demand for base products to the existence of Annex I export refunds, we have made the assessment that, for both wheat and maize, the combined direct and indirect exports of native starch are not very sensitive to the availability of these refunds. This is particularly true in the case of products such as paper, which represent important users of native and modified starches. Therefore, the ordinal value attached to the sensitivity of native starch export volumes to the existence of export refunds is put at 1.

The only other class of exported Annex I starch products manufactured from wheat and maize, and identified in the diagram, is the group combining glucose, maltodextrins and caramel. The ordinal value attached to the sensitivity of this category's demand for wheat and maize starch to the provision of export refunds is put at 2.

Among the non-Annex I exports, the same ordinal rankings were applied as those for production refunds. To arrive at a single final number, the weighted averages of the Annex I and non-Annex I export rankings were obtained (using volumes again as the weights).

Starch Potatoes

The ranking of the two classes of basic products in terms of their sensitivity to the availability of Annex I export refunds is reversed in the case of starch potatoes. Native potato starch exports are definitely sensitive to the existence of export refunds. As we discuss in the context of Questions 4.2 and 5.2, there is the evidence that the system of export refunds for potato starch products encourages exports at the expense of users in the domestic market (this was a view expressed during interviews by a number of paper companies).

Domestic sales of potato starch declined in absolute terms between 1996 and 2000. Yet, total export volumes continue to grow, and potato starch's share of Community exports still averages over 50%. We conclude that exports of native potato starch are very sensitive to the availability of export refunds. Accordingly, the ordinal value attached to the sensitivity of the exports of native potato starch to the existence of export refunds is put at 2.

Miniscule quantities of potatoes are processed into syrups for the export market. The ordinal value attached to this outlet is 1.

As with wheat and maize, the non-Annex I rankings were applied in the same way as the production refund ordinal rankings, and finally the Annex I and non-Annex I rankings were combined using weighted averages.

Results of the Analysis of the Ordinal Rankings

Tables A4.3.4-A4.3.9 in the Appendix to this Question present the detailed results of applying these ordinal measures to an analysis of the significance of export refunds. Since the two Annex I and three non-Annex I ranking schemes have been combined, the overall result is expressed with a maximum possible level of 2.5, the mean of 2.0 and 3.0.

Diagram 4.3.4, which summarises the results, makes it clear that export refunds should be considered to play a significant role in the demand for all three base products. The average values of the ordinal index for the two cereal starches are typically in the region of 1.9-2.0, within the range, which extends from 1.0 to 2.5. For potato starch, however, the ordinal index is 2.0, reflecting the importance to the sector of native starch exports and exports of native starch derivatives, which are vulnerable to a loss of export refunds.

We conclude that for wheat, maize and starch potatoes, export refunds play a significant role in determining the demand for base products.

Diagram 4.3.4: The Sensitivity of Starch Demand to Export Refunds, 1993/94-1999/2000 (Where the Sensitivity Scale Runs from 1 to 2.5)

QUESTION 4.4

Did the amounts of the production and export refunds ensure at a reasonable cost an outlet for the Community starch products?

Part (a): For the production refund, on which a single amount is applied whatever the base product used, one will study more particularly whether the refund amount allowed a suitable compensation of the price differences. This question will be treated by base product (wheat, maize, potato, other), and by using industry (paper mills, chemicals, fermentation products, etc.), taking into account their respective importance.

Part (b): For the export refund, the case of maize starch and potato starch will be analysed more particularly. Did the single amount of export refund for these two products allow a suitable compensation of price differences?

Part (c): The case of glucose will be analysed in detail: individual requirements of use, raw materials used (wheat, maize, potato, sugar), relevance of the single amount of export refund. A comparison with other sweeteners will also be carried out.

We shall consider the three parts of this Question separately as if they are stand-alone Questions in the pages that follow.

QUESTION 4.4: PART A

Did the amounts of the production and export refunds ensure at a reasonable cost an outlet for the Community starch products?

Part (a): For the production refund, on which a single amount is applied whatever the base product used, one will study more particularly whether the refund amount allowed a suitable compensation of the price differences. This question will be treated by base product (wheat, maize, potato, other), and by using industry (paper mills, chemicals, fermentation products, etc.), taking into account their respective importance.

Objective of the Question: To determine whether the amount provided by the production refund to Community users of approved products was appropriate to compensate users for differences between Community base product prices and c.a.f. import prices. To assess whether the production refunds were just sufficient to maintain outlets for Community starch products, or whether these outlets could have been maintained at a lower cost, with a lower level of production refunds. In particular, to consider whether excessive costs were incurred in providing a single production refund, irrespective of base product and of using industry.

Instruments: The production refund (for this question, abbreviated to refund) which is paid to producers of a range of approved products, defined originally in Annex I to the Council Regulation (EEC) No 1722/93 and revisions, when they are processed from starch products. These starch products, made up of the basic starches and specified starch derivatives, are defined in Annex II of the same regulation with revisions. (See the Appendix to Chapter 3, Table A3.1 and A3.2, for the most recent version of these Annexes.).

Criteria: Questions 4.4 and 5.3 concern the value for money that is obtained through the system of refunds. In the current question, we focus on whether the refunds were provided at least cost, while in Question 5.3 we ask whether the refunds created maximum value.

To determine whether outlays on production refunds represented a reasonable cost and whether a single refund allowed a suitable compensation for price differences, one needs to decide what constitute reasonable and suitable payments in the circumstances. The criteria that we propose to use are the following:

The amounts spent on production refunds in each of the most important approved uses (paper, organic chemicals and esterified and etherified starches) were not significantly higher than those needed to maintain outlets for starch in these end-uses. In other words, the sums spent were reasonable if the deadweight in providing refunds to all the three main approved uses was low.

The determination and use of the single production refund was suitable, in the sense that it does not cause significant over-or under-compensation of price differences for any of the main base products, in terms of the principles under which compensation is calculated for individual base products.

If, however, there was over-or under-compensation of price differences for base products, the application of a single refund would be suitable if the impact of the bias was small in relation to the administrative costs of managing a differentiated system.

Indicators: There are three main sets of indicators, corresponding to the separate criteria. The first is the ratio of the amounts spent on production refunds for each major

approved use in relation to the amounts needed to maintain the outlets for starch in these uses. The second is the compensation that would be paid for different base products if the principles of compensating for price differences were applied strictly for each product, where this sum is calculated as a deviation from the single refund paid. The third is the costs of administering a differentiated system of production refunds as a fraction of the potential savings from applying such a system.

THE VALUE FOR MONEY FROM PRODUCTION REFUNDS

Both Questions 4.4 and 5.3 concern the value for money that is obtained through the system of refunds. In the current question, we focus on whether the refunds were provided at least cost, while in Question 5.3 we ask whether the refunds created maximum value.

It is useful to review briefly the objective of the production refund. This is to compensate Community end users of starch products for international differences in raw material prices. The framework for providing this support is to calculate the difference between a benchmark import price, namely the c.a.f. Rotterdam price for imported US maize, and an average of EU internal delivered maize prices. This difference is then multiplied by a technical coefficient, 1.60, which is the inverse of the recoverable starch content of maize, to obtain a refund per ton of starch[12].

The direct budgetary cost of this measure is the resulting refund obtained from this calculation multiplied by the total amount of starch claimed on this refund. This cost, whatever its level, will be judged to be unreasonable, in terms of answering this Question, if there are found to be outlets for starch in approved products that would have been maintained without recourse to the full level of the refund. The cost will further be judged to be unsuitable if any raw material was compensated for a larger amount than would be warranted on the basis of differences between internal prices and c.a.f. import prices, after taking into consideration the additional administrative costs required to manage a system of differentiated, as opposed to single, refunds.

The execution of this judgment requires assessing:

1. Whether the elements used for the calculation of the refund involve excessive cost by compensating users for more than the average price differences for different base products.

2. Whether, *a priori*, the range of approved products that are eligible for a production refund includes products on which refunds are likely to result in excessive cost.

3. Finally, whether the framework in which the support is provided, to meet the objective of compensating Community end users of starch products for price differences, is unnecessarily costly and whether an administratively straightforward, lower cost framework could meet the same objectives.

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[12] See Chapter 3 for a fuller explanation.

DETERMINING WHETHER THE CALCULATION OF THE REFUND INVOLVES EXCESSIVE COST

Chapter 3 explains the way in which the refund is calculated. We deduce from the structure of the calculation that the reasons why the various elements are included in the calculation are as follows: first, maize is used as the benchmark raw material because it is assumed that the main imported competitors for domestic approved products are manufactured using US maize starch products, or using starch products purchased at US maize starch prices in other countries; therefore, US maize starch is the appropriate reference for competing imports. Second, in view of the significance attached to potential imports of approved products using US maize starch as an input, the c.a.f. import prices of US maize into Rotterdam are seen as a good indicator of the maize raw material cost in the starch contained in imports of approved products.

The third assumption in the determination of the production refund is that delivered internal EU prices in the major production and export regions for maize are the appropriate domestic maize prices to use to assess the difference between Community and c.a.f. import prices of maize for the purposes of compensation. Finally, the refund does not differentiate between base products, but applies a single maize based refund to all products because we assume that, when first implemented, the vast majority of domestic starch was derived from maize or starch potatoes, with very little derived from wheat until the 1980s. In addition, the view that the main competition would be maize based reinforced the relevance of using maize price differences as the basis for compensation via production refunds.

In response to these comments, the following points may be made. First, while there can always be disagreement over the choice of reference prices, and individual Member States might benefit more or less than the average from the particular calculation of the refund[13], we can find no serious objection to the choice of reference prices, which are very transparent, since they are based upon widely quoted domestic market prices in major production areas, and the most widely quoted f.o.b. export price in the world market, to which is added a widely quoted freight rate to arrive at the c.a.f. import price in the Community's largest cereal importing port.

In Chapter 3, we highlighted a further assumption in the determination of the production refund, which is that the freight rate on maize in bulk from the US Gulf to Rotterdam is the appropriate freight adjustment to make on imports of the approved products. In other words, it assumes that the freight rates paid on exports of approved products from the US are the same as bulk rates for maize. In fact, the actual freight rates on products are higher, therefore this assumption represents a measure of protection to the recipients of production refunds. Since the production refunds are managed within the CMO for cereals, and are only intended to compensate for the difference in agricultural base product prices in the Community and abroad, the additional protection provided for the industrial end-product by the functioning of the freight market lies outside the framework of the CAP. This additional protection is therefore an unintended consequence of the method employed to determine the production refund.

We do not give serious consideration to one possible argument for having a single maize based refund, which is that it would be costly to differentiate the refund by base product. This is because the data collected by the Commission already provide a break

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[13] For example, Member States far from the location of the reference markets for the internal prices may pay higher raw material prices than these because of freight costs.

down of the refund by raw material use and so, within the current system, information is already collected to apply differentiated refunds, if this distinction is wanted.

Although the US is by far the largest producer of starch in the world, and roughly 99% of its production is maize based, it plays a relatively small role in international trade compared to the size of its domestic industry (see Chapter 1). It is the second largest exporter of starches and starch derivatives, after the Community, but increasing quantities of its exports are destined to go only as far as the neighbouring NAFTA countries under preferential arrangements. In practice, tapioca based starch products, mainly in the form of native tapioca starch, are now at least as important in global export tonnages as US maize products, and cassava is still growing in importance as a starch raw material following increased investment by US and EU companies in this industry, particularly in Thailand. This is particularly relevant since tapioca is viewed by many end-users, such as paper companies, as a closer substitute for potato starch than maize starch. However, inside the Community, relatively little native tapioca starch is used, and the tariff rate quota of 22,500 tons is not filled. By coincidence, this tariff rate quota amount is almost exactly the level of native tapioca starches into the US.

While the calculation of the refund has a clear logic, this logic is undermined somewhat by various ad hoc adjustments. In particular, a cap that has been as high as 130%, and is currently 115%, of the intervention price is often applied to the domestic price that is used to calculate both production and export refunds. This is done on the grounds that internal maize prices become excessively high at the end of the crop year and do not represent the real price at which processors, with forward purchasing and pre-fixation, buy maize on the domestic market. We would question whether the quite intricate logic and calculation of the refund is justified if the calculation, at short notice, may be adjusted in this way. The method may create unnecessary costs if it leads to a refund that is not consistent with the basis for determining appropriate compensation.

Conclusion: The formula to calculate the refund probably leads to a figure that is biased upwards as a result of the freight rate differential between US exports of bulk grains and approved products to the Community. However, this is offset in a somewhat arbitrary manner via the imposition of caps on the internal price used in the calculations.

DETERMINING WHETHER THE LIST OF APPROVED PRODUCTS IS APPROPRIATE

The approved products are those that are considered to be potential users of starch and are not protected significantly by import tariffs from imports of competing products. The Appendix to Chapter 3 contains the list of approved products and the import tariffs on these and other starch-using products, which confirms the appropriateness of the list of approved products. The discussion of Question 4.1 demonstrated that most of the products contained in the list claim few or no refunds, and that the majority of the outlays on production refunds is claimed by producers of just three classes of products: paper, esterified and etherified starches, and organic chemicals.

We can find no *a priori* reasons to question the list of approved products. There are no obvious omissions, but the list contains many products whose presence, while consistent with the logic of the refund, generates no demand or production refunds.

Conclusion: The list of approved products is appropriate. If it were decided, for administrative reasons, to reduce the size of the list, it would be possible to do so without affecting the volume of refunds at all significantly.

THE COMPENSATION PROVIDED TO THE VARIOUS RAW MATERIALS FOR STARCH MANUFACTURE

We begin with a summary of expenditure on the production refund derived from the data presented in the first six tables in the Appendix to Chapter Two. In Table 4.4.1 this expenditure is calculated as average annual refund multiplied by the annual tonnages covered by production refunds on starch. Since each base product and each approved product gives rise to the same production refund per ton of starch, the proportional allocation of the shares of expenditures between different base products and different approved products should be a precise indication of the proportional allocation of budgetary outlays on refunds.

In Diagram 4.4.1 we present a summary of the trend in the production refund measured as the total quantity of basic starch on which the refund is claimed (represented by the line) and allocated by raw material (the proportional allocation depicted in the histograms). The starch quantities covered by the refund have increased from around 2.5 million tons in 1992/93 to just under 3.0 million tons in 2000/01. Over the same period, maize on average accounted for 53% of the refund, potato 28% and wheat 15%. (Note that the significance of the "other" category of base products — barley, oats and rice — is over-stated by the figures in the table. In 1998/99, there is no disaggregation available of the allocation of refunds by end-use for France. Therefore, the entire French use of production refunds for starch in that particular year is allocated by the table to "others", a category which, in practice, in all other years accounts for a negligible proportion of the total refunds.).

Diagram 4.4.1: The Production Refund Claimed on Basic Starch, by Raw Material
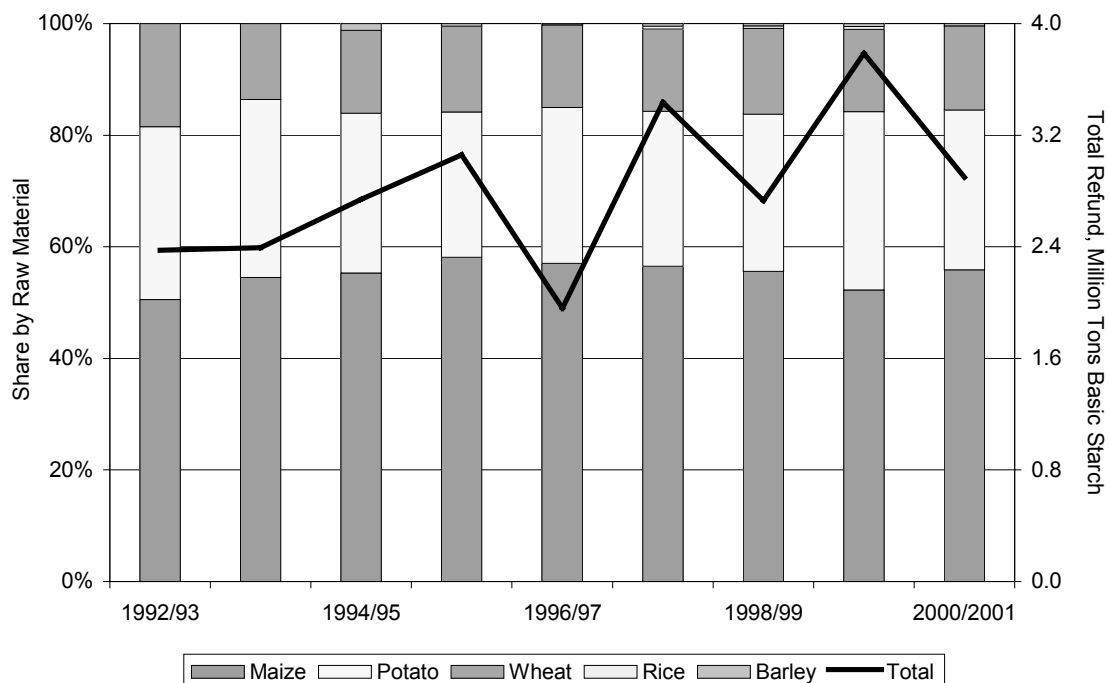
Source: EU Commission (DG Agri, Unit C2).

Table 4.4.1: A Summary of the Total Allocation of Production Refunds, 1992/93-2000/01

(million tons, basic starch)

	Wheat	Maize	Potato	Other	*Total Claim*	Share
Organic Chemicals	0.56	3.67	0.15	0.28	**4.66**	18%
Esters & Ethers	0.60	3.40	4.31	0.42	**8.73**	34%
Paper	2.14	4.09	2.22	0.30	**8.75**	34%
Other	0.41	2.31	0.46	0.07	**3.24**	13%
Total Claim	**3.71**	**13.47**	**7.13**	**1.06**	25.38	
Share	15%	53%	28%	4%		
Estimated Total Expenditure (€ billion)					**1.30**	

Source: EU Commission (DG Agri, Unit C2).

Note: The significance of the "other" category of starch raw materials is over-stated by the figures in the table, for reasons explained in the text.

The Production Refund for Maize

If one accepts the basis of the production refund calculation for maize then we believe that the refund for maize is provided at slightly too high a cost in terms of its compensation of price differences. This is on account of the difference, discussed above, between freight rates on approved product imports and freight rates on bulk grain from the US Gulf. The impact of by-product credits upon the appropriateness of the refund is reviewed in the discussion of Question 5.3.

The Production Refund for Wheat

Diagram 4.4.2 depicts the US Gulf f.o.b. prices of No 3 yellow maize and SRW wheat as well as the wholesale prices of maize in Bayonne and milling wheat in Rouen. It is clear from this diagram that EU wheat prices are considerably closer to world export prices than is the case for maize, reflecting the Community's position as a net exporter of common wheat, and its usual position as a net importer of maize.

The production refund is intended to compensate for international differences in raw materials prices and yet wheat starch receives the single production refund, which the Council for Ministers determined should be based solely on price differences for maize. It is clear from Diagram 4.4.2 that, in general, these maize price differences are greater than the difference in price between EU and US wheat prices.

In Table 4.4.2 we have prepared estimates of the increased budgetary cost of using a maize based production refund, rather than compensating directly for price differences in wheat. The first two columns draw on the data in Diagram 4.4.1 to derive the quantity of basic starch on which a refund is claimed. The next two columns calculate the amount of the production refund that would be granted, if it were based separately on compensation for the differences in wheat and maize prices, where a technical coefficient of 2.00 has been applied to wheat, as against one of 1.60 for maize. The US SRW wheat price has been used as the reference price in this calculation, with the same bulk freight rates assumed to apply from the US Gulf to Rotterdam as for maize.

This calculation is only suggestive. It is likely that, with wheat-based refunds, the pattern of claims under the refund would change, as processors adapt their cereal use to profit from differences in refunds. Nevertheless, the table suggests the following conclusion.

Conclusion: Average annual budgetary savings of over €22 million may be made by adopting separate compensation for wheat. This is the extra sum that is paid to wheat starch producers by tying their compensation to the maize price, rather than the wheat price.

Diagram 4.4.2: The Price of Various Raw Materials in the EU and the US
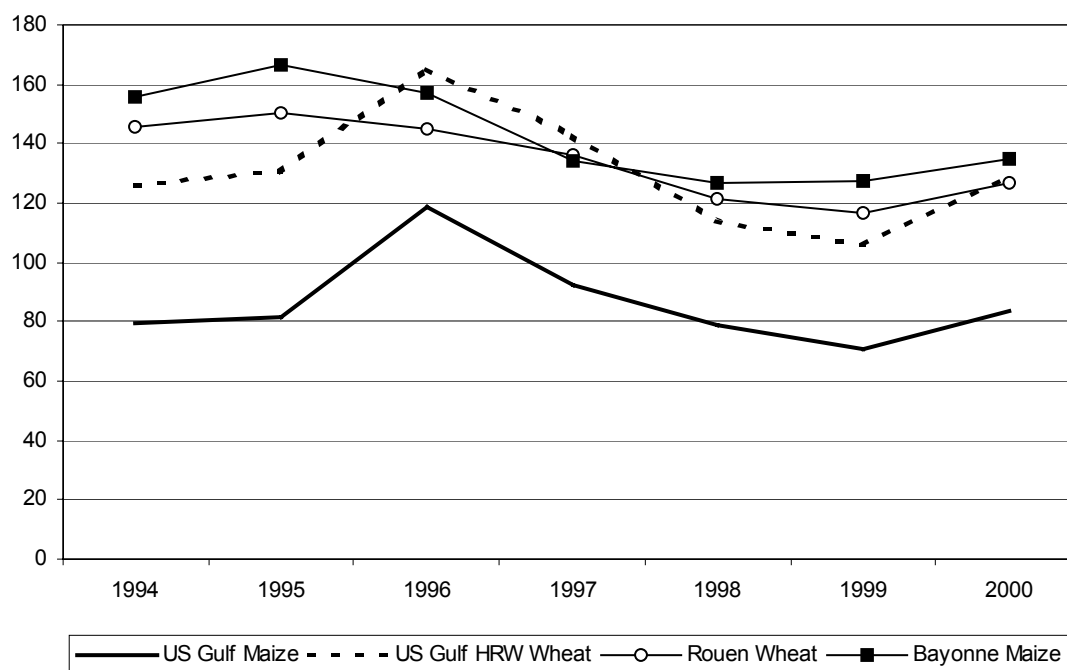
Source: USDA, HGCA.

Table 4.4.2: The Added Budgetary Cost of Using a Maize Based Refund for Wheat (€/ton)

	Refund Claimed on Wheat tons	Refund Claimed on Maize tons	Wheat Based Refund Euro/ton	Maize Based Refund Euro/ton	Overspend million Euro
1994	366,246	1,410,068	52.73	121.54	25.20
1995	438,462	1,647,087	44.92	136.08	39.97
1996	380,285	1,448,365	0.00	61.71	23.47
1997	398,596	1,529,934	19.31	65.83	18.55
1998	393,296	1,477,176	43.69	76.65	12.96
1999	419,180	1,496,042	52.54	89.81	15.62
2000	497,379	1,799,822	36.04	81.55	22.64

Source: EU Commission (FEOGA and DG Agri, Unit C2)), USDA, HGCA, LMC estimates.

Notes: The third and fourth columns, entitled the wheat and maize based refunds, are the estimates of the production refunds needed to compensate Community approved users of wheat and maize starch, respectively, for the differences between c.a.f. US landed prices and domestic prices for wheat or maize, as relevant.

The overspend in the final column is the result of multiplying the difference between the values in the third and fourth columns by the wheat tonnage listed in the first column.

The Production Refund for Potato Starch

The discussion of Question 7.3 later in this Evaluation concluded at one point that "On trade within the domestic market, there is no significant difference between native starch prices for potato starch and maize starch. Therefore, the two starches may be considered to be very close substitutes in the domestic market."

Conclusion: Given this close substitutability, and since the payment to growers for starch potatoes is based on the cereal intervention price, there is no reason to believe that the production refund systematically over-or under-compensates for raw material costs in the production of potato starch; hence we conclude that, for potato starch, the production refund is provided at a reasonable cost.

The Production Refund for Other Base Products

Small amounts of starch that receives production refunds are produced from barley, oats and broken rice. The quantities used are sufficiently small that it would probably be administratively unwieldy and costly to try to operate a separate compensation system for each of these three products. No oat starch received refunds and the average annual quantity of rice starch that receives refunds is of the order of 200 tons.

The only other base product whose use is large enough to be worth considering for separate refunds is barley, whose annual tonnage covered by refunds is approximately 15,000 tons.

The case for separate compensation procedures for these starches is even weaker when it is appreciated that the international reference prices that would probably have to be used to determine the compensation, such as the US No. 2 barley price, are viewed as having less validity as worldwide benchmarks than their maize and wheat counterparts.

Conclusion: Both on the grounds of administrative costs in relation to the quantities likely to be covered by such refunds and the greater uncertainties about the validity of international price comparisons, there is little reason to change the basis of compensation for production refunds for other base products.

THE COMPENSATION PROVIDED TO THE VARIOUS APPROVED USES OF STARCH PRODUCTS

The main sectors receiving the production refund are paper, organic chemicals and esterified and etherified starch, and we consider them in turn, beginning with esterified and etherified starch.

Esterified and Etherified Starch

The discussion of Question 4.1 demonstrated that the outlet for esterified and etherified starch in the Community has been maintained and that the production refund must take at least some of the credit for this achievement, since substitute modified starch products made from tapioca starch are available from Thailand and these have the potential to compete closely with potato starch based esters and ethers. However, other factors are important, in particular the range and sophistication of products available from the Thai industry, and the after-sales support available on its products.

Increasingly, it is EU or US companies that import these products into the Community, often for further modification. In the early 1990s, when the gap between the price of EU products and competing products from abroad was at its greatest (refer to Diagram 4.4.7), so was the refund. As Community raw material prices have fallen, and with them the level of the production refund, so import prices for Thai starch have risen; hence there has been a degree of balance between the cost and effectiveness of the refund.

Furthermore, at the beginning of the 1990s, the US industry was as well placed as the EU industry to produce esterified and etherified starch from maize, and it seems likely that, without the refund, there would be greater trade in these products to the detriment of EU outlets for these starches. Instead, the Community imports mainly waxy maize esterified and etherified starch from the US, and in recognition of the relative lack of availability of some of these products in the EU, the duty on hydroxyethylated waxy maize starch was suspended.

Table 4.4.1 estimates that, over the nine years since 1992, the refund for esterified and etherified starch has cost in the region of €450 million (these starches accounted for 34% of the total production refunds, which cost €1.30 billion). We do not perceive this to be an unreasonable cost to the extent that:

1. The majority of the refund for this approved product is claimed on the use of maize starch and potato starch and it has been established above that, given the objectives of the refund, the compensation given to these starches is appropriate (subject to the qualification, made above, that the freight rate incorporated into the formula does not reflect the difference in freight rates on approved products and bulk cereals).

2. The protection afforded to maize starch esters and ethers is particularly appropriate in competition with the US industry. In addition, the Thai tapioca industry is a potential supplier of these products to the EU, although in small volumes; however, because Thai modified starches are tapioca based, the production refund is not particularly well suited to compensating for raw material cost differences between the EU and Thailand.

3. The end use sectors for starch esters and ethers, in particular the food and paper industry, are either protected or are sizeable exporters. This shifts the pressure from base product costs onto the intermediate product, in this case esters and ethers, since the end use industries are always in a position to reduce domestic purchases and import these products, in view of the low import duty on them.

4. The quantity of native starch used in esterified and etherified starch is between 110% and 117% of the weight of the final product.[14], and starch forms the major share of the cost of esters and ethers. The data provided in the Appendix implies that the ratio of the price of starch esters and ethers to the price of native potato starch is of the order of 1.6 for the period from 1992, and so the refund provides a significant reduction in the raw material cost of these products.

For these reasons, we conclude that the production refund for esterified and etherified starch has been provided at reasonable cost, since the policy has broadly achieved its objectives while compensating, as intended, for base product price differences.

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[14] Interviews with industrial starch users.

Paper Use of Starch Products

Question 4.1 demonstrated that the paper industry is the main outlet for starch among products claiming a production refund. Moreover, this outlet has been maintained, since it has continued to grow at a substantial pace. There is little protection against imports of paper products into the Community, but, despite this, imports are relatively small, and consist mainly of newsprint and kraft paper, which contribute to the Community's stock of raw material for recycling. Little starch enters with these imports.

Despite all these benefits accruing to the starch industry and to producers of starch raw materials from the presence of a successful domestic paper industry, we conclude that the production refund has not been provided to the paper industry at reasonable cost, and that indeed there has been a measure of deadweight in the supply of the refund to the paper industry. This is for the following reasons:

1. According to Table 4.4.1, the paper industry has accounted for 34% of the refund since 1992 (not including indirect refunds via its use of starch esters and ethers), which amounts to around €450 million as calculated above. The main starch used in paper, other than starch ethers in the form of cationic starches, is native starch, much of which is used by the corrugated board industry.

2. We estimate that, on the basis of interviews with the industry and the structure of the production refund, 45% of the starch used in the paper and board industry comprises native starch. Imports of native starch into the Community face heavy duties. We demonstrated in Appendix 2 to Question 4.1 that this has prevented significant imports of native starch. Since paper outlets for native starch were not under threat from imported starch, the main benefit of the refund is to allow starch producers to absorb the higher cost of Community raw materials rather than pass this cost on to the paper industry, which is unprotected from imports.

3. Since the cost of starch is of the order of 3%[15] of the value of paper, we believe that some of the cost increase caused to domestic producers of native starch by higher Community raw material prices could have been passed on to the paper industry without significantly jeopardising this outlet. This would particularly affect corrugated board production, which uses native starch as a binder rather than as a surface size.

4. The paper industry, according to Table 4.4.1, claims a significant amount of the refund in the form of wheat starch, and much of this is likely to be native starch, since wheat starch is generally not favoured for the production of modified starches. As was demonstrated above, wheat starch is, on average, somewhat overcompensated for international price differences and this is an element of the deadweight mentioned above.

For these reasons we believe that, while the paper industry is an extremely important outlet for starch, and is an important processor of agricultural raw materials into high value added products, there has been an element of deadweight in the provision of the refund on basic starches to the paper industry. This outlet for Community base products could therefore have been ensured at somewhat lower cost.

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[15] See Question 4.2.

Organic Chemical Use of Starch Products

Question 4.1 demonstrated that, while the output of organic chemicals has been maintained, the domestic use of starch in this outlet had grown in line with overall starch use. Nevertheless, several outlets in this category are being lost to cheap imports, largely of fermentation products from China.

In particular, in Table A4(2).1.7 in Appendix 2 to Question 4.1, using the data available, we demonstrated that, over the period shown, the refund has, on average, allowed EU producers the opportunity to reduce the price of their organic chemicals for sale in the EU by the equivalent of 4% of the price of their competitors. This advantage would have been much greater at the beginning of the 1990s when the refund was higher. It is clear that, within the constraints of the objective of the refund, this has helped EU producers to secure domestic outlets for their products.

This is not to say that there has not been deadweight. It was demonstrated that producers of powdered sorbitol, for example, thanks to the protection afforded by high specific import tariffs, have not suffered any competitive disadvantage in the domestic market as a result of high Community base product prices, at least recently, and the combination of refunds and tariffs on these products amount to a very substantial barrier to imports. In contrast, in penicillin, where there is no doubt that competition in the domestic market from Chinese imports is very intense, the refund has done little to improve the competitiveness of EU products, because the base product element of their total costs is negligible.

However, while it is possible to find products, such as powdered sorbitol, within the organic chemicals category that do not need the benefit of a refund, or products for which, although a refund is needed, the refund alone is not very effective (e.g., penicillin), we conclude that, for the category as a whole, there is little doubt that the refund has ensured an outlet for Community base products at a reasonable cost. The main reasons for this are straightforward:

1. Organic chemicals on the whole, and particularly the main fermentation products, incorporate large quantities of starch into their production; therefore, the base product cost incorporated into starch is often a significant fraction of total cost.

2. The industry stated consistently during interviews for this study that their products are not very labour intensive. Consequently, it is raw material, rather then labour, cost that is a determining factor in the competitiveness of these products.

3. These products are increasingly seen as commodity chemicals, with competitiveness driven largely by cost differences.

The evidence is that EU producers of organic chemicals are establishing more production facilities abroad. Several of these have been installed in China, but notable exceptions include the plant that has been established by Jungbunzlauer in Canada to draw on a cheap local source of starch hydrolysate. Cargill has chosen Brazil for new investment because of its abundant supply of raw materials. At the same time, some domestic capacity has been closed. These losses of outlets for Community products will eventually be reflected in reduced exports and increased imports of organic chemicals.

We conclude that, within the framework of its objective, namely compensation for price differences in the base products, the refund has been reasonably cost effective as a means of securing domestic outlets for starch in organic chemicals.

Comment Regarding the Appropriateness of the Determination of the Production Refund on Starch Products

In the next part of this Question, an analysis is presented of the significance of the correlation that is discovered to exist between the magnitude of export refunds on native starches and glucose and the volume of exports of these products, using Comext data. To assess whether a similar correlation is to be found in the case of production refunds, we have analysed the relationship between the level of production refunds and the volumes of starch which receive production refunds. Using data that we have been provided for the value of production refunds for calendar years and volumes by marketing years, we have prepared the following diagram.

(It should be noted that, because of the absence of disaggregated data by end-use for France in one year, it is impossible to prepare a separate analysis of the level of production refunds in individual end-use sectors.).

It is impossible to find a clear positive or negative correlation between the two series. Therefore we conclude that, unlike the case with export refunds, there is no correlation between the magnitude of the production refund and the tonnages of starch covered by the refunds.

Diagram 4.4.3: The Volumes of Products Receiving Production Refunds and the Level of the Production Refunds
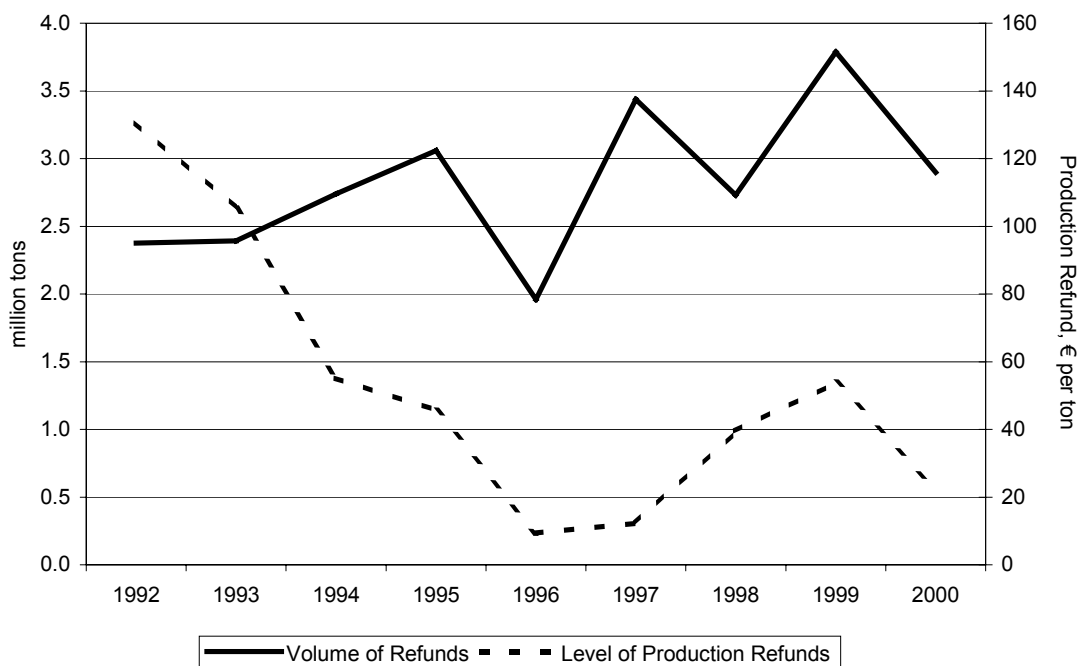
Sources: European Commission (DG Agri, Unit C2 and DG Enterprise), LMC calculations.

QUESTION 4.4: PART B

Did the amounts of the production and export refunds ensure at a reasonable cost an outlet for the Community starch products?

Part (b): For the export refund, the case of maize starch and potato starch will be analysed more particularly. Did the single amount of export refund for these two products allow a suitable compensation of price differences?

Objective of the Question: To determine whether the amount provided by the export refund to Community exporters of Annex I and non-Annex I products was appropriate to compensate users for differences between Community f.o.b. base product prices and f.o.b. export prices from competing exporters of Annex I and non-Annex I products. To assess whether the export refunds were just sufficient to maintain export outlets for Community starch products, or whether these outlets could have been maintained at lower cost, with a lower level of export refunds. In particular, to consider whether excessive costs were incurred in providing a single export refund for potato starch and maize starch.

Instruments: The export refund for starch products provided on exports of Annex I starch products and non-Annex I products manufactured from starch products, where Annex I and non-Annex I refer to the categories defined in Article 32.3 of the Treaty of Amsterdam.

Criteria: To determine whether outlays on export refunds represented a reasonable cost and whether a single refund for maize starch and potato starch allowed a suitable compensation for price differences, one needs to decide what constitute reasonable and suitable payments in the circumstances. The criteria that we propose to use are the following:

The amounts spent on export refunds on Annex I and non-Annex I products were not significantly higher than those needed to maintain outlets for starch in these outlets. In other words, the sums spent were reasonable if the deadweight in providing refunds was low.

The determination and use of the single export refund for maize starch and potato starch was suitable, in the sense that it does not cause significant over-or under-compensation of price differences for either of base products, in terms of the principles under which compensation is calculated for individual base products.

The cost of this instrument, whatever its level, will be judged to be unreasonable if outlets are found for Annex I or non-Annex I products that would have been maintained without recourse to all or part of the export refund.

Indicators: There are two main sets of indicators, corresponding to the separate criteria. The first is the ratio of the amounts spent on export refunds in relation to the amounts needed to maintain the outlets for starch in these uses. The second is the compensation that would be paid for potato starch products if the principles of compensating for price differences were applied strictly, and the magnitude of the difference between the resulting compensation for potato starch products and the level of the refund that is currently paid.

DETERMINING WHETHER THE RANGE OF PRODUCTS ELIGIBLE FOR THE EXPORT REFUND INVOLVES EXCESSIVE COST

Before considering the basis of the calculation of the refund and whether it provides appropriate compensation for the base product price differences, it is important to assess whether the range of products whose exporters are permitted to apply for export refunds is reasonable, or whether the list of products in Annex I and non-Annex I (and summarised in the Appendix to Chapter 3) includes many for which refunds are of little or no importance in ensuring outlets for Community starch products.

Prior to July 2000, when Regulation 1520/2000 was implemented, the list of Annex I and non-Annex I products included most of the export products that were potentially direct or indirect users of starch derivatives; but significantly the list did not include among the non-Annex I products the use of esterified and etherified starches by exporters of paper (who were, however, eligible for export refunds on their use of native starch in exported products). Exporters of those approved products (eligible for production refunds) that appeared on the list of Annex I and non-Annex I products for export refunds received a residual refund payment to bridge the gap between their production refund payment and the level of the export refund.

After July 2000, the non-Annex I product list was pruned considerably, partly to help to ensure that the Commission complies with the commitments made with the WTO to limit total expenditures on non-Annex I export refunds to €415 million from 2000/01 onwards. The most significant change from the perspective of the starch sector was the removal of all but one of the approved products from the list. Apart from esterified and etherified starches (CN 3505 10 50), which continued to be eligible for both production and export refunds, all the other approved products were restricted to production refunds, even on their export sales.

This has created the anomaly that products such as non-chocolate confectionery, which contain significant quantities of Community starch derivatives, receive larger refunds on their export sales than organic chemicals, which may also contain significant quantities of Community starch products.

There was, by common consent among the manufacturers and starch processors whom we interviewed, good reason to reduce the scope of the non-Annex I refunds as far as starches are concerned, since the former list included many products that used minimal amounts of starch, and for which their starch export refunds had a minimal impact upon export outlets. However, the new reduced list is still considered to include products for which starch export refunds are not needed at their current levels in order to maintain export volumes. Exporters of non-Annex I products are still entitled to apply for refunds on the use of starch at incorporation rates so low as a percentage of total production costs that the refund represents cost savings too small to affect export decisions.

The principle of compensation for price differences is valid, but when the effect of the price differences is not material in determining the overall volume of exports of end-products, then we believe that the refund may be considered to represent deadweight, and may even imply a net cost to the Community, once the administration of the refunds is taken into account. Accordingly, we feel that it would be appropriate to remove this deadweight and institute a cut-off threshold level in terms of the share of starch costs in the overall value of the export, as listed in the export licence application; below this threshold level, it would not be economically or administratively effective to grant export refunds.

Since the export refund itself represents only a small fraction of the cost of starch products, a threshold level of, say, 0.5% as a share of starch costs in selling prices would mean that, even in July 1999, when the export refund per ton of maize or potato starch was at its peak over the past five years, at just under €100 per ton, the refund would have represented a saving of less than 0.2% on total costs if the entire starch purchases of this exporter had consisted of native starches, on which the refunds have the greatest relative impact.

The Annex I category of products eligible for export refunds consists entirely of products with a very high starch content. Non-Annex I refund data provided by DG Enterprise reveal that the export refunds are concentrated in two end-use sectors: esterified and etherified starches (which have a considerable starch content) and organic chemicals (among which the major export products claiming the refund also have a substantial starch content). The data included in the Appendix to Question 4.3 revealed that these two non-Annex I categories of end-use typically represent in the region of three quarters of the volumes receiving starch export refunds. Therefore, the introduction of a threshold below which export refunds were not granted would not have had much effect upon the overall volume of such refunds before July 2000, but would have reduced administrative costs.

The threshold would not remove the inconsistency introduced in July 2000 between the treatment of approved products (other than the esters and ethers) and those other products exported with export refunds under non-Annex I. There are undoubtedly many approved products for which the residual export refund does represent deadweight and is not essential to maintaining outlets for Community starch products. However, there are some organic chemicals which face keen competition from imports in the domestic market, and face even more competition from the suppliers of these imports in third country markets, where Community exporters have to incur additional freight costs.

We believe that there is a convincing argument that the exporters of approved products who lost the right to export refunds in July 2000 should be entitled to claim residual export refunds, in common with the exporters of esters and ethers, subject to an appropriate cut-off threshold level in the starch content of such exports. This needs, however, to be put in the context of the administrative need to satisfy the Community's broad WTO undertakings on non-Annex I expenditures.

Conclusion: There is deadweight in the provision of export refunds for products that contain a very low starch content, and this implies that the outlays on such refunds are not reasonable in order to meet the objective of ensuring outlets for Community starch products. We recommend that the Commission should institute a cut-off threshold level in terms of the share of starch costs in the value of the export given in the export licence application, below which export refunds would not be granted.

The changes in the definition of non-Annex I products in July 2000 deprived nearly all approved products (those products eligible for production refunds) of an entitlement to residual export refunds. Some of those excluded from the list, notably organic chemical manufacturers, need the extra export refund if indirect export outlets are to be maintained for Community starch products in these approved products. For this reason, we recommend that exporters of approved products who were formerly entitled to export refunds should have this right reinstated, subject again to an appropriate cut-off threshold level and to the constraints imposed by the Community's WTO undertakings on the maximum permitted levels of non-Annex I export refunds.

DETERMINING WHETHER THE CALCULATION OF THE REFUND INVOLVES EXCESSIVE COST

Chapter 3 explains how the export refund is calculated for maize, potato and wheat starch, and for glucose. US Gulf cereal exports are viewed as the appropriate reference for the base product prices of competing exports of starch-using products manufactured from the different raw materials, with the exception of potato starch, whose refund is tied to that for maize starch, and thus is indirectly linked to the US Gulf price for maize.

Maize and Wheat

It is also assumed that internal EU prices on an f.o.b. basis in the major production and export regions for maize and wheat are the appropriate domestic prices to use when assessing the difference between Community and overseas f.o.b. prices.

As with the production refunds, considered in Part A of this Question, we can find no serious objection to the choice of domestic reference prices, which are based upon widely quoted domestic market prices in major production areas. In the case of wheat, the inclusion of a port such as Hull tends to raise the average Community f.o.b. price appreciably above the level for Rouen, the most widely quoted domestic reference price, and thus raises the export refund; but this does little more than balance the effect of including higher priced US HRW wheat in the calculation of the US Gulf f.o.b. price, when hard wheat is rarely used in the production of wheat starch in the Community.

The inclusion of HRW wheat in the US price is interesting, since, as Diagram 4.2.7 reveals, the US is a rival to the Community in the export market for native wheat starch. The US wheat starch sector is, as the April 2001 US International Trade Commission report on wheat gluten confirmed, primarily a vital gluten producing industry, in which wheat starch is seen as the less valuable co-product. This is in contrast to the EU, in which wheat starch processors reported to us during interviews that starch became the primary product during the 1980s. US wheat starch producers therefore use hard wheat as their raw material, but, in their view, the higher cost of the wheat is more than offset by the greater value of gluten that they obtain during processing. Consequently, as a result of gluten earnings, US processors actually regard HRW wheat as a more economical raw material for starch and gluten output than SRW wheat.

Conclusion: For this reason, we feel that SRW wheat would represent the more appropriate basis for compensation for price differences in the case of the European exporters of Annex I and non-Annex I products made from wheat starch, but also take the view that the inclusion of high priced domestic origins, such as Hull, represents a fair offset to the inclusion of HRW wheat in the calculation of the refund.

As we noted in Part A of this Question, while the calculation of the refund has a clear logic, this logic is undermined somewhat by various ad hoc adjustments. In particular, a cap that has been as high as 130%, and is currently 115%, of the intervention price is often set to the domestic price when the export refunds are calculated. We question whether the precise rules for the calculation of the refund are justified if the calculation, at short notice, may be over-ruled and adjusted in this way. The method may create unnecessary costs via the risk premium that may be added to Community exporters' selling prices, who seek to compensate themselves for the uncertainty created as to whether the refund will provide in full the compensation considered to be appropriate under the f.o.b-f.o.b. formula used as the basis for its calculation.

Starch Potatoes

The suitability of the present method calculation of the export refund for potato starch, which is tied to that for maize starch, rests upon two key assumptions: the absence of independent base product prices that may be used as reference prices for computing the appropriate compensation of differences; and the very close substitutability of potato starch and maize starch in the export market, so that they may be considered to be identical from an economic perspective.

Question 7.3 presents a detailed analysis of these issues, on the former, it concluded:

Taking Poland as the most appropriate producer to us as a benchmark for world starch potato prices, on average, the EU starch refund from 1996/97 to 2000/01, converted to a refund per ton of potatoes, has, on average, been sufficiently close to the difference between Community minimum prices for starch potatoes and Polish prices for starch potatoes, for the refund to be accepted as an appropriate compensation for raw material price differences over this period.

Two major caveats need to be mentioned alongside this conclusion. First, the Polish data are based upon estimates. Second, the annual data suggest that, while the export refund, on average, provides appropriate compensation, the gap between EU and Polish prices is often substantially out of line with the refund. The refund appears to have provided inadequate compensation from 1996/97-1998/99, but excessive compensation in relation to Polish potato prices in 1999/2000 and 2000/01.

On the latter assumption, regarding the substitutability between potato and maize starch in the export market, the discussion of Question 7.3 concludes:

While there is good evidence from price behaviour in the domestic market that native maize and potato starches are close substitutes for one another, there is no such evidence for the export market in third countries. Instead, native potato starch commands a premium over maize starch. In addition, the differential between the export refund and the production refund on potato starch is larger than the differential between domestic and export prices for potato starch, which implies that export sales are, on average, more attractive to local potato starch processors than domestic sales.

The evidence regarding prices in the internal market provides a justification for arguing that, in the absence of internationally traded prices for starch potatoes, it is reasonable to use maize as a proxy for starch potatoes in respect of the production refund, by virtue of the close substitutability of their starch end-products. Regarding the export refund, this argument is not valid. In the export arena, potato starch commands a premium over maize starch; thus they are not close substitutes.

Considering the prices and price differentials presented in Table 7.3.1, it would appear economically judicious that the appropriate compensation for price differences for potato starch in its sales to the export market should be lower than that for maize starch. This is because the domestic price for maize starch was over €60 above the export price, while the corresponding gap for potato starch was less than €20. Yet, they both received the same export refund, which was typically €30-40 above the production refund. Therefore, whereas the export refund had the net effect of making maize starch exports €20-30 per ton less valuable than domestic sales with production refunds, it made the export sales of potato starch €20 or so more valuable than local sales.

If the objective of policy is to achieve some form of parity between maize and potato starches, then an administratively simple means of making potato starch exports €20-30 per ton less valuable than domestic sales with production refunds (i.e., put it in

exactly the same position as maize starch) would be to cease to allow potato starch to receive residual export refunds. In other words, potato starch should be treated in the same way as all the Annex I approved products defined in Commission Regulation 87/99 governing production refunds (with the sole exception of the CN 3505 10 50 modified starches) are now treated, and receive only the production refund when it is exported.

THE COMPENSATION PROVIDED TO THE VARIOUS RAW MATERIALS FOR STARCH MANUFACTURE

Annex I Product Exports

The discussion of Question 4.2 has already gone into considerable detail about the difficulties created by the lack of consistency between the Comext export statistics and the export licence data provided by DG Agriculture, Unit C2 for Annex I exports and DG Enterprise for non-Annex I exports. We refer readers to the discussion in that Question for an analysis of the existence, or otherwise, of a link between the level of direct and indirect exports of starches from the Community and the level of the refunds.

Maize

A common feature of the discussion of Question 4.2 is the apparently strong correlation, notably in the statistics provided by Comext, between exports of starch products and the level of the export refund for the associated base product. This is clearly evident from Diagram 4.2.3, for example. The correlation is not clear for the export licence statistics provided by DG Agriculture. Therefore, we concluded:

The export refund improved the profitability of maize processing for export, and thus must have affected EU processors' decisions to export Community native maize starch and in this sense has maintained outlets for Community maize starch. However, the Comext data suggest that there is some form of link between the level of the refund and export volumes of native maize starch, separately from the full compensation for price differences in base products.

It should be noted, however, that this link is not evident from the Annex I export licence data, which we have been provided only for the period since 1995. Nevertheless, the Comext data, covering the entire period since 1992, provide a basis for believing that there are factors other than the direct compensation for price differences that influence the incentives for exports of native maize starch, and that these incentives have historically been strong when the gap between domestic and world market prices of maize has been wide.

Potato Starch

Earlier in the discussion of the present Question, we quoted some of the conclusions from Question 7.3, which established that native potato and maize starches are not good substitutes for one another in the export market. A further difference between the two starches is in their reaction to changes in the level of the export refund. Diagram 4.2.1 in the discussion of Question 4.2 revealed that potato starch exports have been more stable than other native starch exports, using Comext data, and display almost no apparent sensitivity to the level of the export refund. Diagram 4.2.5 suggests that gross processing margins on exports of native potato starch have a positive correlation with the level of world maize prices and therefore an inverse correlation with the level of maize starch production refunds.

All of this evidence points to potato starch exports operating in a stable world market that is somewhat independent of the world market for maize starch. In part, this will be the consequence of the potato starch production quotas, which effectively cap EU output and ensure that there is a direct one for one trade-off at the margin between direct and indirect exports of potato starch, on the one hand, and internal consumption, on the other. The high, and rising, level of potato starch exports, and the relatively high native potato starch export prices in relation to domestic market prices, reinforces the evidence that the export refund plays less of a role in the competitiveness of potato starch exports than it does for the cereal starches.

The conclusion presented in the discussion of Question 4.2 remains relevant here:

The data presented above do not imply any clear-cut relationship between the level of the export refunds on native potato starch and the exports of such starch. However, the data do suggest that exports have tended to rise during a period when total output has been capped by production quotas, even though there is evidence (from Diagram 2.4.5) that native potato starch exports have been somewhat less profitable in recent years than they were in the mid-1990s.

This weak indication of an underlying upward trend in native potato starch exports may be testament to greater apparent profitability of export sales, with the benefit of export refunds, than of sales to the domestic market. This would fit in with the view expressed more than once in interviews with paper companies that they felt that the availability of potato starch in the domestic market was held back by a desire by the processors to export their output.

Wheat

We have already discussed the appropriateness of the export refund for wheat starch as compensation for price differences, taking into consideration the choice of Community export ports and the quality of the wheat used by the US and EU wheat starch sectors. This led us to conclude that the calculation method did not appear, at first sight, to entail excess budgetary costs to the Commission.

A different approach to the issue of appropriateness is to examine the relationship between export volumes receiving refunds and the magnitude of the refund. This was analysed in the consideration of Question 4.2. Diagram 4.2.7 revealed that the official EU and US export statistics revealed that they both export similar quantities of wheat starch, with Asia as the main market for both. Therefore, the choice of the US as the overseas country of comparison with the Community for the derivation of price differences is supported.

The positive correlation observed in the diagram between the volume of EU native wheat starch exports and the wheat starch export refund caused the discussion of Question 4.2 to query the appropriateness of the export refund calculation. Its conclusions are reproduced here.

Our conclusion is that the export refund enhanced the profitability of native wheat starch exports, which influenced EU processors' decisions to export Community native wheat starch. In this sense, the refund has maintained outlets for Community output. However, both the Comext and Annex I export licence data suggest a link between the level of the refund and the incentives to export native wheat starch, over and above the full compensation for price differences in base products, which is the basis for the calculation of the export refund. These extra incentives have been strongest when the gap between domestic and world market prices of wheat has been at its widest.

Non-Annex I Product Exports

The discussion of non-Annex I exports in relation to Question 4.2 also considered how to reconcile different sources of official data. Diagram 4.2.12 presented a breakdown of non-Annex I export licences by base product, from which the following conclusion was drawn.

The surprisingly low reported level of wheat used in the manufacture of exported starch products suggests that end-users take maximum advantage of their flexibility to define maize as their raw material for the purposes of export refunds.

Yet again, in common with the conclusions outlined above for native maize and wheat starches and glucose, we believe that, by enhancing the profitability of non-Annex I exports, the export refund must have helped to maintain export outlets for Community products. However, there is again a very evident empirical link between the level of the refund and the incentives to export non-Annex I products, since non-Annex I exports of starch in products are correlated in Diagram 4.2.12 with the level of the export refund.

QUESTION 4.4: PART C

Did the amounts of the production and export refunds ensure at a reasonable cost an outlet for the Community starch products?

Part (c): The case of glucose will be analysed in detail: individual requirements of use, raw materials used (wheat, maize, potato, sugar), relevance of the single amount of export refund. A comparison with other sweeteners will also be carried out.

Objective of the Question: To determine whether the single amount of export refund granted on glucose to Community exporters of Annex I products was appropriate to compensate users for differences between Community f.o.b. base product prices and f.o.b. export prices from competing exporters of Annex I products. To assess whether the export refunds were just sufficient to maintain export outlets for Community starch products, or whether these outlets could have been maintained at lower cost, with a lower level of export refunds. In particular, to consider whether excessive costs were incurred in providing a single mixed calculation export refund for glucose. To compare the production and export refunds on glucose with those provided on other sweeteners.

Instruments: The export refund for starch products provided on exports of Annex I starch products, where Annex I refers to the categories defined in Article 32.3 of the Treaty of Amsterdam. Starch production refunds set out in Council Regulations 1766/92 and 1418/76. Sugar production refunds for chemical end-uses, defined under Council Regulation 1010/86.

Criteria: To determine whether outlays on the single amount of the export refund on glucose represented a reasonable cost, we use the following criteria:

The amounts spent on export refunds for glucose in Annex I products were not significantly higher than those needed to maintain outlets for starch in these outlets. In other words, the sums spent were reasonable if the deadweight in providing refunds was low.

The determination and use of the single export refund for glucose, regardless of the base product used in its manufacture, was suitable, in the sense that it does not, on average, cause significant over-or under-compensation of price differences for the base products, in terms of the principles under which compensation is calculated for individual base products.

The compensation provided for price differences for glucose in the domestic market, via production refunds, and the export market, via export refunds, is consistent with the approach applied to other sweeteners.

Indicators: There are three main sets of indicators, corresponding to the separate criteria. The first is the ratio of the amounts spent on export refunds for glucose in relation to the amounts needed to maintain the outlets for starch in these uses. The second is the compensation that would be paid for glucose products if the principles of compensating for price differences were applied strictly, and the magnitude of the difference between the resulting compensation for glucose and the level of the refund that is currently paid. The third is the form of the compensation provided to sugar and other sweeteners, such as isoglucose, via production and export refunds, and an assessment whether differences between their method of derivation and the derivation of the corresponding refunds for glucose are likely to favour one form of sweetener over another

DETERMINING WHETHER THE CALCULATION OF THE REFUND INVOLVES EXCESSIVE COST

Chapter 3 explains how the export refund is calculated as a mixed calculation for glucose, and is set at (Export Refund for Maize x 0.75 + Export Refund for Wheat x 0.25) x 1.6.

In the calculation of the export refunds for maize and wheat, US exports of both wheat and maize are viewed as the appropriate reference for the base product prices of competing exports of starch-using products. When applied to the mixed calculation for glucose, however, it is noteworthy that the technical coefficient that is implicitly applied to the wheat element of the mixed calculation is one of only 1.6 (the coefficient applied to maize), rather than the 2.0 applied to wheat in all other aspects of the policy measures.

This implies that, assuming that the usual coefficient of 2.0 for wheat is valid, the mixed calculation starts with an assumption that under-compensates users for price differences.

As with the consideration of export refunds for native wheat and maize starches, one important empirical test that we choose to apply to determine whether the calculation of the refund on glucose involves excessive cost is to examine whether the pattern of exports of glucose as an Annex I product is correlated with the level of the export refund. If it is, as has been found to be the case with native wheat and maize starches on the strength of Comext export statistics, then we conclude that, regardless of the apparent appropriateness of the principles upon which price differences are calculated, the level of the refund is not fully appropriate.

In arriving at this conclusion, the experience of 1996 is particularly important, since there were period of that year when world prices were sufficiently high that export refunds on glucose fell to zero. 1996, therefore, was an indication as to the likely level of exports of glucose when there was a level playing field between US and EU cereal exports, and no apparent need for export refunds to compensate for price differences.

The pattern of glucose exports in relation to the export refund is depicted in Diagram 4.2.9 in the discussion of Question 4.2. This diagram has a very similar pattern to that seen in the corresponding diagrams for exports of maize starch and wheat starch. In the course of the consideration of Question 4.2, the following conclusion is drawn about the appropriateness of the compensation that is provided via export refunds on the base product price differences for glucose.

Yet again, as with native maize and wheat starch, we draw the conclusion that, by enhancing the profitability of glucose exports, the export refund had an impact upon EU processors' decisions to export glucose products, and so helped to maintain outlets for Community output. However, both the Comext and Annex I export licence data reveal an empirical link between the level of the refund and the incentives to export glucose products, over and above the full compensation for price differences in base products. These extra incentives have been strongest when the gap between domestic and world market prices of cereals have been greatest.

The precise trade-off between changes in the size of the refund and changes in the level of glucose exports is less clear-cut than that observed for wheat and maize starches. This is partly because glucose exporters were much greater users of Inward Processing Relief than either maize or wheat starch exporters. Exports of glucose under IPR rose from 8,500 to 17,400 tons between 1995 and 1996, before falling back to 3,400 tons in 1997. This suggests that when refunds are low, it is attractive for

glucose exporters to switch from the use of export refunds to IPR. However, even when IPR tonnages are added to the exports made with the benefit of export refunds, there was a significant fall in total Community glucose exports in 1996.

We conclude that the refund has been effective in maintaining export outlets for glucose since these have declined in the absence of the refund, for example in 1996, even though greater use of the IPR was made that year. However, the general conclusion found for native maize and wheat starches remains valid for glucose after IPR exports are added to the exports made as Annex I products, namely that there exists an empirical link between the level of the refund and the incentives to export glucose products, over and above the full compensation for price differences in base products. These extra incentives have been strongest when the gap between domestic and world market prices of cereals have been greatest.

The Mixed Calculation

One of the possibilities giving rise to potential over-compensation for price differences on glucose products is that the formula used in the derivation of the mixed calculation for glucose export refunds applies not only a technical coefficient for wheat that is inconsistent with that used in other measures, but which also understates the importance of wheat as a raw material in glucose manufacture.

We do not criticise the decision to use a mixed calculation to derive the refund on glucose, since the technical and administrative complexity of processing and verifying the precise ratios of the base products used to manufacture individual batches of glucose would be tremendous. If a substantial proportion of glucose export shipments needed to be sampled and analysed in order to verify the base product proportions listed in an individual refund application, the costs of the testing procedure could easily outweigh the economic benefits to the producer and to the Community as a whole from exporting glucose.

Conclusion: On administrative, technical and economic grounds, it is not efficient to pay refunds on individual batches of glucose exports on the basis of the base products used in their manufacture. Therefore, a mixed calculation based on both wheat and maize starch refunds is appropriate.

The assumption in the mixed calculation of the refund on glucose is that glucose is made 75% from maize and 25% from wheat. The Appendix to Chapter 2 reveals that the overall output of sweeteners, which are derived from glucose as their starting point, is now divided in a ratio that is close to 50:50 between wheat and maize as raw materials, and wheat has very recently become the more important input. This suggests that the more appropriate weights for the mixed calculation would be 50:50. If so, there is over-compensation in the current refund. As an indication of the extent of the over-compensation, we have prepared Table A4.4.1 in the Appendix to this Question.

The results of 50:50 mixed calculation for glucose export refunds, using the technical coefficient of 2.0 for wheat starch and 1.6 for maize starch, in relation to the current refund paid under the 75:25 mixed calculation, where the technical coefficient applied to wheat starch is 1.6, is depicted in Diagram 4.4.4 (which starts in February 1997, when the export refunds on maize and wheat were first differentiated from one another, and the mixed calculation for glucose was commenced).

Diagram 4.4.4: Comparison of the Export Refund Under a 50:50 Mixed Calculation with the Current Mixed Calculation
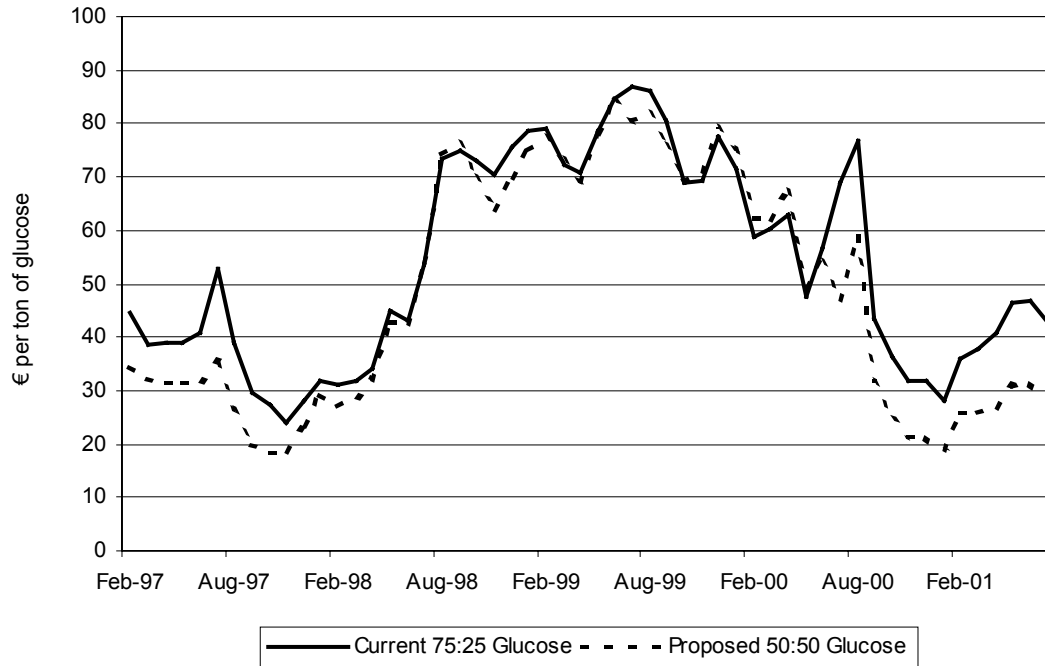
Source: LMC calculations using data provided by DG Agriculture, Unit C2.

On average, the additional export refund paid since February 1997 under the existing mixed calculation for refunds in relation to a 50:50 mixed calculation with the wheat starch technical coefficient set at 2.0, was €5.7 per ton of glucose. Therefore, we conclude:

The overall data on the use of maize and wheat starch in glucose manufacture imply that, in the Community market as a whole, wheat and maize now represent approximately 50% of the starches used in production. If this were reflected in a 50:50 mixed calculation for glucose export refunds, and a 2.0 technical coefficient were applied to wheat, for consistency with all other aspects of the regime, there would be an average saving of over €5 per ton of glucose, which is the measure of the deadweight under the current calculation.

A COMPARISON WITH OTHER SWEETENERS

Glucose not only competes with other sweeteners, it may actually be made from other sweeteners, notably from sugar, by means of inversion of a sugar solution and the subsequent chromatographic separation of the resulting invert syrup. In practice, the high domestic sugar price usually makes the use of sugar as a raw material for the manufacture of glucose uneconomic. However, there is a possibility that sugar-derived glucose syrup could be competitive with starch-derived glucose if the end-product made from sugar receives the relevant export refund (tied to the sugar export refund in the case of sugar-derived glucose for export) and the world price of sugar is low, while the world prices of cereals are relatively high.

There is direct competition between starch-derived glucose and sugar in the domestic market for chemical products, since users of sugar are entitled to refunds in such cases. In the discussion of Question 4.1, Diagram 4.1.9 was prepared, contrasting the net costs of sugar after chemical refunds and the base product costs of cereal-derived glucose, both with and without production refunds. The conclusion drawn from that diagram was:

The sugar refunds are intended to compensate users for price differences between Community and world market prices, and thus have the same basis as the starch and glucose production refunds. Since it is not the objective of the starch and glucose refunds to compensate for the differences between world market cereal prices and world market sugar prices, we see no justification for amending the production refund system to bring starch and sugar costs more closely into line with one another in the manufacture of approved products. Rather, we would merely note that sugar is often very competitive as a substrate in such uses.

Turning now to a consideration of export refunds for glucose, Diagram 4.4.5 presents a direct comparison of the world price of white sugar, which is close to the net cost of sugar for use in the export of processed products, on the one hand, with the net base product costs of starch in glucose (assuming the 75:25 maize:wheat split), both before and after export refunds. The diagram makes it clear that there are occasions when sugar comes close to the net base product cost of starches as a raw material for glucose manufacture for export, but that the starches retain a raw material cost advantage at all times. However, it must be noted that the sugar is in a form in which processing costs for transformation into glucose will be very much smaller than those for the cereals; against this must be set the by-product credits that would be earned on cereal processing, but which are not relevant to white sugar as a raw material.

Diagram 4.4.5: World Prices for White Sugar and the Net Base Product Cost of Glucose, With and Without Export Refunds
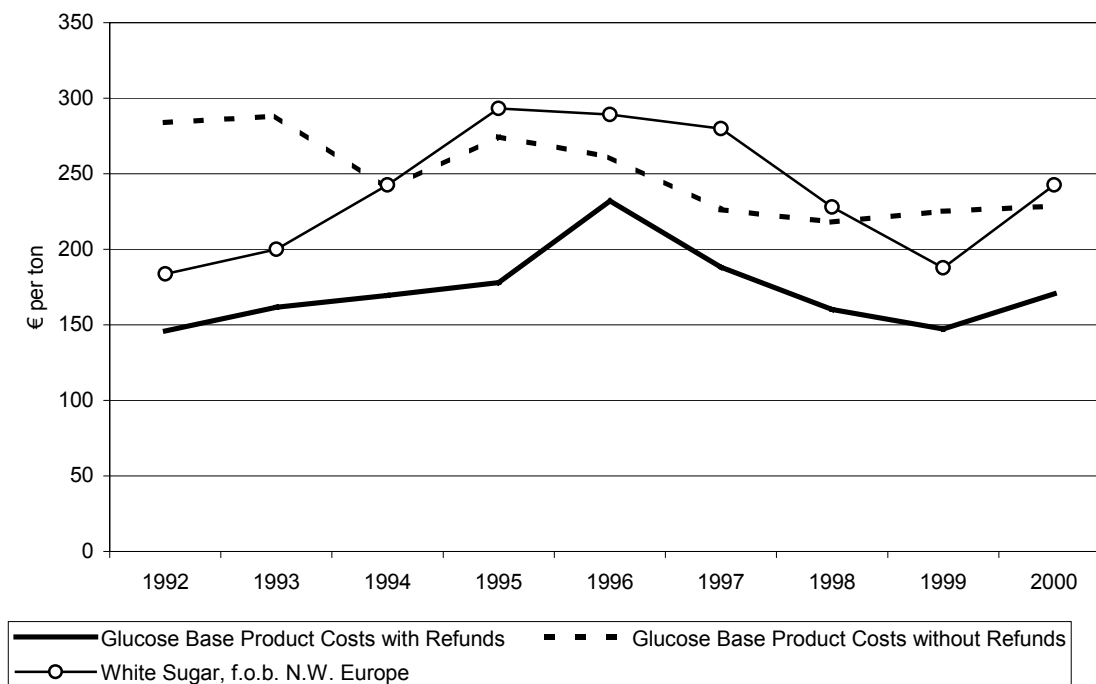
Source: European Commission (DG Agri, Unit C2), LMC Internal Database, LMC Calculations.

The diagram has been prepared on the basis of sugar prices, but it would be equally relevant to other sweeteners that are firmly tied to the Sugar Regime, namely isoglucose (which, although derived from starch is managed within the framework of the Sugar Regime) and inulin syrup, since they receive the same refunds as white sugar.

In terms of the determination of export refunds, sugar, isoglucose and inulin syrup are governed by broadly similar principles to those applied to glucose derived from starch. The refunds are determined in a manner that is intended to compensate for base product price differences, with just one significant difference. This difference is that the compensation for sugar is made at the level of the end-product, sugar, rather than at the level of the base product (which would be sugar beet). The reasons for this difference are practical, and have much in common with starch potatoes, which share with sugar beet the absence of a widely recognised reference price for world trade. A further difference, but a less significant one, is that the world reference price used for sugar export refunds is the f.o.b. price of sugar exported from the Community.

The main factor that might alter the balance between sugar and glucose in the export arena is the possibility of producing crystalline fructose from sugar. The production of crystalline fructose is usually undertaken by means of the chromatographic separation of fructose from a glucose-fructose syrup. The syrup may either be obtained by means of the inversion, by acid or enzymatic means, of a sugar solution[16], or it may be made by the isomerisation of a glucose solution, as is done in the production of isoglucose.

The crystalline fructose produced by separation from the glucose-fructose solution would be eligible to a production refund, whether sold domestically or exported. Therefore, a situation may arise in which it might be more attractive in terms of the economics of processing to use sugar as a raw material in the production and sale of crystalline fructose, with the benefit of a refund, with glucose derived as a by-product. The glucose could then be isomerised, and upgraded into a glucose-fructose syrup, to increase the extraction of fructose as a proportion of the initial input of sugar. In the case of conventional starch-derived glucose, the isomerisation stage would oblige the producer to reclassify the syrup as isoglucose, and put it under the control of the appropriate regulations. For sugar, we believe that, since it is already governed by the Sugar Regime, the isomerisation would not create extra regulatory difficulties for the producer. The by-product glucose that emerges from this process would probably be competitive with starch-derived glucose.

We believe that some by-product glucose is manufactured in this way from sugar, but understand that the quantities are small. Crystalline fructose is only produced to a very small extent from starch: the average annual tonnage covered by refunds in the entire Community is under 20 tons per annum, and is frequently zero. Therefore, sugar almost certainly accounts for the lion's share of Community production of crystalline fructose and this generates some by-product glucose. However, crystalline fructose is imported in substantially quantities into the Community, mainly from the US, which faces a tariff rate quota in the EU, and Israel, which enjoys duty-free access for fructose which is manufactured in the method just described, namely by inverting and separating sugar syrups. These imports reduce the economic attractions of large scale Community production of crystalline fructose and associated glucose syrups from sugar.

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[16] The hydrolysis of inulin has a similar effect, but yield a syrup with a higher fructose content, of the order of 83%.

Conclusion: The competition between starch-derived glucose and other sweeteners as alternative raw materials for the manufacture of glucose is a possibility. However, the analysis presented here suggests that starch glucose is well placed to retain the vast majority of the potential market when appropriate and consistent methods of compensation are applied to sugar and other sweeteners in both chemical applications in the internal market and in export markets.

Chapter 5: The Impact of Policy on Production Channels

QUESTION 5.1

Question: *Did the support measures for potato starch contribute significantly to maintaining the potato starch production channel?*

The effect of the various measures will be analysed separately: potato starch premium and compensation of the specific costs, quota fixing and actual production, compensatory payments, minimum prices.

Objective of the Question: To examine whether, in the absence of the various support measures for potato starch, starch potato farmers would have maintained their production of starch potatoes since 1992 and potato starch processors would have continued to process the base products they were supplied.

Instruments: The instruments of policy in the sector are the potato starch premium and the compensation of the specific costs, production quotas, compensatory payments (now known as direct payments to growers) and minimum prices, set out in Commission Regulation 2718/99.

Criteria: The policy would be judged successful in assuring the maintenance of the EU potato starch sector if Community production has been sustained in its size since 1992, whereas without the measures, output would have decreased. The other main criterion of success is whether the EU potato starch sector's share of world potato starch output has been maintained or has risen in relation to that of other major potato starch producing countries. In this respect, Poland, as the other main exporter of potato starch, will be used as the benchmark for comparison.

Indicators: The trend in potato starch output since 1989, immediately before the reunification of Germany, is a valuable indicator of the success of Community policy in maintaining the potato starch production channel (*filière*). The actual trend in potato starch production will be compared with a series of four other indicators, which represent estimates of what would have happened to output in the sector in the absence of each of the individual instruments of policy, namely the potato starch premium and the compensation of the specific costs, production quotas, direct payments to starch potato growers and minimum prices.

The relativities between Polish and EU potato starch output and their foreign trade balances in potato starch are further good indicators of the effectiveness of policy in the sector.

THE PRODUCTION OF STARCH POTATOES

Diagram 5.1.1 illustrates the growth in starch potato output in the EU-12, both before and after the introduction of quotas in 1995. These 12 member states were the ones for whom the measures in the sector were originally intended; hence, an examination of their potato production trends will provide a valuable insight into the effectiveness of the measures. We have had to estimate starch potato output for 1995/96 and 1996/97, since neither the European Commission nor the industry association was able to provide starch potato crop output figures for that period. Instead, we have assumed that the starch potato output in each of these years moved exactly in parallel with the

potato starch tonnages that were monitored by the Commission within the framework of the newly instituted production quota system.

No official data were available for 1994/95; therefore, the values provided in the diagram are estimated derived from aggregated data provided by the AAC, the European cereal starch association.

These figures reveal that total starch potato output has changed very little between 1992 and 1999. 1993, two years before the introduction of quotas, witnessed the peak in starch potato output in the 12 Member States. 1996 and 1997 both came close to the 1993 level, while production in both 1995 and 1998 was affected by poor weather.

Diagram 5.1.1: The Production of Starch Potatoes by Crop Year in the EU-12
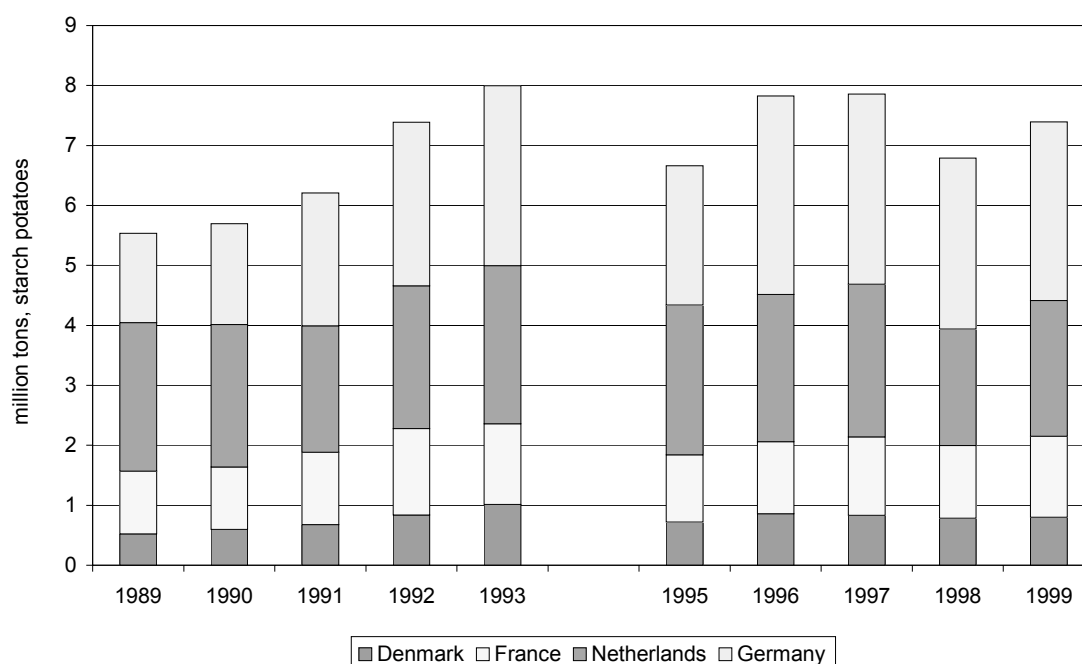
Source: UK Potato Marketing Board; AAC; European Commission.

Conclusion: The output of starch potatoes was maintained in the EU-12 between 1992 and 1999.

THE IMPACT OF PRODUCTION QUOTAS UPON POTATO STARCH OUTPUT

Even if one discounts some of the growth in German production after re-unification, which probably would have occurred in any case, as a result of new investments in East Germany, it is evident that the various support measures already in effect, such as the potato starch premium and the minimum prices, and, in 1993/94, the introduction of compensatory payments, were sufficiently attractive to growers to persuade them to expand their output in the early 1990s, when they were unconstrained by quota ceilings. The peak in output in the EU-12 in 1993 and the strong upward trend in production since 1989 is evidence of the desire to grow more starch potatoes under the measures then in effect. Output in Germany grew particularly

strongly, and doubled between 1989 and 1993, partly because the new Länder were only included after reunification, but combined output in the other three starch potato producing Member States increased by approximately a quarter over the same period.

The introduction of quotas in 1995/96 was intended to cap production after the failure of producers to limit their output in the manner requested by the Commission. The quotas allocated to the Member States had three elements: the main one was determined on the basis of production capacities installed or already irrevocably commissioned on 1st January 1994. However two special provisions were introduced for Germany; an extra quota of 90,000 tons was granted in specific recognition of the capacity additions already made in Eastern Germany after reunification, and, in 1996/97, a reserve of 105,000 tons of output was permitted for German producers, to take account of the expansions undertaken after reunification, but not expected to start to be productive until that year. The reserve was incorporated into the German national quota from 1997/98 (see Table 3.2 and the discussion of quotas in Chapter 3 for further details).

Diagrams 5.1.2 and 5.1.3 demonstrate that producers were eager to produce up to their permitted total (with the sole exception of Spain, whose 2,000 ton quota was too small to be of interest to local processors). Only in years with weather damage did production fall far short of the overall quota.

Diagram 5.1.2: The Production of Potato Starch in the Community
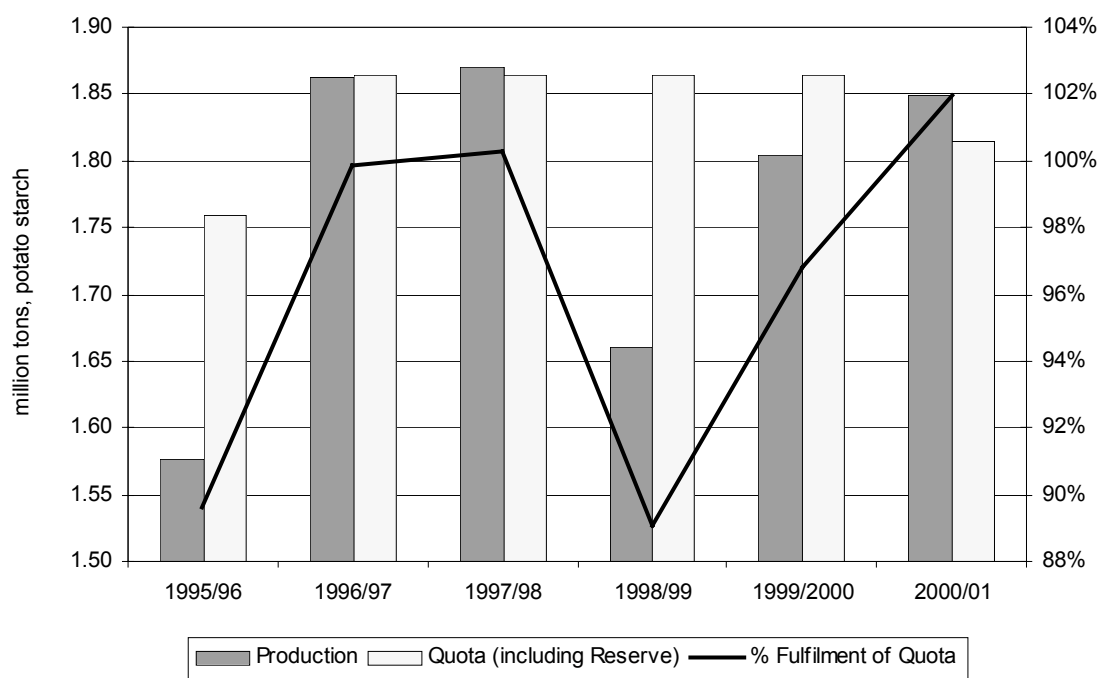
Source: European Commission.

As is explained in Chapter 3, the production quotas for potato starch allow producers a limited degree of production flexibility. A 5% allowance for over-production in a Member State is permitted in an individual crop year, but this then has to be taken off the following year's basic quota to derive the permitted output under quota that year.

The national figures of potato starch output within the enlarged Community are presented in Diagram 5.1.3; in this diagram, each Member State's production is

contrasted with national basic quotas. This reveals that there has so far been only one year since the introduction of quotas in which a member state has exceeded 105% of its quota (France in 1999/2000). Also, since 1996/97, there have only been three cases in which individual countries ever achieved less than 90% of their individual quotas.

The reaction of the individual Member States to the basic quotas is analysed in detail in the Appendix to this Question. The discussion reveals that over-production on a scale that obliges the Member State to export some of its output without any benefits from the support measures is an uncommon occurrence. With the exception of the single French experience, the over-shoot has always been within the 5% limit. In addition, the production of potato starch from raw materials other than starch potatoes is estimated to be no more than 1% of the total quota, i.e., 10-20,000 tons per annum, which is not large enough to threaten the integrity of the quotas.

Conclusion: Potato starch production quotas have been effective in maintaining output very close to the level of the quota. There is no real evidence that producers in any of the Member States are unwilling to meet the quota in full. Therefore, the quotas achieved their intended effect of capping output, but have also had the unintended effect of setting a de facto *floor to production, a floor that is very close to the quota.*

Diagram 5.1.3: The Fulfilment of the Potato Starch Quotas by Country
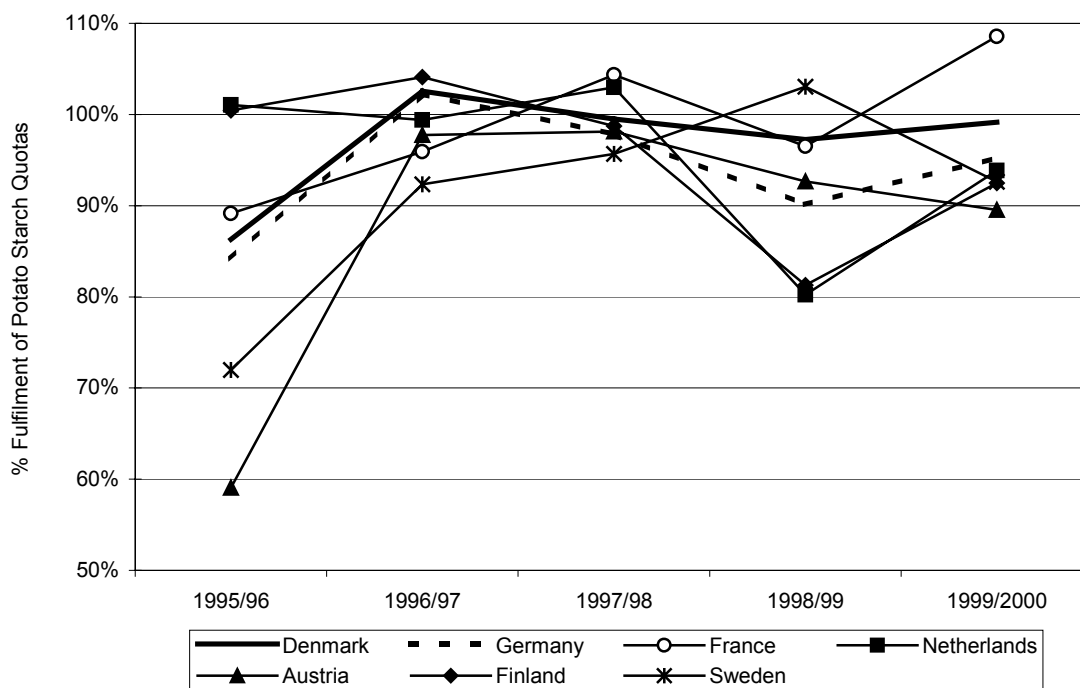
Source: LMC estimates from European Commission (DG Agriculture, Unit C2) data

DIRECT PAYMENTS TO STARCH POTATO GROWERS

It is difficult to discuss direct payments to growers in isolation from the other measures; therefore, we have prepared Table 5.1.1 summarising the key elements of the starch potato scale in effect from 1995/96 to the 2001/02 crop year. The top section of the table describes the determination of the starch potato price from the cereals intervention price, to which 10% is added under the pricing formula applied to potatoes.

The second part of the table introduces the direct payments to potato farmers, which correspond to the area payments give to cereals and oilseeds farmers. An important difference was created within the Agenda 2000 reforms in the compensation for starch potato and cereal farmers for reductions in intervention prices. Whereas for cereals, the area payment has been increased by an amount that compensates farmers for 48.4% of the reduction made to the intervention price under Agenda 2000, for starch potatoes, the direct payment has been raised by an amount that compensates growers for 75% of the impact of the reduction in the intervention price[1]. We conclude that:

The divergence created in the Agenda 2000 reforms between the rules for determining direct payments to starch potato growers and for deciding area payments to cereal farmers has reinforced the economic attractions of direct payments in starch potato farming and these have contributed significantly to maintaining the potato starch filière.

Table 5.1.1: The Starch Potato Payment Scale, 1995/96-2001/02
(in € per ton of 17% starch content potatoes)

	1995/96-1999/00	2000/01	2001/02
Intervention Price for Maize	119.19	110.25	101.31
Intervention Price plus 10%	131.11	121.28	111.44
Transformation Coefficient	1.60	1.60	1.60
Minimum Potato Price			
(a) per ton of potatoes	41.96	38.81	35.66
(b) per ton of potato starch	209.78	194.05	178.31
Direct Payment to Growers			
(a) per ton of potatoes	17.39	19.75	22.11
(b) per ton of potato starch	86.94	98.74	110.54
Revenue to Farmers			
Minimum Price + Direct Payment = Revenue to Farmers			
(a) per ton of potatoes	59.34	58.56	57.77
(b) per ton of potato starch	296.72	292.79	288.85
Net Cost to Processors			
Processing Premium			
(a) per ton of potatoes	4.45	4.45	4.45
(b) per ton of potato starch	22.25	22.25	22.25
Minimum Price - Processing Premium (i.e., Net Cost to Starch Processor)			
per ton of potato starch	187.53	171.80	156.06
Net Cost to the Community Budget			
Direct Payment + Processing Premium (i.e., Net Cost to EC)			
per ton of potato starch	109	121	133
Potato Starch Quota	1,864,304	1,814,237	1,762,148
Total Net Cost to EC (million €)	**203.56**	**219.50**	**234.00**

Note: The net costs are for specific measures for the starch potato sector, assuming that the quota is filled.

The standard starch potato in terms of which the payment scale is defined is one containing 17% starch on a dry content basis. This quality of potato is assumed to yield 16% starch on a dry basis, after processing. Since commercial native starch is defined as having 80% dry matter, this means that the standard starch potatoes yield 20% of commercial starch per ton of potatoes.

Source: LMC estimates from data provided by DG Agriculture, Unit C2.

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[1] This difference in the compensation calculation was the reason why the potato starch production quotas have been reduced, since the Council of Ministers agreed to award the higher compensation to potato growers on condition that the overall effect of the changes displayed budgetary neutrality.

Adding together the minimum price and the direct payment, the effect of the Agenda 2000 reforms is to reduce the net minimum revenues for potato farmers from €59.34 to €57.77 per ton between 1995/96 and 2001/02, which is slightly less than the corresponding reduction in cereal farmers' overall revenues per ton.

A further difference between the policy applied towards cereal or oilseed farmers since 1992 and that applied to starch potato growers is that the latter do not have to participate in a set-aside scheme. Instead, they have been subject to production quotas since 1995/96, which is also unlike the policy towards cereal or oilseed farmers.

Since the 1980s, potato starch processors have received a stable potato starch processing premium of €22.25 per ton of starch. Therefore, the net cost of potatoes to the starch industry, after subtracting the processing premium which they receive, is the minimum price *minus* the processing premium. This net cost to processors will fall from €187.53 to €156.06 per ton of starch between 1999/2000 and 2001/02, as shown in the lower part of Table 5.1.1.

Over the same period, the net cost to the Community budget of specific measures relating to the potato sector, namely the direct payment and the potato starch premium, has risen from €109.19 to €132.79 per ton of starch. After the reduction in the production quota, the last row of Table 5.1.1 reveals that the total budgetary cost of the direct payments to growers and the processing premium to processors will increase from €203.56 million to €234.00 million, if the quota is met in full, albeit at a lower level.

The discussion of Question 6.1 presents data drawn from Finland, France and Germany, comparing the margins that they earn on starch potatoes and those that they earn on their main alternative crops. The results from Table A6.1.1 in the Appendix to Question 6.1 suggest that starch potatoes yield a significantly higher net profit margin per hectare than the alternative crops. Moreover, the fixed costs for Germany include a significant item, costing over €300 per hectare, which is the payment made by farmers for delivery rights to a potato starch factory.

The willingness on the part of growers to pay for their potato delivery rights, as well as the evidence that the cultivation of starch potatoes yields higher net margins per hectare than the main alternative crops, supports the earlier conclusion that producers are eager to meet their production quotas in full. This leads us to believe that the overall payment to starch potato farmers is sufficiently attractive to farmers to make them want to maintain the potato starch filière.

It is difficult to distinguish the attractions to a farmer of a minimum starch potato price from the attractions of direct payments, since the grower receives them together in the form of the single payment according to the starch potato payment scale. In Question 5.2, we compare the direct payments made to starch potato farmers with the area payments made to cereal farmers. The conclusion from that discussion is that, if the direct/area payments are assessed per ton of starch, they were exactly the same for maize and potatoes until 1999/2000. Since then, the direct payments per ton of starch in potatoes have moved ahead of the area payments per ton of maize starch, and by 2001/02 will be just under €10 per ton of starch higher for potatoes.

Conclusion: The direct payments for starch potato farmers until 1999/2000 were as attractive per ton of starch as the area payments for maize farmers. Since then, they have become somewhat higher. Therefore, the direct payments have contributed significantly to maintaining the growers' willingness to grow starch potatoes, in a manner that has created a divergence between the bases of the compensation provided to the two groups of farmers for the reductions in the intervention prices under Agenda 2000.

This divergence in the bases of the compensation is in contrast with the approach adopted towards the compensation provided prior to 2000/01, during earlier reductions in cereal intervention prices under the MacSharry reforms, when exactly the same compensation per ton of starch was applied to cereals and starch potatoes.

In comparing the measures applied to starch potato growers and cereal or oilseed farmers, the newly created difference in the direct/area payments per ton of starch is not the only respect in which starch potatoes are treated differently under the CAP from other major arable crops. Since 1993/94, starch potato farmers have received direct payments per ton, while cereal and oilseed growers have received area payments, which differed between the two crops, and were calculated per hectare.

In most regions of the Community, the manner in which the area payments were applied to these two major arable crops tended to result in higher area payments for oilseeds. However, the Agenda 2000 reforms implied a fundamental change in policy, with an end to all differences between the area payments for cereals and oilseeds crops in 2002/03, after a three year transition period.

This reform will bring the two main arable crops into line with one another as regards supplementary income supports via area payments. Therefore, we conclude that an intended effect of the Agenda 2000 reforms is to adopt a uniform approach towards the area payments in the Community, and eliminate differences that are based upon the choice of crops.

We also conclude that the intended effect of the same reforms is to move towards a situation in which crop prices are aligned more closely to world market levels than was previously the case and in which supplementary income supports are applied on a standard basis across commodities within each region of the Community.

In its origins, the payment scale for starch potatoes is linked very closely to that for cereals. Therefore, it would be fully consistent with the approach adopted towards cereal and oilseed crops if the direct payments on starch potatoes (the counterpart of the area payments for these other crops) were also brought into line with these other crops.

In the discussion of Question 5.2, we examine the effects, over the period from 1998/99 to 2002/03, of having adopted a system of area payments for potatoes that is similar to that applied to cereals and oilseeds, whereby supplementary income payments are made per hectare, rather than per ton of starch. We undertake this analysis, first, by calculating the average direct payments made per hectare of potatoes in the five Member States in which field visits were undertaken. The average direct payments per hectare are estimated by multiplying estimates of the average national starch potato yields by the actual direct payment per ton of potatoes.

In Question 5.2, we then calculate the area payments that the same farmers would have received on those crops that are major alternatives to starch potatoes. In practice, the main alternatives are assumed to be cereals or oilseeds. This is because plantings of sugar beet, another alternative crop, are limited by production quotas, while the market for edible potatoes, another attractive alternative, would not easily be able to absorb a large increase in planted areas without substantial price declines.

Diagram 5.2.4 in the discussion of Question 5.2 depicts the results of the analysis of the consequences of applying an identical uniform system of area payments to starch potatoes, as well as cereals and oilseeds. With the sole exception of France (until 2001/02), starch potato farmers have always earned a much higher direct payment per hectare than the area payments made on either oilseeds or cereals.

Conclusion: The direct payments per hectare on starch potato crops are (except for oilseeds farmers in France until 2001/02) substantially higher than those paid on major alternative arable crops. Therefore, the direct payments have contributed significantly to maintaining the growers' willingness to grow starch potatoes.

The intended effect of the direct payments on starch potato production was to ensure parity with cereals in the payments per ton of starch. This was achieved until 1999/2000. The unintended effect of the measure was to make the average direct payments per hectare substantially higher for starch potatoes than for alternative crops.

MINIMUM PRICES

The minimum starch potato price is set 10% above the cereal intervention price, when expressed on an equivalent basis to maize starch. This minimum price has the benefit to a farmer of providing starch potato growers a very stable price, without the risk of internal market price volatility, which confronts cereal farmers.

Evidence obtained during field visits to five important potato starch producing Member States suggested that the average yields obtained per hectare were in excess of 40 tons of potatoes containing 20% recoverable starch, which is equivalent to more than 8 tons of starch per hectare. With technical coefficients of 1.60 for maize, these starch potato yields are the equivalent of 12.8 tons of maize per hectare in starch terms.

The revenues earned per hectare from the minimum prices paid on starch potatoes are therefore well in excess of those from cereals. The direct payments reinforce the revenue advantages for starch potatoes. The production costs for starch potatoes are considerably higher, too, as Table A6.1.1 reveals. Nevertheless, to the extent that farmers are often influenced in the short term by gross margins per hectare (since capital costs represent sunk costs), the higher gross revenues offered by starch potatoes reinforce growers' willingness to produce starch potatoes.

Conclusion: The minimum prices paid for starch potatoes are similar per ton of starch to those paid to maize farmers, but provide greater price stability. The minimum price, when viewed in terms of revenues per hectare, generates larger gross margins and overall incomes per hectare than cereals. Therefore, the minimum prices have also contributed significantly, though probably not as significantly as direct payments, to maintaining the growers' willingness to grow starch potatoes.

THE COMPENSATION OF THE SPECIFIC COSTS OF POTATO STARCH PROCESSORS

For many years, the main difference between the budgetary cost to the European Commission of potato starch processing and that of maize starch processing has been the starch premium of €22.25 per ton of starch, which is intended to cover the specific costs of potato starch processors.

These specific costs arise because potato starch producers are restricted in the length of their processing season by the timing of the potato harvest and the need to processed stockpiled potatoes before they deteriorate. The average processing campaign lasts for less than six months, and therefore, the average fixed costs of potato processing are much higher than for cereal starch processing, which occurs throughout the full 12 months of the year.

The net effect of these additional specific processing costs is summarised in Table 5.1.2, which is derived from Table A5.1.3 in the Appendix to this Question. The table

identifies the processing cost disadvantages of potato starch vis-à-vis maize and wheat starch in the Community between 1995 and 2000. The disadvantages shrank over this period, but were still €32 per ton in relation to maize starch and €27 per ton against wheat starch in 2000. These values are to be contrasted with the potato starch premium of €22.25.

Table 5.1.2: Processing Cost Disadvantages of Potato versus Maize and Wheat Starch
(€ per ton of starch)

Processing Cost Disadvantage	1995	1999	2000
Potato vs. Maize	48	33	32
Potato vs. Wheat	42	25	27

Source: Derived from data provided by LEI, the Netherlands, and UFE.

In order to obtain independent corroboration of the compensation for specific costs that is needed to ensure the viability of starch potato processors, we have prepared Table 5.1.3. This table analyses the profits, after interest, of Avebe, the Dutch potato starch co-operative, which produces potato starch in the Netherlands, Germany and France, and is also a minor wheat starch producer. Avebe has been selected because it is close to being a pure producer and modifier of potato starch, and therefore its results should not be unduly affected by activities unrelated to potato starch processing.

Table 5.1.3: The Reported Profits, After Interest, of Avebe, 1995/96-1999/2000
(in millions of Euros)

	Financial Year Ending				
	1996	1997	1998	1999	2000
Profits (€ million)	20.20	9.00	2.40	-8.90	3.70
Starch Quota (in '000 tons)	794.68	794.68	794.68	794.68	794.68
Profits/ton (€)	25.42	11.33	3.02	-11.20	4.66
Starch Premium/ton (€)	22.25	22.25	22.25	22.25	22.25
Profits/ton in the absence of Starch Premium	3.17	-10.92	-19.23	-33.45	-17.59

Source: LMC estimates derived from the Annual Accounts of Avebe.

In Table 5.1.3, it is assumed that Avebe's annual output equals its quota. The table reveals that, with the potato starch premium of €22.25 per ton in place, Avebe made a profit in all but one of the past five years. If, however, the premium had not been paid, the company would have made a profit in only one of the past five years.

Conclusion: The analysis of starch processing costs for different raw materials and of the annual profits recorded by Avebe both provide strong evidence that the starch premium is needed to compensate for specific costs, and is essential to the financial survival of potato starch processors. Therefore, this element of the support measures for potato starch contributes significantly to the maintenance of the potato starch filière.

To summarise the preceding discussion of the various measures applied to starch potato growers and processors, we conclude that the measures applied to the sector, notably the minimum and area payments and the starch premium, have contributed significantly to maintaining the potato starch filière.

THE EXPERIENCE OF THE POLISH POTATO STARCH SECTOR

The apparent willingness of EU starch potato farmers to maintain and, prior to 1993, increase their output, may be contrasted with the experience in Poland, traditionally, the world's second most important potato starch producing and exporting country. In Diagram 5.1.4, we depict the trend in the Polish output of starch potatoes for processing, alongside its exports and imports of potato starch products, since 1989[2].

Over the past decade, Poland has been transformed from a net exporter of potato starch products to a net importer (predominantly from the EU), even though the Polish government provides some export subsidies for such products and the domestic starch potato price is considerably below that in the EU (see the discussion of Question 7.3 for a comparison of Community and Polish starch potato prices).

Part of the explanation for the failure of the Polish industry to maintain its status as a net exporter may be found in the old age and lack of modernisation of most Polish starch plants, which the government has been trying to privatise. However, these problems did not prevent the country from being a significant net exporter during the 1980s, when the government was prepared to provide greater export subsidies than it was in the 1990s.

Diagram 5.1.4: The Processing of Starch Potatoes in Poland and Its Foreign Trade in Potato Starch Products
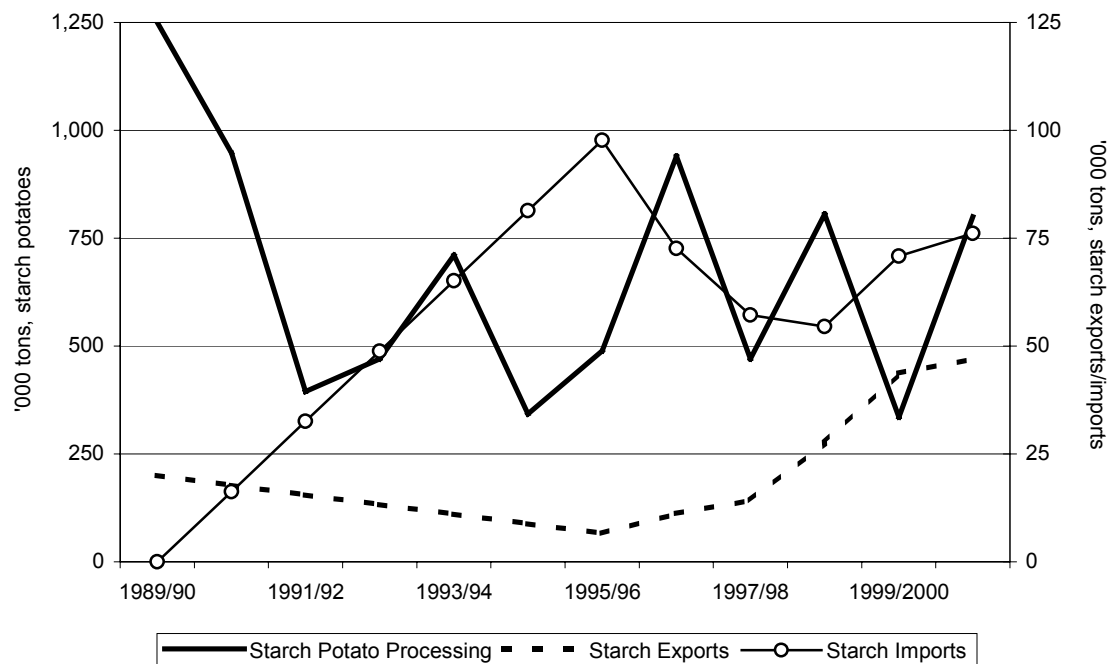
In more recent years, the evidence of Poland's negative trade balance in potato starch is that benefits received by Polish potato starch producers in the form of export subsidies have been insufficient to offset the advantages that EU producers receive via their various support measures, including export refunds. This view is supported by the

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[2] As we do not have the detailed foreign trade data for the early 1990s, we have connected the 1989 data for exports and imports to the 1995 data with a straight line.

analysis of Question 7.3, in which it is demonstrated that Community export refunds on potato starch more or less exactly offset the starch potato price differences between Poland and the Union. However, EU processors also receive a €22.25 per ton starch premium, unlike their Polish counterparts, and have been able to modernise and maintain the efficiency of their factories, thanks to the support provided by the CMO for cereals, as applied to the starch potato sector, while the Polish factories have suffered from a lack of investment.

Conclusion: The experience of Poland provides further evidence that the support measures provided to the Community starch potato sector play a significant role in sustaining output in the filière. *If a country like Poland cannot remain a major player in the world potato starch market, and has become a net importer in the face of competition from EU exporters of potato starch, it suggests that the policies established to sustain Community potato starch production have a major commercial impact.*

QUESTION 5.2

Question: *Did the measures for the potato starch sector ensure at a reasonable cost the competitiveness of the Community market for potato starch versus grain starches?*

Objective of the Question: This question has two objectives: first, it asks whether the measures for the potato starch sector ensured the competitiveness of potato starch in competition with grain starches in the internal market. It also seeks to determine whether the costs of the measures are low in relation to the benefits of achieving the degree of competitiveness that is secured for potato starch.

In answering this question, we distinguish between the costs borne by the Commission budget and in the indirect impact upon resource allocation (and thus the economic opportunity cost) within the Community.

Instruments: The policy instruments that relate to the costs of the measures applied to the potato starch sector are the main elements of the potato starch regime, namely the potato starch premium, potato starch production quotas, the compensatory payments paid to starch potato farmers and the minimum prices incorporated within the measures under the terms laid out in Commission Regulation 2718/99. Other policy instruments that affect the behaviour of the potato starch sector are the production and export refunds for starches and starch products,

Many of the same policy instruments are relevant to the cereal starches that compete with potato starch. Their output, too, is affected by the system of production and export refunds; and their farmers are influenced in their choice of crop by compensatory area payments. They also face an additional influence, in the form of set-aside obligations on the areas that they may plant to cereal crops.

Criteria: Before considering whether the costs of ensuring the competitiveness of the potato starch sector in the domestic market are reasonable, the first criterion that will be used to assess the effectiveness of the measures applied to the potato starch sector is to determine whether they have, in practice, been successful in defending the sales of potato starch on the domestic market.

From a Commission perspective, a vital criterion in determining whether the costs of the current policy are reasonable is that the budgetary costs to the Commission of providing these measures for domestic sales of potato starch should be no greater than, or similar to, the budgetary costs associated with the production of a similar quantity of grain starches.

A further criterion that will be used to evaluate the success of the present measures in ensuring the competitiveness of potato starch in the internal market is that the deadweight associated with the measures is low. In other words, the support provided to the sector is essential to ensure the competitiveness of potato starch, in the sense that even a small change in the measures would cause potato starch to lose significant sales domestically.

For domestic users, the policy measures in place will be considered successful if they do not raise local prices.

For the Community economy as a whole, the measures will be judged to have a reasonable cost if they do not lead to noticeable misallocation of resources.

Indicators: The indicators of the success of the current policy will be, first, the maintenance of sales of potato starch in the internal market; second, the opportunity cost from the perspective of the Commission budget of the measures in the potato starch sector vis-à-vis the cost of measures in the cereal starch sector. The third indicator will be the deadweight associated with the measures. The fourth will be the price level of potato starch, compared with cereal starch; and the fifth will be the impact of the measures upon the overall allocation of resources in the Community economy.

SALES OF POTATO STARCH IN THE DOMESTIC MARKET

From a production point of view, there is strong evidence, outlined in Question 5.1, that the present measures are successful in stimulating supply. Production quotas had to be introduced to prevent output from rising to levels that were considered to be too high, and since then, potato starch output has tended to be close to the quota ceiling.

The need to impose quotas already suggests that there were concerns about the ability or willingness of the domestic market to absorb the potato starch that the sector was willing to provide. The estimates that we have prepared of the outlets for potato starch imply that such concerns would have been justified.

We have assumed in Diagrams 5.2.1 to 5.2.3 that modified starch exports are divided between potato, maize and wheat starches in proportion to their shares of the production refunds awarded each year for the manufacture of CN 3505 10 50 (esterified and etherified starches), the main category of modified starches.

Tables A5(1).2.1 to A5(1).2.3 in Appendix 1 to this Question contrast the outlets for potato, maize and wheat starch produced within the Community, using Comext export data as the source. In the Appendix we explain why we used Comext data for the analysis, but also indicate how the use of official export licence data for Annex I and non-Annex I products would have altered the conclusions.

Diagram 5.2.5: Sales of Potato and Cereal Starches to the Domestic EU Market
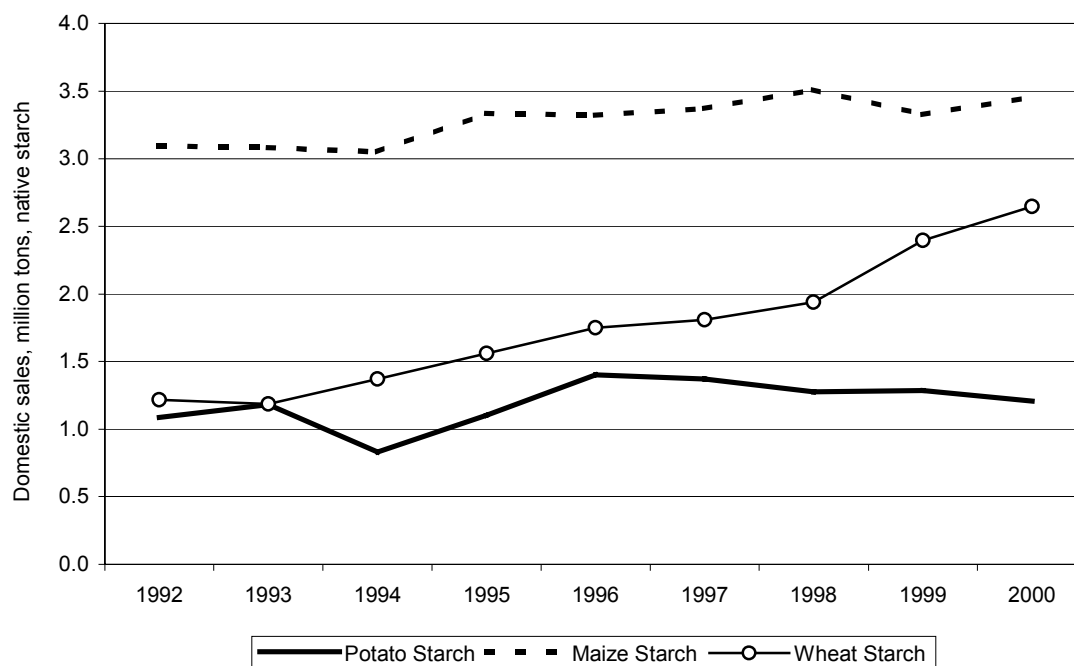
Source: LMC estimates derived from data provided by Comext, AAC and interviews with processors.

It emerges that the export shares of both potato and wheat starch are virtually unaltered by switching from Comext to export licence data; however, the export share of maize starch sales almost trebles from roughly 10% to 27% in 1999/2000, in moving from Comext to DG Agriculture and DG Enterprise export licence statistics.

Whereas the domestic demand for potato starch peaked in 1996, and has fallen since then, the demand for maize starch has been flat or slowly growing, and that for wheat starch has risen steadily and rapidly (see the comparison depicted in Diagram 5.2.1). The contrast with the export picture is striking. The export share of potato starch sales has consistently been much greater than the share for the other starches, and shows no sign of declining.

Diagram 5.2.2 highlights the dichotomy between potato starch's domestic and export performance. Potato starch's share of the local starch market is tending to decline (the recovery in output after the poor 1994 and 1995 crops caused a temporary upturn in its share, but the decline has since been resumed). At the same time, potato's share of total EU exports of native and modified starches averages above 50%, notwithstanding the strong growth in the output of wheat starch.

In order to examine whether the contrasting fortunes of potato starch in the domestic and export arenas, we prepared Tables A5(1).2.4 to A5(1).2.6 in Appendix 1, dividing the domestic deliveries of native and modified starches, as well as of sweeteners, by base product. The results of this analysis are summarised in Table 5.2.1 and Diagram 5.2.3. They reveal that potato starch has lost considerable ground in recent years in the Community home markets for native starches and sweeteners (in the latter of which they have always held only a very small market share). The sole end-use in which potato starch has been able to ensure that its internal market share has not been eroded has been modified starch.

Diagram 5.2.6: The Share of Potato Starch in EU Domestic and Export Sales
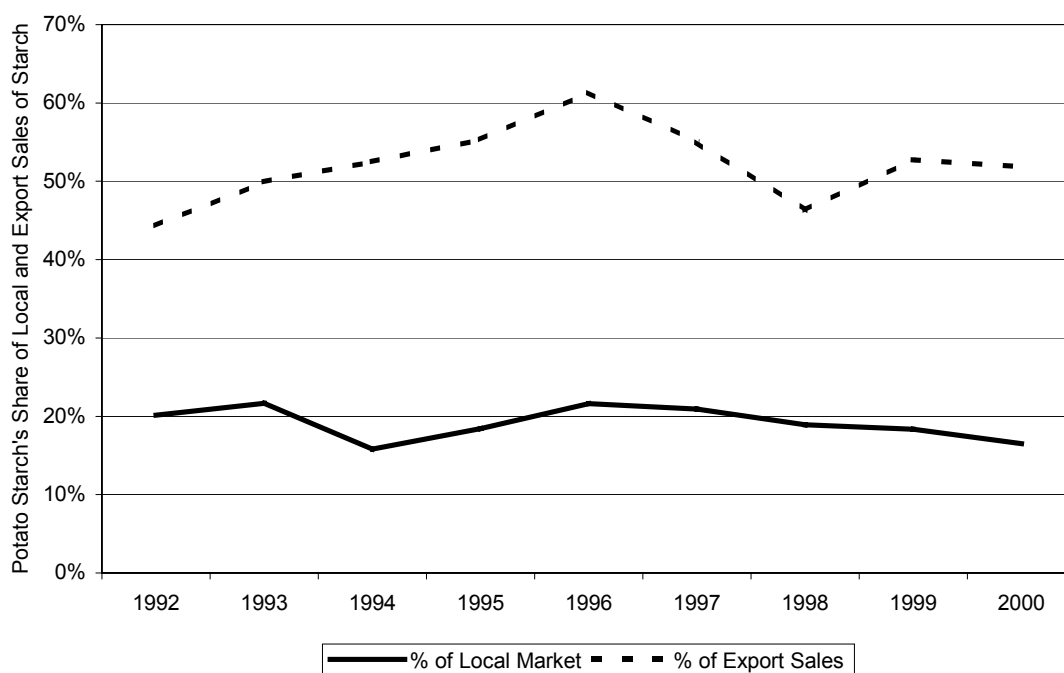
Source: LMC estimates derived from data provided by Comext, AAC and interviews with processors.

Further support for this broad picture is provided by analysis of the imports of native starches in the Union. Among these imports, the major item is cassava starch, which is not manufactured in the Community, and which is generally considered to represent a close competitor to potato starch. Cassava starch imports, primarily from Thailand, are subject to a tariff rate quota, which has not been filled in recent years; but they have tended to rise. After seven years from 1992 to 1998, when cassava starch imports into the EU, using official Comext data, were in a narrow range either side of 8,000 tons, they increased to 9,458 tons in 1999 and 14,351 tons in 2000.

Table 5.2.4: The Composition of the EU Market for Potato Starch by Product, 1992-2000
(in million tons, native starch)

	Native Starch	% of EU Market	Modified Starch	% of EU Market	Sweeteners	% of EU Market	Total	% of EU Market
1992	0.56	36.4%	0.43	50.0%	0.09	3.1%	**1.09**	20.2%
1993	0.62	41.4%	0.46	52.1%	0.09	3.1%	**1.18**	21.7%
1994	0.26	21.0%	0.48	52.5%	0.10	3.1%	**0.83**	15.8%
1995	0.55	31.3%	0.46	47.7%	0.10	3.1%	**1.11**	18.4%
1996	0.65	40.2%	0.64	51.9%	0.11	3.0%	**1.40**	21.6%
1997	0.63	38.1%	0.63	51.3%	0.12	3.1%	**1.37**	20.9%
1998	0.73	43.5%	0.42	35.1%	0.12	3.1%	**1.27**	18.9%
1999	0.52	27.9%	0.73	52.0%	0.04	1.0%	**1.28**	18.3%
2000	0.43	21.8%	0.74	50.9%	0.04	1.0%	**1.21**	16.5%

Source: LMC estimates derived from data provided by Comext, AAC and interviews with processors.

Diagram 5.2.7: The Share of Potato Starch in EU Domestic Sales by Product
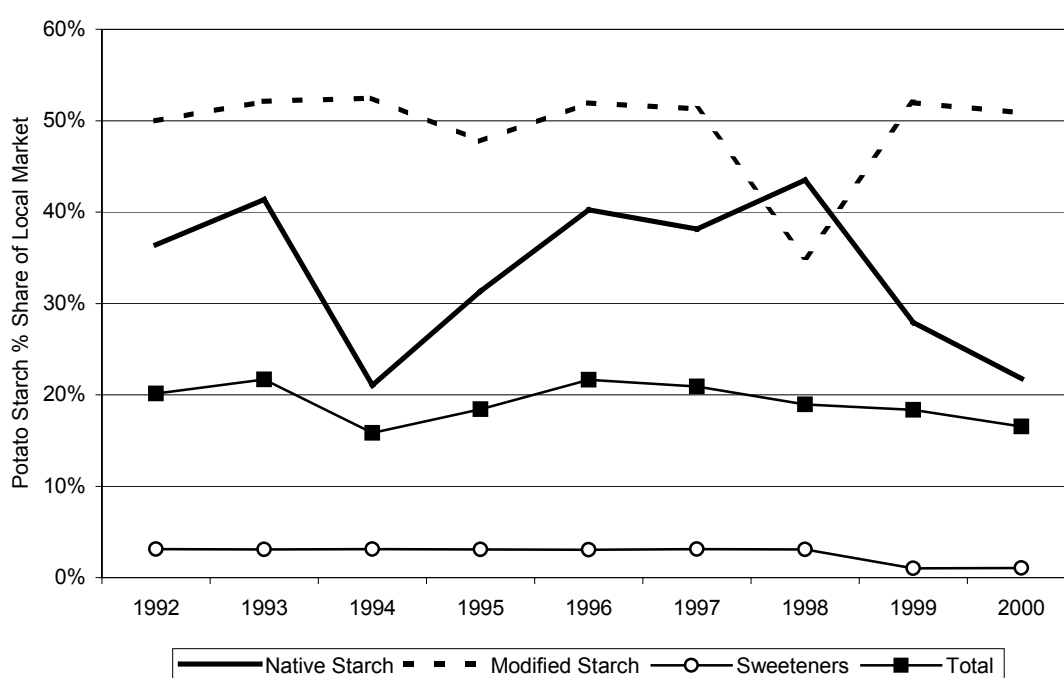
Source: LMC estimates derived from data provided by Comext, AAC and interviews with processors.

Conclusion: the policy has not been very successful in ensuring the competitiveness for potato starch in the Community market. Its market share has fallen, and its domestic sales declined in absolute terms by over 13% between 1996 and 2000. Yet, total export volumes continue to grow, and potato starch's share of Community exports in the form of native and modified starches and sweeteners still averages over 50%, on the basis of Comext data. This implies that the policy has been more successful in ensuring that potato starch is competitive in the export market when competing with grain starches.

IMPACT UPON THE COMMUNITY BUDGET OF THE MEASURES TO SUPPORT POTATO STARCH

The opportunity cost to the Commission's budget of measures to support the potato starch sector is the difference between the budgetary costs of supporting the output of one more marginal ton of starch potatoes, as opposed to the budgetary costs of inducing the farmer to switch the same marginal unit of land to an alternative crop.

To simplify the comparison, we shall initially assume that the farmer's trade-off is between planting cereals and starch potatoes. As a further simplification, we shall assume that the trade-off is viewed as a direct 1:1 trade-off between potato and cereal starch, so that a reduction of one ton in domestic potato starch production and sales causes a one ton increase in the domestic production of cereal starch[3]. In the analysis, we take account of the export surpluses that apply to all three of the main starches in the Community; therefore, at the margin, the trade-off is, in practice, one between exports of potato and cereal starches, with their associated export refunds.

Table 5.2.2 contrasts the costs to the Community budget of switching starch production from potato starch to maize or wheat starch. There are three separate budgetary cost elements that are identified: first, the area/direct payments per hectare, under the assumption that cereal farmers supplying the starch sector achieve exactly the regional reference yields that are used to calculate the area payments.

Area (or Direct) Payments

The area payments are expressed per ton of starch. However, they are calculated per hectare, multiplying the area payment per ton of cereals by the regional average reference yields for cereals. We have assumed that these payments are the same per ton of wheat and maize (in other words, that the reference yields for wheat equal those for maize). Since maize has a technical coefficient of 1.6, while wheat has one of 2.0, the area payment per ton of starch (as distinct to those per ton of cereal) is 25% higher for wheat than for maize. The direct payment per ton of starch in potatoes used to be set equal to that per ton of starch in maize, but under Agenda 2000 is now higher.

Potato Starch Premium

The second component of the Commission's costs associated with a marginal ton of potato starch output is the starch premium of 22.25 € per ton, paid to the processor.

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[3] This is not usually the case. Starch yields per hectare from potatoes are significantly higher than those for cereals. Therefore, measures that switch land from potatoes to cereals will reduce the net starch output in the Community, provided no new land is brought into the production of raw materials for starch. A further complicating factor in reality is way in which the application of compensatory payments for cereal areas is based upon cereal yields, without distinction between maize and wheat, while maize and wheat have different technical coefficients when processed into starch. This is incorporated into Table 5.2.2.

Export Refund

The third component of the Commission's costs associated with a marginal ton of potato starch production is associated with the export refund. If potato starch production is reduced by one ton, and the same land is used to produce enough wheat or maize to supply one ton of cereal starch, the balance sheet for the Commission shows a saving of one ton on potato starch export refunds (since, at the margin, the marginal ton of potato starch will presumably be exported), and an increase in spending on export refunds for one ton of cereal starch.

The Derivation of the Net Budgetary Costs

Table 5.2.2 reveals that, when contrasted with maize, since 2000/01, the new starch potato pricing regulation has made the direct payments per ton for starch potatoes more costly than the area payments for maize. The area payments on wheat per ton of starch are higher (because of the higher technical coefficient applied to wheat).

The potato starch premium is a specific budgetary cost attributable to the measures affecting potato starch.

The export refund is the same for potato and maize starch, but has recently been significantly lower for wheat starch.

The conclusion to be drawn from the last two rows in the table is that there is a net budgetary cost, typically €20-30 per ton of starch (mainly from the starch premium), in supporting the production of potato starch, under the assumptions outlined above.

The Effect of Introducing Actual Yields into the Calculations

Table 5.2.2 ought to be considered illustrative, rather than conclusive, since the assumption made about the likely yields of starch in switching from starch potatoes to cereals is unlikely to be achieved in practice.

For this reason, in Appendix 2 to this Question we have prepared a number of tables for starch potato growing regions in the six member states that were included in the field trips for this report. In these tables, we have contrasted the area payments per hectare that would be paid on cereals and oilseeds (applying the regional reference yields) with the direct payments paid for starch potato, which have also been calculated per hectare, on the basis of the potato yields estimated for the same regions.

The results of this exercise are presented in Table 5.2.3 and Diagram 5.2.4. Only in France, among the countries included in the comparison, did another crop offer a higher area payment per hectare than starch potatoes in the past; but as the area payments for oilseeds (whose area payments were always at least as great as those for cereals in our survey areas) are brought into line with those for cereals in 2002/03, the advantages offered to growers of starch potatoes become increasingly significant, even if it is assumed that yields of potatoes do not improve from the 2000 levels.

Payments made on starch potatoes in the form of direct payments, are nearly always higher per hectare than the maximum area payments that farmers receive on cereals and oilseeds (typically the area payment for oilseeds is the higher of the two). The difference between these direct payments and maximum area payments per hectare is estimated to rise between 1998 and 2002 from €239 to €433 per hectare for Austria; from €185 to €293 for Finland; from *minus* €363 to *plus* €524 for France; from €86 to €464 for Germany; and dips slightly from €388 to €383 per hectare for the Netherlands.

Table 5.2.5: EC Budgetary Costs of Switching One Ton of Starch Output Between Potatoes and Cereals, 1992/93-2001/02 (€ per ton)

	1992/93	1993/94	1994/95	1995/96	1996/97	1997/98	1998/99	1999/2000	2000/01	2001/02
Area/direct payments per ton of starch										
Maize	-	48.30	67.62	86.94	86.94	86.94	86.94	86.94	93.87	100.80
Wheat	-	60.38	84.53	108.68	108.68	108.68	108.68	108.68	117.34	126.00
Potato	-	48.30	67.62	86.94	86.94	86.94	86.94	86.94	98.74	110.54
Potato starch premium										
Potato	22.25	22.25	22.25	22.25	22.25	22.25	22.25	22.25	22.25	22.25
Export refund per ton of starch										
Maize	140.92	84.89	91.00	65.75	25.75	42.51	81.60	74.97	57.49	
Wheat	140.92	84.89	91.00	65.75	11.27	14.75	62.68	63.01	3.20	
Potato	140.92	84.89	91.00	65.75	25.75	42.51	81.60	74.97	57.49	
Net additional budgetary cost per ton of potato starch										
(1) Over maize starch	22.25	22.25	22.25	22.25	22.25	22.25	22.25	22.25	27.12	
(2) Over wheat starch	22.25	10.17	5.34	0.51	15.00	28.27	19.43	12.47	57.94	

Source: European Commission (FEOGA)

Note: It is assumed that both wheat and maize farmers achieve the average reference yields that are used to calculate area payments per hectare.
No allowance has been made for the consequences of set-aside obligations that apply to cereals, or for the production quotas applied to starch potatoes.

Table 5.2.6: Direct Payment Advantage for Starch Potatoes Over The Higher of Cereals and Oilseeds Area Payments, National Averages for Survey Regions, 1998-2002 (in € per hectare)

	1998	1999	2000	2001	2002
Austria	239.2	261.8	328.3	378.4	433.1
Finland	184.8	184.8	216.7	245.8	293.8
France	(363.3)	(340.7)	(90.6)	123.2	523.6
Germany	85.8	110.3	298.2	355.4	463.6
Netherlands	387.6	427.6	408.4	382.2	382.2

Source: LMC estimates based on data provided by the European Commission (DG Agriculture, Unit C2) and starch potato growing and processing associations in individual Member States. Details of the calculations are provided in Appendix 2 to this Question.

Diagram 5.2.8: Area Payment Advantage for Starch Potatoes, 1998-2002
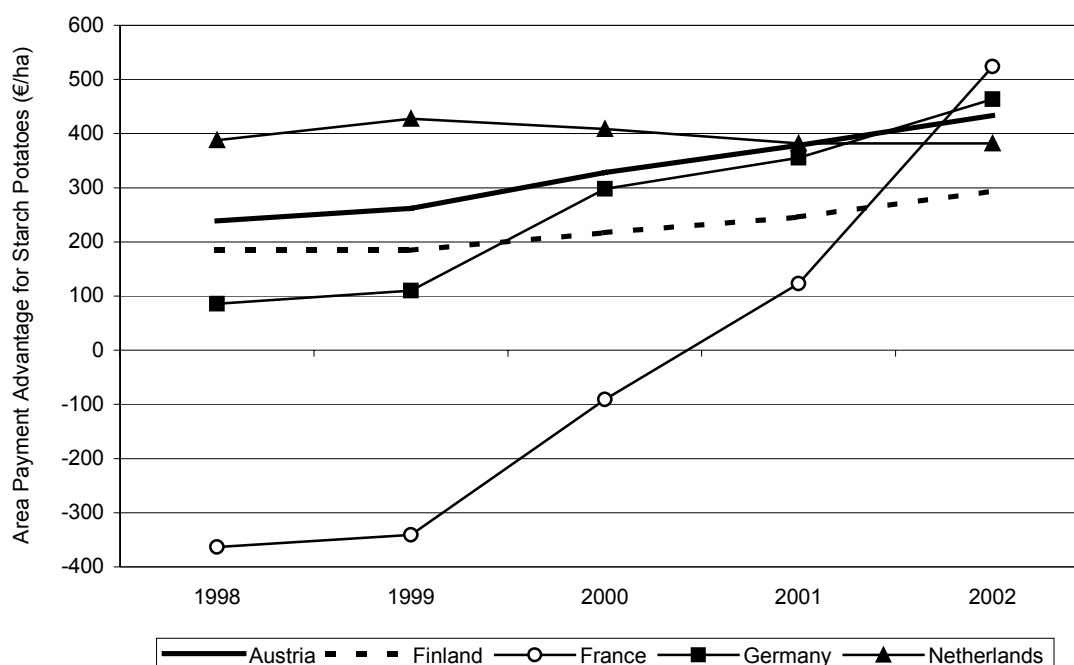
Source: LMC estimates derived from Table 5.2.3, above.
Note: The figures in this diagram represent simple national averages of the regions covered in Appendix 2.

Conclusion: The net budgetary cost per hectare (vis-à-vis the alternative cost of the measures implemented in the cereal and oilseed sectors) of the measures that provide support to the potato starch industry in its domestic sales has typically, though not always, been positive in the past. Before the introduction in 1993/94 of compensatory payments (subsequently renamed direct payments for starch potatoes and area payments for cereals), the main element of additional budgetary cost for starch potato production in relation to maize starch was the potato starch premium, paid to the processors. More recently, as the role of area payments in the CMO for cereals and oilseeds has increased, the net budgetary costs per hectare of the measures in the starch potato sector have risen; and they will rise further by 2002/03, when oilseeds receive the same area payments as cereals.

Whereas the net budgetary costs per hectare of the measures for starch potatoes were not large in the early 1990s, and might have been considered to represent a modest and reasonable cost for ensuring that the sector continued to retain significant competitiveness in the domestic market, this is ceasing to be true. By 2002/03, the net budgetary costs, notably in terms of direct payments, will be unreasonably large per hectare when compared with alternative crops.

The intended effect of the compensatory (area or direct) payments was to equalise the payments <u>per ton of starch</u> between maize and starch potatoes. This equality has ceased to exist with the direct payments awarded to starch potatoes under the Agenda 2000 reforms, which exceeded the increase in the area payments granted to cereal farmers; but this was offset in budgetary terms by the reduction in the potato starch production quotas.

The unintended effect of the higher direct payments for starch potatoes was typically to create much higher <u>payments per hectare</u> for starch potatoes than for cereals or oilseeds. This unintended effect has become more important as the reliance upon area or direct payments for income supports for farmers has increased, and as the area payments for oilseeds and cereals have been harmonised under Agenda 2000.

THE DEADWEIGHT ASSOCIATED WITH THE MEASURES IN THE POTATO STARCH SECTOR

Starch potato farmers as a group reveal their satisfaction with the current measures applied to the potato starch sector in their production decisions and in their valuation of the rights to supply potatoes within the framework of the potato starch quotas.

Once one allows for unpredictable climatic influences and the mechanism whereby up to 5% over-production of the national quota is permitted in one year provided an offsetting reduction in the quota is made in the following year, there is very little circumstantial evidence that farmers are unwilling to produce as large a volume of starch potatoes as is permitted by the quotas (see Diagram 5.1.3 in the discussion of Question 5.1, illustrating the fulfilment of the potato starch quotas by country).

Other evidence is provided by the keen demand for the right to have a contract to supply starch potatoes and the element (payment for delivery rights) that appears in the starch potato production costs of Germany in Table A6.1.1, in the Appendix to Question 6.1. This indicates that there is an element of economic rent in the current system, and that this economic rent is now sometimes incorporated into the cost of land whose owner has a delivery right to a factory.

Conclusion: This behaviour suggests that there is already some deadweight in the measures that are in effect. The deadweight will increase as area payments decline on oilseed lands, while the direct payments per hectare increase faster for starch potatoes than other crops.

The reduction in production quotas following the increase in potato direct payments will not necessarily reduce the deadweight at all significantly (since the changes in direct payments are supposed to have budget neutrality[4]). It is likely that the decline in output will fall disproportionately upon the marginal small farmers, allowing intra-marginal producers to gain some net benefit from the higher direct payments.

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[4] We have not been able to confirm that the quota reductions were neutral to the budget.

THE COSTS CAUSED TO DOMESTIC USERS OF POTATO STARCH

During the course of the field research for this Evaluation, domestic users of potato starch products, in the paper sector, for example, informed us that they believed that the operations of the measures in the potato starch sector had often worked to their disadvantage. They stated that the extent to which they felt that they were put at a disadvantage depended upon the level of domestic potato starch output: they believed that when output was low (when they expected that export sales would accommodate the fall in production) domestic supplies were cut back, and local prices for potato starch products would rise further above those for maize or wheat starch substitutes.

They stated that this situation was made more difficult by the system of export refunds, which are always higher than the production refunds. They felt that the export refunds reinforced the incentive for potato starch producers to supply esterified and etherified starches (CN 3505 10 50) to the export market, rather than the domestic market. The exemption of this group of products from the reforms in 2000, which ended the practice of paying residual export refunds on goods entitled to production refunds, has left the esterified and etherified starches as the sole category of approved products (entitled to production refunds) for which export markets are still more profitable to processors than domestic markets.

The view of these customers is that the rise that they have observed in the prices of potato starch derivatives in relation to cereal starch alternatives is the result of the twin effects of a reduction in supplies, in the wake of the quota cuts, and the continued attraction of export market sales over domestic sales, by virtue of the export refunds provided on CN 3505 10 50 products. To paraphrase one paper company: "potato starch companies prefer to get export refunds to supply the Far East than to sell to their home customers".

Conclusion: There is perceived to be some additional cost caused to domestic users of potato starch by the measures in place, most notably the export refunds. The reduction in the scope of these refunds in July 2001 may help the users slightly, but they feel that the continuation of higher export refunds than production refunds on the CN 3505 10 50 category of modified starches is continuing to reduce the availability of potato starch products locally, and obliges them to pay higher prices than they would otherwise, or switch to substitute cereal starch derivatives. This is viewed as being reinforced by the effects of the reduction in production quotas, with potato starch producers eager to defend export markets, putting the burden of adjustment to quota cuts onto local users.

THE ALLOCATION OF RESOURCES WITHIN THE COMMUNITY

Conclusion: The preceding sections of this part of the Evaluation have provided evidence that there was an element of excessive investment of resources in the potato starch sector within the Community in the early 1990s. Evidence of this misallocation may be found in the expansion in potato starch capacity in agriculture and processing, much of it intended for the export market, stimulated by the incentives provided by the starch potato payment formula and the export refund system.

The imposition of production quotas prevented the excessive allocation of resources from getting further out of hand, but reforms in other aspects of policy, most notably the effects of the MacSharry and Agenda 2000 reforms to the CAP, which made area payments a major element of policy, have greatly increased the net budgetary cost to the Commission of protecting the potato starch filière *(vis-à-vis cereal starches). The outlook is for a further imbalance of budgetary resources in favour of starch potato production to emerge as cereal and oilseed area payments are harmonised in 2002/03.*

The analysis presented in the discussion of this Question suggests that the direct payments to potato farmers are now too large, and by 2002/03 will be even larger, in relation to the main competing crops, which is associated with an element of deadweight.

This is argued on three grounds: first, there is strong evidence that starch potato farmers and processors find the crop's production attractive right up to the limit permitted by the production quotas.

Second, the evidence about the margins per hectare on starch potato farms presented in the discussion of Question 6.1 reveals that starch potatoes nearly always generate significantly higher returns than the main alternative crops, and in the case of Germany, growers make a specific payment for starch potato delivery rights, which implies that starch potatoes are more profitable than alternative crops.

Third, the Agenda 2000 reforms are bringing the area payments for cereals and oilseeds into line with one another, which leads us to believe that such harmonisation represents an objective of policy, and the present system of direct payments for the starch potato sector is not consistent with this objective.

A misallocation that is perceived by some users of potato starches is a bias in favour of export sales, even at the expense of local sales. There is a striking contrast between the declining share of the domestic starch market accounted for by potato starch, and the maintenance of potato starch's share of the total EU export sales of starch products (native and modified starches, as well as sweeteners). The potato starch share of total export sales is still, on average, just over 50%, which compares with its 16.5% share of the domestic starch market in 2000.

QUESTION 5.3

Did the production and export refunds on starch products contribute at a reasonable cost to maintaining the channels of production and use of native products?

This question will be treated:

- *For the production refund: by using industry, classifying the second processing products in terms of efficiency in view of the Community value added created.*

- *For the export refund: by exported product, classifying the products in terms of efficiency in view of the Community value-added created; one will also compare with the other cereal products benefiting from an export refund, and analyse the effects of the Inward Processing Regime.*

- *Taking into account the market value of the by-products of grain and potato starch manufacture.*

- *Distinguishing between production receiving aid (through production and export refunds) and not receiving aid (sales to protected sectors inside the Community).*

- *Studying the alternatives to starch products offered by the market.*

Objective of the Question: To examine whether the refunds represent cost-effective means of supporting the domestic processing of base products. (Note that in the penultimate part of the Question, we have redefined the production not receiving aid as sales to protected sectors, rather than as sales for food uses. The reason for the change is explained in Appendix 1 of Question 4.1)

Instruments: The production refund which is paid to producers of a range of approved products, defined originally in Annex I to the Council Regulation (EEC) No 1722/93 and revisions, when they are processed from starch products. These starch products, made up of the basic starches and specified starch derivatives, are defined in Annex II of the same regulation with revisions. (See the Appendix to Chapter 3, Tables A3.1 and A3.2.)

The export refund for starch products provided on exports of Annex I starch products and non-Annex I products manufactured from starch products, where Annex I and non-Annex I refer to the categories defined in Article 32.3 of the Treaty of Amsterdam.

The Community Customs Code, which describes the terms on which inward processing procedures may be undertaken, was established in Council Regulation 2913/92 and implemented in Commission Regulation 2454/93.

Criteria: Questions 4.4 and 5.3 concern the value for money obtained through the system of refunds. In Question 4.4, we examined whether the refunds were provided at least cost; in the present Question, we ask whether the refunds created maximum value.

To determine whether outlays on production and export refunds contribute at a reasonable cost to maintaining the channels of production and use of native products, one needs to define what constitutes a reasonable cost in the circumstances, and what maintaining both the channels of production and the use of native products means in the context of this Question. We now explain the definitions that we employ.

The amounts spent on production and export refunds are considered reasonable if they were not significantly higher than those needed to maintain channels of production and outlets for native starch products in approved products (whose producers are entitled to production refunds) and to maintain the similar channels and outlets for native starch products in the production of Annex I and non-Annex I products (entitled to export refunds). In other words, the sums spent were reasonable if the deadweight in providing production and export refunds was low.

By maintained, we mean that the use of Community basic starches and starch derivatives has been held steady or has increased in the production of approved products, entitled to production refunds, and of exports made with the benefit of export refunds as Annex I or non-Annex I products.

The criteria that we propose to use are the following:

Production Refunds:

The expenditures on refunds are concentrated in those second processing, i.e., approved, products that are the most efficient in creating Community value added.

The definition of efficiency in this context needs some clarification. In principle, it would be most efficient if the expenditure on refunds were to be concentrated on those products for which the ratio of [the value added from the product] to [the expenditure on the refund] is highest. However, this almost inevitably means that the refund has little impact on the outcome, since the contribution of the refund to the overall economics of the manufacture of the approved product is minimal.

Therefore, the definition of efficiency in creating Community value added needs to be amended to add also the criterion that the refund is considered to be a significant factor in creating the Community value addition. Thus, we shall adopt a twofold measure of efficiency: first, the value added per Euro spent on the production refund, and second, the significance of the refund in the creation or maintenance of Community production. The latter will be more subjective than the former.

Another criterion, which relates to the second of the parameters that we shall use in assessing the efficiency of the refunds, is that there is very little deadweight created by granting production refunds on second processing products.

Export Refunds:

The expenditures on export refunds are concentrated in those starch products and starch-using more highly processed products that are the most efficient in creating Community value added. The definition of efficiency used in this context is the same as the one just explained, namely we shall apply a twofold measure of efficiency: the value added per Euro spent on the export refund, and the significance of the refund in the creation or maintenance of Community production. The comparison will include other cereal product exports.

A further criterion is that there is very little deadweight created by granting export refunds.

Inward Processing Regime:

The IPR for starch products represents an alternative means of processing cereals into starch products for re-export. A large use of IPR for starch products will be interpreted as an indication that the export refund system does not compensate fully on an f.o.b./f.o.b. basis for price differences in base products. Therefore, a low use of IPR will be a criterion for the effectiveness of the export refund in compensating for price differences.

By-Product Credits from Processing Base Products into Starch:

In the consideration of by-product credits, the criterion that will be applied to both production and export refunds to determine that the costs of refunds are reasonable is that the production and export refunds compensate fully for the price differences with the US for the different base products, once by-product credits are taken into consideration as an aspect of the price differences.

Treatment of Protected Products

The application of export refunds to protected products will be considered to represent a reasonable cost, in relation to unprotected products, if the budgetary costs of compensating for price differences in the export of one ton of starch in protected products (which are not approved products in terms of the production refund, and therefore are not eligible for production refunds) are similar to the costs of exporting one ton of starch in unprotected products.

Alternative Products:

The criterion that will be applied to a comparison with alternatives to starch products will be that the methodology underlying the compensation for price differences provided to sugar in chemical uses in the domestic market is not significantly different to that applied to the compensation for price differences in the use of starch in approved products in the domestic market or the export of starch products in glucose or non-Annex I products.

Indicators:

Production Refunds:

The production refund as a percentage of the value added (in this case, defined as the gross margin between the internal market price and the internal cost of native maize starch) in the domestic market on the leading approved products.

An assessment of the significance of the production refund in the creation or maintenance of Community production

The deadweight associated with the provision of production refunds.

Export Refunds:

The export refund as a percentage of the value added (in this case, defined as the gross margin between the external market price and the external price of native maize starch) in the export market on leading export products.

An assessment of the significance of the export refund in the creation or maintenance of Community production

The deadweight associated with the provision of export refunds.

Inward Processing Regime:

The volume of starch products processed under the IPR as a proportion of total starch product exports.

By-Product Credits from Processing Base Products into Starch:

The net cost of base products per ton of starch in the Community and the US, after subtracting the revenues from by-products from the base product cost.

Treatment of Protected Products

The export refund per ton of starch exported in protected products as a proportion of the export refund per ton of starch exported in unprotected products.

Alternative Products:

The extent of the similarity between the principles underlying the compensation for price differences on sugar in chemical uses in the domestic market is not significantly different to that applied to the compensation for price differences in base products in the use of starch in approved products in the domestic market or the export of starch products in glucose or non-Annex I products.

PRODUCTION REFUNDS

Before examining the efficiency with which production refunds are allocated to different protected products, in terms of the value added that is created, it is important to restate some of the main conclusions already reached as to whether the costs of maintaining the channels of production and use of native products are to be considered reasonable.

In Question 4.4, we concluded, in terms of the treatment of different base products, that:

The formula to calculate the refund probably leads to a figure that is biased upwards as a result of the freight rate differential between US exports of bulk grains and approved products to the Community. However, this is offset in a somewhat arbitrary manner via the imposition of caps on the internal price used in the calculations.

Average annual budgetary savings of over €22 million may be made by adopting separate compensation for wheat. This is the extra sum that is paid to wheat starch producers by tying their compensation to the maize price, rather than the wheat price.

Given this close substitutability (for maize starch in the domestic market), and since the payment to growers for starch potatoes is based on the cereal intervention price, there

is no reason to believe that the production refund systematically over- or under-compensates for raw material costs in the production of potato starch; hence we conclude that, for potato starch, the production refund is provided at a reasonable cost.

Among the three main approved classes of products that were eligible for production refunds, the discussion of Question 4.4 concluded:

The production refund for esterified and etherified starch has been provided at reasonable cost, since the policy has broadly achieved its objectives while compensating, as intended, for base product price differences. (It should be noted that the discussion of Question 4.1 revealed that esters and ethers accounted for 33% of all production refunds in 2000/01.)

While the paper industry is an extremely important outlet for starch, and is an important processor of agricultural raw materials into high value added products, there has been an element of deadweight in the provision of the refund on basic starches to the paper industry. This outlet for Community base products could therefore have been ensured at somewhat lower cost. (Note that the discussion of Question 4.1 revealed that paper and paper products accounted for 33% of the direct production refunds granted in 2000/01; however, the sector was also the major user of esters and ethers. The combined volume of these two forms of production refund, one direct and the other indirect, meant that the paper sector represented 58% of the volume of production refunds, as a final beneficiary.)

Within the framework of its objective, the refund has been reasonably cost effective as a means of securing domestic outlets for starch in organic chemicals.

To summarise, therefore, the conclusions reached so far in Question 4.4: the maize and potato starch production refunds are considered to be reasonable, as are the refunds on organic chemicals and esters and ethers. However, the production refund on wheat starch is considered to be somewhat too high, and the refund on paper, the largest single user of production refunds, involves some deadweight.

Production Refunds and Value Added

The discussion in Question 4.1 revealed that by far the most important categories of approved products that receive production refunds are paper products, esterified and etherified starches (the majority of which are destined for final use in the paper sector) and organic chemicals. In order to determine whether the expenditures on refunds are concentrated in those second processing products that are the most efficient in creating Community value added, we have prepared Table 5.3.1. In this table, we have estimated the share of the production refund as a proportion of the value added in the domestic market.

Table 5.3.1: The Production Refund as a Proportion of the Value Added in the Internal Market on Selected Approved Products

	Liquid Sorbitol	Powdered Sorbitol	Citric Acid	Vitamin C	Esters & Ethers
CN Code	29054411	29054491	291814	293627	35051050
1998	15%	5%	5%	3%	18%
1999	34%	8%	10%	4%	38%
2000	16%	4%	4%	2%	13%

The definition of value added that we have employed in this table is a specific one. It compares the domestic price of the product (which is assumed to be equal to the export unit value that has been estimated from internal trade within the Community) with the domestic market cost of the native maize starch used in its manufacture (again assuming that the appropriate price is that estimated from internal trade within the Community), and applying the technical coefficient that is used for the calculation of production refunds. Thus, the value added is the addition of value that occurs between the purchase of the native maize starch used in a product's manufacture and the sale of the final product.

This addition of value to native starch is compared with the value of the production refund. The percentages listed in the table are the magnitude of the production refund received on the product as a fraction of the value added in the domestic market.

A high percentage in Table 5.3.1 implies that the refund is very important in maintaining domestic producers' margins. Without the refund, a domestic producer selling on the local market would have to reduce its sales price significantly to maintain the net cost of the approved product to local customers.

The products that we have included in the table are four leading organic chemicals and esters and ethers. Commercial confidentiality and the absence of any form of disaggregation of the organic chemical category of products benefiting from production refunds means that we do not have figures about the domestic market sales volumes of the different organic chemical products listed in the table, however, we believe that the two most important in volume terms are liquid sorbitol and citric acid. The most important single approved product in the table, however, is the esters and ether category, CN 3505 10 50.

Two other possible products that might have been added to the table are not included; these are paper products and penicillin. In the case of both these categories, among which paper products are much more important as an end-use of starches, the proportion of starch in the end-product is so low that the proportion of the production refund in the value added in the domestic market is no more than 1% at the most.

If one starts from starch as the key raw material in which we are interested, then the value addition to starch in the manufacture of both paper and penicillin is very high indeed. However, the concomitant implication is that the production refund plays a negligible role in determining the profitability of domestic production. Therefore, the paper industry, the most important end-use of all for starch in volume terms in approved products, makes a very considerable value addition to the starch it uses, but the production refund is of little importance in maintaining Community output of the end-product.

The next three most important approved uses in volume terms, the esters and ethers, liquid sorbitol and citric acid, all have modest value added, especially the first two. In 1999, in particular, when the domestic native maize starch price was relatively high, for both the esters and ethers and liquid sorbitol the production refund represented over one third of the entire value addition to starch as an input. Powdered sorbitol and

vitamin C were the most effective in generating value addition in the list in the table. However, even in 1999, the production refund represented less than 10% of the added value that was recorded on these two products.

The other criterion that we proposed for considering the efficiency of the expenditures on refunds is the significance of the refund in the creation or maintenance of Community production. This is very similar to the estimate of the deadweight associated with the refund.

It is almost inevitable that those approved products for which the production refund as a proportion of domestic value added is the lowest are also the products in which the refund has the least significance for continued Community production for the local market.

If the refund contributes less than 1% to the costs of a manufacturer, this is unlikely to have a major impact upon the producer's survival or growth prospects in the domestic market. If, by contrast, the refund represents 20% or 30% of value added, defined in the way applied to Table 5.3.1, then the production refund is extremely crucial to the maintenance of domestic production for local use, in the absence of sizeable tariff protection (as is true of the unprotected products which make up the approved product category, that is eligible for production refunds).

Accordingly, we conclude that those products which achieve the highest value added per unit of refund also have the least need for the refund, since there is considerable deadweight associated with it.

Among those products that definitely appear to require the refund, the ones listed in Table 5.3.1 that we would argue are most dependent upon the refunds are the ones in which imports are already substantial and the Community market is a net importer. These are citric acid and vitamin C (although lysine is not included in this table, it should be noted that these considerations also apply to lysine). For the esters and ethers, as well as the two forms of sorbitol, the Community is a substantial net exporter.

Therefore, out of the list of seven major approved products that we analysed (including the paper products and penicillin), we conclude that:

The two products for which the value addition per Euro of production refund is highest, namely paper products and penicillin, the deadweight associated with the provision of the refund is large. The refund is too small to make much difference to the future prospects of these products in the domestic market; therefore we would rate the efficiency of the production refund in these two products as low.

The product with the next highest value added per Euro of outlays on production refunds is vitamin C. This faces considerable competition from imports; therefore, we assess that there is little or no deadweight in the application of the refunds. We assess that the efficiency of the production refund on this product is high.

Powdered sorbitol and citric acid both represent products with moderately high levels of value added per Euro spent on production refunds; but whereas imports are a major threat to local producers' sales of citric acid; they pose little threat in the case of powdered sorbitol. Therefore, we assess the efficiency of the refund for citric acid as moderately high, while that for powdered sorbitol is medium.

Liquid sorbitol and esters and ethers both display a comparatively low value added per Euro spent on refunds; but they are also both exported on a large scale. Therefore,

despite the high percentage that the production refund constitutes in value added, it would appear that the refund may be slightly larger than would be needed merely to maintain the local producers' very high share of the domestic market, Consequently, we conclude that the efficiency of the production refund in these two important products is moderately high.

EXPORT REFUNDS

As we did for production refunds, we shall restate some of the conclusions already drawn as to whether the costs of maintaining the channels of production and use of native products are to be considered reasonable, before turning to an examination of the efficiency with which export refunds are allocated to different products, in terms of the value added that is created.

In Question 4.4, we concluded, in terms of the treatment of different base products, that:

The export refund improved the profitability of maize processing for export, and thus must have affected EU processors' decisions to export Community native maize starch and in this sense has maintained outlets for Community maize starch. However, the Comext data suggest that there is some form of link between the level of the refund and export volumes of native maize starch, separately from the full compensation for price differences in base products.

It should be noted, however, that this link is not evident from the Annex I export licence data, which we have been provided only for the period since 1995. Nevertheless, the Comext data, covering the entire period since 1992, provide a basis for believing that there are factors other than the direct compensation for price differences that influence the incentives for exports of native maize starch, and that these incentives have historically been strong when the gap between domestic and world market prices of maize has been wide.

In contrast, there is no clear-cut relationship between the level of the export refunds on native potato starch and the exports of such starch. However, the data do suggest that exports have tended to rise during a period when total output has been capped by production quotas. This weak indication of an underlying upward trend in native potato starch exports may be testament to greater apparent profitability of export sales, with the benefit of export refunds, than of sales to the domestic market. This would fit in with the view expressed more than once in interviews with paper companies that they felt that the availability of potato starch in the domestic market was held back by a desire by the processors to export their output.

For native wheat starch, the conclusion is similar to that for native maize starch exports, in that the export refund had a positive influence on EU processors' decisions to export Community native wheat starch. In this sense, the refund has maintained outlets for Community output. Unlike the case with maize starch, both the Comext and Annex I export licence data suggest a link between the level of the refund and the incentives to export native wheat starch, over and above the full compensation for price differences in base products, which is the basis for the calculation of the export refund. These extra incentives have been strongest when the gap between domestic and world market prices of wheat has been at its widest.

In terms of the cost-effectiveness of the coverage of the refunds, Question 4.4 stated:

There is deadweight in the provision of export refunds for products that contain a very low starch content, and this implies that the outlays on such refunds are not reasonable in order to meet the objective of ensuring outlets for Community starch products. We recommend that the Commission should institute a cut-off threshold level in terms of the share of starch costs in the value of the export given in the export licence application, below which export refunds would not be granted.

To summarise the conclusions from Question 4.4: The export refunds on native cereal starches appear to have stimulated exports most strongly when the level of the refund was at its highest values, to judge by the correlations between export volumes and the level of the refund, which is clearer for wheat than for maize. There is also evidence of deadweight in the provision of export refunds for products with a low starch content.

Export Refunds and Value Added

Unfortunately we have no breakdown of expenditures on individual non-Annex I product exports. Therefore, the categories of products that we consider in this discussion of the efficiency of export refunds are the same as the approved products discussed in the previous section on the efficiency of production refunds. In order to determine whether the expenditures on refunds are concentrated in those products that are the most efficient in creating Community value added, we have prepared Table 5.3.2, which is the counterpart of Table 5.3.1, relating to production refunds.

Table 5.3.2: The Export Refund as a Proportion of the Value Added in the External Market on Selected Products

	Liquid Sorbitol	Powdered Sorbitol	Citric Acid	Vitamin C	Esters & Ethers
CN Code	29054411	29054491	291814	293627	35051050
1998	21%	9%	15%	6%	19%
1999	35%	13%	19%	9%	26%
2000	35%	8%	13%	6%	19%
Foreign Trade (tons)					
Exports	N/A	N/A	12,884	13,552	318,892
Net Imports	N/A	N/A	38,239	4,644	-283,162

Source: LMC estimates, using unit value data on extra-EU trade from Comext.

Note: The value added in the external market is defined as the difference between the import unit value from the main overseas supplier to the Community and the EU export unit value of native maize starch, applying the technical coefficient as appropriate to each product. The technical coefficients are 1.068 for liquid sorbitol, 1.52 for powdered sorbitol, 1.2 for citric acid, 4.5 for vitamin C and 1.14 for esters and ethers.

The external market price applied to liquid sorbitol is the internal market price, since imports are negligible.

The very large "Secret" category of foreign trade explains why no foreign trade data are given for sorbitol.

Before turning to the table, in which the share of the export refund as a proportion of the value added in the export market has been estimated, it should be noted that, since July 2000, only esters and ethers among the approved products are entitled to claim export refunds. The other approved products receive only the production refund. In the table, we have assumed, for purposes of comparison, that the export refund was available throughout the period from 1998 to 2000. As an indication of the impact of the

change in eligibility in mid-2000, it should be noted that the average annual production refund in 2000 was €23 per ton, while the average export refund on maize starch was €64. Therefore, if only the production refund had been available in 2000, the percentages shown in Table 5.3.2 for 2000 would have been at just over one third of the values indicated for all entries, apart from the esters and ethers.

The definition of value added in Table 5.3.2 is analogous to that used in Table 5.3.1. We have compared the export price of the product, which is assumed to be the import unit value estimated on imports from third countries into the Community[5], with the cost (applying Community export unit values on sales to third countries as the prices) of the native maize starch used in its manufacture, applying the technical coefficient used for the calculation of export refunds. Thus, the value added is the final product price *minus* the value of the native maize starch used in its manufacture.

The percentages listed in the table are the magnitude of the export refund received on the product as a fraction of the value added in the export market. A high percentage in Table 5.3.2 implies that the refund is very important in maintaining domestic producers' export margins. Without the refund, the domestic exporter would have to reduce its sales price significantly to match the prices charged by third country suppliers.

The conclusion we draw from the table is that the three most important exports in volume terms, the esters and ethers, liquid sorbitol and citric acid, all have relatively modest value added. In 1999, in particular, when the native maize starch export price was high, the esters and ethers and liquid sorbitol both found that the production refund represented over a quarter of their entire value addition, and the figure was over one third in the case of liquid sorbitol.

Citric acid contributed slightly more value added to export refunds, but its export volumes are well behind those of the esters and ethers or liquid sorbitol. Powdered sorbitol was even more effective in creating value added from export refunds, but we believe that its exports were well behind those of liquid sorbitol (neither are published fully in the Comext trade statistics). Vitamin C is the most effective of those included in the table in generating value addition, and exports were significant, even though the Community is a net importer.

The other criterion that we proposed for considering the efficiency of the expenditures on refunds is the significance of the refund in the creation or maintenance of Community production. As we note in the context of the production refund, it is almost inevitable that those approved products for which the export refund as a proportion of value added is the lowest are also the products in which the refund has the least significance for continued Community production for the export market.

The product with the next highest value added per Euro of outlays on production refunds is vitamin C. This faces considerable competition in the export arena; therefore, we assess that there is little or no deadweight in the application of the refunds. We assess that the efficiency of the export refund on this product is high, which argues against the decision to end the residual export refund.

Powdered sorbitol and citric acid both represent products with moderately high values of the value added per Euro spent on export refunds; but whereas competition in the export market is considerable for citric acid; it is less keen in the case of powdered

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[5] For liquid sorbitol, we have used the internal market price as the indicator, since very little is imported into the Community.

sorbitol. Therefore, we assess the efficiency of the refund for citric acid as moderately high, while that for powdered sorbitol is medium.

Liquid sorbitol and esters and ethers both display a comparatively low value added per Euro spent on refunds; and they are also both large export products. Therefore, despite the high percentage that the export refund constitutes in value added, it would appear that the refund has helped to create export sales, which might not have occurred in the absence of the full refund. This suggests a degree of deadweight. Consequently, we conclude that the efficiency of the production refund in these two import products is low, and that the elimination of the residual export refund, which was applied to liquid sorbitol may also be appropriate for the esters and ethers.

Accordingly, as in our consideration of production refunds, we conclude that:

Those products which achieve the highest value added per unit of export refund also have the least need for the refund, since there is considerable deadweight associated with it.

Among those products that definitely appear to require the refund, the ones listed in Table 5.3.2 that we would argue are most dependent upon the refunds are the ones in which exports are substantial and yet the Community market is a net importer. These are citric acid and vitamin C. For the esters and ethers, as well as the two forms of sorbitol, the Community is a substantial net exporter.

The removal in July 2000 of the entitlement to residual export refunds from all approved products, apart from esters and ethers, means that most of the calculations in Table 5.3.2 are illustrative, rather than representative, of products that are eligible for export refunds. Therefore, the conclusions that follow will be expressed in a general manner.

Products which face considerable competition from imports, and for which the Community is a net importer, would appear to need the benefit of compensation for price differences in order to retain a reasonable degree of competitiveness, in both domestic and export markets; therefore, we conclude that there is little or no deadweight in the application of the export refunds for such products. We assess that the efficiency of the export refund on this product is high.

In the case of products for which net exports are substantial, it is possible that there is an element of deadweight in the provision of export refunds. In practice, as noted above, the deadweight is likely to be greatest for the products with the highest level of value added per Euro spent on the export refund.

The Efficiency of Export Refunds on Starch Products in Relation to Other Cereal Products

Regarding the efficiency of the provision of export refunds on starch products in relation to other cereal products benefiting from export refunds, in the absence of disaggregated non-Annex I export data, the only comparisons that we are able to make is between the three categories of native starch exports, for which Tables 5.3.3 to 5.3.5 present estimates of the value added on export sales in relation to the base product cost, multiplied by the technical coefficients of 2.00 for wheat and 1.60 for maize.

In each case, we have computed the raw material cost per ton of native starch, and calculated the value added both before the export refund and after the export refund. We have also listed the export sales of each of these native starches. The conclusion that we draw is:

The value addition on export sales is greatest with native potato starch, native maize starch follows next, and native wheat starch has the lowest value addition on export sales. This reflects the order in which the three native starches are ranked in terms of export sales volumes. Therefore, the efficiency of export refunds on native starch products is high in terms of Community value added, in the sense that the product (potato starch) generating the highest value addition per ton of export sales and per Euro of export refunds is also the product with the highest export volume; the product with the second highest value addition in both respects (maize starch) has the second highest export volume, and the product with the lowest value addition per ton of export sales and per Euro of export refunds (wheat starch) is also the product whose export sales are lowest.

Table 5.3.3: The Value Added on Native Wheat Starch Exports from the EU (€ per ton)

Native Wheat Starch	1998	1999	2000
Export Price	254	206	262
Wheat	121	119	126
Value Added Without Refund	12	(32)	10
Export Refund	48	68	49
Value Added With Refund	60	36	59
Exports ('000 tons)	26	35	34

Source: LMC estimates from Comext and European Commission, DG Agriculture, Unit C2, data.

Table 5.3.4: The Value Added on Native Maize Starch Exports from the EU (€ per ton)

Native Maize Starch	1998	1999	2000
Export Price	274	233	276
Maize	127	126	134
Value Added Without Refund	71	31	62
Export Refund	64	86	64
Value Added With Refund	135	117	126
Exports ('000 tons)	71	107	110

Source: LMC estimates from Comext and European Commission, DG Agriculture, Unit C2, data.

Table 5.3.5: The Value Added on Native Potato Starch Exports from the EU (€ per ton)

Native Potato Starch	1998	1999	2000
Export Price	321	287	349
Potatoes	131	131	131
Value Added Without Refund	111	78	139
Export Refund	64	86	64
Value Added With Refund	175	163	203
Exports ('000 tons)	260	310	331

Source: LMC estimates from Comext and European Commission, DG Agriculture, Unit C2, data.
Note: The potato price is the maize-equivalent minimum starch potato price, at 110% of the intervention price.

Inward Processing Regime

The IPR has had little impact upon the foreign trade in starch products. Table 3.3 in Chapter 3 demonstrates that the annual volumes of starch exports under the regime have often been below 5,000 tons in total. In 2000, they increased to over 17,000 tons, and were over 27,000 tons in the first five months of 2001, but virtually the entire figure is made up of exports of glucose to just two Central European destinations: Hungary and Slovakia, which were supplied predominantly from Austria and Germany.

The conditions under which IPR authorisations are granted are restrictive, as Chapter 3 indicated, and are more or less defined in such a way as to preclude exports under the IPR of products that may be produced and exported competitively from the Community.

In terms of Community value added, one would expect the IPR to yield a lower overall figure than exports made within the framework of the CMO for cereals, with export refunds. This is because the IPR permits processors to buy their base products at c.a.f. import prices and export their end-products at export prices. The resulting cost of the base products per ton of starch is therefore below that paid within the Community by a sum that should be equivalent to the production refund. However, the net export price (inclusive of the export refund) will be below that received by Community exporters by a sum equivalent to export refund. Therefore, the net value added on IPR exports will be below the figures in Tables 5.3.3 to 5.3.5 by an amount equal to the difference between the export refund and the production refund.

In 1998, 1999 and 2000, the production refunds average €40, €54 and €23, respectively. This was below the export refund in every case. Therefore, we conclude:

The IPR is little used in the Community starch sector, partly because of the restrictions that surround its use. However, where the IPR is used, the value addition achieved per ton of starch is lower than that on domestic processing by an amount equal to the difference between the export refund and production refund. The IPR causes no cost to the Community, other than minor administrative costs, but it contributes little to maintaining the filière, and, by virtue of its rules, generates no demand for Community native products.

ALLOWING FOR THE IMPACT OF BY-PRODUCT CREDITS

The by-products from the processing of base products into starch are also considered to be basic agricultural products and are regulated by the CMO for cereals. Therefore, there is a compelling reason for including them in any assessment of the appropriate compensation for price differences between Community and third country base products. Any assessment of whether the production and export refunds constitute a reasonable cost for maintaining channels of production and use of native products should take account of the contribution of by-products to the overall economics of raw material use.

The three main base products used in the manufacture of starch in the Community generate different amounts of by-product credits (see Chapter 1 and its Appendix 2). At one extreme is starch potato, whose limited volumes of fibre and protein by-products have virtually no value. At the other lies wheat, whose vital gluten by-products are actually worth more than the native starch obtained during wheat processing in the United States, and which also has wheat bran and protein soluble by-products. Maize lies somewhere in the middle, with a substantial contribution from the sale of corn gluten feed, corn gluten meal and corn oil.

In Tables 5.3.6 and 5.3.7, we have computed the impact of taking account of by-product credits for wheat and maize in the calculation of base product price differences and the compensation that would be appropriate in relation to US export supplies of these two starches. The key element in the calculations is the correction for the value of by-products to take account of whether the country is a net importer or net exporter, since the value of by-products will be higher in a net importing country.

In constructing the tables we have made the following assumptions. First, the wheat and maize prices used to reflect Community and US prices are the Rouen breadmaking wheat and Bayonne maize prices, and the US Gulf f.o.b. values for SRW wheat and No. 3 yellow maize. Second, the Community is a net exporter of vital gluten and seed oils (such as corn oil), and a net importer of protein feeds such as corn gluten feed and meal. Third, the US is a net exporter of all by-products, apart from vital gluten, which it imports from the Community. Fourth, the freight cost difference on corn gluten feed and meal is the same as the actual price difference between corn gluten feed in Rotterdam and in the South East US. Fifth, the corn oil price is the same in both countries. Sixth, the US vital gluten price equals the EU vital gluten price plus the c.a.f. versus f.o.b. adjustment incorporated into the calculation of Community production refunds (it should be noted that this does not take account of the tariff protection granted to the US vital gluten sector, which should not be included in the compensation for price differences). Seventh, the value of the minor by-products, such as wheat bran and protein solubles, is the same in the two countries.

Table 5.3.6: The Compensation for Price Differences for Wheat, Including By-Product Credits (€ per ton)

	1996	1997	1998	1999	2000
EU					
Prices of products					
Wheat	145	137	121	119	126
Vital gluten	694	646	860	902	847
Cost per ton of starch					
Wheat	291	275	242	238	252
All by-products	185	175	192	200	192
Net cost	105	100	50	38	60
US					
Prices of products					
Wheat	149	127	100	90	108
Vital gluten	726	678	884	931	886
Cost per ton of starch					
Wheat	298	253	199	180	217
All by-products	190	180	196	205	198
Net cost	108	74	4	-24	18
Implied Compensation for Price Differences	-2	26	46	62	41
Production Refund	9	12	40	54	23
Export Refund	29	20	48	68	49

Source: LMC Starch and Fermentation Analysis, European Commission (DG Agriculture, Unit C2), USDA.

With these assumptions, we have computed the net base product costs of starch from wheat and from maize in the two countries, after deducting the by-product credits, and the difference between the two measures is referred to as the implied compensation for price differences. In the case of wheat, since the US is a net imported of vital gluten,

the US wheat sector benefits from the incorporation of by-products into the overall economics of starch production. For maize, however, the Community's processors benefit, since the Community imports the corn gluten products.

The effect of incorporating by-product credits and price differences into the calculations may be deduced from a comparison of the final two rows of each table. For wheat, the average implied compensation for price differences with the US between 1996 and 2000 was €35 per ton of starch, which compared with the average production refund of €28 in the same period. For maize, the corresponding average implied compensation for price differences with the US between 1996 and 2000 was €41 per ton of starch.

Table 5.3.7: The Compensation for Price Differences for Maize, Including By-Product Credits (€ per ton)

	1996	1997	1998	1999	2000
EU					
Prices of products					
Maize	156	133	127	126	134
Corn gluten feed	121	105	84	94	101
Corn gluten meal	308	359	274	278	322
Corn oil	427	485	588	500	382
Cost per ton of starch					
Maize	249	213	203	201	214
All by-products	95	95	85	85	86
Net cost	154	117	118	116	129
US					
Prices of products					
Maize	131	104	92	84	96
Corn gluten feed	101	82	64	61	69
Corn gluten meal	289	336	253	245	290
Corn oil	427	485	588	500	382
Cost per ton of starch					
Maize	210	166	148	135	154
All by-products	85	84	75	69	70
Net cost	124	82	73	66	84
Implied Compensation for Price Differences	30	35	45	50	45
Production Refund	9	12	40	54	23
Export Refund	29	46	64	86	64

Source: LMC Starch and Fermentation Analysis, European Commission (DG Agriculture, Unit C2), USDA.

The calculations have been prepared using the Rouen and Bayonne wheat and maize prices as a reference, and these are not exactly the same as the prices used to determine the production refund. Subject to that qualification, we derive the following conclusion:

The incorporation of by-product credits into the calculation of the appropriate compensation for price differences tends to offset the perceived advantage that wheat enjoys over maize by virtue of much higher by-product credits per ton of starch. In the case of production refunds (which are often criticised for applying one single refund to all base products), it emerges that the refunds should be fairly similar for both wheat and maize. The results in Tables 5.3.6 and 5.3.7 suggest that wheat should receive a lower refund than maize; but the average difference in the levels of the appropriate

compensation for the two cereals between 1996 and 2000 was just €6 (€41 minus €35) per ton of starch.

Undertaking the same exercise for export refunds, the calculations yield the opposite result, in the sense that whereas the difference between the average implied compensation and the average export refund for wheat starch between 1996 and 2000 was €8 (€43 *minus* €35), the difference for maize starch was €17 (€58 *minus* €41). Thus, these figures imply that, once by-product credits are taken into account, the calculation of export refunds for wheat under-compensates its users by just €9 per ton of starch (or over-compensates maize users, or a mixture of these two effects). This may be due to the incorporation of US Hard Red Winter wheat into the calculation of the wheat export refunds. We conclude that:

The incorporation of by-product credits into the calculation of the appropriate compensation for price differences in the determination of export refunds suggests that the current system of calculating the refunds is fairly accurate in the determination of the difference between the export refunds provided for wheat and maize starch exports. The results in Tables 5.3.6 and 5.3.7 suggest that wheat is actually under-compensated slightly; but the average under-compensation vis-à-vis maize between 1996 and 2000 was just €9 per ton of starch.

A point to emphasise in these calculations is that the compensation should not aim to bring net wheat costs (net of by-product credits) down to the same level as maize. Its objective is to compensate for differences between base product prices in the Community and in its main competitor countries. If, as is the case, the net cost of wheat per ton of starch is lower than that for maize, this should be interpreted as a reflection of the commercial realities of the competitiveness of wheat over maize in the Community.

We conclude that production and export refunds on starch products take reasonable account of the impact of by-product credits upon the choice of base product for processing into products for sale on the domestic and export markets.

THE DISTINCTION BETWEEN PRODUCTS RECEIVING PRODUCTION REFUNDS AND THOSE WHICH DO NOT

In the discussion in Chapter 3, we concluded that, within the domestic market, the basis of the entitlement to production refunds is consistent with the principle that the approved products that are eligible or refunds are in unprotected sectors. The main starch-using products in the protected sectors (listed in the Appendix to Chapter 3) all receive sufficient protection via import tariffs for their exclusion from any entitlement to production refunds to be fully justified.

Conclusion: The basis for granting production refunds is the absence of significant protection via import tariffs. Protected products, excluded from the category of approved products, already receive substantial protection via import tariffs; therefore, it is appropriate that they do not have an entitlement to production refunds, since any such refunds would constitute an unreasonable cost to the Commission budget.

In the export arena, most of these protected products used to be entitled to the export refund as non-Annex I products. Since the revisions made to the list of non-Annex I products in July 2000, an anomaly has arisen, in that protected products now receive a larger export refund than unprotected (approved) products. On logical grounds, if the unprotected products are assumed to be able to manage without the residual export

refunds when they compete in the export market, it is not at all clear why protected products should not be assumed to be able to survive in the export arena with only production refunds, too. In fact, one may go further and note than unprotected products, by virtue of the lack of significant protection in the domestic market, are unlikely to be able to make as large margins in their domestic sales (because of competition from imported end-products) as the sellers of protected products, whose competitive threat from imports is lower. Therefore, it is arguable that the exporters of protected products in the non-Annex I group of products are better able than exporters of unprotected products to be able to afford to export their output without full compensation for f.o.b./f.o.b. price differences in their base products. Consequently, we conclude:

There is no reason to treat the producers of protected products more generously than the producers of unprotected products in the refunds that they are entitled to receive when exporting. They should receive the same effective refunds on their export sales, namely the production refund.

ALTERNATIVE PRODUCTS COMPETING WITH STARCH

Diagram 3.5 in Chapter 3 depicts the effect of the production refunds granted on the use of sugar in the manufacture of approved products. These production refunds are similar in value to the export refunds provided on exports of sugar-containing products. Sugar is the main competitor to starches both as a fermentable substrate and as a base product for glucose manufacture, and the prices of other important potential substrates, notably isoglucose and inulin syrup, are tied to the sugar price via the sugar regime.

In terms of the reasonable cost or otherwise of the system of starch production and export refunds in relation to alternative products, the key question is whether there is a lack of consistency between the approach adopted to the compensation for base product costs under the starch and sugar regimes. There is no justification for trying to ensure that different base products are automatically compensated to exactly the same net cost, since that would take no account of the underlying differences in base product prices. Therefore, we analyse Diagram 3.5 to examine whether the basis for compensating for sugar price differences in noticeably different from that for starch. (It should be recalled that Diagram 4.1.9 in the discussion of Question 4.1 illustrates how the net cost of sugar in chemical uses, after deducting refunds, compares with the net cost of cereals processed into glucose for approved uses, such as chemical uses, entitled to production refunds.)

In Chapter 3 we explain the basis for the determination of the sugar production refunds, and, with the single exception of the choice of North West European f.o.b. export prices as the reference for world market pries, the underlying principle behind them is very similar indeed to that adopted for starch. The compensation for production refunds and the similar calculation used to determine export refunds for sugar-containing products are based upon the difference between a world market reference price and a domestic price, with an adjustment to reflect the costs of internal freight to the export port.

Diagram 3.5 reveals that, on average, the net cost of sugar to domestic users is slightly above the world price. Until July 2001, the sugar production refund was calculated quarterly, which is why the net cost of sugar sometimes fell below the world price. Since July 2001, the refund has been computed monthly; therefore, it is likely that the net cost of sugar will usually be above the f.o.b. world price.

Conclusion: The determination of compensation for sugar is very similar, in principle, to that for starch products. No bias is detectable from the method of application of refunds for sugar vis-à-vis that for starch products. Therefore, the current system of calculating starch production and export refunds is considered to represent a reasonable cost in relation to the sugar system.

There is also limited competition for starch products in a few applications, notably paper-making, from synthetic products, such as butadiene, and from latex rubber, and starches compete with synthetic products in the production of plastics. When such competition occurs, the starch derivatives are usually considerably more expensive, but offer technical advantages, such as biodegradability, that the synthetic alternatives do not possess.

In view of the technical advantages of starch-derived end-products, it would not be appropriate to compensate processors for price differences between base products and petroleum or natural rubber derivatives, since that would take no account of the value of these technical advantages. Such compensation would be potentially very costly, and would potentially generate an unsustainable demand for starch in applications such as plastics. Therefore, we do not recommend that any measures are introduced to provide compensation for price differences between starches and synthetic competitors.

Chapter 6: The Impact of Policy on Income and Rural Development

QUESTION 6.1

Question: *Did the grain and potato starch regime contribute significantly to supporting the income of farmers concerned, in particular of the starch potato producers?*

The role of the production structures will be examined in particular.

Instruments: The Common Market Organisation for cereals regulates the instruments relevant to the grain and potato starch regime. Those that determine the measures applied to starches in general, and to potato starches in particular, are the minimum price for starch potatoes; the intervention price for cereals; the area payments and direct payments; the production and export refunds available to eligible end-users and processors; the starch potato premium for processors; and the national potato starch production quotas.

Criteria: The regime will be considered to have been successful in meeting the objective of supporting the relevant farmers' incomes if it meets the objectives outlined in the Treaties of Rome and Amsterdam. Under Article 39 of the Treaty of Rome in 1957, the CAP includes the objectives of "ensuring a fair standard of living for the agricultural population, increasing the earnings of persons engaged in agriculture; and stabilising markets; while guaranteeing regular supplies".

The resolutions following the Stresa Conference in 1959 established the principles that have tended to govern CAP philosophy in the subsequent period. These include the declaration that "efforts made to raise productivity should permit the application of a price policy which simultaneously avoided overproduction, while allowing farmers to remain or to become competitive"; a statement that "an improved structure should permit the capital and labour used in European Agriculture to receive remuneration comparable with that which they obtain in other sectors of the economy"; and the intention that "given the importance of the familial structure of European agriculture….., every effort should be made to raise the economic and competitive capacity of such enterprises".

In the light of these objectives and principles, the criterion of "supporting the income of farmers" is interpreted as ensuring that farmers' incomes are supported at average levels that are comparable to those in other sectors of the domestic economy. This means that the earnings of farmers from starch potato cultivation and from cereal farming supplying the starch industry have kept pace with average earnings elsewhere in the economy and are at least as high as those in other agricultural sectors. It also means that their incomes are more stable and less prone to volatility than those in these other sectors.

The role of production structure is interpreted in two ways in answering this question: first, in relation to the distribution of production by farm size (this is the sense in which structure is used in the third of the principles listed above from the Stresa Conference). The second interpretation is in relation to the role of producer cooperatives in starch processing.

Using the first definition, success in meeting the objectives of the regime will be considered to have occurred if the importance of smaller farms has been maintained in starch potato and cereal cultivation in the relevant regions. In relation to the second definition, the policy will be considered successful if cooperatives represent a significant proportion of starch processing capacity and play a role in supporting their members' incomes.

Indicators: Before turning to a review of the indicators that will be used to determine how well starch policy has met these criteria, we should remark on the availability and value of the data that exist about the cultivation of raw materials for starch production, and, in particular, about the cultivation of starch potatoes.

THE DATA AVAILABLE ON STARCH POTATO PRODUCTION

In contrast with the situation for many other important crops, it proved very difficult indeed to obtain basic data on aspects such as the area, output and yields of starch potato farmers in Member States and different regions of the Member States, let alone economic data on the income and costs of production of these farmers. In many countries, starch potatoes are not identified as a separate crop in agricultural statistics.

The official European statistical data network of FADN will only start collecting data on starch potatoes from 2000 onwards, but FADN informed us that they had asked the governments in individual Member States whether they already collect separate data on starch potatoes. They were informed that only the Netherlands, Sweden and Finland included codes for starch potatoes within their current statistical system for agriculture. Denmark, Austria, Germany and Belgium said they do not have any provision, at present, for monitoring starch potatoes in a distinct manner from other crops, while Spain and France did not answer the enquiry.

We tried, therefore, to obtain income data for starch potato farmers from the three countries that have a system in place for statistical analysis of the starch potato sector, namely the Netherlands, Sweden and Finland, in the hope of being able to use the FADN framework for alternative crops as a consistent methodological basis to allow us to compare the results of the national surveys for starch potatoes in these three countries with the FADN results for farmers who grow other crops. In this manner, we had hoped to be able to make direct comparisons of the level and volatility of farmers' incomes from starch potato cultivation with the level and volatility of incomes from alternative crops, and thus deduce whether the measures in effect have supported the incomes of starch potato farmers.

Unfortunately, this, too, proved to be a forlorn hope, in that, as yet, the relevant data on the economics of starch potato cultivation have not been collected centrally for any of the starch potato producing Member States.

As with several other aspects of the policy in the starch sector, we should record our concern about the poor quality of the data that are available and the lack of transparency surrounding many activities in the sector. The starch sector in general, as part of the CMO for cereals, absorbs a sizeable budget at the Community level, and the potato starch sector, in particular, has its own special measures that require careful monitoring (e.g., production quotas and the payment scale for potatoes) as part of the management of the CAP. Therefore, it is remarkable that data are not more readily available to the Commission to determine whether these expenditures are having their intended economic and social development effects. A significant number of the questions asked in this Evaluation have only been able to be answered because of

private communications with organisations within the starch sector or as a result of the field visits undertaken for this report.

The answers to this question have been based, therefore, on a comparison of the costs and margins of producers of starch potato and alternative crops from information collected at a local level during the course of the research on this report. The data were expressed in different forms in each country, and so we have modified them to make them as comparable as possible with one other.

THE CHOICE OF INDICATORS

This means that we have had to evaluate the effectiveness of the CMO in meeting the Stresa principle that "capital and labour used in European Agriculture .... receive remuneration comparable with that which they obtain in other sectors of the economy" in terms of a comparison between the incomes earned by producers in the cultivation of cultivation of the base products used for starch production and those earned in the cultivation of the main alternative crops open to the same farmers.

The grain and potato starch regime will be judged to have contributed significantly to supporting the income of farmers concerned, in particular of the starch potato producers, if their income is at least as high as it would have been had they cultivated the main alternative crop instead. This applies the opportunity cost principle to the choice of crop by the farmer.

Therefore, the main indicators that we have used in answering this question are, first, the ratio between the average net margins earned on starch potato farms and the average net margins earned on the main alternative crops in the same areas, where these net margins are expressed both per hectare and per unit of land; and second, the ratio between the statistical volatility of the incomes of starch potato farmers, as expressed by the coefficient of variation[1] of their incomes, and the statistical volatility of the incomes earned on alternative crops.

Corresponding indicators, comparing the levels and volatility of incomes from growing starch base products with the levels and volatility of incomes from alternative crops, are appropriate to the elements of this Question that relate to the success of the starch regime in supporting the incomes of farmers who supply cereals to the starch industry.

THE INCOMES AND MARGINS EARNED BY STARCH POTATO FARMERS

In order to determine whether the starch regime supported the income of starch potato farmers, we analyse the differences between the income and cost structures of starch potatoes and those of other crops. Three alternative measures of income may be used to give an answer: one is the gross margin per hectare, which is relevant in the short run, when capital and labour costs may be viewed as sunk costs; a second is the net margin per hectare, which is relevant when access to farm land is seen as the crucial constraint for farmers; and the third is the net margin per unit of labour input, which is relevant when farm labour is seen as the crucial constraint.

Diagrams 6.1.1, 6.1.2 and 6.1.3 compare the revenues and the costs of growing starch potatoes with the revenues and costs of the main alternative crops in important starch potato growing regions of three European countries: Germany (Niedersachsen),

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[1] The coefficient of variation is the standard deviation divided by the arithmetic mean value.

Finland (using the national average) and France (Somme). The alternative crops in all cases were cereals: namely winter rye, feed barley and wheat respectively. It is clear from the diagrams (for which the underlying data are presented in the Appendix to this Question) that the gross margins from the cultivation of starch potatoes is, in all three countries, considerably higher than the gross margins earned from the alternative crops. However, for all three countries the capital and labour costs are much greater for starch potatoes than for the alternative crops[2].

Diagram 6.1.4 compares the gross margins per hour of labour input for starch potatoes and the main alternative crop in the same three countries. Starch potato farmers appear to be unanimous in the view that the cultivation of starch potatoes is very labour intensive (potatoes are two to three times more labour intensive than cereals according to the interviews with representatives of French farmers, and up to five times more labour intensive according to interviews with German growers). Every step of the cultivation process requires more labour than alternative crops.

The first peak in demand is in the Spring, when the seed potatoes are planted. During the growth of the plants, starch potatoes require constant care, since the plants have to be checked on a daily basis for diseases, and fertilisers need to be given regularly. The second labour peak is during the harvest period. First the foliage is cut off and has to be removed[3]. Once the potatoes have been lifted and collected prior to delivery to the factory, special attention is given to removing earth from the potatoes (the amount of earth – the tare – depends on the type of soil) and also removing stones and straw.

The capital costs per hectare are also higher for starch potatoes than for other major crops, since the cultivation of starch potatoes requires specialised machinery such as planting machines, special harvesters and cleaning machines. These machines are either owned by a single producer, by groups of several producers, or are hired from a company, depending on the size of the farm.

A further cost arises from the growers' obligation to store and finance part of their harvest at their own expense. Up to the end of September (or the end of August in the North of Europe), potatoes can be harvested just before they are delivered to the processing factory[4], but after that they have to be harvested and stored until they may be delivered. Special storage buildings are required that guarantee that the temperature remains at 8° in order to ensure that the potatoes do not start germinating.

Farmers meet the costs of transporting the starch potatoes to the processing plants. Since potatoes are 80% water, the transport costs per ton kilometre of starch are much higher than for cereal raw materials for starch. Starch potato farmers told us that the farms that are the farthest from the processing plant tend to cease growing starch potatoes over time. Generally it becomes uneconomic to cultivate starch potatoes if the distance to the factory is more than 100 km.

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[2] Some of the results derived from the official data are unexpected. The most surprising is the implication to be drawn from Diagram 6.1.3 that the net margin on wheat farming in the Département of Somme in France is virtually zero. However, since the information on the economics of starch potato cultivation comes from the same source, one imagines that the estimates of the net margins on starch potato farming have similar biases to those for wheat farming.

[3] Currently the foliage is often killed chemically, but in countries such as the Netherlands farmers are required by the government to kill a percentage of their foliage mechanically. This regime is part of the Cross Compliance programme that requires farmers receiving aid to comply with certain rules.

[4] Normally the foliage is cut off one week before the delivery. The potatoes remain in the soil for about a week before being lifted and delivered.

In the gross and net margin calculations presented below, the costs do not include the costs of the farmers' own land and own labour. This is significant since starch potato farms are frequently family businesses, and all the members of the family contribute labour when it is needed.

There is some strong circumstantial evidence about the profitability of starch potato farming in relation to alternative crops. In Germany, the production cost figures provided for starch potato farmers include an item named "delivery rights". Growers entered into contracts with starch factories in the past (in 1978, in the case of Emsland Stärke) and these delivery rights may be traded or rented to other farmers.

These rights were valued at €307 per hectare in Germany in 2000 (see the Appendix to this Question), and were found in both Weser-Ems, in former West Germany, and in Mecklenburg-Vorpommern, in the East. This is to be interpreted as the market's valuation of the extra income provided by starch potato farming over and above its leading alternatives.

Strictly speaking, this item should not be included in the production costs since it is no more than the capitalisation of the above normal profits expected to be earned from having a contract with the right to deliver starch potatoes to a factory. It is, in effect, one indication of the market's valuation of the extra profitability of starch potato farming in relation to the main alternative crops.

Data from 1994-99 for the Netherlands

The data in Diagrams 6.1.5 to 6.1.9 allow us to analyse the average differences between the revenues, costs and profits for various crops over a six year period in a leading starch potato region in another Member State, the Netherlands. The data refer to all the main crops of the Veenkoloniën and the Northern Sand Region in the Netherlands. It is clear that the various types of potatoes and sugar beet are the two classes of crops that generate much higher revenues then cereals and other crops.

A comparison of the different crops reveals that starch potatoes have the highest cost/revenue ratio: 39%, as against 28% for cereals, 30% for seed potatoes, 35% for edible potatoes, and 18% for sugar beet. As a result, the income of the average starch potato farmer (the gross profits *minus* the cost of hired labour for starch potatoes) is lower than the income earned on other kinds of potatoes and sugar beet. However, when compared to cereal farmers, it is clear that the net profits from starch potatoes are higher. During the period 1994-1999, the average net profit earned by starch potato farmers was 3,293 Guilders/hectare, compared to 2,003 Guilders for winter wheat, 1,773 Guilders for summer barley, and 1,580 Guilders for other grains.

Diagram 6.1.1: Gross Margin, Costs and Net Margin for Starch Potatoes and Winter Rye in Germany (in €/hectare)
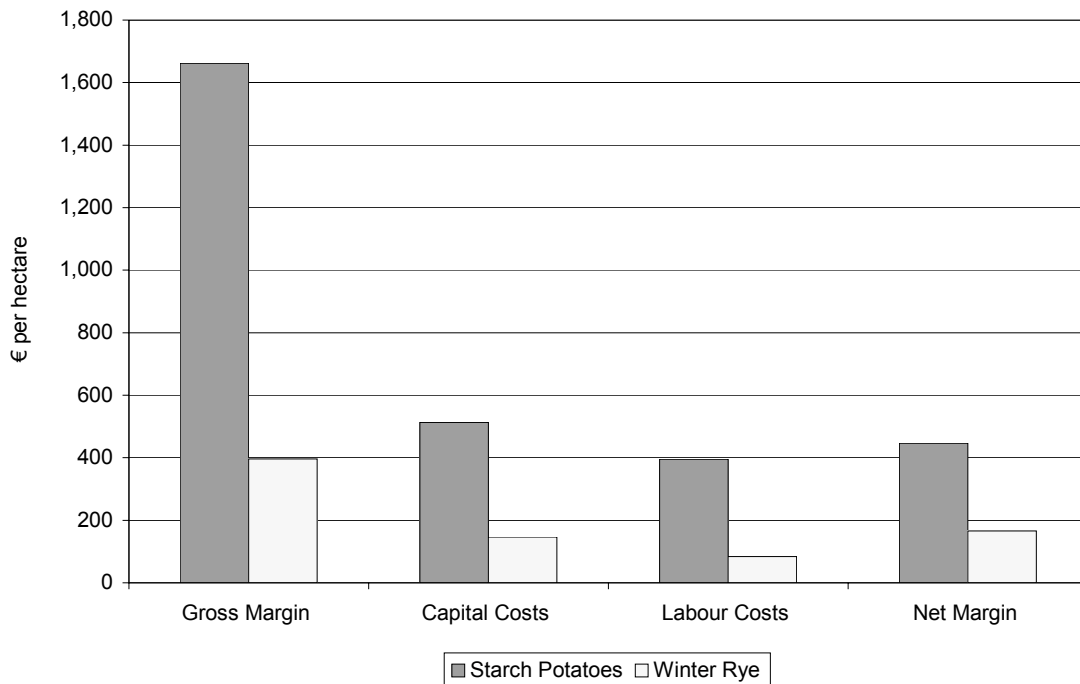
Sources: LMC estimates derived from data provided by FID Landwirtschaftskammer Hannover, Bayerische Landesanstalt für Betriebswirtschaft und Agrarstruktur, Landwirtschaftskammer Weser-Ems.

Diagram 6.1.2: Gross Margin, Labour Costs and Net Margin for Starch Potatoes and Feed Barley in Finland (in €/hectare)
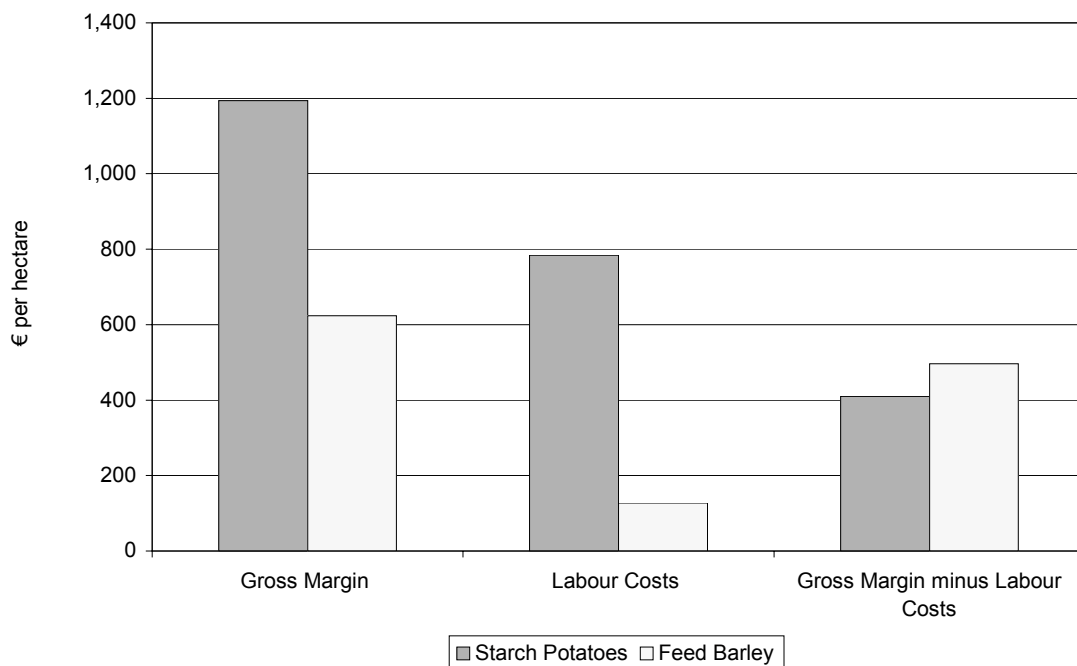
Source: LMC estimates derived from data provided by MKL, Finland.

Diagram 6.1.3: Gross Margin, Costs and Net Margin for Starch Potatoes and Wheat in Somme, France (in €/hectare)
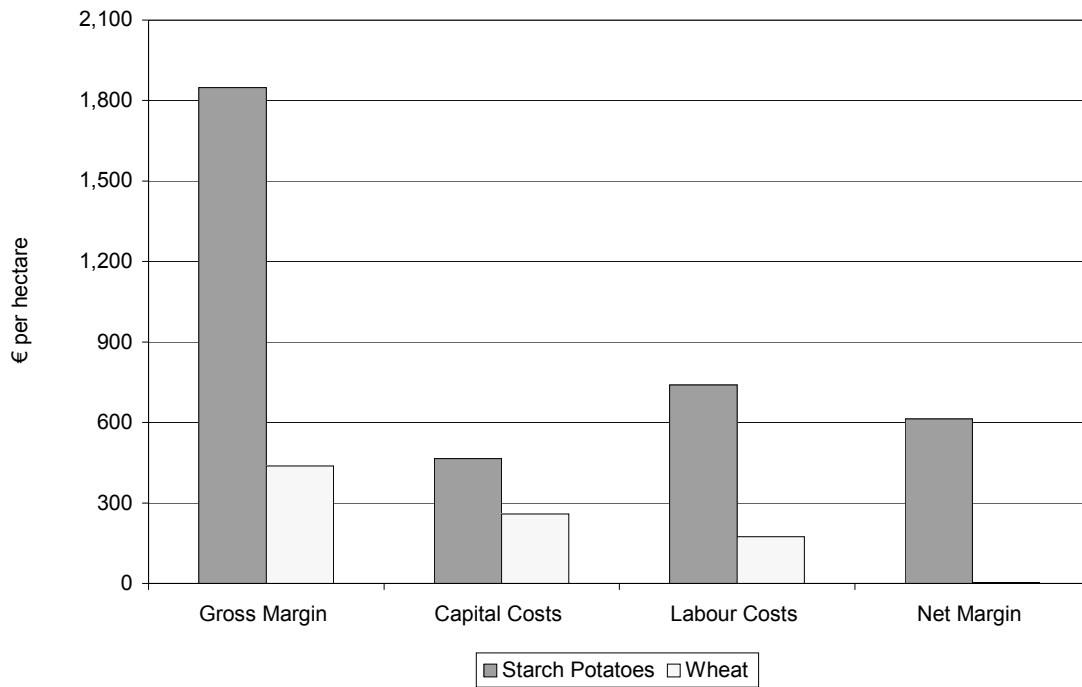
Sources: LMC estimates from data provided by FNPTI, DDA of the Ministry of Agriculture of the Somme Département.

Diagram 6.1.4: Gross Margin per Labour Hour for Starch Potatoes and the Main Alternative Crop (€ per labour hour)
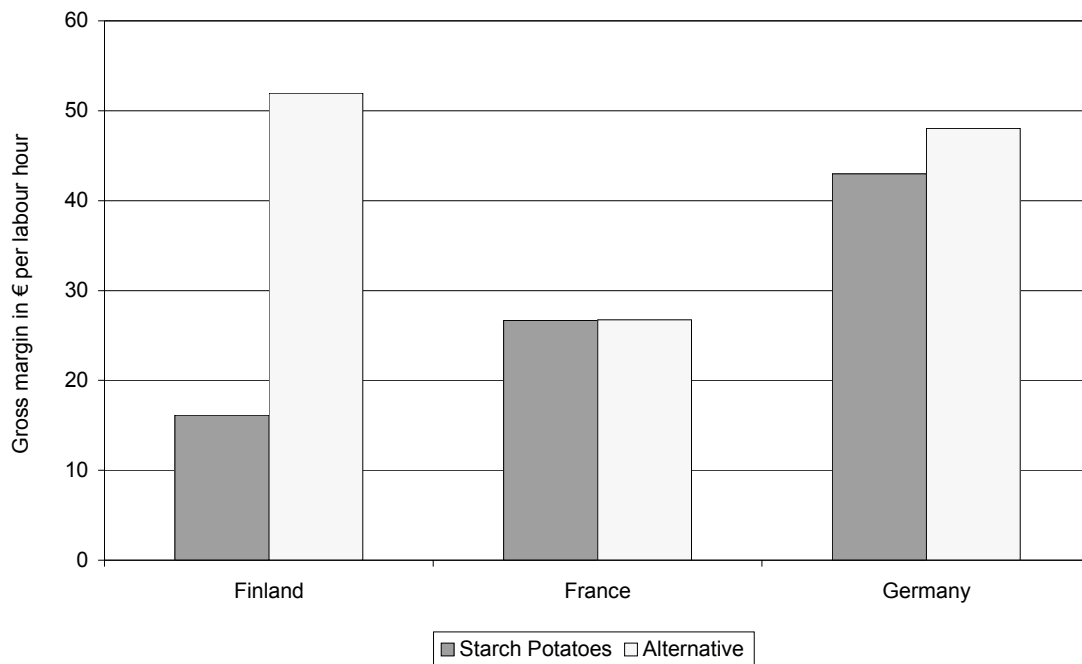
Source: LMC calculations derived from data from FID Landwirtschaftskammer Hannover, Bayerische Landesanstalt für Betriebswirtschaft und Agrarstruktur, Landwirtschaftskammer Weser-Ems (for Germany), MKL (for Finland) and FNPTI, DDA of the Ministry of Agriculture of the Somme Département (for France).

Results from Starch Potato Growing Regions in the Netherlands

Diagram 6.1.5: Revenues per Hectare in the Veenkoloniën and the Northern Sand Region in the Netherlands for Various Crops (in Guilders/hectare)
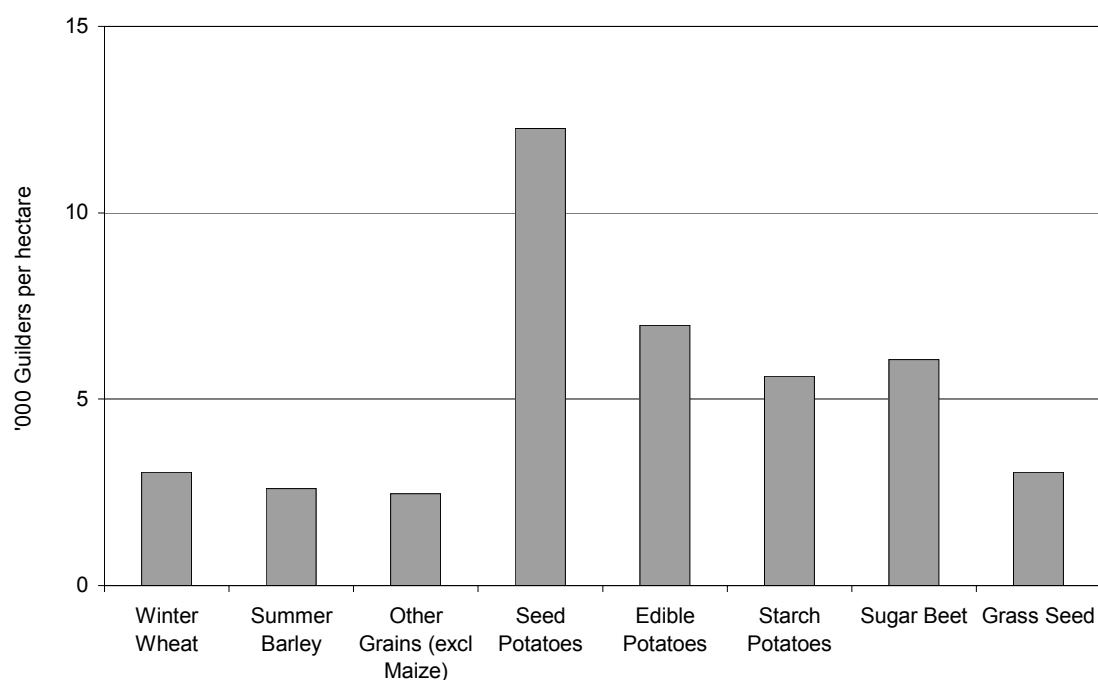
Source: LEI, Netherlands.
Note: The revenues per hectare include possible compensation for hail damage and from 1993/1994 onwards the MacSharry premia. The revenues from by-products are also included.

Diagram 6.1.6: Costs per Hectare in the Veenkoloniën and the Northern Sand Region in the Netherlands for Various Crops (in Guilders/hectare)
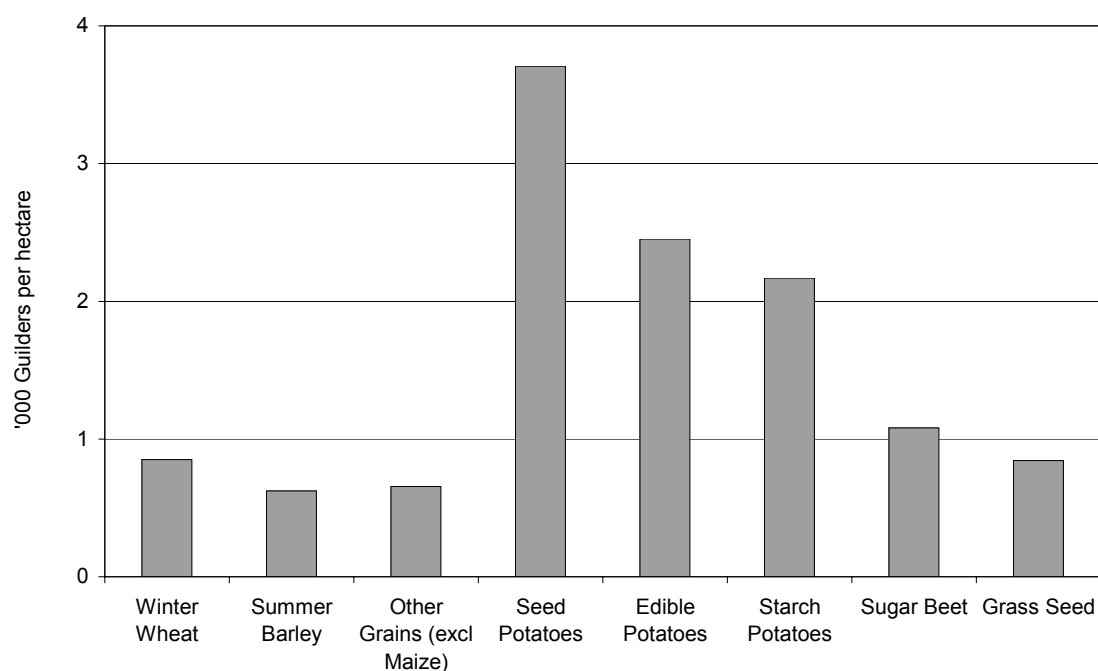
Source: LEI, Netherlands.
Note: Costs per hectare include seeds and plants; fertiliser, fungicides and herbicides; and direct costs.

Diagram 6.1.7: Gross Margins per Hectare in the Veenkoloniën and the Northern Sand Region in the Netherlands for Various Crops (in Guilders/hectare)
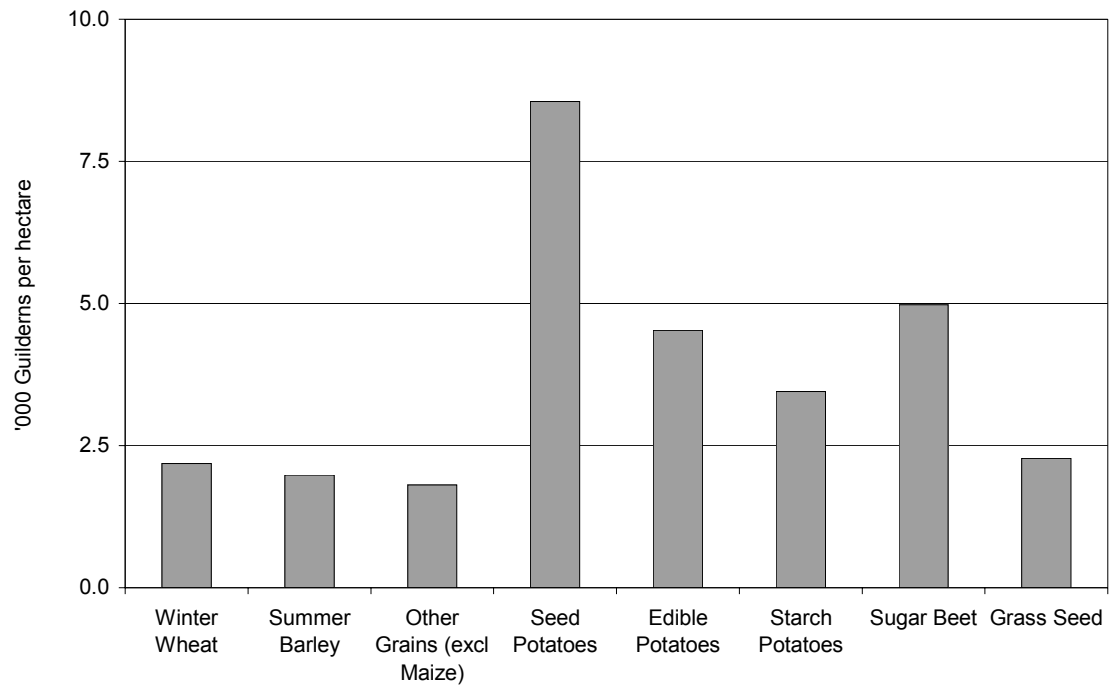
Source: LEI, Netherlands.

Note: Gross margins are the difference between revenues per hectare and costs per hectare. Hired labour is not included in the costs.

Diagram 6.1.8: Costs of Hired Labour per Hectare in the Veenkoloniën and the Northern Sand Region in the Netherlands for Various Crops (in Guilders/hectare)
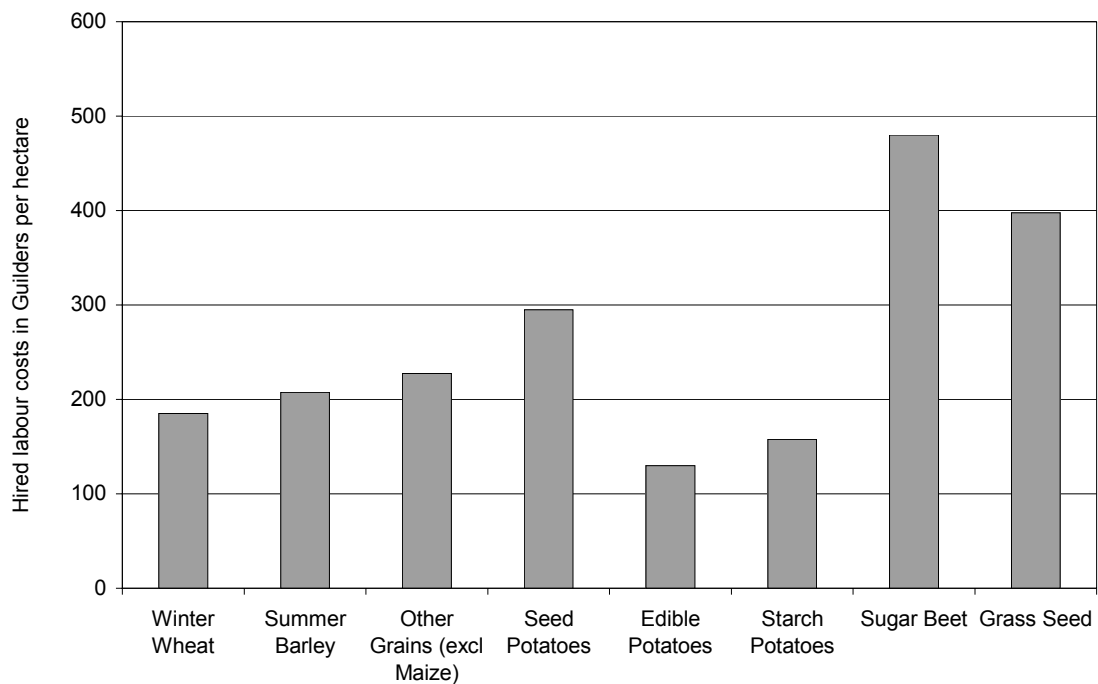
Source: LEI, the Netherlands.

Diagram 6.1.9: Net Margin per Hectare in the Veenkoloniën and the Northern Sand Region in the Netherlands for Various Crops (in Guilders/hectare)
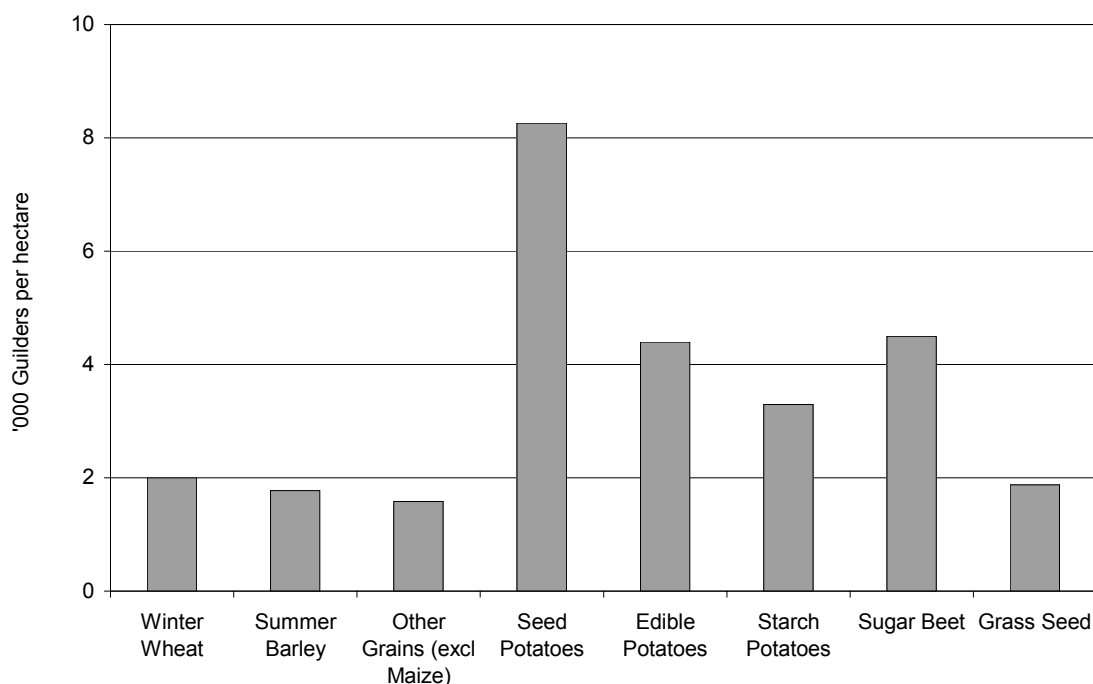
Source: LEI, the Netherlands.

Note: The net margin is the gross profit margin minus the costs of hired labour.

Conclusion: The measures in the starch potato sector were successful in ensuring that starch potato farmers earned a higher gross margin per hectare from their crop than from cereal crops. The only crops that were able to offer growers gross margins that rivalled those from starch potatoes were other types of potato and sugar beet, none of which has very elastic demand, and which therefore would be unable to absorb a sizeable shift of areas out of starch potatoes.

Starch potato farming is relatively intensive in its use of capital and labour. Nevertheless, after subtracting these costs from gross margins to derive net margins (or profits) per hectare, one still finds that, for three of the four countries surveyed (the sole exception was Finland), starch potatoes also offer farmers higher average net margins per hectare than cereal crops, which are the main large scale alternatives to starch potatoes. Therefore, where land is a constraint for an individual farmer, so that the net returns on farming are judged per hectare, the starch regime has ensued that starch potatoes usually generate a higher income than the alternative major crops.

Where labour is the binding constraint for farmers, rather than land, the high labour requirements of starch potatoes weigh against them in the choice of crops, and the net margin per unit of labour is typically below the net margin on the main alternative crops. Consequently, when labour is scarce and difficult to hire in rural areas (which, it should be noted, implies that the region in question is already well developed economically, and the social development role of potato farming is less important), the regime has failed to ensure that, in general, starch potato farmers secure a better return per hour of labour than alternatives.

The evidence from the Netherlands (see Diagram 6.1.10) implies that the starch potato farming provides a considerably more stable source of income than alternative crops.

EVIDENCE FROM THE FULFILMENT OF POTATO STARCH PRODUCTION QUOTAS

Further evidence of farmers' perceptions of the profitability of starch potato farming in relation to other crops is provided by their eagerness to expand production in the period until the decision to impose production quotas, which was undertaken specifically because farmers were unwilling to restrain their output in response to exhortations to do so. The need for limits to production is illustrated by farmers' collective willingness at a national level to fulfil their national potato starch production quotas.

Diagram 5.1.3 demonstrates that, since their introduction in 1995/96, with the exception of the weather affected crops in some Member States in 1998/99, national starch potato quotas have been filled almost completely every year in the member states that have been allotted quotas. Ever since the first year of quotas, in 1995/96, there have never been more than two countries that have achieved less than 90% of their individual quotas.

We conclude that it is clear that farmers are keen to grow starch potatoes and that the income they obtain from growing starch potatoes is high enough to encourage them to aim to meet their quotas in full.

THE VOLATILITY OF INCOMES FOR FARMERS

We now analyse another element of support for the incomes of starch potato farmers, which would be to stabilise the incomes of these farmers. Therefore, we examine the volatility of income for farmers of starch potatoes compared to farmers of other crops (unfortunately, we have only been able to obtain a run of data for the Netherlands, and, even then, we only have a run of data for larger farms).

Diagram 6.1.10 illustrates that, for this group of farmers, starch potatoes generate a very stable income compared to other crops. The much higher coefficients of variation[5] of the incomes of seed and edible potatoes are a result of the role of the market in determining the prices of these potatoes, which is in sharp contrast to the situation with regard to starch potatoes, in which the minimum payment for potatoes and the direct payments to growers are both determined annually by the Council of Ministers.

Conclusion: The starch potato regime has played a significant role in stabilising the incomes of farmers.

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[5] The coefficient of variation of farmers' incomes equals the standard deviation of their incomes divided by the arithmetic mean income.

Diagram 6.1.10: Coefficient of Variation of the Incomes of Various Crops on Larger Farms in the Netherlands, 1997/98-2000/01
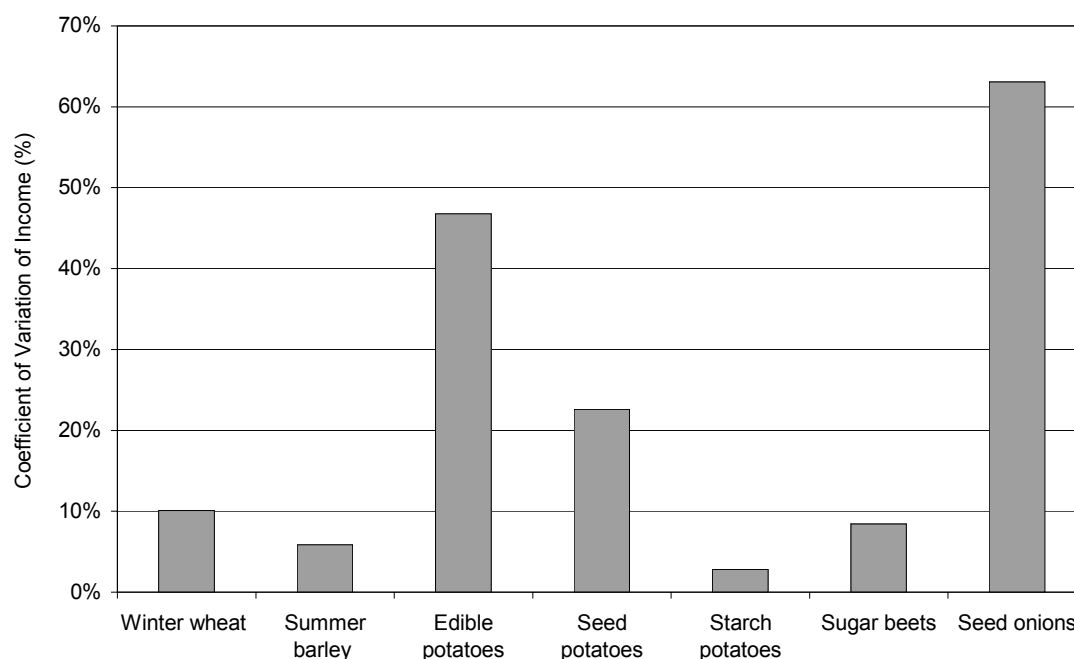
Source: LEI, Netherlands.

THE STRUCTURE OF PRODUCTION

The production structure can be interpreted as referring either to the distribution of farms by size (the convention adopted in the annual Commission document: *Agricultural Situation in the Community*) or to the relationship between farmers and processing plants, notably whether the latter are cooperatives or privately-owned.

Both the various ministries of agriculture in the Member States visited during the course of this study and starch potato growers' representatives in the same countries mentioned that the average size of the farms on which starch potatoes are cultivated is tending to increase and the number of starch potato farmers is tending to decrease over time. Diagram 6.1.11 depicts the data that we were able to obtain as a result of interviews, and confirms this trend.

An important factor behind this pattern, which is similar to that observed in other sectors of Community agriculture, is the high capital costs, some of which are fixed costs, which can no longer be borne easily by small farms. Producers in both the Somme region of France and Mecklenburg Vorpommeren in Germany told us that, in their view, a farm should have a minimum of 30 hectares of starch potatoes to be profitable. The ideal farm size in economic terms was one of around 200 hectares, of which about 50 hectares would be planted to starch potatoes (this is 25% of the farm size, a proportion which is constrained by the agronomic crop rotation requirements).

The rationalisation of starch potato farms is, however, slowed by the production quota system. Individual starch potato farms have contracts with factories, and these are not freely transferable to other farmers without the approval of the processor. Therefore, it takes some time for the process of the expansion of the larger farms to occur.

Diagram 6.1.11: The Average Size of Starch Potato Farms (hectares)
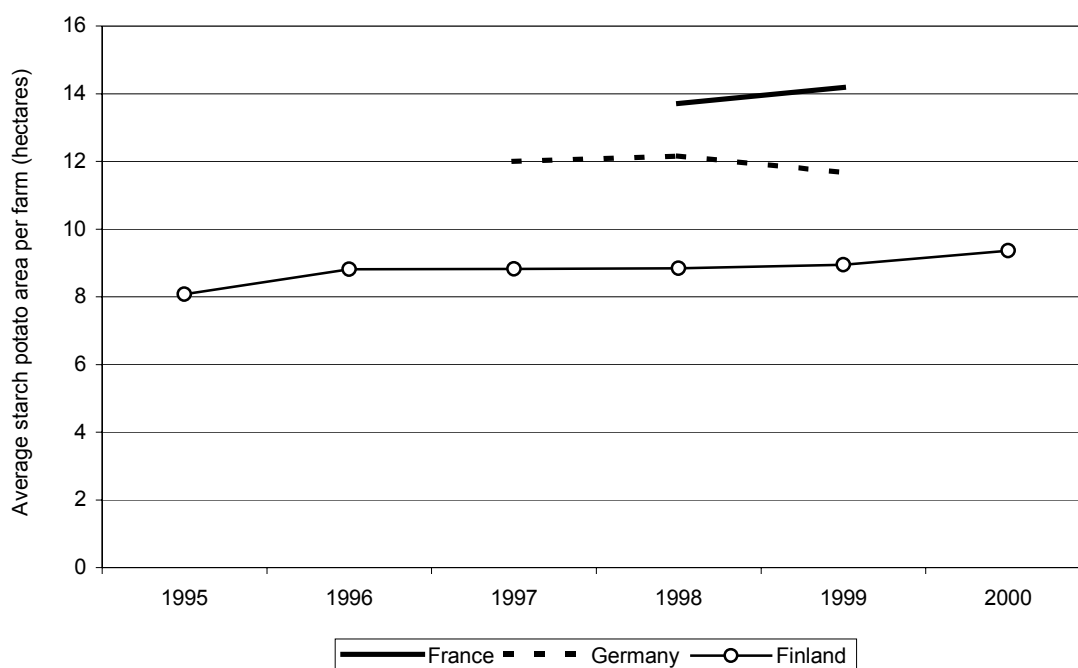
Source: LMC estimates derived from data provided by FDI, Germany; MKL, Finland; FNPTI, France.

The second interpretation of production structures that is relevant to this Question is the nature of the relationship between potato growers and processors. It is noteworthy that close to 60% of Community potato starch factory capacity is owned by co-operatives: Avebe in the Netherlands, Germany and France and Südstärke (Germany) are the biggest ones; indeed, Avebe is the largest potato starch producing company in the Community. KMC (Denmark) and Lyckeby (Sweden) are other significant cooperatively owned potato starch processors.

The strength of cooperatively-owned companies is that farmers are perceived as having a somewhat greater commitment to maintaining their production of starch potatoes in the long run, since they share in the returns from processing as well as from farming. Nevertheless, there is also a strong privately owned (in the sense of not cooperative) sector presence in potato starch production, with Emsland[6] (Germany) and Roquette (France), the largest, and with Raisio (Finland), Agrana (Austria) and Cerestar (in Denmark) other important private sector potato starch producers.

This substantial involvement by cooperatives is not found in the cereal starch sector. In wheat starch processing an estimated 3% of total capacity is cooperatively owned, led by Avebe, while no maize processing capacity is owned in this manner. This is not surprising, in view of the much less close relationships that exist between farmers and cereal starch processors, who may buy their grains from traders, rather than directly from growers. For potato starch, by contrast, direct contracts between growers and processors are central to the success of efficient starch production.

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[6] Many outsiders view Emsland as a pseudo-cooperative, in its ownership structure. If it were included in the definition of cooperatives, the share of potato starch capacity that would be classified as cooperatively-owned would rise to 79%.

The farmers who deliver their starch potatoes to a cooperatively-owned factory are usually expected to own shares in the factory company, in proportion to their delivery rights[7]. The results of Avebe, which are reviewed in the discussion of Question 5.1, imply that the profits on its processing activities have been low in recent years, and therefore the income from shareholdings in the company will not have represented a major source of income for its farmer-owners. Rather, the investment helped to secure the outlet for the starch potatoes that its shareholders produce.

Overall Conclusions Regarding Starch Potato Farming

We may draw together the preceding sections to answer the question posed at the start: did the potato starch regime contribute significantly to supporting the income of farmers concerned? We conclude that the evidence presented implies that the net income per hectare obtained from starch potatoes is high compared to most other alternative crops, and is more stable than that earned on other crops.

This is true, even though the capital, labour and transport costs associated with starch potato farming are higher than for most other crops, both in absolute and in relative terms. Only other (seed, industrial and edible) potatoes and sugar beet provide a higher net margin, but the income earned on these crops is less stable, and the scope for expanding the profitable production of these crops is limited as well. The market for edible potatoes is usually supplied in full, and any sudden increase in production, even a small one, reduces the price significantly. Seed potatoes and potatoes for other (non-starch) industrial uses are grown under contract, and, again, the market cannot absorb a sizeable increase in tonnage. For sugar beet, there exists a production quota system for the final product, as there does for starch potatoes.

The evidence presented here suggests that the starch potato regime has contributed significantly to supporting the income of starch potato farmers, as a group. However, the support is not so extensive that all farmers find the sector profitable regardless of their production conditions. In aggregate, farmers appear to be keen to meet their quotas in full, but within the starch potato farming community, there is a trend, found throughout Community agriculture, towards consolidation of land in larger farms. For the smallest farmers, the fixed specific costs of starch potato farming weigh down on their profitability, and they are the group that is leading the slow exodus from the sector, whose pace is held back by the operations of the production quotas.

The structure of potato starch processing is distinctive in terms of the prominent role of cooperatively owned factory companies. This ownership connection reinforces the stability of starch potato output over time, and permits processors and growers to provide mutual support. Farmers may be prepared to tolerate a period of minimal returns from their investment in processing in return for ensuring the survival of their outlet for starch potatoes, while processors will be able to pass on their profits, in the form of dividend payments, when their margins are good.

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[7] This is not always true; for example, Avebe's potato starch factories are located in three different member states, and not all growers are members of the parent cooperative.

THE IMPACT OF THE STARCH REGIME UPON THE INCOMES OF CEREAL FARMERS

Wheat

In contrast with the position with starch potatoes, the wheat and maize used for grain starch output do not have to be grown in the vicinity of the processing plants. They are not perishable crops, and their transportation is not very costly; furthermore, the quality of the grain is not affected by transportation. Processors in Belgium, Netherlands and France buy most of their wheat from Picardie, because of the high quality of the wheat from that region and because local supplies closer to the coast are keenly sought for export markets. Hence the presence of a starch processor in the locality does not seem to have a direct effect on the income of wheat farmers in the wheat processing regions.

To assess the validity of this view, we asked farmers' representatives and processors in a number of countries about the impact of wheat starch production on milling wheat demand and prices in the areas around the processing plants. There was a strong consensus that, important though it is, the demand for cereals for starch processing does not influence the income of farmers very much. In fact, almost without exception, they had never thought about this issue, and it was only when we asked them about it that they considered the possibility to be significant.

Maize

The maize used by Northern European starch processors is produced some distance to the South of their plants. The view was expressed more than once during interviews that the maize industry in the Loire was partly established because the maize starch processing industry exists in northern France. However, it was said that the quality of this maize is not as good as that from further South, and the demand arising from processing plants relatively close to the Loire region has therefore been considerably reduced in recent years, and the Loire maize now goes mainly for animal feed. Therefore, even if the existence of the starch industry may have helped to create some opportunities for maize farmers, and thus had an indirect impact on their income, it is not clear that this has been of lasting benefit.

At a broader EU level, it should be recalled that a mere 5-6% or so of EU wheat output is processed into starch, and 16% of EU maize is destined for starch processors. Therefore, at a Community-wide level, it is reasonable to support the consensus view that the impact of the starch regime on grain farmers' income is limited. Even without the regime, an assured outlet exists within the Union and in the export markets.

Conclusion

We have concluded that the starch potato regime did contribute significantly to supporting the income of farmers in the starch producing areas; the major role played in starch processing by cooperatively owned factories is an element of this support, providing some further stabilisation to grower/shareholders.

The policy for grain starch, however, does not influence the income of grain farmers significantly in the starch producing areas.

There is some evidence of a gradual change in farm structure towards larger farms, but the system of potato starch production quotas hinders the process of consolidation to some extent.

QUESTION 6.2

Did the grain and potato starch regime contribute significantly to supporting the income of the rural population in the areas concerned?

Objective of the Question: To determine whether, using the interpretation of "supporting incomes" presented in the discussion of the objectives of the Treaty of Rome and the Stresa Principles in Question 6.1, the starch regime supported the incomes of the rural people who live in the areas that produce the base products (starch potatoes and cereals) affected by the starch regime.

Instruments: The measures of the Common Market Organisation for cereals, notably the intervention prices; area payments and direct payments; potato starch production quotas; the starch potato premium; and the provision of production and export refunds.

Criterion: The starch regime will be considered to have contributed significantly to supporting the incomes of the rural population in those regions that grow the base products used in starch production if their average incomes are higher than the levels in neighbouring regions that do not produce such base products for starch processing.

Indicators: The average per capita GDP (as a proxy for average incomes) of the population in the regions growing base products for starch processors will be contrasted with the average per capita GDP of the population in regions (excluding any which are known to have a very strong urban bias) neighbouring those that cultivate base products for starch processors.

THE AVAILABILITY OF SUITABLE DATA FOR ANALYSIS

It will be noted that, whereas the question refers specifically to the rural population in the regions in which the base products are cultivated, the indicators that we have used to answer the question refer to average incomes for the entire population in the relevant regions. This is because, despite many requests made during interviews in the six Member States visited during the study, neither regional nor national government agencies were able to provide data in the form required if the question is to be answered fully as stated.

In a more positive vein, we were sometimes provided with specific local data and analysis that helped to throw some light on the issues raised in this question. We have drawn upon these in answering this question, but should note that the very specific nature of these analyses make it impossible to prepare directly comparable reviews of the situation in more than one region.

Accordingly, we have been obliged to adopt a rather broader, and more general, view than we had hoped to take towards the populations that are surveyed in the course of this section. This is because the only consistent data that we have been able to obtain on regional incomes data in the cross-section of countries and regions covered in this study relate to regional measures of the GDP per capita published by Eurostat.

Because these regions are relatively large, the role of rural areas in the economy of these regions is often only a modest one; and therefore, our results are much more likely to be indicative of the general prosperity of the areas under review than of the incomes of the rural population alone. Ideally one would have obtained local data for rural regions alone, down to the level of the individual communities within which starch potatoes and cereals for starch processing are grown, and would then compare them with the data for neighbouring communities which do not grow the same crops. Sadly,

these data are not available. In the analysis presented below, we used the latest data published in the Eurostat publication, "Regions: Statistical Yearbook". Because we were obliged to rely upon this publication for the analysis, we were restricted in our choice of variables for investigation; for example, GDP per capita was the only measure available for the examination of average incomes in the different regions. Similar constraints affected the choice of variables used in answering other Questions in this chapter.

FOCUSING UPON STARCH POTATO PRODUCTION REGIONS

For the production of potato starch, it is possible to determine exactly where the raw material for the processing plants comes from. Therefore, an analysis of the impact of the starch regime on the income of the population in the area near the processing plant should be possible. By contrast, it is impossible to tell from which areas the raw materials for wheat and maize starch processing plants originate. Since the transport costs of wheat and maize are lower per ton of starch than for potatoes, by virtue of the much higher starch content of the cereals, wheat and maize are often supplied from regions that are far removed from the processing plants.

The important Dutch and Belgian cereal starch processing industry, for example, buys much of its raw material needs from other countries. This makes the specific impact of the processing of cereals into starch hard to distinguish, since most farmers who supply starch factories sell their crops to intermediaries who lessen the direct feedback to their incomes from its use in starch production. Only about 16% of Community maize production is used in the starch processing industry and for wheat the share is 5-6%. Hence, an analysis of the impact of the cereal starch regime on the income of the rural population in the areas in which the crop is grown is virtually impossible, since the effects are both likely to be very small and very diffuse.

Accordingly, we have focused our analysis solely on those regions that are starch potato growing regions. Cereal growing regions are not included in the analysis, since it is considered impossible to distinguish in a clear-cut manner those regions that supply starch factories from those that do not.

THE IMPACT OF THE STARCH POTATO REGIME ON THE INCOME OF THE RURAL POPULATION IN THE REGIONS CONCERNED

The approach that we adopted to the analysis of the impact of the starch potato regime on the income of the rural population in the relevant region is explained in the Appendix to this Question. The key aspect of the analysis is the application of a t test of the differences between population sample means, when the sample variance is unknown. This is used to determine whether there is a statistically significant difference between the average per capita GDP in regions in which starch potatoes are grown and GDP per capita in two, or occasionally one, neighbouring regions. These regions have been selected to be within the same country (and in the case of the German comparisons, the contrasting regions were chosen so that former East German regions are compared for other former East German areas, and West German areas are compared with other West German regions) and so as to avoid including heavily urbanised regions for the comparison. When these criteria are hard to satisfy, the comparison of average per capita GDP levels is made with only one neighbouring region.

The Eurostat report only provides information for 1999, and expresses GDP per capita as a percentage of the Community average. Unfortunately, it does not provide time series data, which would permit us to compare the relative variations in incomes in the

areas that we are studying. Instead, we are only able to make a snapshot assessment of whether the regions which host starch potato production are significantly different in their per capita GDP levels from otherwise similar neighbouring regions, that do not have significant areas planted to starch potatoes.

Table 6.2.1: The GDP per Capita in Starch Potato Growing Regions and Neighbouring Regions in Five European Starch Potato Producing Countries (EU average = 100)

	Starch Potato Regions		Neighbouring Regions		Difference
Germany	Oberbayeren	164.7	Niederbayeren	101.4	63.3
			Mittelfranken	121.3	43.4
	Weser-Ems	102.2	Münster	96.5	5.7
			Detmold	102.1	0.1
	Lüneburg	81.1	Schleswig-Holstein	102.1	-21.0
			Braunschweig	97.6	-16.5
	Mecklenburg-Vorpommern	66.0	Magdeburg	61.5	4.5
			Dessau	60.1	5.9
	Brandenburg	74.5	Magdeburg	61.5	13.0
			Dessau	60.1	14.4
France	Picardie	80.9	Haute-Normandie	101.2	-20.3
			Nord-Pas-de Calais	81.7	-0.8
	Champagne-Ardennes	90.1	Lorraine	84.9	5.2
			Bourgogne	86.5	3.6
The Netherlands	Groningen	136.3	Friesland	91.5	44.8
			Overijsel	98.9	37.4
	Drente	92.0	Friesland	91.5	0.5
			Overijsel	98.9	-6.9
Austria	Niederöstenreich	96.6	Burgenland	72.2	24.4
			Oberöstenreich	102.6	-6.0
Finland	Väli-Suomi	83.9	Itä-Suomi	75.1	8.8
			Pohjois-Suomi	86.0	-2.1
	Etelä-Suomi	93.5	Itä-Suomi	75.1	18.4
	Average of Sample	**96.8**	**Average of Sample**	**87.4**	**9.4**
	t Value	*1.3*	*Significant?*	*No*	

Source: LMC estimates derived from Eurostat, Regions: Statistical Yearbook.

The left hand side of Table 6.2.1 lists the potato starch growing regions in the Member States that were visited during the Evaluation, with the neighbouring regions used for comparative purposes listed on the right. The results reveal the following:

Conclusion: The starch potato regions have a higher average GDP per capita than the neighbouring regions. The difference is slightly less than 10%. However, the difference is not statistically significant. The t value is only 1.3, when the 95% confidence level that is commonly taken to establish significance would require a t value of 2.0. If the difference had been significant at the 95% confidence level, the difference between the sample averages would have had to be 15.2, rather than the 9.4 shown in the table.

The same Eurostat Yearbook provides comparable data for many other social indicators, and these are used in preparing the answers to Question 6.3. It is interesting to discover from the Yearbook that the data on the share of agricultural employment in the regions listed above reveal that the starch potato growing areas

have an average agricultural share of 6.2%, as against only 4.8% for the neighbouring regions. However, once again the differences are not statistically significant, which means that it is not possible to conclude that the starch potato regions have a more strongly rural nature than the neighbouring regions.

The failure to derive any unambiguous link between the presence of starch potato cultivation and average incomes is not surprising. The regions that are available for analysis are so large that starch potatoes form just a very small fraction of the total economy. As just mentioned, agriculture in aggregate represents little over 6%, on average, of total employment in the starch potato regions surveyed, but in the most important single such region, Groningen in the Netherlands, the fraction is only 2.4%.

Outside the agricultural activities, other employment is generated in processing and other related activities. Avebe employs more than 1,800 employees in the province of Groningen, and the same company has estimated that a total of 3,850 jobs are related to the presence of Avebe in the provinces of Groningen and neighbouring Drente. However, when put into perspective against the regional government estimates that the total labour force of Groningen is 334,000 and Drente 277,000, it is evident that the existence of the starch potato regime has not played a major role in generating employment in the region.

The same conclusion can be drawn for France, where we were informed during interviews with farmers' organisations and local processors there are about 2,000 starch potato farmers and 600 people directly employed in potato starch processing plants. The regional government data reveal that the labour force in the two main starch potato areas, Picardie and Champagne-Ardennes, is 1,047,000 (of which 4.0% work in agriculture) and 727,000 (of which 8.6% works in agriculture) respectively. Even when all the people employed in related services, such as transport and machinery maintenance are included, there can be little doubt that the current contribution of starch potato processing to the average income levels in the areas in which it is located is very small. It would require implausibly high local regional employment multipliers for such a small sector to have a perceptible impact upon the average income in the wider regional economy.

Conclusion: Data collection on a more local level is required to be able to draw sound conclusions about whether or not the starch potato regime contributed significantly to supporting the income of the rural population in the areas concerned. From the data we have analysed, which relates to fairly large national regions, we cannot draw any firm conclusion whether the presence of a starch potato industry contributed significantly to supporting the income of the rural population.

Since starch processing absorbs only a limited proportion of the total output of maize and wheat in the Community (16% and 5% respectively) and it is impossible to define exactly from which areas European wheat and maize starch processors obtain their raw materials, it is very difficult to relate the activities of the starch industry to specific income benefits in well defined rural areas. Therefore, we cannot draw any conclusion whether the measures related to cereal starch production influence the incomes of the rural populations concerned in the production of the grain used by the starch sector.

QUESTION 6.3

To what extent did the Community policy for the grain and potato starch sector contribute to the economic and social development of the rural areas concerned?

Objective of the Question: To assess the broad economic and social development impact of the measures of starch sector policy in the rural communities that produce the base products affected by these measures.

Instruments: The measures of the Common Market Organisation for cereals, notably the intervention prices; area payments and direct payments; potato starch production quotas; the starch potato premium; and the provision of production and export refunds.

Criterion: The measures contribute significantly to ensuring that the Treaty of Rome objectives are met in terms of the attainment of a fair standard of living and an acceptable level of social development in the regions that supply base products to starch processors. The average levels of key economic and social indicators for the regions supplying base products for starch manufacture are at least as high as those in neighbouring regions that do not produce such products.

Indicators: The indicators that are used to assess the levels of economic and social development in the regions affected by Community policy for the starch sector are limited by the comparative data available from national or Commission sources. The comments made in the discussion of Question 6.2 are equally valid in this context. We noted that we have been obliged to adopt a rather broader, and more general, view than we had hoped to take towards the populations that are surveyed in the course of this section. This is because the only consistent data that we have been able to obtain on regional data in the cross-section of countries and regions covered in this study relate to data published in the Eurostat publication, "Regions: Statistical Yearbook".

Unfortunately, because these regions are relatively large, the rural areas play only a small role in the economy of these regions; therefore, our results are mainly indicative of the general situation of the areas under review, and do not refer specifically to smaller communities within which starch potatoes and cereals for starch processing are grown.

We would also restate the comments made in the consideration of Question 6.2 about the difficulties of identifying the impact of starch processing upon cereal farmers in particular regions; these difficulties contrast with the relative ease of determining exactly where the raw materials for potato starch factories come from. Accordingly, we focus our analysis solely on regions that cultivate starch potatoes.

The indicators that are presented on a comparative regional basis in the "Regions: Statistical Yearbook" tend to relate primarily to labour statistics, such as labour force participation, unemployment levels and migration rates. These have therefore been used as the indicators of the levels of economic and social development in the analysis that follows.

In addition, measures of vehicle ownership and of the share of research and development expenditures in relation to regional GDP have been studied as indicators of the relative wealth and standard of living of the regional population (in the former case) and of the progressiveness of the region and its investment in knowledge (in the latter case.).

THE IMPACT OF THE STARCH POTATO REGIME ON THE ECONOMIC AND SOCIAL DEVELOPMENT OF THE RURAL AREAS CONCERNED

In order to analyse whether the starch regime contributed to the economic and social development of the starch regions, we have complied a number of economic and social development indicators and compare them with the data for neighbouring regions. Using the statistical methodology to compare the means of two populations, which has been introduced in the Appendix to Question 6.2, we assess whether there is a statistically significant difference between the mean values of the various indicators in starch potato growing regions and their neighbouring regions.

Indicators for Economic and Social Development

The indicators that we have employed in the analysis of social and economic development are summarised below, together with a brief outline of the reasons why they were felt to be valid for the purposes of the comparison.

The *Unemployment Rate* reflects the number of unemployed people as a proportion of those participating in the labour force. Since unemployment benefits are below average full time wages, regions with high unemployment rates are likely to be more deprived and have lower standards of living than those with low unemployment rates.

Labour Force Participation Rate (referred to as the Activity Rate in the statistics) measures the degree in which the population aged between 18 and 65 is actively participating in the labour market, i.e., has a job or is looking for a job. A low participation rate might indicate that there is considerable hidden unemployment, with potential workers deciding that the prospects of obtaining a suitable job are so low that they decide not to search actively for employment. A low participation rate is therefore expected to be associated with a relatively low level of economic development.

The *Female Unemployment Rate* is the unemployment rate amongst economically active women. A high female unemployment rate indicates that the employment opportunities for women are poor, and signifies low levels of both economic and social development in the affected region.

The *Youth Unemployment Rate* is the unemployment rate amongst people aged less than 25. A high youth unemployment rate jeopardises seriously the economic development of the region as it hinders the creation of a trained labour force and hence the prospects for economic growth and long run employment growth in the region.

Net Inward Migration is the difference per 1,000 inhabitants between in-and out-migration. Regions with a high net inward migration rate tend to have a higher level of economic and social development than regions where the population is decreasing as a result of outward migration. Generally speaking, a high net inward migration flow reflects the attractions of a region in terms of jobs and standard of living.

Part-Time Employment as a Percentage of Total Employment indicates the share of the population that voluntarily or involuntarily works less then full-time. On the positive side, part-time employment reduces the unemployment rate; it also enables workers to increase the amount of leisure time that they enjoy. This is, however, probably most relevant to comparatively prosperous regions. In poorer parts of the Community, it is probably true to say that part-time employment is both lower paid and less skilled, and contributes less to economic and social development than the creation of a job in full-time employment. Therefore, a high level of part-time employment will be interpreted as a sign of a poor regional performance in economic and social development.

The *Dependency Ratio* is the ratio of the economically inactive population to the economically active population. It assesses the care-taking burden, imposed by the non-active population on its active counterparts. A high dependency ratio indicates that a large proportion of the region's income is spent on the elderly or young, and is likely to imply that the region is socially and economically less highly developed than nearby regions with lower dependency ratios. Hence, in regions with a high dependency ratio, not only is a lower percentage of the region's population economically active, which decreases the economic development potential of the region, but also a lower percentage of the region's private income is available to be spent on measures that contribute to social and economic development.

The expenditure on *Research and Development (R&D) as a Percentage of the GDP* indicates how much of the income of a region is spent on creative activities in a systematic manner with the aim of enhancing the overall knowledge base and to use this knowledge in new applications. R&D expenditure includes all resources employed in carrying out R&D, such as labour costs, operational costs and capital expenditure. R&D expenditure increases the economic development of the region since it provides regions with innovative technology that enhances their economic performance.

Private Vehicle Ownership (expressed as number of cars per 1,000 inhabitants) can be seen as an indicator of the relative prosperity of a region. Regions with higher average incomes can be expected to have higher ownership rates. Generally, high levels of private vehicle ownership and social and economic development are positively correlated, although this effect is moderated in sparsely populated regions, where public transport is poor, and a car may be needed for work and household activities.

Using the t-test analysis of differences in the means of two populations (as explained in the Appendix to Question 6.2), we have derived Table 6.3.1, the individual elements of which are detailed in the tables in the Appendix to the present Question. From this table we conclude that for none of the nine indicators listed is there a statistically significant difference between the mean values of the social and economic indicators in starch potato growing regions and neighbouring regions.

Table 6.3.1: Statistical Analysis of Economic and Social Development Data in 1999

	Average of Sample in Starch Potato Areas	Average of Sample in Neighbouring Areas	T-Value	Significant at 95% Confidence Level?
Unemployment Rate	10.5	11.5	-0.3	No
Labour Force Participation Rate	59.0	58.1	0.8	No
Female Participation Rate	11.1	11.6	-0.2	No
Youth Unemployment Rate	9.6	10.5	-0.4	No
Net Migration	2.0	-0.4	1.6	No
Part-Time Employment as a % of Total Employment	0.2	0.3	-1.0	No
Dependency Ratio	12.0	12.6	-0.2	No
Research and Development as a % of GDP	1.3	1.3	0.0	No
Private Vehicle Ownership	485.0	478.5	0.1	No

Source: LMC estimates derived from Eurostat, Regions: Statistical Yearbook.

CONCLUSIONS

From the regional data that we were able to collect and analyse, we are unable to draw any conclusion whether the starch potato regime contributed significantly to the economic and social development in the starch potato areas. This conclusion hold true regardless of which of the nine variables listed in Table 6.3.1 one uses as indicators of such development.

One cannot determine with any precision from which regions European wheat and maize starch processors obtain their raw materials. Therefore, we cannot draw any conclusion about the influence of the measures related to cereal starch production upon the economic and social development of the areas from which their base products are supplied.

QUESTION 6.4

Did the Community policy for the sector of grain and potato starch contribute at a reasonable cost to the development of the rural areas concerned?

Objective of the Question: To examine whether the starch regime is a cost-effective means of supporting the rural areas from which base products are supplied to Community starch producers.

Instrument: The measures of the Common Market Organisation for cereals, notably the intervention prices; area payments and direct payments; potato starch production quotas; the starch potato premium; and the provision of production and export refunds.

Criteria: Employment is generated in the relevant rural areas at a low opportunity cost (in relation to the alternatives that are open to the farmers who supply base products to the starch sector) by the operations of Community starch policy. Incomes are also created at a low opportunity cost through the operations of the policy; and so is the social and economic development of the rural areas concerned.

Indicators: The key indicators are the opportunity costs to the Community as whole, and to the Commission in particular, of implementing policy in the sector, in terms of a comparison of the costs of the policy in the starch sector in relation to the costs imposed by the alternative uses of the resources that would be released if the policy on starch did not exist.

Three main indicators will be used to evaluate the costs of the policy: budgetary; social; and the deadweight associated with the measures.

The main budgetary costs that arise in connection with the starch potato regime are outlays on production and export refunds; expenditures on the potato starch premium; the minimum price of starch potatoes; and the direct payments to starch potato farmers. The budgetary costs associated with cereal starch production are principally the production and export refunds; and the area payments to farmers.

The opportunity costs of the policies towards the starch sector may be determined directly by comparing the budgetary costs associated with current measures with the costs that would arise if the land, which is currently used to cultivate potatoes and cereals for processing into starch, were switched into alternative arable crops. A straightforward way in which to make this comparison is to consider what would happen if areas currently under starch potatoes or producing cereals for starch processing were used instead for the production of cereals for exportation in other forms, such as in non-Annex I products or as base products, since, at the margin, any increase in cereal output will be exported.

The second indicator is the social costs related to the employment, income and social development effects of the policy (discussed vis-à-vis Questions 6.2 and 6.3), to the extent that they can be identified in regional terms. In addition, the opportunity cost of the employment generated by cultivating one hectare of base products for starch production in relation to alternative arable crops will be used as an indicator.

The third indicator is the deadweight associated with policy in the starch sector. This is linked to the discussion of Questions 4.4, 5.2 and 5.3. The costs of the current policy will be compared with the minimum outlays that would be needed to achieve the same outcomes.

OPPORTUNITY COSTS IN BUDGETARY TERMS

The best starting point in assessing the budgetary costs and savings associated with the current set of policy measures is to compare the costs to the Commission of producing one ton of starch within the framework of current measures with the costs of the policies which would apply to the same base products in the absence of the starch measures.

The Appendix to this Question presents the detailed analysis of the budgetary costs and savings associated with the production of starch potatoes in relation to the alternative of the same farmer increasing the areas under cereals or oilseeds. The assumption behind this view is that, if starch potato areas are reduced, the land is likely to be planted instead to one of the major arable crops. High value horticultural crops or non-starch (i.e., edible or seed) potatoes are crops whose demand is sufficiently price-inelastic to lead one to expect that a large scale switch of areas into these products would caused their prices to fall sharply. Among the main arable crops planted to a large area, sugar beets are not a realistic attractive alternative for starch potato farmers as long as sugar production quotas remain in place. Thus, the main alternative for the 200,000 hectares or so planted to starch potatoes is the major cereal and oilseed crops, whose markets would be able to absorb a significant increase in Community areas without triggering a price collapse.

In the analysis of the opportunity cost of the current policy measures in budgetary terms, we compare the effect of two alternative assumptions:

Using Export Refunds as the Reference

First, we take export refunds as the reference, since all the three main starches are exported at the margin, and thus any shift in the composition of production will be reflected in exports. In the determination of the export refunds, potato starch output is seen as the direct equivalent of 1.6 tons of maize (using the technical coefficient applied to maize starch) or 2.0 tons of wheat (using its technical coefficient).

Under this assumption, the opportunity cost of the potato starch regime in budgetary terms could therefore be seen as the net budgetary trade-off between reducing potato starch output by one ton and, at the same time, increasing the export volume of maize derivatives by the equivalent of 1.6 tons of maize or wheat derivatives by the equivalent of 2.0 tons of wheat. This particular trade-off ensures that the calculations are strictly neutral between the changes in starch equivalents in potato and cereal output; with zero net change in the overall starch tonnages. Thus, the assumption is equivalent to assuming that, with a marginal increase in cereal output as a result of a reduction in potato output, there will be a net increase in the Community's exportable surplus of cereals[8], and this will be exported in a semi-processed or processed form (as Annex I or non-Annex 1 products), which have similar budgetary implications to the exportation of cereal starches.

Table 6.4.1 (derived from Table 5.2.2 in the discussion of Question 5.2) presents the opportunity cost to the Commission budget of producing more starch potatoes and exporting one more ton of starch from starch potatoes, as opposed to producing more cereals and exporting one more ton of cereal starch. The calculations in the table take

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[8] In the case of maize, the Community does not always have a surplus of output over demand, but adding the imports required under the Blair House Accord with the US usually transforms the EU into a net exporter.

account of the area payments on cereals, the direct payments on starch potatoes, the potato starch premium and the export refunds. The net budgetary cost per ton of potato starch vis-à-vis maize starch was equal to the potato starch premium of €22.25 per ton until 1999/2000; but has risen since then as a result of the end of the direct link between the calculation of starch potato direct payments per ton of starch and the area payments for cereals (also per ton of starch). The net budgetary cost difference of potato starch vis-à-vis wheat starch has fluctuated, both because of the different transformation coefficients applied to potato and wheat starch and because the export refund for wheat has differed from that for potato and maize starches since 1997. However, the annual net budgetary costs associated with producing and exporting one ton of potato starch have always been higher than those for wheat starch.

Table 6.4.1: The Opportunity Cost to the EC Budget of Producing and Exporting One Ton of Potato Starch versus Producing and Exporting One Ton of Cereal Starch (€/ton)

	1992/93	1993/94	1994/95	1995/96	1996/97	1997/98	1998/99	1999/2000	2000/01
Net additional budgetary cost per ton of potato starch									
(1) Over maize starch	22.25	22.25	22.25	22.25	22.25	22.25	22.25	22.25	27.12
(2) Over wheat starch	22.25	10.17	5.34	0.51	15.00	28.27	19.43	12.47	57.94

Source: Derived from Table 5.2.2, based on LMC estimates and European Commission (DG Agriculture, Unit C2)

Note: Cereal farmers are assumed to achieve the reference yields used to calculate area payments per hectare. These reference yields are nearly always the same for wheat and maize.

No allowance has been made for the effects of set-aside obligations that apply to cereals, but not to potatoes.

The comparison with maize starch is the easier to analyse, since potato and maize starch have the same technical coefficient. Table 6.4.1 reveals that, when the opportunity cost of one extra ton of potato starch output is interpreted as being equivalent to the displacement of one ton of maize starch output, this cost was simply equivalent to the value of the potato starch premium until 2000/01. Since then, the divergence created between the formula for the calculation of the starch potato direct payment and the level of the cereal area payment has added an extra element to the net additional budgetary cost listed in the first row of the table. This extra element was just under €5 per ton of starch in 2000/01, and will be twice as large in 2001/02.

The opportunity cost to the Commission's budget of increasing cereal starch output by one ton in relation to the alternative of exporting one more ton of cereals incorporated into exports of base products or non-Annex I products is negligible. Since no aids are provided to cereal starch processors, the opportunity cost trade-off is that between the export refund on one ton of cereals in starch products and the export refund on cereals in another form, which should be very similar indeed.

Taking the Crop Area as the Point of Reference

The first set of assumptions, outlined above, regarding the opportunity cost in budgetary terms of the potato starch regime is based upon the view that the opportunity cost of one ton of potato starch output is to be viewed in terms of the direct substitution of one ton of potato starch by one ton of cereal starch. The second set of assumptions that we consider now is, we believe, more correct from the point of view of the logic of opportunity cost calculations. It considers the issue from the perspective of the individual farmer. Specifically, it is based upon a quantification of the budgetary cost of inducing a farmer to switch one hectare of land from the cultivation of starch

potatoes to cereals or oilseeds, the main alternative crops. This is because the farmer does not usually have the choice to decide whether to produce one ton of starch content in cereals rather than potatoes; instead, the choice is about which crops to plant on particular plots of land.

The details of the calculations of opportunity costs in this sense are presented in the discussion of Question 5.2 and Appendix 2 to that Question. Table 5.2.3 and Diagram 5.2.4 reveal the net effect of estimating the budgetary costs of area payments, applying the reference yields for cereals and oilseeds in each starch potato growing region, and comparing their cost per hectare with the implied direct payments made, via the starch potato pricing formula, on the production of starch potatoes in the same regions.

Diagram 5.2.4 plots the difference between the average per hectare direct payments made for starch potato cultivation and the higher of the average per hectare area payments paid on cereals and oilseeds in each Member State analysed in detail in this Evaluation. In other words, if the average payments per hectare of oilseeds are higher than those on cereals (as tends to be the case until they are unified in the 2002/03 crop year), the figures in the table represent the difference between the average payments per hectare on starch potatoes and oilseeds. In 2002/03, the cereal and oilseed area payments are to be unified.

The figures portrayed in the diagram imply that the direct payments represent a substantial additional opportunity cost associated with the potato starch measures, over and above those included in Table 6.4.1. The reason is that average yields of starch per hectare of starch potatoes are well above the average yields of starch from a hectare of maize or wheat.

It should be noted that the results illustrated in Table 5.2.3 and Diagram 5.2.4 are *conservative* estimates, since oilseeds are typically taken for the purposes of the calculation as the alternative crop to starch potatoes, since they generate a *higher* budgetary cost through area payments than cereals, and thus imply a *lower* opportunity cost to the Commission of the direct payments made to starch potato farmers. Yet, in reality, cereals are much more likely to replace potatoes if the potato output is reduced.

If cereals, not oilseeds, are the true alternative crop, should starch potato output be reduced, then the average difference in area/direct payments between starch potatoes and cereals seems to be near €400 per hectare in the Community as a whole. Therefore, applying an average EU starch potato yield per hectare, which we believe to be in the region of 40 tons[9] and the normal assumed starch recovery rate of 20% of the potato output (making the starch yield 8 tons per hectare), then the net budgetary cost to the Commission as a result of the different basis to area/direct payments on cereals and potatoes may be calculated to be €400/8 = €50 per ton of starch.

Conclusion: We believe that this second approach is more appropriate when assessing the importance of the direct or area payment elements in the opportunity costs of the starch potato policy to the Commission budget. This is because, when farmers reduce starch potato areas, the switch to alternative crops is a one-for-one change in land use. In other words, the appropriate opportunity cost measure is one that is land-based, with one hectare replacing another. It is not starch-based, in the sense of one ton of starch replacing another (as discussed in relation to Table 6.4.1 above).

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[9] It should be recalled that among the more remarkable absences of data about the starch potato sector in the Community is the absence of comprehensive information on planted areas and yields.

Accordingly, the full opportunity cost per ton of potato starch vis-à-vis maize starch under this interpretation has two components: €22.25 as a result of the potato starch premium, and close to €50 as a result of the higher direct/area payments made to starch potato farmers than to cereal farmers, making the final figure more than €70 per ton of starch.

OPPORTUNITY COSTS IN SOCIAL AND ECONOMIC TERMS

The answers to Questions 6.2 and 6.3 provide the most rigorous means available to us for assessing the social and economic opportunity costs of current measures applied in the starch sector. It will be recalled that it was considered to be impossible to draw any conclusions regarding the economic, social or development benefits for rural areas that flowed from the existence of a cereal starch processing industry. This was because cereal farmers supplying starch processors are often geographically far removed from the processing plants, and the link between the prices paid for their crops and the demand for starch processing is a weak one.

In the case of potato starch, we sought to establish whether there is a statistically significant difference (at a 95% confidence level) between many alternative measures of economic and social development in starch potato growing regions and neighbouring regions that do not grow starch potatoes. In every single respect in which we approached this analysis, there was no statistically significant difference between the relevant measures of development for the two sets of regions. Hence, we were unable to draw any conclusions whether the existence of a starch potato sector helped or hindered economic, social and rural development in a particular region.

Employment Generation

The opportunity cost of creating one job in the cereal starch sector from the point of view of the Community budget is low. Since almost no cereals are grown specifically to supply the starch sector (waxy maize is the most important exception, and enjoys no special treatment under the CMO for cereals), the opportunity cost of the cereal starch regime in terms of agriculture is minimal. Areas planted to cereals (other than waxy maize) for use in starch factories are likely to have been planted to cereals in any case.

The employment creation in cereal starch processing is also unlikely to have had a noticeable budgetary cost to the Commission. At the margin, such starches are exported, but the alternative, if they had not been exported in a processed form, would have been to export the same cereals in another processed form or without any processing at all, both of which involve the payment of export refunds.

In the case of starch potato, as we have seen in the preceding section, there are specific budgetary costs associated with processing (the potato starch premium) and agriculture (the additional payments per hectare). This may be set against the direct benefits, in the form of employment creation, from the existence of a potato starch industry in rural areas. We now consider the scale of these employment benefits.

The assumption that we make in our analysis is that the net number of full time equivalent jobs created by the potato starch regime may be divided between those created in farming by virtue of the higher labour intensity of starch potato cultivation than alternative major crops, and those generated in potato starch factories. The net budgetary cost per extra full time rural job is derived by dividing the total costs of the measures by the net number of full time equivalent jobs created by them.

Even though we could not conclude in the discussion of Questions 6.2 and 6.3 whether or not the European potato starch regime had an impact upon the income of rural communities and the economic and social development of the regions concerned, it is clear that without the existence of the regime the rural communities in starch potato growing areas would be affected in some way.

The aim of the analysis in the remainder of the discussion of the present Question is to determine what the Community gains in rural development terms, in the tangible form of employment generation, in return for the extra budgetary costs of the starch potato regime. It was commonly stated during the field visits undertaken for this report that starch potato faming employs more workers per hectare than the main cereal crops, which are viewed as the most important alternatives to starch potato cultivation. In addition, unlike the case with many cereal starch factories, potato starch factories tend to be located close to the farmers who supply them, and thus create employment in, or close to, rural areas.

Among the data that we obtained during the course of our field trips were the data summarised in Table 6.4.2 for the Niedersachsen region of Germany. This provides an estimate of the number of hours per annum devoted to farming and harvesting a hectare of different crops. In addition, there are fixed costs, in the form of the time devoted to managing the farm, but our assumption is that these overhead items are similar per hectare for the different crops.

The point to note in interpreting the table is that, from the perspective of opportunity costs, it is the *difference* between the number of hours per hectare that is crucial to the calculations that follow, since they represent the net gain from the existence of starch potato farming, rather than a simple expansion of cereal areas. General farm management activities that add an identical number of hours to each crop cause no change to the net gain from increasing the starch potato area.

Table 6.4.2: Average Labour Input for Alternative Crops in Niedersachsen, Germany, 2000/01 (hours per hectare per annum)

Winter Rye	8.26
Starch Potatoes	38.62
Maize	11.00
Winter Barley	10.80
Summer Barley	10.10
Oats	8.70
Winter Wheat	8.00
Field Beans	6.00
Sugar Beet	25.00

Source: Landwirtschaftskammer Hannover. Richtwert-Deckungsbeiträge.

The table demonstrates that starch potato farms are more labour intensive than cereal farms. The only major crop that comes close to it in its need for labour is sugar beet; but the sugar production quotas limit the area under beet. The rural development benefit from the starch potato regime is that it keeps the labour force in the rural areas. In the interviews we held in Finland, we were told that the phenomenon of part-time farmers is becoming more and more common. Farmers who grow crops with low labour inputs, such as feed barley and oats, often have a job in the city, too, and for them, farming is their second job. Starch potato farmers cannot have this kind of life-style,

since the labour intensity of the crop obliges them to spend more time on the land; hence starch potato cultivation ensures the presence of farmers in rural areas. Per hectare, the starch potato regime buys more employment than the other crops, including cereals.

In estimating the net budgetary cost of creating an extra full time job in starch potato farming and processing, we have made the following assumptions.

First, the Niedersachsen estimates of the labour inputs needed per hectare of different crops are valid for the Community as a whole.

Second, 1,500 hours per annum are assumed to be equivalent to a full time job in agriculture.

Third, the average starch potato yield per hectare in the Community is 40 tons of potatoes yielding 20% starch.

Fourth, the main alternative crops to starch potatoes are assumed to be cereals.

Fifth, the average number of hours of farm labour that cereals require per annum per hectare is assumed to be the arithmetic mean of the figures listed in Table 6.4.2.

Sixth, the employment in potato starch factories has been estimated from data supplied by a few processors and national authorities. All this employment is assumed to be full time. (This is an over-statement, since processing occurs for under half of the year; but this assumption permits us to argue that the end-result errs in a conservative direction.)

Seventh, we consider the effect of applying the two alternative measures introduced above (namely what we have referred to as the "export refund" and the "crop area points of reference") of the opportunity cost to the Commission of one ton of potato starch.

In the case of the export refund point of reference, the opportunity cost per ton of potato starch is given by the first row of Table 6.4.1. This equalled the potato starch premium of €22.25 per ton of starch until 2000/01. Applying, instead, a crop area point of reference, the opportunity cost equals the potato starch premium of €22.25 per ton *plus* the difference between direct payments to starch potato growers and area payments to cereal farmers, which amount to approximately €50 per ton of starch at present, as depicted in Diagram 5.2.4.

Finally, for each of these two alternative definitions of opportunity cost, we divide the net budgetary cost to the Commission of the entire Community output of potato starch by the total number of full time jobs created in starch potato cultivation and in starch potato processing to arrive at the net budgetary cost per full time job. The calculations are presented in the Appendix to this Question in Tables A6.4.1 and A6.4.2.

Diagram 6.4.1 compares how the total full time equivalent employment generated by the potato starch sector and the total net budgetary costs to the Commission – under each of the alternative definitions of opportunity cost-compare with one another. It reveals that, while the overall employment in the sector has fallen since the 1996/97 peak, net budgetary expenditures on the sector have risen. They rose particularly rapidly under the crop area point of reference for opportunity costs, in view of the growing importance of area payments in the CAP.

Diagram 6.4.1: The Net Budgetary Costs of the Potato Starch Regime and the Full Time Equivalent Employment Generated by the Regime
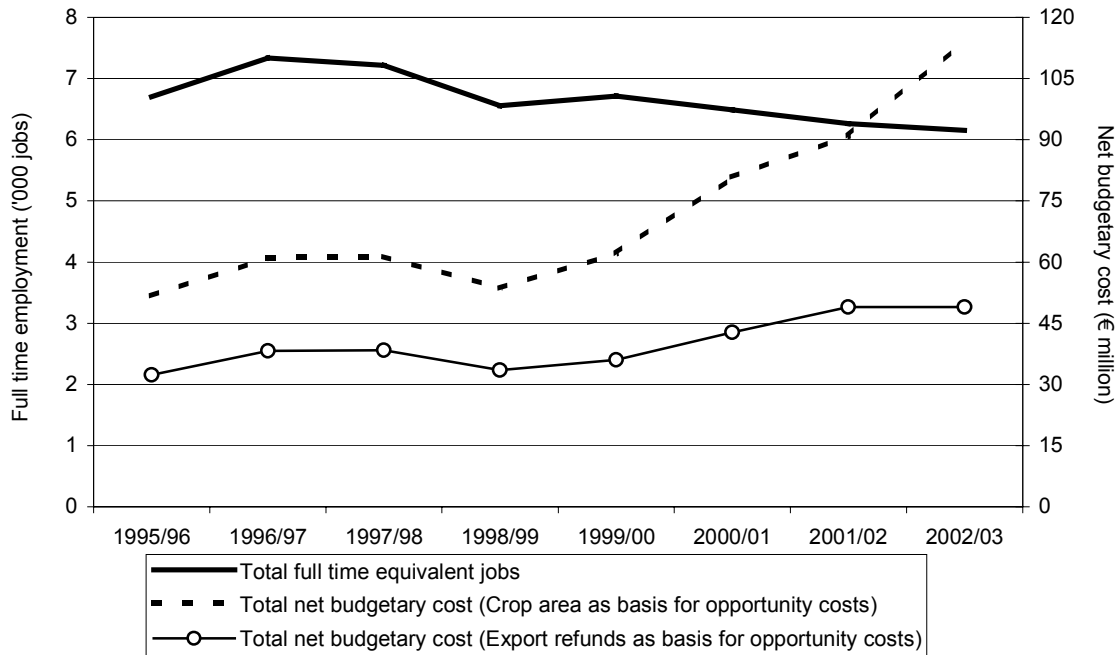
Legend:
— Total full time equivalent jobs
- - - Total net budgetary cost (Crop area as basis for opportunity costs)
—O— Total net budgetary cost (Export refunds as basis for opportunity costs)

Source: LMC estimates derived from data provided by European Commission (DG Agriculture, Unit C2) and national starch potato organisations

One of the main potential objections to the results depicted in Diagram 6.4.1 is that it simply compares the area payments per hectare of starch potatoes with the *higher of* the area payments for cereals and oilseeds (which in practice means the area payments for oilseeds in every starch potato region in which oilseeds have been given a reference yield by the national authorities). This is not a fair reflection of the likely alternative crop in many regions of starch potato cultivation. Cereals are more likely to be the choice, according to our informants during field visits.

Diagram 6.4.2 has therefore been prepared to indicate the net budgetary cost per hectare, both in the base case (using the results depicted in Diagram 6.4.1 under the two alternative assumptions about opportunity costs) and for the Netherlands alone (adopting the crop area as the point of reference for opportunity costs). The Netherlands has been selected since it is the only Member State in our sample that does not have a separate reference yield for oilseeds in the regions of starch potato cultivation. Therefore, the Netherlands results are likely to be a very good indicator of the outcome if cereals are truly the favoured alternative crop vis-à-vis starch potatoes.

The Netherlands example reveals that, where cereals alone are considered to be the main alternative to starch potatoes in farming operations, the crop area point of reference for opportunity cost calculations (which always yields higher opportunity cost measures than the export refund approach) implies that measures to assist the starch potato *filière* are a costly means of creating full time employment. The annual cost of such employment generation in the Netherlands has been over €16,000 since 1996/97, and has been rising gently.

Diagram 6.4.2: The Net Budgetary Costs per Full Time Job Generated by the Potato Starch Regime: The Base Case and the Netherlands
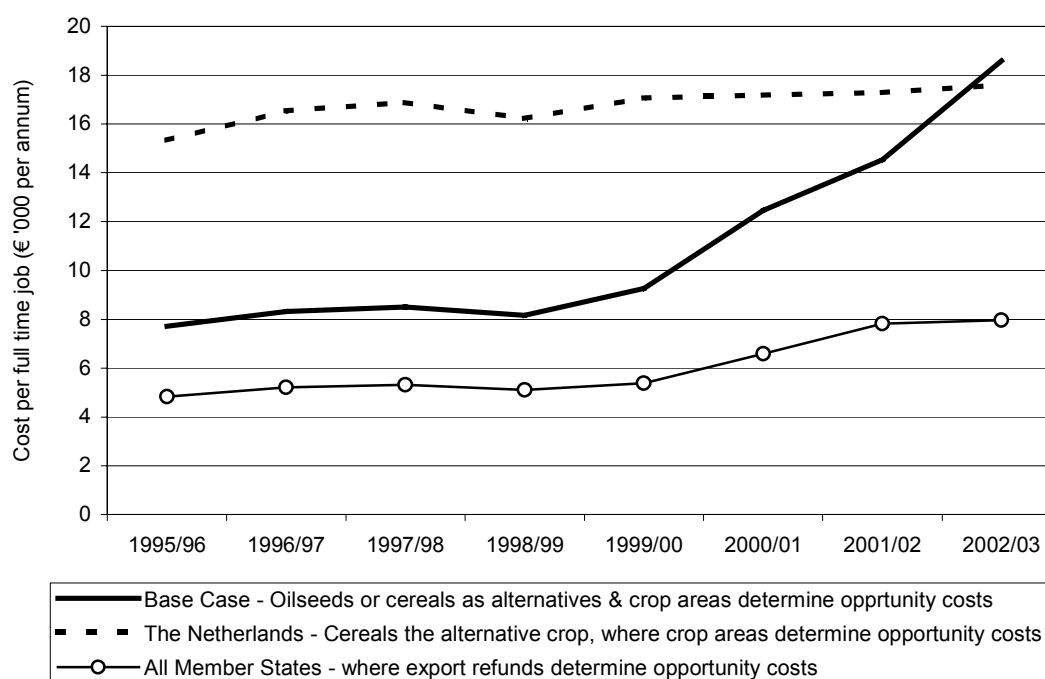

Source: LMC estimates derived from data provided by European Commission (DG Agriculture, Unit C2) and national starch potato organisations.

We conclude that the net budgetary cost of creating one full time job in rural areas as a result of the measures in support of policy in the starch potato sector will be in the region of €8,000 by 2002/03 in the case in which the opportunity cost of potato starch production (when compared with maize starch) takes export refunds as the point of reference. In this case, the additional budgetary costs of measures to support the potato starch filière are judged solely in terms of higher direct payments since 2000/01 and the €22.25 starch premium.

When the crop area point of reference is adopted towards the definition of opportunity costs, we conclude that the net budgetary cost of creating one full time job in rural areas as a result of starch potato policies will be in the region of €18,000 by 2002/03, as a result of the actions being implemented to harmonise cereal and oilseed area payments by that year. The main element of the net budgetary cost in the starch potato sector arises because of the high level of direct payments per hectare for starch potatoes, when compared with the area payments for alternative arable crops.

If oilseeds are the main alternative crop to starch potatoes, and crop areas are the starting point for calculations of opportunity costs, the net budgetary cost to the Commission per full time job in the starch potato sector has risen from close to €8,000 per annum from 1995/96 to 1998/99 to over €14,500 in 2001/02, and will be in excess of €18,500 by 2002/03. If cereals are the main alternative crop, then the Netherlands experience suggests that the net cost per full time job has averaged close to €17,000 since 1995/96.

In order to put these figures into some sort of perspective, we have prepared Table 6.4.3, comparing employment in the starch potato sector with that in all agriculture, and as a proportion of employment and the population in the Community as a whole.

The starch potato regime employs only a fraction of the European labour force directly. The data presented here imply that 0.0033% of the total EU labour force have full time employment in the starch potato sector. Among the farming community, just under 0.28% undertake some starch potato farming, but the full time equivalent number of workers growing this crop is 0.0465% of the total number of workers in the agricultural sector.

Table 6.4.3: The Community Potato Starch Industry as a Source of Employment, 2000

	Starch Potato Farmers	Full Time Equivalent (FTE) Farm Jobs	Employees in Starch Potato Factories	Total Employment FTE in the Sector
As % of total EU population	0.0063%	0.0010%	0.0008%	0.0018%
As % of total EU labour force	0.0115%	0.0019%	0.0014%	0.0033%
As % of total EU agricultural labour force	0.2796%	0.0465%	0.0335%	0.0800%

Source: LMC estimates, derived from Eurostat: Regions — Statistical Yearbook.

THE DEADWEIGHT ASSOCIATED WITH MEASURES TO ENSURE ECONOMIC AND SOCIAL DEVELOPMENT IN REGIONS GROWING STARCH BASE PRODUCTS

The conclusion drawn elsewhere in this Evaluation is that there is significant deadweight in the application of the measures in the starch potato sector. Farmers have demonstrated that they find potato cultivation more attractive than alternative crops both through their efforts to fill the production quotas and their willingness to pay for delivery rights to supply starch potatoes under contract.

Further evidence of the deadweight in the application of the measures is found in the eagerness displayed by potato starch processors to export their output, even though important users in the domestic market repeatedly stated in interviews with the study team their view that supplies were being kept scarce in the domestic market.

We conclude that the measures in the sector cause deadweight in the provision of support. The magnitude of the deadweight is difficult to quantify; however, possible indicators are provided in the case of processing margins by the discussion in Question 7.1 of the export refunds for potato starch, and in the case of farmers by the earlier discussion in the present Question.

In the case of processors, one of the conclusions drawn in Question 7.3 is that no residual refund is warranted on exports of native potato starch, by virtue of the premium that this starch enjoys over native maize starch in the export market. This corresponds to deadweight of the order of €40 per ton on average on exports of potato starch.

In the case of farmers, their willingness to pay for starch potato delivery rights (as recorded in the German production costs in Table A6.1.1 in the Appendix to Question 6.1), when these are absent from cereal or oilseed production costs, is a good indicator of the economic rent earned on starch potato farming per hectare. The cost of these delivery rights in Germany was over €300 per hectare; if this were a fair reflection of the Community as a whole, this represents three quarters of the €400 per hectare (€50 per ton of starch) additional direct/area payment associated with planting one hectare of starch potatoes, rather than cereals.

Chapter 7: Management Methods in the Sector

QUESTION 7.1

Question: *To what extent did the starch scale (in French, le barème féculier) in force contribute to the monitoring of the actual Community potato starch production?*

The Objective of the Question: To evaluate the difference between the actual quantities of Community potato starch production in selected years and the levels that are implied by the contracts between farmers and potato starch processors settled using the *barème féculier*.

Instrument: The instrument of policy is the CMO for cereals, whose regulations governing the payment made for starch potatoes are set out in Commission Regulation 2718/99 and Regulation 97/95 Annex 2(A). The payment to starch potato farmers for their deliveries of clean potatoes is based upon a starch scale, the *barème féculier*, which is described in the Appendix to this Question, and which estimates the amount of starch that will be recovered from each ton of potatoes. This estimate is used as the official production measure for the purposes of monitoring the potato starch quotas.

Criterion for Assessing the Outcome of the Policy: The *barème féculier* laid down by the Commission would be judged successful if there is no difference between the measurement of potato starch output for the purposes of payments to farmers using the *barème*, and the actual starch production achieved by starch potato processors.

Indicators: The most direct way to answer this question would be to collate statistics of the actual potato starch production achieved by processors buying starch potatoes on the basis of the official payment scale, and then to compare this figure with the recoverable starch content implied by the scale. Unfortunately, no statistics are available in this form. All production figures, such as those to determine whether the production quotas have been met, or to establish the payments to factories for the potato starch production premia and area payments to growers, are monitored in terms of the data generated by the *barème*.

In the absence of actual production data from individual potato starch factories, this Question has been analysed by means of a direct examination of the effect of the starch potato payment scale upon the prices paid for potatoes with different starch contents. The indicator that is used to answer the Question is our estimate of the actual output of potato starch produced within the framework of the CMO for cereals as a proportion of the production declared to the Commission on the basis of the *barème féculier*. If the actual output differs significantly from that derived from the application of the *barème féculier*, we shall deduce that the *barème* did not contribute usefully to the monitoring of Community potato starch output.

MONITORING POTATO STARCH OUTPUT

There are three separate elements to the Community's total production of potato starch that are of relevance to the implementation of the Commission's policy on potato starch, and which therefore should be monitored each processing campaign.

The first category lies entirely outside the scope of the CAP and the CMO for cereals. This is the output of potato starch from the treatment of effluent from factories processing edible potato products, such as frozen chips, as well as from the processing

of surplus edible potatoes. This production is not included in any official data; according to interviews with potato starch producers, the consensus is that the total output of such non-quota starch is in the region of 10,000-20,000 tons per annum, mainly in Belgium and the UK, but at least one estimate puts the figure at double this quantity.

The suppliers of the potatoes used to make this non-quota output receive no direct payments or minimum price guarantees; the processors of this starch do not receive the starch premium of €22.25 per ton. However, if sold on the domestic market, the starch benefits from the protective price umbrella established by the starch regime; but users of such starch are not entitled to production refunds. If non-quota native potato starch is exported, it is entitled to export refunds, since monitoring is not undertaken to track the flow of native starch from the processor to the point of export.

The second, very much larger, segment of domestic potato starch production is output within the production quota. This is monitored via returns prepared on the basis of the *barème féculier*.

The third category is output derived from starch potatoes, but which is in excess of the 105% production flexibility built into the management of the national quotas. This surplus that is in excess of 105% of national quotas has to be exported without the benefit of export refunds, and without direct payments to those growers from whose potatoes the surplus was produced. As a disincentive to processors to permit such over-production, they are still obliged to pay the growers the minimum price on these surplus potatoes.

If the *barème féculier* leads to an under-estimate of the output actually achieved from starch potatoes, the suppliers of the starch potatoes are unaffected, since their payment is based solely upon the *barème*, regardless of the actual output obtained from their potatoes.

For the processors, the extra production does not benefit from payments under the starch premium, since these, too, are linked to the *barème.* They do obtain some indirect benefits, however, in the form of the entitlement to export refunds and production refunds, when sold to domestic end-users.

The Commission's management of the sector is affected by under-estimates of actual output. The volumes available for export, with the benefit of export refunds, are higher than the *barème* and the production quotas might lead the authorities to believe, with a consequent increase in the budgetary costs of exports of potato starch derivatives.

This would be an unintended effect of the *barème féculier*. The intended effect of the payment scale was, we believe, to provide a technically straightforward method of deriving an equitable system of payments for starch potatoes with different starch contents, which was fair in dividing revenues between growers and processors. It was not intended to enable processors collectively to exceed the official production quota for the year with impunity, by achieving higher starch recovery rates than those implied by the *barème féculier*.

Diagram 7.1.1, whose derivation is explained in detail in the first table in the Appendix of this Question, describes the relationship between the starch content of potatoes, derived using the standard weighing method, and the factory starch processing losses implicit in the *barème* (as calculated in the final column of Table A7.1.1.). These processing losses are defined as the proportion of the total starch content of the potatoes that the factory does not pay for.

Diagram 7.1.1: The Relationship Implied by the *Barème Féculier* Between Potato Starch Content and Processing Losses in the Factory
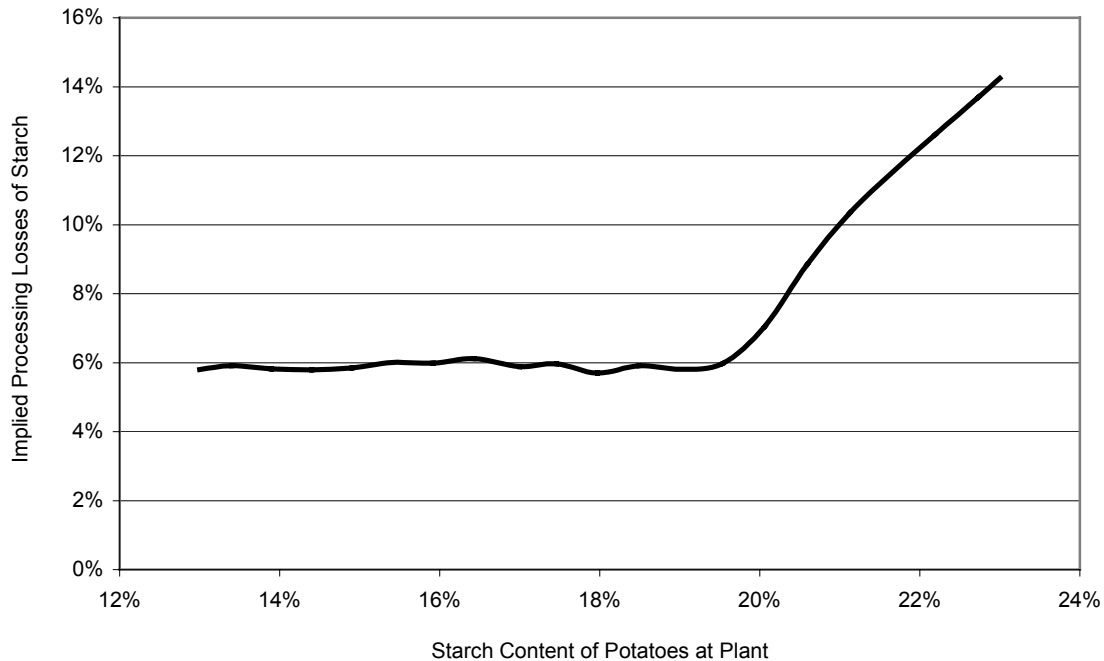
The implied processing losses are listed in the final column of Table A7.1.1 in the Appendix, and may be seen to be stable up until a starch content of 20%, but they then rise steadily. Comparing potatoes with starch contents of 17.0% and 19.5% on a dry basis, one sees that both of them are assumed to suffer processing losses of just below 6% of their starch. A 20% starch content potato, by contrast, has implied processing losses of almost exactly 7%, while a 23% starch potato (at the top end of the payment scale) has implied losses of over 15.2%.

Diagram 7.1.2 provides an insight into the distribution of starch potato deliveries by starch content. It has been prepared using data provided by one processing company from analysis of the starch content of all its deliveries in 2000/01. It compares the actual frequency distribution of the starch content of these deliveries with the processing losses implied by the application of the Regulation 97/95 Annex 2(A) to the pattern of potato deliveries depicted in Diagram 7.1.1. In other words, Diagram 7.1.2 superimposes the actual starch distribution of the company's potatoes upon the curve drawn in Diagram 7.1.1. 23% of total deliveries were made at the higher end of the starch scale, where the implicit processing losses are over 6%. In fact, as against an implied processing loss of 6% or so for potatoes with less than 19.5% starch (which was where the mean, median and mode of this company's deliveries lay), the average implied loss for this company according to the *barème* was almost 7%.

To illustrate the sensitivity of the outcome, we have analysed what would have happened if all the company's potato farmers has grown a crop with a starch content that was 1% or 2% higher than they achieved, pulling the frequency distribution 1% or 2% to the right, as depicted in Diagram 7.1.3. In this event, the implied average overall processing losses (with the same underlying frequency distribution) would, according to the *barème*, rise increasingly steeply (see Diagram 7.1.4, which contrasts the average starch content of the entire distribution with the average implied processing losses).

Diagram 7.1.2: The Distribution of the Starch Content of Deliveries in 2000/01 and the Processing Losses in the Factory Implied by the *Barème Féculier*
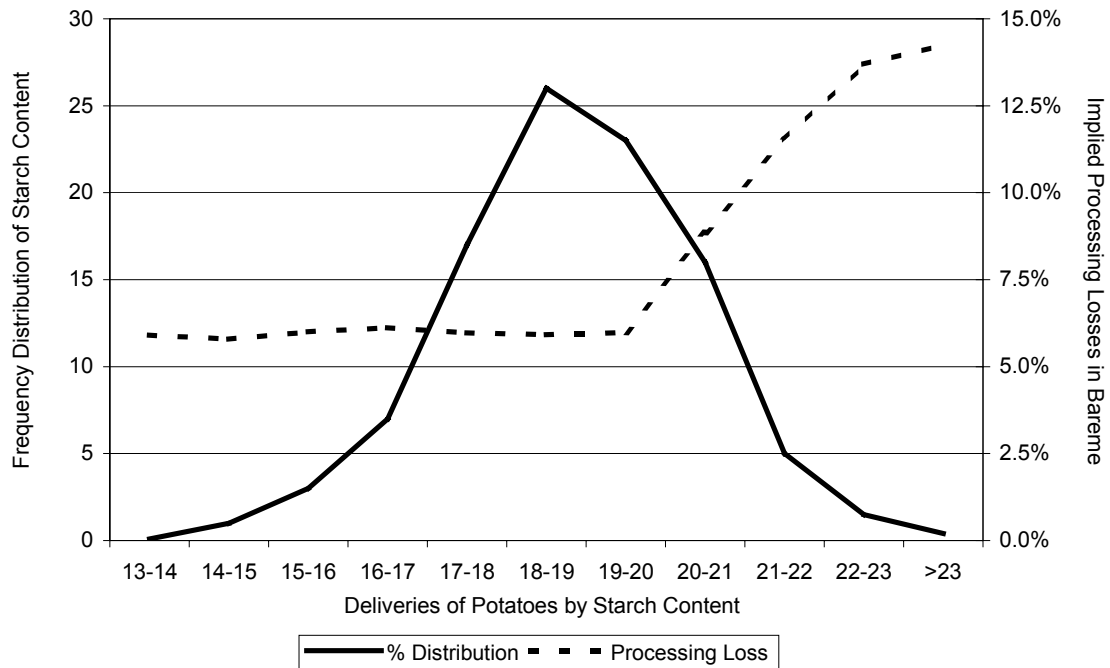
Source: LMC estimates from data provided by a Community potato starch producer.

Diagram 7.1.3: The Impact of Assuming a 1% Increase in the Starch Content of All Potato Deliveries
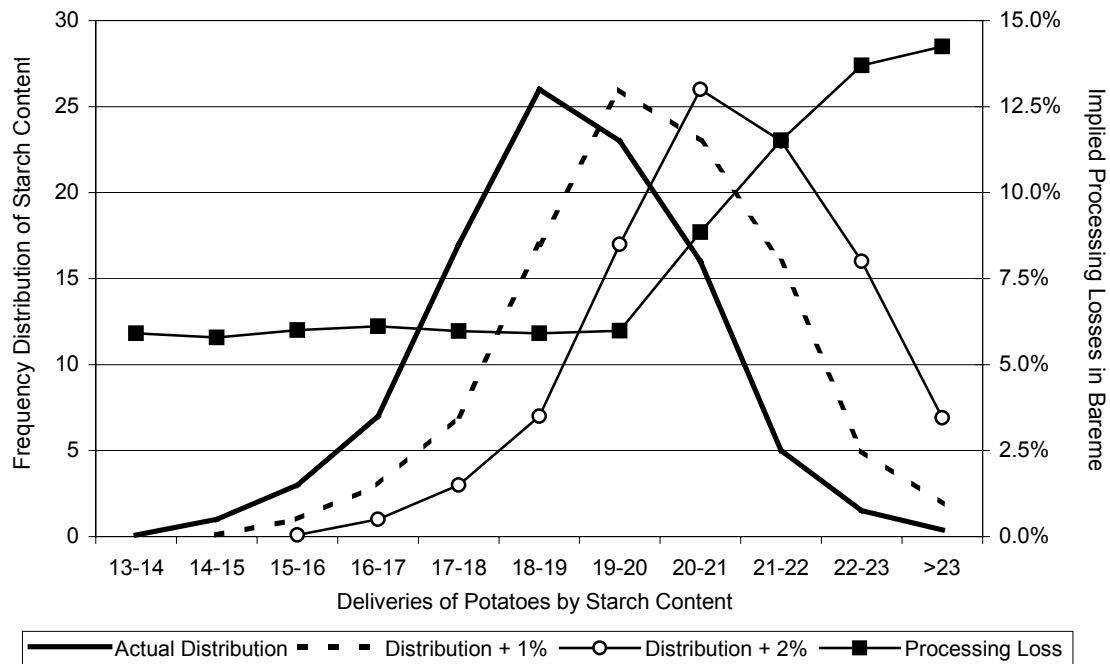
Source: LMC estimates from data provided by a Community potato starch producer.

Diagram 7.1.4: The Impact Upon Average Assumed Processing Losses of a 1% Increase in the Starch Content of All Potato Deliveries
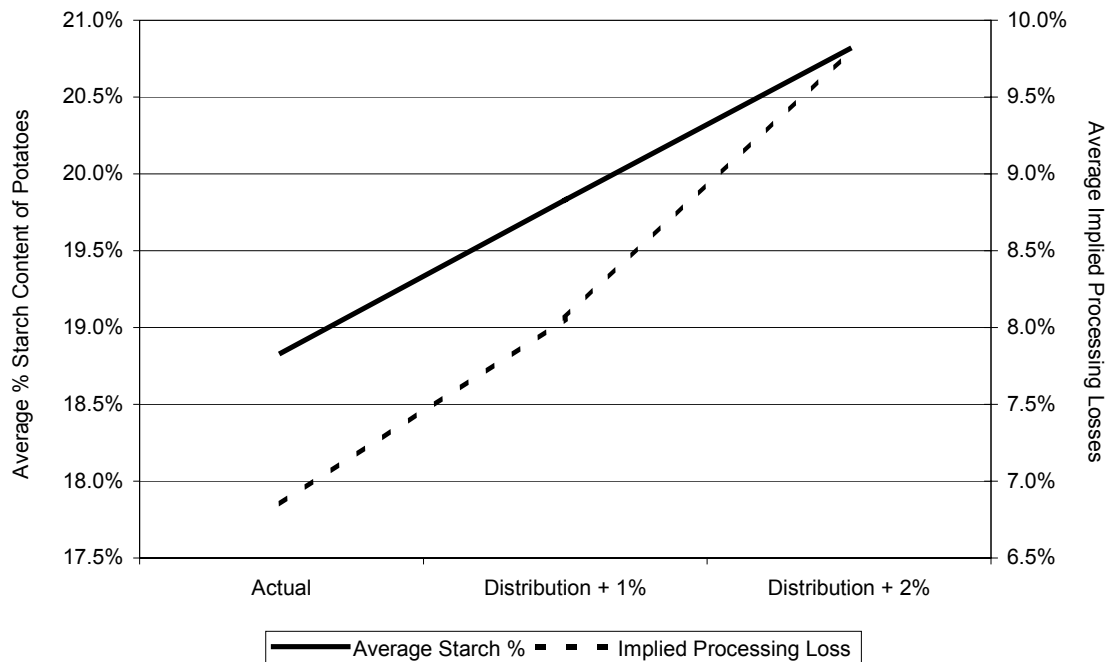
The Validity of the Implicit Assumptions Regarding Potato Processing Losses

There are two reasons for doubting the validity of the implicit increasingly steep rise in processing losses assumed in the *barème*. The first is that, over a certain range, it may actually be easier to extract starch from potatoes as the starch content increases. This is because processing losses arise either because some starch degrades during manufacture, or because starch is attached to non-starch material, such as fibre. *A priori*, the degradation losses should be proportional to the starch content, which would imply that compensation of a fixed percentage of the overall starch content would be appropriate for this component of the losses.

In discussions with processors and engineering companies, we were told that the losses of starch to fibre or other non-solubles ought to be related, at least to a significant degree, to the amount of fibre and other non-starch material in the potato. If it were true that these non-starch components do <u>not</u> increase more rapidly than the starch content (in the sense that a 21% starch potato does not have more than 50% more non-starch material than a 14% starch potato), then there appear to be sound reasons for questioning the way in which the implied processing losses rise steeply beyond a 20% starch content.

In the Appendix to this Question, we have analysed the results of a series of samples of starch extraction rates and processing losses prepared by a European potato starch producer. The analysis is made somewhat complicated by the used of an ordinal scale to measure the fibre content of the potatoes sampled for the exercise, but the results lead us to the following conclusion:

Apart from the one outlier in the scatter diagram (Diagram A7.1.3), there is no trend, or possibly a slight downward trend to the relationship between the starch content of potatoes and the processing losses of starch to the potato fibre. Thus, we cannot find convincing evidence that processing losses start to rise markedly as soon as the starch content of potatoes moves above 20%.

Lessons from the Experience of Sugar Beet Payment Scales

The second reason for questioning the form of the payment scale is the experience of a similar crop, sugar beets. As with starch potatoes, sugar beet growers and processors have very clearly defined scales for adjusting payment to reflect the richness of the raw material. Therefore, it is possible to deduce the implicit processing losses in the beet payment schedule. This is discussed in the Appendix to this Question, from which it is evident that over much of the range of quality found in practice, notably at lower levels of sucrose content, the payment scale implies that the losses suffered in processing <u>decline</u> with rising sucrose content, which is as we conjectured for starch potatoes.

Diagram 7.1.5 compares the starch potato *barème* with that for sugar beet. One sees that, above 18% sucrose, the implicit processing losses for sugar beet start to rise as they do for starch. However, in the Appendix we explain that this is likely to be caused, at least in part, by recognition of the complexities of the sugar quota system.

In the Appendix, we conclude that:

To the extent that parallels may be drawn between potato starch and beet sugar processing, one would expect the barème féculier would assume that factories are able to extract from higher starch content potatoes a higher share of the starch in the potatoes than is assumed in the current system.

Diagram 7.1.5: Comparing the Relationships Between the Starch Potato and Sugar Beet Payment Scales and Implied Processing Losses in the Factory
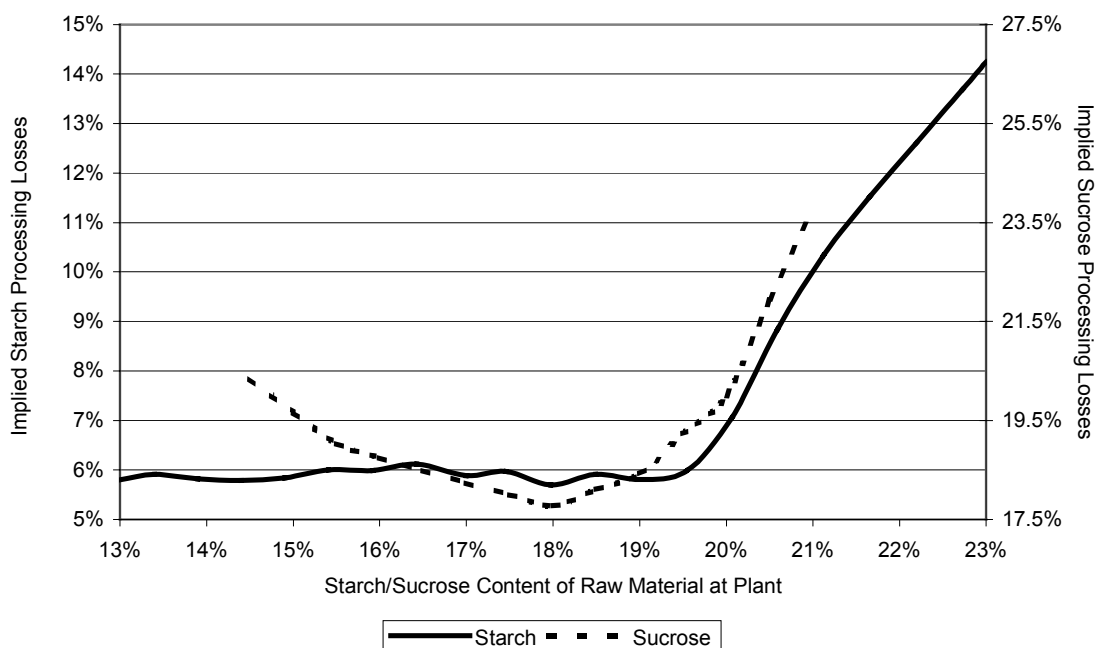
Source: LMC estimates from European Commission data on the payment scales for sugar beets and starch potatoes.

Conclusions

There are some indications that the starch potato payment scale may underestimate the actual starch production that is achieved from the potatoes that are processed for starch within the framework of the potato starch regime. The precise magnitude of the underestimate is difficult to assess, not only because a great deal of the basic data needed to undertake the analysis were not available to us, but also because the analysis would need to draw upon specialised technical knowledge.

This evidence takes three forms. One is that the technology of processing has undoubtedly improved since the payment scale was first established. The second is the comparative experience of the sugar beet sector, as discussed in the Appendix to this Question. The third is drawn from discussion held with companies in the filière. During the course of at least three interviews held during the course of this study, mention was made to an estimate (whose origin we do not know) that total Community output of potato starch in excess of the production recorded by the Commission was close to 100,000 tons. This includes the production from potatoes that are not classified as starch potatoes, but, even so, we find this a surprisingly large estimate.

On balance, we conclude that the starch potato payment scale contributes to the monitoring of Community potato starch output, but not as efficiently as it might do in terms of providing the Commission with full information for the management of refunds in the sector. In order to ensure that the production quota meets its intended purpose, we recommend that the Commission undertakes a technical review of the actual starch recoveries that are achieved by starch processors using modern technology and amends the barème féculier appropriately.

QUESTION 7.2

Did the technical coefficients in force for the calculation of production and export refunds ensure appropriate compensation of the price differences?

Objective of the Question: To determine whether, taken in conjunction with the calculation of the production and export refunds, the technical coefficients ensure that processors of base products into starch products and starch-using products are compensated appropriately for the differences between Community base product costs and those facing overseas competitors, on the manufacture of approved products that are eligible for production refunds or of Annex I or non-Annex I products that are eligible for export refunds.

Instruments: The technical coefficients used in the calculation of the production and export refunds to convert from base product quantities into starch equivalent amounts. These coefficients are defined in the regulations on the production refund, and are listed for basic starches and certain starch derivatives in Annex II to Commission Regulation 87/99.

The approved products that are eligible for production refunds are defined in Annex I to the Council Regulation (EEC) No 1722/93 and revisions. The products eligible for export refunds are governed by the regulations on the export refund for starch products, and are defined in Annex I and non-Annex I of Article 32.3 of the Treaty of Amsterdam.

The magnitude of the production refund is determined as one of the elements of the Common Market Organisation for cereals. The export refunds are determined within the framework defined in Council Regulations 120/67 and 3448/93 and Commission Regulation 1501/95.

Criteria: There are two possible approaches to establishing the criteria by which this Question will be answered. One is that there is no disparity between the administrative technical coefficients and empirical values of the coefficients applied to the different base products in different processed products. The second is that there is a systematic bias in the determination of the technical coefficients, but this is exactly counter-balanced by an equal and opposite relative bias in the determination of the production and export refunds.

Indicators: The ratio between the technical coefficients incorporated into the management mechanisms for the calculation of refunds and the coefficients actually observed in maize and wheat starch processing in the Community.

The ratio between the technical coefficients observed in the US and those incorporated into the management mechanisms for the calculation of refunds.

The combined cost of providing production or export refunds for selected starch products as a proportion of the combined cost that is considered to represent appropriate compensation for the combined effect of the actual, empirically observed, technical coefficients in the Community and the magnitude of the production and export refunds that are considered to provide appropriate compensation for base product price differences.

TECHNICAL COEFFICIENTS

Technical coefficients are the conversion rates used for the calculation of the production and export refunds for native and modified starches. For native starches the technical coefficients represent the amount of the base product material needed to produce one ton of starch. Since the refund aims at compensating for base product price differences between domestic and world markets, the technical coefficients for native starches are intended to calculate the multiple of the refund on the base product that would be appropriate to apply in determining the refund on one ton of native starch. The European Commission applies 1.60 as the technical coefficient for maize starch and 2.00 for wheat starch (see Commission Regulation 4056/87). Potato starch has its technical coefficient defined in terms of parity with maize starch. The technical coefficient applied to barley and oat starches is 2.40, while that applied to rice starch (as a multiple of broken rice) is 1.52.

The technical coefficients for starch derivatives identify the quantity of native starch needed to obtain one ton of a particular derivative. Annex II to Commission Regulation 1722/93 and subsequent revisions, the latest of which is Commission Regulation 87/99, defines the coefficients used to calculate the production and export refunds for selected starch derivatives. These coefficients are then applied to the refund per ton of native starch to calculate the refund that is applied to approved products (in the case of production refunds) and Annex I and non-Annex I products (in the case of export refunds).

THE TECHNICAL COEFFICIENTS FOR NATIVE STARCHES

The technical coefficients for native starches have been at the present levels throughout the entire period covered by the Evaluation, and some have been in effect for over 20 years. In the next few paragraphs, we shall examine whether changes in the processing technology for native starches have altered the appropriate technical coefficients.

The technical coefficients are defined in a precise manner to simplify administration of the system of refunds, but in reality the coefficient varies somewhat from processing batch to processing batch. This is because there is some inherent variation in the base products being processed. This is partly because the technical coefficients applied in the Community relate to the commercial weights of the cereal used as raw materials, and the commercial weights are higher than clean weights on account of the extraneous matter and moisture that are found in commercial deliveries; and the amount of such extraneous and moisture varies to a certain extent from shipment.

The other reason for some variation in the quality of the base products is the innate variation that occurs in the composition of agricultural products. The view expressed by several of the processors whom we interviewed for this Evaluation was that the inherent variation is greatest for starch potatoes; but this particular variation is defused as an issue by applying the coefficients solely to potato starch, rather than the potatoes themselves; and for the purposes of applying refunds to potato starch derivatives, the decision to assume that potato starch is equivalent to maize starch, effectively treats the two starches as one in administrative terms. As we shall see, wheat lies somewhere between maize and starch potatoes in terms of the variation in its starch content. This is largely a reflection of the differences in the protein content of the wheat processed for starch.

Native Potato Starch

Despite the administrative decision to define native potato starch as the equivalent of native maize starch for the payment of refunds, there is one important point of difference between native potato and maize starch from the perspective of technical coefficients. Annex II to Commission Regulation 87/99, defining the technical coefficients of different products, states that "The coefficient shown applies to starch with a dry matter content of at least 87% in the case of maize, rice, wheat, barley and oats starches, and of at least 80% in the case of potato starch".

This, we were informed during interviews with starch users and processors, is a fair reflection of the terms in which the different native starches are traded commercially; however, it raises questions about how potato starch derivatives should be treated vis-à-vis other starches in terms of their technical coefficients. In those applications in which starches are more highly processed, it is to be expected that the weights and prices of the end-products will be expressed on a similar basis, for example, per ton, dry matter. If so, differences between the dry matter content of the native starch from which they are derived will count for little or nothing in the dry matter content of the end-product. In the case of fermentation products, for example, a ton, dry matter, of native starch will yield the same amount of the end-product, regardless of the base product used. In certain circumstances, the difference in moisture contents of native potato and maize starches could mean that, in some end-products, the refunds operate in such a way that the 7% of extra moisture in potato starch also receives a refund.

Therefore, we believe that, in theory, there should be a scale that adapts the technical coefficient applied to native potato starch according to the degree of subsequent processing, and the degree to which potato starch loses its distinctive identity. If a 1:1 ratio to maize starch is considered appropriate in the provision of refunds for native starches, a 80:87 ratio[1] would be appropriate to those processed products in which the distinctive identity of potato starch has been lost.

We, therefore, conclude:

In the case of the products derived from the further processing of potato starch, the current identity between the technical coefficients applied to potato and maize starch appears potentially inaccurate, possibly by as much as 8.75%[2]. This is an intended bias in the measures, and over-compensates customers of products that use derivatives of native potato starch. However, the maximum magnitude of the over-compensation has only averaged approximately €3 per potato ton of starch in exports over the past 12 months. Therefore, it is not administratively cost-effective to correct for this error.

In the discussion of Question 7.3, we note that potato native starch commands a very similar average price in the domestic market to maize starch, and concluded that they could be treated to all intents and purposes as perfect economic substitutes for one another. This justified the management decision to treat them as the same for the determination of production refunds. In the export arena, however, it was concluded that native potato starch consistently commands a higher price than native maize starch. We concluded that:

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[1] Derived as the ratio of 80% dry matter to 87% dry matter.

[2] 87/80 = 108.75%.

While there is good evidence from price behaviour in the domestic market that native maize and potato starches are close substitutes for one another, there is no such evidence for the export market in third countries. Instead, native potato starch commands a premium over maize starch. In addition, the differential between the export refund and the production refund on potato starch is larger than the differential between domestic and export prices for potato starch, which implies that export sales are, on average, more attractive to local potato starch processors than domestic sales.

This divergence between the structure of prices in the domestic and export markets for native maize and potato starches is not what one might expect to find. In the case of maize starch, the differentials between domestic and export market prices are, on average, very close to the differentials between export and production refunds, which is what one would expect as arbitrage occurs between the two markets. The failure of potato starch prices to experience a similar harmonisation of relative prices and refunds in response to arbitrage requires some explanation. The one that we find most convincing starts from the observation that, whereas outside the Community potato starch is a niche product with just 2% of the overall starch market, inside the Community it is a major starch, representing over 20% of starch supplies.

Outside the EU, the comparative scarcity of potato starch enables it to command a premium for its special functional properties; inside the EU, its plentiful supplies mean that it must compete with maize in several bulk starch applications, so that it cannot sustain a price premium. The question still remains: Why does arbitrage not erode the incentives to export larger quantities of potato starches?

We would suggest two answers. One is that the elasticity of demand for potato starch on the export market is low; therefore, the marginal revenue on export sales may be well below the average revenue on these sales, and no higher than the marginal revenue earned on sales to the domestic market, in which the demand elasticity is higher. The second reason is that starch potato farmers and processors are well aware that the continuation of present policy measures requires political support. Such support would become harder to secure if the industry was perceived as exporting so much of its output that it might be viewed as depriving domestic customers of supplies and of relying unduly upon the public purse, via export refunds, for its survival.

Native Maize Starch

The technical coefficient of maize starch used by the Commission in its calculations is 1.60, which corresponds with a 62.5% starch recovery percentage.

In its calculation of the economics of starch processing in the US, the US Department of Agriculture (USDA) in the *Sugar and Sweetener Situation and Outlook Report*, published by its ERS division, assumes that a bushel containing 56.0 lbs of maize yields 31.5 lbs of starch, dry basis. Since the European Commission assumes that maize starch has 87% dry matter, the USDA calculations correspond to the assumption that the starch recovery from maize processing is equivalent to a technical coefficient of 1.55[3] on native maize starch.

The difference between the European Commission and the USDA in their assumed starch recovery percentages has three possible explanations. One is that the European Commission uses commercial maize weight, which includes waste, impurities and extra

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[3] (56/31.5)*0.87= 1.55.

moisture, as noted earlier, whereas the USDA data are, we understand, based upon clean maize, and the difference between the two measures, according to our interviews with processors, is typically 2-3%. A second difference of significance is that the USDA calculations are based upon No. 2 yellow maize, whereas the EC figures are derived from slightly lower quality (and lower starch content) No. 3 yellow maize. The third explanation could be that the EC calculation understates the starch yields that are now considered usual in the sector.

During interviews for this Evaluation, several processors stated that they believed that the technical coefficient of 1.6 for maize is valid as an average, and that they had not noted any significant change since the 1970s. The recovery can be increased slightly, by taking more care in extracting starch from corn gluten feed, but the benefits of recovering more starch have to be weighed against the costs of the extra processing. Also, the inclusion of some residual starch in corn gluten feed generates slightly larger revenues from the modestly increased volume of gluten feed sales, which offset the costs of a reduction in starch recovery.

One major processor whom we interviewed stated that maize processors regard the low 60s in percentage terms as a benchmark starch yield from maize. Anything below this would be a major cause for concern. The very high 60s could be an achievable industry target for maize starch yields, but this depends on the kind of maize used and it was said that very high quality maize (e.g., No. 1 yellow maize) yielding so much starch would probably prove uneconomic to process, since the extra starch did not compensate for the increased cost of the maize, particularly when comparatively little high quality maize is available from the domestic crop.

Only one maize starch company among those we interviewed during this study was able to provide actual historical data on the technical coefficient that it had achieved in practice. A close monitoring of the technical coefficient over the decade to 1993/94, when the monitoring ceased, generated an average value of 1.5826.

Conclusion: Taking into consideration the experience of the US and the evidence from the Community, the technical coefficient of 1.60 for maize is probably slightly too high for current technical conditions. However, our interviews yielded no clear indication as to the appropriate technical coefficient under present conditions.

Native Wheat Starch

The European Commission considers the starch recovery from wheat be 50% which corresponds to the technical coefficient of 2.00.

In the case of wheat, by-product credits are much more important than they are for maize in determining how much effort will be put into extracting all the starch. In view of the high value of vital wheat gluten, efforts are always made to maximise its recovery; however, the crucial commercial decision for any wheat starch processor is how much of the lower quality starch to extract from the second and third stages of processing.

In the Appendix to Chapter 1 we explained the wheat starch processing flow, and mentioned that, if the processor starts with 100% wheat flour (which accounts for around 75% of wheat, the remainder being wheat bran), and having separated out 12% vital gluten, the remaining slurry consists of 70% A starch, a 10% creamy layer and 8% solubles. The A starch is all recovered as starch. The creamy fraction that is separated from the A starch consists of starch that is difficult to recover, in the form of broken starch granules together with some fat and protein. This is typically processed further, yielding a less pure and more highly coloured wheat starch (B starch). The solubles

also contain a certain amount of starch, sometimes called "C" starch, and also includes ash, some protein and the remaining mineral content of the wheat.

A normal separation process will recover 62% of material (calculated on wheat flour) as A starch. A further 6% of the material is generally recovered as B starch from the creamy layer. This may be combined with the A starch, or sold separately as a lower grade starch or be used for fermentation. The remaining 20% of material, consisting of solubles and C starch is sold as animal feed or is used for fermentation. If a wheat starch plant does not have a ready market for low value solubles, then it is likely to extract as much starch as possible depending on the starch price. If it has a fermentation facility, it is more economic to leave more starch in solubles and to allow this to be fermented. In this event, the amount of starch in the solubles is too low for efficient fermentation. Therefore, it is customary to add B starch to the solubles for the production of products such as ethanol.

Wheat processors reported during interviews that, until the mid-1980s, they did not bother to maximise the extraction of B and C starches from their wheat, since hitherto the main product from wheat processing had been viewed as being the vital gluten. In the United States, this is still the case, which is why US processors prefer to use high protein wheat, and achieve starch recovery rates that are well below the levels assumed in the Community technical coefficient, since a high protein level tends to reduce the starch content of the wheat being processed. In the Community, by contrast, the growing interest in wheat as a major alternative source of cereal starch to maize starch during the 1980s promoted a shift in favour of low protein wheat, with associated higher starch extraction rates, via the recovery of C starch and the establishment of circuits to ferment solubles mixed with some B starch.

European wheat starch producers interviewed in the course of the present study informed us that, when the B and C starches are recovered, the total recovery of starch is, at its best, in the low 50s as a percentage. The technical maximum recovery is about 75% (of wheat flour), which results in a starch yield of 56.25%.

One processor provided us with historical analysis of the technical coefficient of wheat for the decade until 1993/94. This demonstrated that the coefficient was typically above 2.20 in the mid-1980s, but following an investment in new technology in 1987/88, when the company started to recover B and C starches, the coefficient fell. It averaged around 2.04 in the early 1990s, but was volatile. It is noteworthy that it never fell below 2.00.

Conclusion: The evidence from processors in the Community is that the technical coefficient of 2.00 for wheat is fairly close to current industry performance.

THE TECHNICAL COEFFICIENTS FOR MODIFIED STARCHES

During the interviews with processors, there was a consensus that the technical coefficients for modified starches are acceptable and a fair reflection of reality. They did not think that it is necessary to add more sub-categories in order to fine-tune the currently existing broad categories. Even though such fine-tuning might result in somewhat more precise coefficients, it would constitute an extra administrative burden, and would need to be adapted frequently as new modified starches are developed. Furthermore, the amounts of modified starches in final processed products tend to be very small. Hence, the benefits of further fine-tuning would be minimal in relation to the overall costs of the regime and of its administration.

The main conversion rates in effect at present for the specific starch derivatives mentioned in Annex II of Commission Regulation 87/99 are listed in Table A3.2, in the Appendix to Chapter 3. The coefficients have evolved a little since the 1980s to reflect changing technology. For example, whereas the dextrins in CN Chapter 3505 receive a coefficient of 1.14 on maize starch, Table A7.2.1 in the Appendix to the present Question reveals that the coefficient used to be 1.174.

Conclusion: During the course of interviews with processors and end-users, we encountered no evidence that the technical coefficients applied to modified starches are out of line with current technical realities. Thus, we deduce that there is no noteworthy disparity between the administrative technical coefficients and empirical values of the coefficients applied to the different base products in different modified starch products.

In the discussion of the criteria for this Question, the issue was raised of the possibility of systematic biases in the determination of the technical coefficients or in the determination of the production and export refunds. We have concluded in the previous pages that, on technical grounds, with the sole exception of highly processed products derived from potato starch, the application of the current coefficients represent appropriate compensation of the price differences, <u>provided that the production and export refunds themselves are not wrong.</u> In this respect, the conclusions from Question 4.4 are potentially important. In answering that Question, it was discovered that the Comext foreign trade data suggest that there is some form of link between the level of the refund and export volumes of native cereal starches, as well as of glucose. It was stated that there were reasons for believing that there are factors other than the direct compensation for price differences that influence the incentives for exports of native maize starch, and that these incentives have historically been strong when the gap between domestic and world market prices of maize has been wide.

The weight to be attached to this conclusion is affected by uncertainties about the comprehensiveness of the Comext export data, and by some evidence that the conclusion would be weakened by the use of export licence data, instead. To the extent that the conclusion is true, it means that the export volumes behave <u>as if</u> the technical coefficient should have been lower than the levels specified for production and export refunds. In this event, the possible bias could be offset by reducing the technical coefficients that are applied to the base products. However, the statistical correlation, based as it is upon Comext data, is not powerful enough to form the basis for a change in the methods of determining export refunds or technical coefficients.

QUESTION 7.3

Question: *Did the single amounts of export refunds for maize and potato starch on the one hand, and for various types of glucose on the other hand, ensure appropriate compensation of the price differences?*

As far as possible, the following questions will be explored:

- *Is a differentiation per base product justified?*

- *Is it technically possible?*

- *Is it economically judicious?*

Objective of the Question: To examine whether a single export refund for native maize and potato starch, and for glucose and products, is neutral in its influence upon the choice of base product for the manufacture of exported products. Also to examine whether, if biases exist, it is technically and economically feasible to deal with them by a differentiated system.

Instruments: The export refunds provided under Annex I of Article 32.3 of the Treaty of Amsterdam on maize and potato starch and on glucose.

Criteria: The system of applying a single export refund for native maize and potato starch and a single mixed calculation of the refund on exports of glucose will be considered justified if processors are compensated in full for differences in the costs of the relevant base products within the Community and in third countries.

If differentiation on the basis of base product is considered to be warranted:

The first criterion to be considered is the technically feasibility of undertaking such differentiation.

If, after assessment, it is found to be possible to differentiate on the basis of base products, the differentiation will be considered economically judicious if the costs of administration in both the public and private sectors associated with the management of a differentiated system are small in relation to the benefits.

Indicators: The issue of the appropriateness of the single export refund for native potato and maize starch will be considered first. The key indicators that will be used in determining whether this system ensures appropriate compensation are estimates of (a) how the refund, as determined by the Commission in accordance with Commission Regulation 1501/95, compares with the actual difference between the base product costs of producing one ton of native maize starch in the Community and one ton of the same starch in countries that compete with Community processors in third country markets; and (b) how the refund compares with the difference between the base product costs of producing one ton of native potato starch in the Community and in other countries that compete on the export market.

In the cases of the mixed calculation for glucose, the key indicator is the difference between the refunds that would be calculated for the main alternative base products (wheat and maize) if it were technically feasible to differentiate the raw materials.

The assessment of the economic judiciousness of differentiating refunds between base products will be based upon estimates of the costs to the Commission of undertaking the technical analyses to monitor such a system and to both the Commission and the

filière of administering a system of differentiated refunds, in relation to the economic and budgetary benefits of introducing differentiated refunds.

THE DETERMINATION OF EXPORT REFUNDS FOR NATIVE MAIZE AND POTATO STARCHES

Maize Starch

The determination of the export refund for maize starch is undertaken in a manner that is derived directly from the principle of full compensation for differences in base product prices. The assumptions that are needed to reach this conclusion are:

1.   The prices quoted for No. 3 yellow maize f.o.b. US Gulf are correct.

2.   The prices quoted for maize in the four reference points used to calculate the average Community maize prices for the purposes of the derivation of export refund payments on maize starch are correct.

3.   The qualities of maize at the four points in the Community are similar to that of No. 3 yellow maize in the US.

4.   The cost adjustments made to internal maize prices to convert them to an f.o.b. basis are correct.

Discussions with the starch industry in the Community and with grain traders during the course of the Evaluation did not reveal any concerns about the validity of these assumptions. Consequently, there is no reason to question the reliability of the data employed in the calculation of the maize starch export refunds in relation to the objectives laid down in Commission Regulation 1501/95.

The change in the weights attached to the four Community reference points in 1998 in the calculation of the average f.o.b. Community maize price, to give the two French ports a weight of 75% and the two Italian ports one of 25%, as against the previous 50:50 weighting, was generally viewed as an appropriate reflection of the greater importance of French maize to the European starch industry. Unfortunately, we do not have a breakdown of the national origins of the starches used in non-Annex I export refunds; therefore, we have to rely upon the analysis of Community production refunds provided in the Appendix to Chapter 2 for our judgement that the change of weights was correct.

In 1999/2000, the use of maize in approved products receiving production refunds totalled 716,000 tons for France, and the Netherlands, with 315,000 tons, was second. Italy was third with 244,000 tons. In that year, there was a strong case to be made for giving a much greater weight to France in the determination of refunds on the use of maize in starch.

Potato Starch

For potato starch, it is very much harder to find an appropriate benchmark for comparison with world market prices, to perform the same role as the US Gulf export quotations. Starch potatoes are not traded internationally. Therefore, it is necessary to find an alternative means of determining what would be an appropriate compensation for prices differences in the Community vis-à-vis competitors in the export arena.

Two approaches could be adopted to provide such alternatives. First, one or more competitor exporting countries could be identified in the potato starch sector, and their domestic starch potato prices could be employed as a benchmark for the purposes of determining the appropriate compensation for price differences. This would be analogous to compensating starch potato processors for the price differences in the potatoes-in-processed products, without having an actual f.o.b. price for the potatoes themselves.

It is interesting to observe that in the case of a sector in which very similar issues arise, that of sugar, the determination of export refunds is based not on the calculation of differences in the agricultural raw material prices but upon market-derived valuations of the difference in the processed end-product prices. In the case of the Commission, the weekly tenders for export restitutions and export licences are the mechanism that is used. It is noteworthy that, to the best of our knowledge, the methods used throughout the world to provide compensation to exporters of sugar-containing products from other third countries are entirely based upon calculations linked to the prices of sugar, and not to price differences in the sugar cane or beet used to manufacture the sugar.

The alternative approach is to find a product that is a perfect substitute for starch potatoes in its economic (as opposed to physical) properties. If there is a product that yields a native starch that is identical to native potato starch in its economic valuation by users, and which is viewed as a perfect substitute (in the sense that the emergence of a minor price differential between the two starches would cause demand to switch from the more expensive to the cheaper starch, and thus eliminate the price differential), then it is *as if* the price of the raw material used to manufacture the competing starch is an exact proxy for the starch potato price.

In this respect, the experience of sugar, again, is a valuable parallel. Because refined white beet sugar and refined white cane sugar are perfect substitutes for one another, commanding identical prices internationally, there is no distinction whatsoever made in any of the relevant economic elements of the export regulations within Community sugar policy, or in sugar policies anywhere else in the world, between the treatment of refined sugar derived from beet or cane. Thus, the export restitutions on refined beet and cane sugar are identical in every respect.

The regulations adopted for isoglucose and inulin syrup also are illuminating in this context. Neither is a perfect substitute for sugar, since their chemical composition is not exactly the same as that of any syrup derived from sugar. When isoglucose was first regulated in 1977, it had its own basic regulation, Council Regulation 1111/77; but from 1981, it was included in the regulation covering the Sugar Regime, i.e., Council Regulation 1785/81, and when inulin syrup was regulated, too, in 1994, it was added to the scope of the basic Sugar Regime regulation. Accordingly, for the purposes of regulation, both isoglucose (a starch derivative) and inulin syrup are treated as if they are perfect substitutes for sugar, and are not regulated, as they might otherwise have been expected to have been, under the measures applied to starch products.

Determining a Possible Benchmark for International Starch Potato Prices

In the preceding discussion, we identified two alternative approaches towards the appropriate treatment of potato starch for the purposes of deriving an estimate of the compensation for differences in raw material prices. The first was the identification of a competing potato starch exporter, whose starch potato prices could be used as an international reference. Poland is the best candidate for this role. After the EU, it is the largest exporter of potato starch, although its potato starch sector is very much smaller than its Community counterpart, producing close to 100,000 tons of output annually.

During the research for this study, we held discussions with the Polish Ministry of Agriculture and Institute of Agricultural Economics (IERiGZ, to give its Polish acronym). The data that we obtained are not as comprehensive as we would have liked, partly because starch potato prices are negotiated between factories and their suppliers, and vary with starch content, as well as by location and time. Also, the average Polish prices are given only for industrial users as a whole, including snacks and chips (for which, potatoes command higher prices); therefore, we have relied upon data obtained from earlier interviews with the leading Polish potato starch group, covering 1990-94, to apply an assumption that starch potatoes are paid 75% of the average price for industrial potatoes as a whole. (This was the ratio that was valid in 1990-94.).

Using these data, we have constructed Table A7.3.1, in the Appendix to this Question, and prepared Diagram 7.3.1. The relationship between the differential between Polish and EU potato prices and the level of the export refund is weak, but on average, the two are fairly close to one another. Therefore, we conclude that:

Taking Poland as the most appropriate producer to use as a benchmark for world starch potato prices, our estimates indicate that, on average, the EU starch refund from 1996/97 to 2000/01, converted to a refund per ton of potatoes, has been sufficiently close to the difference between Community minimum prices for starch potatoes and Polish prices for starch potatoes, for the refund to be accepted as an appropriate compensation for raw material price differences over this period.

Diagram 7.3.1: EU and Polish Starch Potato Prices vs. EU Export Refund
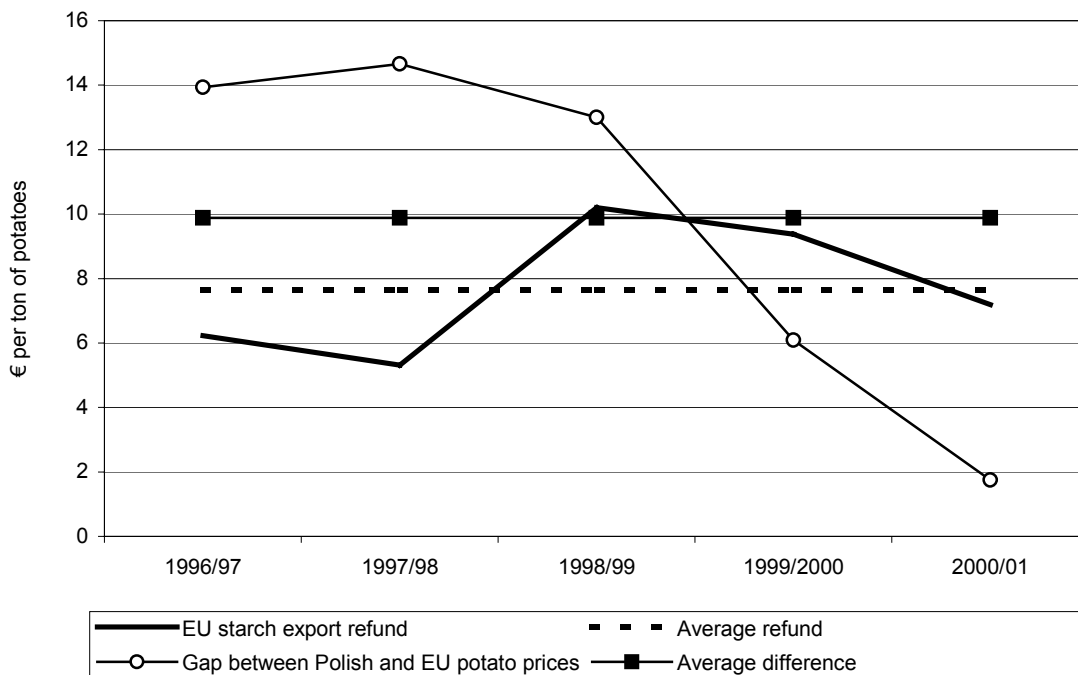
Sources: IERiGZ, Poland; European Commission (DG Agriculture, Unit C2).

Two caveats need to be mentioned regarding this conclusion. First, the Polish data are based upon estimates. Second, the data suggest that, while the export refund provides appropriate compensation, on average, the gap between EU and Polish prices is often substantially out of line with the refund. The refund appears to have provided inadequate compensation from 1996/97 to 1998/99, but excessive compensation more recently, in both 1999/2000 and 2000/01.

Determining Whether Native Potato and Maize Starches are Very Close Substitutes for One Another

The alternative approach outlined above to the question of the appropriateness of equality between the export refunds provided on maize and potato starches is to determine whether they are viewed as near-perfect substitutes of one another in the market for native starches. To answer this question, we examine the prices of native maize and potato starches in the domestic market and the export market. The extent of the substitutability between native potato starch and native potato starch should be revealed by the closeness of the prices in the markets in which they are sold.

If the prices are very similar, this suggests that they are close substitutes; if they diverge in a systematic manner, this suggests that they are not close substitutes. In the former case, it may be considered appropriate to use the compensation of price differences for maize as the basis for compensation for potato starch, in the absence of foreign trade in starch potatoes. In the latter case, where there is a sustained premium or discount for native potato starch prices over native maize starch, it may be argued that the market views them as different products. Therefore the compensation provided for maize would not be appropriate for potato starch.

Despite the inclusion within the questionnaires prepared for this Evaluation study of a number of questions addressed to starch producers and users requesting, in confidence, historical information on starch product prices, the only information that we received came from a number of industrial users, who provided data on a number of modified starches. Consequently, we had to turn to alternative sources for price data on native starches, and from these sources we prepared Table A7.3.2 in the Appendix to this Question.

In this table, we have derived the unit values on sales of native starches manufactured from maize, potato and wheat within the Community and to third country export markets, on the basis of foreign trade statistics published by Comext. The assumption that we have made is that the unit values on intra-EU trade represent domestic prices, and unit values on third country exports represent export prices on sales to the world market. The prices derived in this manner are depicted in Diagrams 7.3.2 and 7.3.3.

Diagram 7.3.2: Native Starch Export Prices Within the Community, 1992-2000
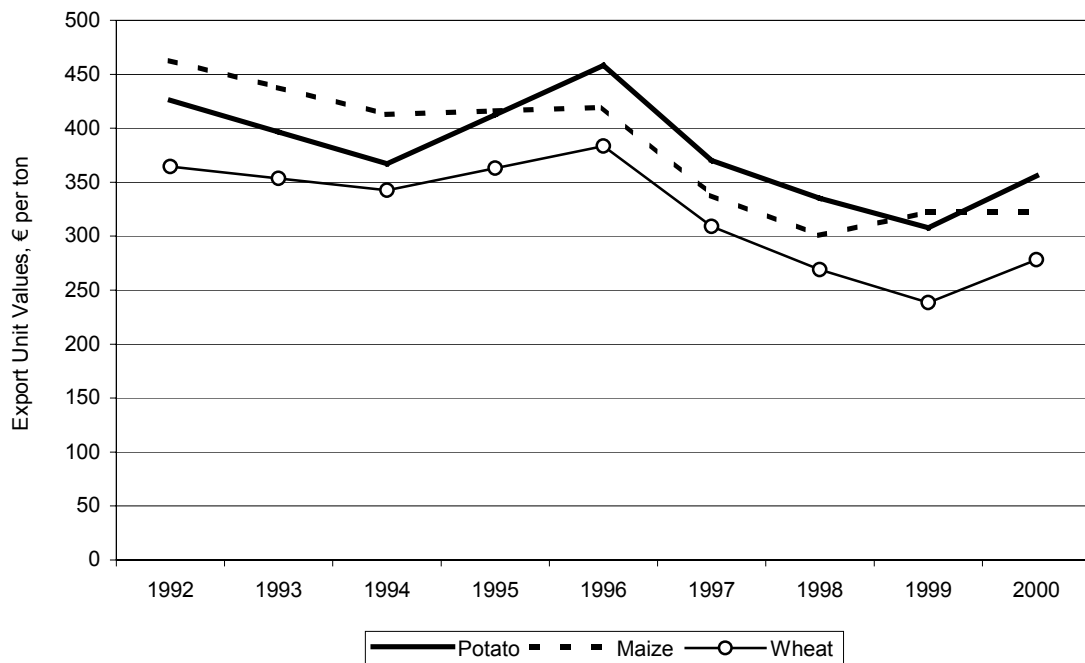
Source: Comext

Diagram 7.3.3: Native Starch Export Prices to Third Countries, 1992-2000
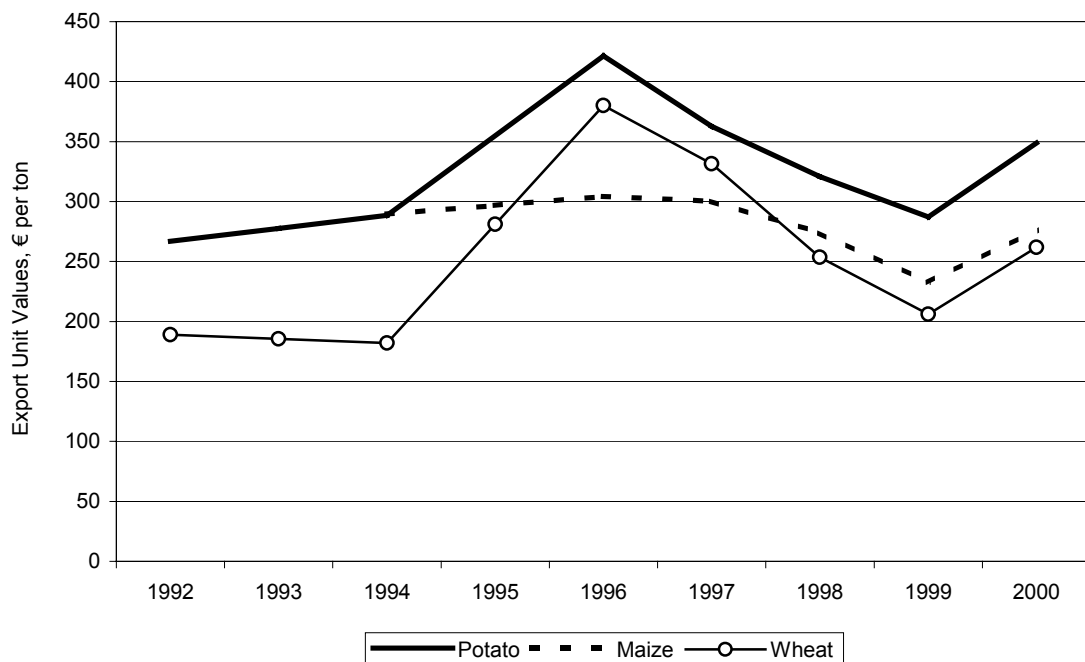
Source: Comext

An analysis of the two diagrams and the table reveals that native maize and potato starch prices are reasonably close to one another in the domestic market. In fact, Table A7.3.2 in the Appendix includes a calculation of the average difference between the two prices from 1992 and 2000, and finds it to be zero. However, from 1996 to 2000, for which the trade data are more comprehensive and cover the current 15 Member States of the Union, the difference is €25 per ton. This is still modest, and in view of the doubtful reliability of some of the data, would lead us to conclude that:

On trade within the domestic market, there is no significant difference between native starch prices for potato starch and maize starch. Therefore, the two starches may be considered to be very close substitutes in the domestic market.

The same is not true in the export arena, in which native potato starch consistently enjoys a premium over native maize starch. Diagram 7.3.3 and Table A7.3.2 demonstrate this. From 1992 to 2000, the premium averaged €59, and from 1996, it was €71 per ton.

In order the examine this further, we have also prepared Table 7.3.1, which summarises the results depicted in the two diagrams by computing the differences between domestic prices and prices on exports to the world market from 1996 to 2000, for which the data are considered more reliable than for the earlier years.

For every year, the domestic market price stands at a premium to the export price, which is what one would expect in view of the import tariff protection for local producers and the proximity advantage enjoyed by domestic suppliers. In addition, the export market would be expected to stand at a discount to local prices purely on account of the operation of the production and export refunds on maize and potato starch.

Export refunds are always higher than production refunds, by an amount that represents the freight costs from the US Gulf to Rotterdam *plus* the costs of fobbing domestic maize at the ports of Bayonne, Bordeaux, Genoa and Alessandria. Therefore, one would expect that, in an equilibrium, the gap between domestic and export prices for both native potato and maize starches would be at least as large as the (identical) difference between the export and production refunds provided on these two starches.

For maize starch, this is true. For native potato starch, this is not true. Between 1996 and 2000, the domestic price of maize starch average €63 above the export price, while the gap for potato starch averaged only €17, while the difference between the export refund and production refund on both maize and potato starch averaged €35.

Table 7.3.1: Differences Between the Unit Values of Native Potato and Maize Starch Exports to Domestic and Third Country Markets, 1996 – 2000 (in € per ton)

Domestic minus Export Prices	1996	1997	1998	1999	2000	Average
Maize Starch	115	37	27	90	46	63
Potato Starch	37	8	14	21	7	17
Export Refund minus Production Refund	20	34	27	35	44	32

Source: Eurostat (Comext); LMC estimates.

Notes: The intra and extra-Community trade unit values have been based upon data for France and Germany alone. The last row measures the gap between export and production refunds on both maize and potato starch.

This result fits the general picture painted by domestic end-users of potato starch and by the data on the distribution of potato starch sales between the domestic and export markets. As we saw in Table A2.3.2 (in the Appendix to Chapter 2), for example, it is evident that potato starch is much more heavily directed towards the export market than the local market, and this has led to complaints from some local customers of the potato starch industry that they have been forced to turn to alternative starches, notably those derived from maize and, to a lesser extent, from imported tapioca, while potato starch suppliers supply export markets instead.

The higher net revenue (after taking account of production and export refunds) obtainable on export sales of potato starches explains why exports are so important for this raw material. It also tallies with another point that was made more than once in the course of the interviews undertaken for the study. Both starch processors and customers said that they view the domestic potato starch market as having two distinct segments. There is a domestic market segment, which the consensus put at the order of 20% of total production (i.e., 350-400,000 tons per annum), for which potato starch was seen as having considerable technical advantages, and would command a premium on these grounds. The remainder of the domestic market was seen as directly substituting for maize starch. The premium priced segment characterises the export market for potato starch, in which potatoes are the base products for a mere 2% of the non-EU outlets for starches, with these customers supplying special niches.

This view is confirmed by our analysis of the price patterns at home and abroad, which demonstrates that the export market is limited in its availability of potato starch. Besides the Community, only Poland is traditionally an important source of supply, and in recent years, Poland, too, has become a net importer of potato starch derivatives, importing more from the EU than it exports to third countries. With Community exports limited by the production quotas, the non-EU market for potato starch is, we believe, restricted in its access to potato starch, and so demand is dominated by the end-uses which are willing to pay a premium for native potato starch over maize starch.

Conclusion: While there is good evidence from price behaviour in the domestic market that native maize and potato starches are close substitutes for one another, there is no such evidence for the export market in third countries. Instead, native potato starch commands a premium over maize starch. In addition, the differential between the export refund and the production refund on potato starch is larger than the differential between domestic and export prices for potato starch, which implies that export sales are, on average, more attractive to local potato starch processors than domestic sales.

The evidence regarding prices in the internal market provides a justification for arguing that, in the absence of internationally traded prices for starch potatoes, it is reasonable to use maize as a proxy for starch potatoes in respect of the production refund, by virtue of the close substitutability of their starch end-products. Regarding the export refund, this argument is not valid. In the export arena, potato starch commands a premium over maize starch; thus they are not close substitutes.

Considering the prices and price differentials presented in Table 7.3.1, it would appear economically judicious that the appropriate compensation for price differences for potato starch in export sales should be lower than that for maize starch. This is because the domestic price for maize starch was over €60 above the export price, while the corresponding gap for potato starch was less than €20. Yet, they both received the same export refund, which was typically €30-40 above the production refund. Therefore, whereas the export refund had the net effect of making maize starch exports €20-30 per ton less valuable than domestic sales made with production refunds, it made export sales of potato starch €20 or so more valuable than local sales.

If the objective of policy is to achieve some form of parity between maize and potato starches, then an administratively simple means of making potato starch exports €20-30 per ton less valuable than domestic sales with production refunds (i.e., put it in exactly the same position as maize starch) would be to cease to allow potato starch to receive residual export refunds. In other words, potato starch would be treated in the same way as all the Annex I approved products defined in Commission Regulation 87/99 governing production refunds (with the sole exception of the CN 3505 10 50 modified starches) are now treated, and receive only the production refund on exports.

It should be stressed that this suggestion is made for pragmatic, rather than theoretical reasons. It just happens to be true that the gap between native potato starch export prices and native maize starch export prices in the official Comext data has been almost identical, on average, to the gap between the production and export refunds. Therefore, it would be administratively simple to provide appropriate compensation for the price difference between the two starches in the export arena by treating native potato starch as if it were an approved product, and ending the residual export refund.

Because the suggestion is made on pragmatic grounds, the issue of its extension to the use of potato starch in other products that receive export refunds should also be made on pragmatic grounds. The most important such use now is the CN 3505 10 50 group of esters and ethers. It is interesting to note, in this context, that one of the conclusions to Question 5.2 was.

There is perceived to be some additional cost caused to domestic users of potato starch by the measures in place, most notably the export refunds. The reduction in the scope of these refunds in July 2001 may help the users slightly, but several reported during interviews undertaken during the course of this Evaluation that they feel that the continuation of higher export refunds than production refunds on the CN 3505 10 50 category of modified starches is continuing to reduce the availability of potato starch products locally.

This obliges them to pay higher prices than they would otherwise, or switch to substitute cereal starch derivatives. This is viewed as being reinforced by the effects of the reduction in production quotas, with potato starch producers eager to defend export markets, putting the burden of adjustment to quota cuts onto local users.

Therefore, there is a strong case to be made for treating all exports derived from native potato starch in the same way, and removing the residual export refund on the use of native potato starch in esters and ethers.

The management of such a system is technically feasible. This conclusions is drawn for two reasons:

First, since distinctions are already made between starches in terms of their raw materials in the collection of statistics for the management of production refunds (where the raw material has no effect upon the level of the refund), the same system could be applied without creating any extra technical demands in the case of export refunds.

Second, native potato starch is distinguished from maize starch in export statistics; therefore, at the level of native starch they are clearly distinguishable. In addition, potato starch factories are now physically separate from cereal starch factories. Consequently, even though some companies manufacture both cereal and potato starches, it is straightforward to monitor the origin of a processed starch product by relating it to the factory in which it was manufactured.

The application of different export refunds for potato and maize starch is also economically judicious. The economic benefits to the Commission are evident, since the proposal to pay only production refunds on exports of potato starch would be less costly than the current system of export refunds. In addition, the management of the system, both in the public and private sectors, would impose no additional workload or costs in relation to the system already in place. Indeed, there would possibly be some administrative savings, since all potato starch products would be entitled, at most, to just one level of refund, rather than two, as is the situation today.

THE APPLICATION OF A MIXED CALCULATION FOR THE EXPORT REFUNDS ON GLUCOSE

The Policy Instrument: the Formula Applied to the Mixed Calculation

The mixed calculation for the determination of the export refund on glucose is a weighted average of the export refund on maize starch and the refund on wheat starch.

In deriving the export refund for "glucose and products", the Commission assumes that they are 75% maize derived and 25% wheat derived. The formula that the Commission applies is as follows:

Where WX is the export refund on wheat and MX is the export refund on maize, the export refund for glucose is then calculated per ton of glucose as:

$$(WM \times 0.25 + MX \times 0.75) \times 1.6.$$

This is remarkable in one respect; in all other contexts the technical coefficient applied to wheat in starch output is 2.0, but the mixed calculation formula implicitly assumes that the technical coefficient applicable to wheat starch in glucose manufacture is 1.6. If the normal technical coefficients had been applied in this case, the mixed calculation would have yielded the following formula:

The expected refund per ton of glucose = $(WM \times 2.0 \times 0.25 + MX \times 1.6 \times 0.75)$.

The difference between these two formulae is one of $WM \times 0.4 \times 0.25 = WM \times 0.1$. Therefore, the mixed calculation formula for glucose export refunds actually *under-pays* exports of glucose the equivalent of 10% of the wheat export refund per ton of glucose, if the normal technical coefficients had been applied in the calculation.

Conclusion: The mixed calculation for the export refunds on glucose and its products is not consistent with the technical coefficients used in determining the export refunds for wheat and maize starch in other products. If the mixed calculation had been undertaken on a consistent basis, it would have been higher (per ton of glucose) by the equivalent of 10% of the export refund on wheat in wheat starch products.

Diagram 3.4 from Chapter 3 depicts the behaviour of the export refunds per ton of starch for maize and wheat starch, as well as for glucose, since 1997. It may be seen that the export refunds are nearly always higher on maize starch than wheat starch, but there were very short-lived periods, e.g., in early 2000, when wheat starch actually received a higher export refund per ton of starch.

The difference between the maize and wheat starch curves in that diagram suggests that there is a strong *a priori* case for differentiation in the export refunds for glucose according to whether it is derived from maize or wheat. Moreover, since the export refunds on native maize and wheat starches are considered in the answer to Question

4.4 to provide something close to appropriate compensation for the difference in base product prices between the Community and third country exporters, there must be an initial assumption that differentiation on the basis of base product would also be warranted in the case of glucose production. However, the complexity of the technical monitoring system needed to identify the base product from which an exported starch product was manufactured militate against efforts to introduce separate refunds according to the raw materials used in glucose manufacture.

The first reason for arriving at this conclusion is that glucose manufacture is often undertaken in factories that process both wheat and maize[4]. Within these factories, as well as in decisions about the location of production within multi-factory companies, glucose syrup manufacture is often switched from one raw material to another at short notice, to reflect the variable costs and availability of the alternative starch slurries.

A second pragmatic reason for favouring a single refund for glucose, regardless of its base product, is that the technology needed to make a distinction by raw material is costly to employ. A good analogy in this respect is testing for the presence of DNA for the monitoring of GMO/non-GMO glucose. The more highly refined the glucose, the harder it is to identify DNA that reveals the origin of the cereal that was processed. With 100% refined glucose, there should be no trace of the cereal that was used as the raw material. The machinery used for GMO monitoring is extremely expensive to operate, since it has to be able to trace parts per billion in its identification of the base product. With native and modified starches, the base product is much easier to identify from the physical properties of the starches in question; therefore, it is technically feasible to identify the raw material without undue cost or difficulty, which makes the monitoring of the flows of native and modified starch products on the basis of base products comparatively simple.

For the GMO/non-GMO distinction in the case of syrups, it may be sufficiently important economically to the food processor to bear the necessary cost, which we understand amount to tens of Euros per ton, in order to be able to give cast iron assurances to customers as to the origin of the base product that is used. This expenditure would not economically efficient in terms of administering export refunds in glucose products. Therefore, we arrive at the following conclusion:

For the monitoring of glucose for the determination of differentiated export refunds, the expenditures needed to monitor the base products used in its manufacture cannot be considered economically judicious. The costs of monitoring are likely to exceed the sums that are likely to be saved by making the distinction between the raw materials.

The conclusion that a single mixed export refund is economically judicious for glucose and its products still leaves open the question of whether the formula that is employed is a correct one. We have already noted the apparent inconsistency between the formula that is used for the mixed calculation and the one employed in determining export refunds for wheat starch. There is also the matter of the weights given to maize and wheat in the calculation, namely 75% to maize and 25% to wheat.

In determining the appropriateness of the weights used in the mixed calculations, two alternative approaches have been considered. The first, taking account of our best estimates of the division of starch derivative output between the different raw materials (detailed in the Appendix to Chapter 2), is to compare the proportions of total starch sweetener output in the Community that have been derived from maize and wheat.

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[4] In practice, very small tonnages of glucose are now manufactured from other base products.

Diagram 7.3.9: Shares of EU Production of Sweeteners by Raw Material
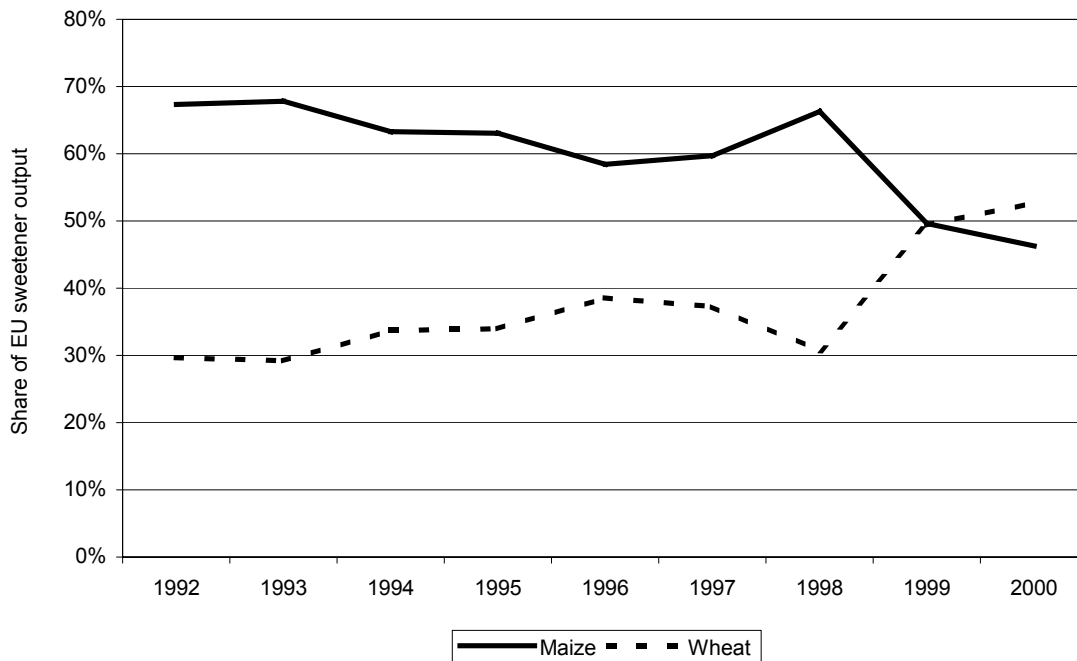
Source: LMC estimates, derived from data provided by individual starch processors

Diagram 7.3.4 presents the results of that comparison (details of the calculation are provided in the Appendix to this Question). Until 1998, wheat accounted for between 29% and 39% of Community glucose output, since then it has risen rapidly to become the main raw material in glucose production. Maize, by contrast, held a share that lay between 58% and 68% of total output until 1998, and since then has fallen below 50%.

A second approach was adopted during interviews with starch processors, when a question was posed about their raw material use in glucose manufacture. The only company that provided a quantitative answer to this question said that its own latest analysis revealed that, on average, in the past year, the share of low and medium DE (dextrose equivalent) glucose syrups that was wheat-derived was below 20%; but the wheat share of very high DE hydrolysates (for fermentation) was close to 30%. The weighted average of the two figures was almost exactly 25%.

A different picture is painted by an analysis of the production refunds granted on organic chemicals (again the details are provided in the Appendix to this chapter). We have estimated that this class of products depends upon sweeteners for approximately 95% of its starch inputs; therefore, the composition of the starches used in the sector (as revealed by the production refunds) might be expected to be a good reflection of the composition of the starches used in glucose production in the Community as a whole.

Diagram 7.3.5 reveals that the wheat share of the starches that receive production refunds in the manufacture of organic chemicals was below 10% from 1995/96 to 1997/98, and was steady at less than 15% in 1999/2000 and 2000/01.

Diagram 7.3.10: Shares of Maize and Wheat Starch in the Production Refunds Granted for Organic Chemicals

Source: Derived from data provided by European Commission (DG Agriculture, Unit C2).

Note: The French data for 1998/99 are not disaggregated by base product; therefore 1998/99 data have been excluded.

Conclusion: Yet again, the analysis of data for the starch sector proves to be confusing, since the different sources yield sharply differing results. Our own qualitative assessment, based upon a number of discussions with starch processors, is that the weights used in the mixed calculation for the glucose export refund were probably fairly close to the truth until 1997-98, but since then, they have increasingly failed to reflect the rapid increase in wheat starch-derived glucose capacities and production.

The consistent understatement of the export refund on glucose by virtue of the use of a technical coefficient of 1.6, rather than one of 2.0, on wheat starch is a partial offset (intentional or otherwise) to the effect of the mixed calculation, which is generating a refund that appears to be too high on average, since it applies too low a weight to wheat in the formula.

However, we believe that it would only be technically feasible at a considerable cost to provide export refunds on glucose and its products that differentiated according to the base product used in the manufacture of glucose.

In addition, we conclude that it is economically judicious, in terms of the administration of the system of refunds, to continue with a single refund system for glucose, which does not require expensive methods of testing which are likely to cost more per ton of glucose than the savings achieved in the average level of the export refund.

Consequently, the changes that we would recommend to the mixed calculation for the export refund for glucose and its products would be ones that both correct for the inappropriate technical coefficient applied to wheat and reflect the much greater importance of wheat as a raw material in glucose manufacture in recent years.

The formula that we recommend is the following:

Where WX is the export refund on wheat and MX is the export refund on maize, the export refund for glucose should be calculated per ton of glucose as:

(WM x 0.5 x 2.0 + MX x 0.5 x 1.6.) = WM + MX x 0.8

This assumes that glucose is manufactured 50% from wheat and 50% from maize, and applies a technical coefficient of 2.0 to wheat and one of 1.6 to maize. Had this been applied from February 1997 to July 2001, it would have reduced the average refund by €5.7 per ton below its actual level, and the movement in the refunds would have been as depicted in Diagram 7.3.6.

The refund would have been very little altered during the periods when it was at its highest levels, but would have been reduced considerably in recent months, as the export refund on wheat starch dwindled to zero on many occasions.

Diagram 7.3.11: Impact of Implementing the Recommendation for Revising the Glucose Export Refund Calculation, February 1997–July 2001
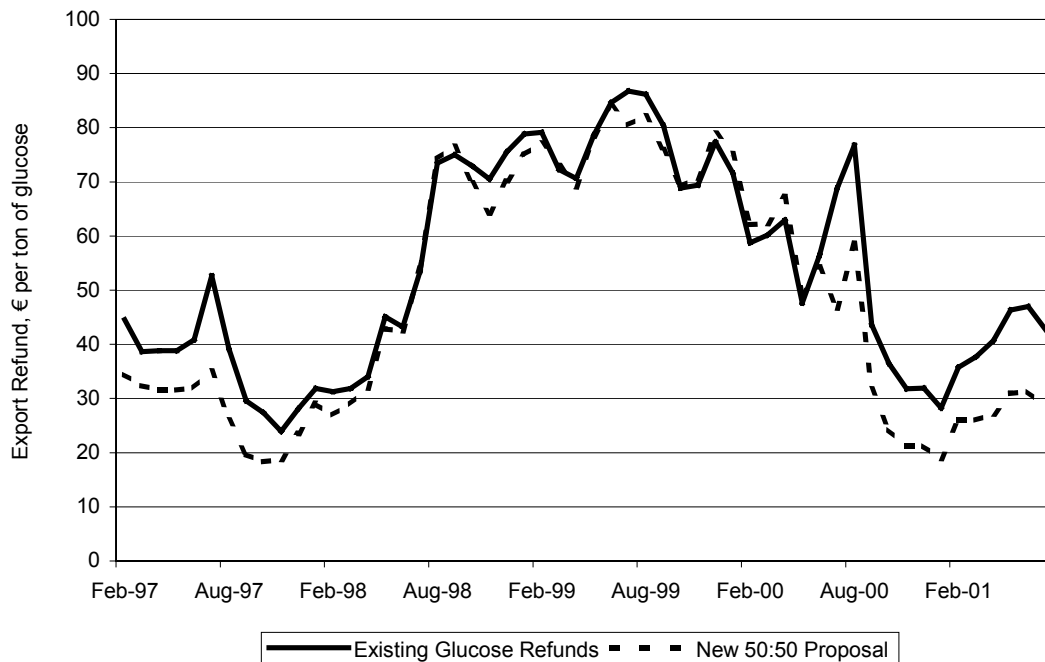
QUESTION 7.4

Did the management mechanisms and the administrative systems installed in the grain and potato starch sector, in particular the production quota, the fixing of refunds and the monitoring of licences, ensure efficient management of the sector?

Objective of the Question: To determine whether the current systems for managing the systems in effect in the starch sector are efficient in the amount of administration that is required in both the private sector and the public sector management of the system.

Instruments: Potato starch production quotas, the calculation of production and export refunds, the computation of technical coefficients, the payment of refunds and the supervision of export licences.

Criteria: The costs of administration of the mechanisms are minimised. The costs of administration are very small in relation to the sums spent on the mechanisms.

Indicators: The number of people employed at each point of administration of the system in the public and private sectors.

The costs of employing these people to administer the management of potato starch quotas, the calculation and processing of claims for refunds, and the supervision of export licences.

METHODOLOGY

The answer to this question is mainly based on the information we received from the people we interviewed during the course of the evaluation. A synthesis of our visit notes can be found in Appendix C.

In the case of the cereal and potato starch sectors, management can be understood as the implementation, supervision and control of the regulations to meet the objective of compensating European starch processors for the higher base product prices in the European market. The main instruments used to do so are the potato starch production quota, the production refund and the export refund.

The efficiency of the management of the system depends on whether the existing instruments enable it to meets its objectives without creating an unacceptable administrative burden.

THE PRODUCTION QUOTA FOR POTATO STARCH

Even before the introduction of the quota system for potato starch, starch potatoes had to be weighed on reception at the starch potato processing plant, in order to determine the price paid to the starch potato farmers. Independent controllers supervise the weighing and sampling of starch potatoes.

The only extra administrative task imposed upon the factory by the quota is sending information on a regular basis to the payment agency during the campaign, and by the 31st of May at the latest, about the total quantity of deliveries (both in tons of potatoes and the correspondent tons of starch, according to the formulae laid out in the *barème féculier*).

The national payment agencies have administrative responsibility for the monitoring of deliveries during the campaign and to ensure that the national quota is not exceeded beyond the 5% margin for flexibility permitted under the regime. They also have to ensure, in addition, that any starch produced beyond the 105% permitted upper limit to the quota is exported without a refund.

The 5% upward flexibility permitted in the quota (to be offset in the form of a reduction in the quota the following year) has to be applied for. The processor needs to ask permission of the payment agency by the 30th of April.

In summary, the quota system does not impose a noticeable extra administrative burden in connection with the potato starch regime. The extra administration required is minimal, as controls at the reception points of the starch factory have to be undertaken even without the quota system, and sending in regular statistics about the delivery quantities is not considered to be a time-consuming task.

The Refunds

In order to obtain a production or an export refund, the producer, end-user or exporter has to apply for a production refund certificate (Article 5 of Commission Regulation 1722/93) or an export refund certificate (Article 10 of Commission Regulation 1520/2000). The recipients of certificates have the right to pre-fix the refunds. Chapter 3 provides details of the pre-fixation rules.

During the validity period of the export certificate the holder is eligible to apply for the refunds equal to the amount for which the certificate has been issued on goods exported during the period of validity of the refund certificate. Production refund certificates are valid until the end of the fifth full month following the month in which the application for this certificate has been made. In the case of export refunds, they are valid for four full months beyond the current month, or until the end of the Commission's budgetary period, if this is earlier. For export certificates granted after June 1, the Commission may extend their period of validity.

If production refund rates are fixed in advance, these rates remain valid until the end of the fifth month following the month in which the application for advance fixing was lodged, or until the end of the period of validity of the certificate if this is earlier. In the case of export certificates, the refund rates may only be pre-fixed up to four full months beyond the current month.

For some products, the certificates have to be used within 30 days during the inter-crop period. Because the main maize harvest does not start until October, whereas the new wheat crop is available in July, in the period between July and end-September, production refunds and the export refunds on both maize starch and glucose exports have a validity of only 30 days. This is done to prevent refunds being pre-fixed on the basis of seasonally high maize prices before the arrival of the new crop, and then being applied to exports made once the new crop comes in at lower prices, or being applied to glucose made mainly from new crop wheat in the July-September period.

The application for a production or export refund certificate is usually undertaken by the same people in the end-use or processing sectors as those who apply for export licences. Likewise the people in the payment agencies and ministries dealing with the refunds are nearly always the same as those handling export licence applications as well. Hence the extra administrative burden is not very significant.

During the interviews held as part of the current Evaluation, both processing and end-use companies confirmed that, even when the refunds are very low, as has recently been the case for wheat starch, they still find it worthwhile to claim the refund. They have the administrative infrastructure in place to do so, and they have to request the export licences anyway.

A general complaint encountered from end-users and processors who were contacted during this Evaluation is about the level of the guarantee required for the pre-fixing of refunds. Before, when the refunds were very high, the guarantee required was often more than €100 per ton; now it is only €15 per ton. However, they feel that the guarantee should be lower, at present, since it is currently actually higher than the production refund. The guarantee is intended to be a guarantee against a failure to use a refund that has been pre-fixed, and therefore it appears excessive for the amount of the guarantee on occasion to be greater than the sum at risk.

Furthermore, a few starch processors and end-users stated that they felt at a competitive disadvantage with rivals in the US, who were able to use commodity price hedging mechanisms to cover their base product price risks as far as one or two years ahead, as is possible in the US. In the Community, processors may have long term contracts with customers, but are only permitted to pre-fix the refunds for a limited period.

They say that it is much harder to hedge far forward in the EU than elsewhere; however, this, we feel, overstates the situation. Within the Community, traders are willing to cover raw material price risks well into the future on a private basis. They are able to do so because the main risk related to the level of refunds is the risk that the differential between US and EU cereal prices will vary, and this particular risk may be managed by conventional hedging means, with the use of cereal future contracts in both markets.

If such hedging mechanisms are not available to individual starch producers or end-users, exporters can always put their products produced with the benefit of export refunds under Customs control, so that when the time limit to the refunds expires, the products are placed under Customs control and the products in question are considered legally to have been exported, without leaving the territory of the Union.

The Export Licences and T5 Customs Documents for CN 3505 10 50 Products

Export licences have to be requested for starches and other starch products, such as wheat gluten and maize gluten feed and meal, in order to be able to export them. In addition, the producers of starch esters and ethers (the CN 3505 10 50 Code products) require T5 Customs forms when transporting their products across national boundaries within the Community.

Many people whom we interviewed suggested the abolition of the requirement that esters and ethers should be used in conjunction with T5 Customs forms. They stated that most of the users of these products are too small to invest in the machines needed to transform these products back into native starch. They also noted that that the low current level of the production refund has removed any economic incentive to convert these products into glucose or native starch and then back into esters and ethers, and thereby claim a second production refund.

The costly transformation of esters and ethers into native starch is, however, not the only way in which such modified starches might be adapted so as to receive more than one production refund. It would be relatively simple, for example, for processors to add

some native starch to certain etherified and esterified starches made by acetylating native starch, and by doing so to turn them, in a strictly legal sense, back into native starches (as the percentage of acetylates in the resulting mixture would be too low to be classified as 3505 10 50 products).

Therefore we believe that there is justification for maintaining these special controls for esters and ethers, as the sole starch derivatives whose production refund is received by the starch processor. In the past, processors have breached the regulations on this category of products, and without the controls they could do so again.

The Employment Directly Related to the Administration of the European Starch Regime

The system of applying for export licences and for the T5 Customs documents involves a considerable amount of time. The regime is complicated, labour intensive and the costs incurred in controlling it are high.

Table 7.4.1 gives an estimate of the number of full-time jobs that are required for the management of the starch regime per country. These jobs include an allowance for the time allotted to the administration of refunds, export licences and quotas. The estimates are based on data that we received in the interviews we held with ministries, payment agencies, end-users and processors, and have been adapted to take account of the different number of starch factories in each Member State.

For the ministries, payment agencies and end-users, the allocation of time to starch-specific administration of refunds and licences is often difficult to attribute, since the export refunds for non-Annex I products may involve refunds on more than starch alone.

The officials who deal with starch also handle many other base product and input purchases, too. Nevertheless, large companies with many factories in the Community stated that the administration of the refund is often difficult to centralise, since the Customs authorities require the people responsible for the refunds for a particular product to be sworn in formally, and the amount of information needed to be submitted is sometimes very specific to each plant location.

A company using starch products on 100 sites may require 100 separate people to be involved in the day-to-day administration of starch related issues, as well as other purchasing and exporting responsibilities, although the adoption of sophisticated management information systems is enabling a much greater degree of centralisation to occur.

In the table, we have built upon very specific data collected for a number of companies and countries, and have assumed that the administration of the refunds on esters and ethers is included in the figures provided by the starch companies.

For the end-user estimates, we have compared the volumes of starch for which production refunds have been received in all uses, apart from CN 3505 10 50 products, and then assumed that the employment required for the administration of refunds is proportional to these starch volumes. Altogether an estimated 561 full time jobs are involved in the administration of the starch measures, divided roughly 1:2:1 between official agencies, end-users and processors.

Table 7.4.1: Estimates of the Number of Jobs Related to the Management of the Starch Measures in Official Agencies, Processing Plants and End-Users by Member States, 2001

	Official Agencies	End-Users	Processors	Total
Austria	6	21	6	**33**
Belgium	3	6	3	**12**
Denmark	15	10	15	**40**
Finland	12	1	12	**25**
France	19	76	20	**115**
Germany	32	49	33	**114**
Greece	1	1	2	**4**
Ireland	0	4		**5**
Italy	6	29	6	**41**
Netherlands	13	27	13	**53**
Portugal	1	2	2	**5**
Spain	4	20	5	**29**
Sweden	16	0	17	**33**
UK	7	37	8	**52**
Total	**139**	**284**	**139**	**561**

Source: LMC estimates based on interview notes with ministries, end-users and processors.

In order to understand the importance of these costs in relation to the scale of the starch sector, it is useful to analyse the value added in the starch sector and to calculate the value added per job directly related to the management of the starch regime. Table 7.4.2 does this, calculating the difference between total starch production and the cost of base products, i.e., the value added generated by the processing of raw materials into starch. The value added per job directly related to the administration of the starch regime is then computed. One job in the management of the starch regime represented an average value addition of €1.68 million in 2001.

Table 7.4.2: The Value Added per Job Related to the Management of the Starch Regime

Total Value Raw Material (in € billion)	1.69
Total Value Starches (in € billion)	2.63
Value Added by Starch Sector (€ billion)	0.94
Number of Jobs for Starch Regime Management	561
Value Added by Starch Regime per Job (in € million)	1.68

Source: LMC estimates and data from the Fachverband der Stärke-Industrie, Germany.

Conclusions: The current instruments used to manage the potato and cereal starch regimes are adequate to ensure that payments are made where they are supposed to be made under the various regulations. Even though at first some aspects such as the T5 Customs documents for esterified and etherified starches might seem an unnecessary administrative burden, a closer analysis demonstrates that the system has been needed in the past to avoid fraud, and the ease with which processors could

attempt to circumvent the controls in the absence of the T5 form calls for the continuation of such measures.

The number of people in the private and public sector working on the implementation, supervision and control of the quota and the refund system is large, but many of these people also handle the application process for export licences, which are needed even if no refund will be claimed. In addition, several end-users have complained that the current administration of the system often makes it difficult to centralise the process of claiming refunds.

When the number of jobs related to the administration associated with the measures of the starch regime is compared with the value added in the starch industry, each full-time job corresponds to €1.68 million of value added in the filière*. This, we believe, represents a low level of value added, or alternatively a high ratio of administrative costs to overall value added. Once one allows for the full costs of administrative staff and their non-wage expenses, it is conceivable that as much as 5% of the value added in the sector could be absorbed in administrative expenses.*

Chapter 8: Conclusions

Before turning to a summary of the main conclusions to be drawn from this Evaluation, it is important to note one respect in which the starch *filière* proved unexpectedly difficult to evaluate. The coverage of the data available on the sector's activities is often surprisingly patchy, which makes it difficult, not only to answer some of the Questions posed in this Evaluation, but also to make a judgement about the appropriateness of measures applied to the sector.

A couple of examples of the deficiencies in data coverage will illustrate the nature of the problems that one encounters. The first example is drawn from agriculture, and relates to the analysis of the opportunity cost of the measures applied to the starch potato sector. In order to compare starch potato farming with the leading arable crops, which are the main alternatives to potatoes, one needs to take account of the increasing role played by area payments in the incomes of cereal and oilseed farmers. The most appropriate comparison in this respect is between the overall incomes and margins earned per hectare on starch potato and cereal or oilseed crops; yet, there are no comprehensive official, or unofficial, sources of data regarding the areas and the yields of starch potato farmers. Therefore, precise opportunity cost comparisons per hectare, which lie at the heart of some aspects of the Evaluation, cannot be made.

The second example relates to the analysis of export refunds. The most readily available and detailed data on exports of starch derivatives from the Community are those published by Comext. The Comext data aggregate the national foreign trade statistics from the individual Member States. The alternative information, derived from export licence and export refund statistics, not only proved unexpectedly difficult to obtain, but is much less detailed in its scope.

This would not matter if the two series were similar in magnitude and in their broad patterns over time; unfortunately, when the two sets of trade statistics are compared, one discovers that national agencies which provide Comext with its information, choose to conceal or suppress a considerable amount of data, presumably to protect the commercial confidentiality of private companies. This means that Comext statistics refer to significantly smaller volumes of foreign trade than the export licence figures, and the pattern of variations in the Comext series over time often differs from the pattern revealed by shorter time series provided by DG Agriculture, Unit C2, and DG Enterprise on the volumes of Annex I and non-Annex I exports.

In the end, the analysis contained in this Evaluation is based primarily upon the statistics obtained from Comext, because the run of data is longer and the information is much more disaggregated; but the policy measures applied to export refunds actually affect the quantities covered by the official export licence and export refund statistics. Accordingly, an important element of the analysis is missing.

Therefore, one of our main conclusions is that there is an urgent need to improve the quality and availability within the Commission of key data needed to monitor the performance of the starch sector and the measures applied to it. In this respect, the highest priority should be attached to improving information about the starch potato sector, notably the areas and yields of the crop. It is intended to incorporate starch potatoes within the FADN/RICA network to monitor the economics of farm enterprises, but our impression is that this is happening slowly. We believe that this needs to be given greater urgency.

The availability of information about the export volumes receiving export licences and export refunds also needs to be improved, to permit more precise analysis. There are very important aspects of the Evaluation, notably about the effectiveness of the system of export refunds, that could only be undertaken in broad outline, because the full data were not available for long enough periods to be suitable for rigorous analysis and because disaggregated information was not provided for the main sub-categories of starch products.

KEY ISSUES IN THE EVALUATION

In the course of this final chapter, we shall focus upon the three major areas of policies towards the starch sector. These are the determination and implementation of the system of production refunds; the determination and implementation of the system of export refunds; and the specific measures applied to the potato starch sector.

These policies have consequences for the consideration of the Questions that are considered in the course of Chapters 4 to 7, namely the equilibrium within the starch market and the overall markets for base products (in Chapter 4); the production channels within the starch sector (in Chapter 5); farmers' incomes and rural development in the regions supplying the base products for starch manufacture (in Chapter 6); and the management of policies within the sector (in Chapter 7).

Many of the policies applied to starch products are not directed solely towards the starch sector. Production refunds apply to other agricultural sectors, and are part of the broader CMO for cereals; and export refunds cover a very wide gamut of products derived from agricultural base products. Virtually the only major group of policies that is specific to starch is the set of policies applied to the potato starch segment.

This means that it is possible that some of the conclusions presented below, which are seen as being in the interests of more cost-effective and efficient management of policies in the starch sector, may conflict with broader objectives of the Council of Ministers. Thus, what is first best for the starch sector alone may clash with the second best solution that is more appropriate to the Community as a whole.

PRODUCTION REFUNDS

The appropriateness and effectiveness of production refunds are the criteria by which these refunds should be judged in relation to the main objective, which is to compensate for price differences between the base product prices in the Community and those in overseas countries which supply competing end-products to the Community, when these competing end-products are unprotected (or, more correctly, little protected) by import tariffs.

In considering this issue, we concluded that there are three major issues to be examined. The first is the appropriateness of a single refund for all base products. The second is the appropriateness of the coverage of the products eligible for production refunds. The third is efficiency of the management of the refunds.

The Appropriateness of a Single Production Refund

The origins of the single production refund are readily understood. When the CAP was being established, maize starch dominated the domestic starch sector. Potato starch was important, but was viewed as a close substitute for maize starch, while wheat starch was seen in much the same way that it is still regarded in the US, namely primarily as a source of vital gluten, with the starch merely an important co-product.

The situation today is very different. Maize starch accounts for less than half of all the starch produced in the Community, and wheat is rapidly catching up with maize in various important applications of starches. For example, wheat is now the base product for over half of the glucose syrups produced in the Community.

On theoretical grounds, there is little reason to believe that a single refund is appropriate. As just mentioned, wheat is now a major alternative raw material to maize in starch production, and since 1997, separate export refunds have been applied to starch products derived from these two different base products. In practical terms, therefore, there is no administrative difficulty in applying separate refunds to the two base products. Indeed, separate information is still maintained on the allocation of production refunds by base product, although a single production refund has been applied for over a decade (with the exception of minor cereals, such as barley, for a period).

On practical and pragmatic grounds, the question to be answered is whether the production refund that would be determined by a separate calculation for wheat, maize and potato starch would yield a significantly different refund for each base product.

In the case of potato starch, the analysis presented in this report reveals that, in the internal market, this starch is a very close substitute for maize starch, in the sense that the two native starches sell at very similar prices. There is no transparent method of determining appropriate compensation for price differences in the base products (i.e., starch potatoes) in relation to other exporters of potato starch. The criterion that we favour towards the appropriateness of establishing the same refund for maize and potato starch was that they behave as if they are very close substitutes. Therefore, we see no reason to establish different refunds for maize and potato starch.

For wheat, however, the calculations of the appropriate compensation for price differences reveal that, on average, wheat requires a somewhat lower refund than maize. We should stress that this is <u>not</u> because wheat receives higher by-product credits in processing than maize. The full calculation of the appropriate compensation for price differences (undertaken while answering Question 5.3) should reflect only the like-for-like differences in the same base product prices in the Community and abroad. In other words, wheat prices in the Community should be compared with wheat prices elsewhere, and not with maize prices. If wheat is more cost-competitive than maize as a raw material for starch manufacture, as has recently been the case in many Member States, it is not the role of the production refund to offset that inherent competitiveness.

We believe that the US is the appropriate benchmark for comparison in both the wheat and maize starch sectors. This is because US exports of native wheat starch now rival those from the Community, while US exports of maize starch derivatives, notably to its NAFTA neighbours, are now larger than those from the EU. Since the information needed to pay production refunds separately to wheat and maize already exists (the production refund returns distinguish between the base products used in the manufacture of each approved end-product), it should be administratively simple to introduce separate refunds.

Therefore, we conclude that it would be appropriate to introduce separate production refunds for wheat and maize starch. In calculating the wheat refund, it is suggested that the US Soft Red Winter wheat price is used to determine the base product price in the relevant competing overseas market, since common wheat is the preferred raw material in the Community wheat starch industry.

In terms of compensation for the price differences, we believe that it is appropriate to take account of by-products in determining refunds (this is true of both the production and the export refunds), since by-products are also managed within the CAP, as basic agricultural products.

The method that we propose for the incorporation of by-products does not actually require close monitoring of the value of the by-products. Instead, we propose that the estimate of the refund is adjusted to reflect the f.o.b. to c.a.f. freight costs that arise if one country is an importer of a particular by-product from the other. On this basis, US wheat starch processors would be assumed to receive higher vital gluten by-product credits than EU producers, while Community maize processors would be assumed to receive higher by-product values from corn gluten feed and corn gluten meal. The effect of allowing for by-product credits in the calculation of production and export refunds is outlined in the Appendix to this chapter.

We conclude that account should be taken of by-product credits in the determination of maize and wheat starch refunds. In view of the substitutability between native maize and potato starches in the internal market, the proposed maize refund with an allowance for by-product credits should also be applied to potato starch. Also, the modest scale of starch production from barley, oats and rice leads us to recommend that they continue to be given the same production refund as maize starch.

The Range of Approved Products

The most important category of approved products for production refunds is paper products, which directly and indirectly account for almost 60% of total production refunds. 33% of the refund is received directly on native starches (and a small amount of glucose) and the remainder indirectly via the paper industry's use of esters and ethers. However, the conclusion from the consideration of the cost-effectiveness of the production refunds was that the proportional use of starch is so low in the paper sector (averaging 3% by weight of the end-product) that the refund suffered from considerable deadweight in its application. Indeed, we concluded that many end-uses in the paper sector could be removed from the list of approved products without creating any problems in terms of ensuring outlets of Community base products in starch.

Similar deadweight applies to the provision of production refunds for many other approved products. Therefore, we conclude that it would be appropriate to reduce the definition of approved products for the granting of production refunds. Instead of including products whose starch use is negligible, we believe that production refunds would be more effective if there is a requirement that the starch content should exceed a certain minimum threshold percentage. At present, with low production refunds, the limit should be set at a relatively high level, such as 5% of the value of the end-product.

This would greatly reduce the range of products that received refunds, without having, we believe, a noticeable impact on the share of the domestic market supplied by local producers of the approved products. The main recipients of the refunds if the proposed reform is instituted would be the producers of esters and ethers and manufacturers of some of the organic chemical products, which, besides the paper sector, are the other main users of production refunds.

Many times during the course of the interviews carried out for this study, processors and end-users complained about the bureaucracy associated with the refund system on esters and ethers, which are monitored using a Customs form, the T5 form, on intra-Community trade in order to prevent fraud.

We concluded, however, that although the forms require extra administration, a danger exists that, by blending acetylated starch with native starch, it is possible to transform a product entitled to a production refund (in terms of exceeding the acetyl level that defines an acetylated starch) into one which qualifies as a native starch and receive a further refund. Therefore, we feel that the system of T5 forms should remain in place.

Pre-Fixing Refunds and the Administration of Production Refunds

The proposals outlined above should lower the administrative costs associated with the refund, since the range of products covered by the refund would be reduced. However, there are other benefits for the management of the sector that should follow the introduction of separate maize and wheat refunds. For example, the pre-fixing of refunds would be able to be simplified. A number of processors and end-users expressed their disgruntlement about the limits placed upon the eligibility of refunds and the pre-fixation of such refunds during the inter-crop period for maize, from July to September. Moving to a system of separate refunds would allow wheat processors to apply for refunds with several months' validity and to pre-fix their refunds during the July-September quarter.

We conclude that adopting a framework in which production refunds are specific to the base products, it should be possible to make the refund system more flexible, and reduce the need for bureaucratic intervention during the marketing year.

EXPORT REFUNDS

The evaluation of the present system of export refunds reveals that several of the issues that arise are similar to those that emerge in the consideration of production refunds. In addition, there are a few issues that are specific to export refunds, such as the measures of July 2000, which ended the right of almost all approved products, those entitled to production refunds, to receive residual export refunds (the sole exception is now the class of esters and ethers).

Among the conclusions relevant to export refunds, and which have already been mentioned in the context of production refunds, is the introduction of by-product credits into the calculation of the appropriate compensation for base product price differences, using the same approach as that outlined above[1]. The restriction of refunds to products with a minimum threshold level of starch content would be another. The former reform — regarding by-product credits — would be easy to introduce, while the latter would reduce the administration associated with the processing of refunds.

As just noted, the coverage of products eligible for export refunds as non-Annex I products was reduced in July 2000, so as to remove from the scope of such refunds all approved products, apart from esters and ethers. This has created a situation in which products that are considered to be protected in the domestic market, and thus which are not entitled to production refunds in the domestic market, are eligible for larger export refunds than the products which are considered to be unprotected in the local market, and are thus entitled to production refunds on domestic sales, as so-called approved products.

If, since July 2000, the unprotected products are assumed to be able to manage without residual export refunds when they compete in the export market, it is not at all clear why protected products require higher refunds. In fact, unprotected products, by virtue of their lack of significant protection in the domestic market, are unlikely to earn such good margins on their domestic sales as the sellers of protected products, whose competitive threat from imports is lower. Therefore, we believe that producers of unprotected products have a greater need for export refunds on commercial grounds.

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[1] One would simply replace the c.a.f. price by the f.o.b. price in the formulae listed in the Appendix to this chapter.

Consequently, we conclude that there is no reason to treat the producers of protected products more generously than the producers of unprotected products in the refunds that they are entitled to receive when exporting their output.

The difficulties of obtaining long time series of definitive and comprehensive export data for starch products make the evaluation of the appropriateness of export refunds harder than we had expected. The official export licence data were only available to us since 1995, whereas the less comprehensive Comext foreign trade data may be obtained in a disaggregated form for the entire period covered by the Evaluation.

An important empirical test that we applied to assess the appropriateness of the current system of determining export refunds is the nature of the correlation between the magnitude of the export refund and the volume of exports of individual starch products.

The evidence from Comext data is persuasive, and proves to apply with equal force to exports of native maize and wheat starches, as well as to glucose. It suggests that the volumes of exports of these products are positively correlated with the size of the refund. A very important year for this analysis is 1996 when, for several months, export refunds were zero, and Community processors were able to buy base products at similar prices to their US competitors. Yet, in that year, when there was little apparent need for exporters of cereal starch products to be compensated for base product price differences, and when their US rivals were exporting increasing volumes of cereal starches, Community exports, according to Comext data, were at their recent lows.

The evidence from export licence statistics is less clear cut, partly because the series that we were provided do not extend further back than 1995. However, we believe that the following conclusion may still be drawn:

Export data for Annex I starch export products suggest that there is an empirical correlation between the level of the export refund and the incentives to export native maize and wheat starches, as well as glucose products, and that these incentives go beyond the full compensation for price differences in base products, since full compensation ought to leave the incentive to export unaffected by the level of the refund. Instead, these extra incentives appear to have been strongest when the gap between domestic and world market prices of cereals has been largest.

We conclude that priority should be given to obtaining long series of comprehensive export licence data for the main categories of starch products to prepare statistical analyses to determine whether the correlation that is evident between Comext export volumes and the level of export refunds applies also to the export licence statistics. If the correlation is also found in the export licence data, the reason for the correlation should be studied to deduce whether it is related to the calculation of the export refund.

In the case of glucose, there is the special issue of the mixed calculation undertaken to determine the export refund. After examining the formula used to compute the export refund on glucose and considering whether it would be appropriate to link export refunds to the precise choice of base product for its manufacture, we conclude that:

The costs of applying complex technical systems to monitor raw material use in glucose would be a wasteful use of resources. We therefore favour the continuation of a simple mixed formula for determining export refunds on glucose. We recommend that the calculation should reflect the current situation in the glucose sector in the Community and attach equal 50:50 weights to the refund on wheat starch and the refund on maize starch I the formula.

POTATO STARCH

The potato starch regime includes a number of measures that are specific to the potato starch sector. These are the minimum payment for starch potatoes, which is determined as part of the CMO for cereals and is closely linked to the intervention price for cereals; the direct payments to starch potato farmers, which prior to 2000/01 were closely linked to the area payments for cereal farmers; the starch potato payment scale (the *barème féculier*); the starch premium provided to potato starch processors to compensate them for specific costs caused by the lack of valuable by-products and their limited processing campaigns; the potato starch production quotas; and the production and export refunds paid on potato starch.

The conclusions reached under each of these headings may be summarised as follows:

Since potato and maize starch sell at very similar prices in the domestic market, the direct link between the minimum payment for starch potatoes and the intervention price for cereals is reasonable, and does not distort the competition in the Community market between the two starches.

The direct payments to starch potato farmers raise important issues regarding the appropriate notion of opportunity cost to apply to the cultivation of base products for the starch sector. This is because the role of area payments/direct payments in the incomes of cereal and starch potato farmers has been increased substantially over the period since 1992/93, while the role of intervention prices has been reduced. A very significant reform introduced under the Agenda 2000 measures is the harmonisation of the area payments per hectare for cereal and oilseed crops. Therefore, we conclude that:

An important new element of CAP is the harmonisation of area payments between the two main arable crops. The analogue of these area payments in the case of starch potatoes, namely the direct payments to growers, should be assessed in relation to this new policy, which will be fully implemented by 2002/03.

In order to determine how the direct payments for starch potatoes affect the incentives for starch potato farming in relation to alternative crops, we have analysed evidence collected during the course of this Evaluation regarding the profitability per hectare of potato farming in relation to cereals and oilseeds, in particular. We concluded that:

Evidence of the profitability of starch potato production is to be found in payments for delivery rights. These exceeded €300 per hectare per annum in our German sample.

The cost to the Commission budget of direct payments to starch potato farmers vis-à-vis cereals and oilseeds, the cost, when expressed per hectare, has increased in recent years. By 2002/03, when the area payments for oilseeds and cereals are unified, the direct payments to the growers of starch potatoes will represent the equivalent of close to €400 per hectare higher revenue for farmers than the average area payments for cereals or oilseeds.

Approximately 20% of this higher income per hectare is the consequence of the decision to compensate starch potato growers, via the direct payments, for 75% of the intervention price reductions made under Agenda 2000, instead of the 48.4% compensation made to cereal farmers via higher area payments. The remaining €320 or so extra payment is a direct consequence of the higher starch yields per hectare obtained in starch potato cultivation. It is significant that this is close to the magnitude of the payments made for delivery rights by German starch potato farmers, and suggests that much of the benefit from direct payments is reflected in the higher profitability of starch potato farming, and the market's valuation of delivery rights.

Since starch potato farmers do not harvest an exactly standard product, a payment scale is embodied in the regulations that determine how the minimum potato prices are determined for different qualities of potatoes. The conclusion that is derived after an examination of the scale is that:

Examination of the barème féculier suggests that it under-records the actual output of potato starch produced within the quota, because processors achieve higher recoveries of starch from the raw material they receive. It is recommended that a technical study be undertaken to bring the payment scale into line with current reality.

Evidence provided by the Dutch potato starch industry revealed that the costs of producing potato starch are considerably higher than those of producing cereal starches. Key influences upon this outcome are the absence of valuable by-products from potato processing and the limited duration of the potato processing campaign. We examined the annual accounts of the sole Dutch starch potato company, and concluded that:

The potato starch premium was needed by processors to compensate them for the innate disadvantages they suffer by virtue of shorter campaigns than other starch processors and the absence of any valuable by-products. With the benefit of the starch premium, this company (the cooperative, Avebe) made a profit in four of the latest five years for which results were available; without the premium, it would have made losses in four out of the five years.

The potato starch production quotas were intended to establish a ceiling to potato starch output, within the Community, and they have succeeded in this objective. Only once, since the introduction of quotas in 1995/96, has a Member State exceeded the 105% flexible upper limit permitted in the national quotas. However, the quotas have also acted as a *de facto* target for production. We concluded that:

The starch potato payment system provides strong incentives for starch potato cultivation. Farmers aim, in aggregate, to produce up to the total national potato starch quotas in each country, and any shortfalls tend to be weather-related and short-lived. The sole exception to this statement is Spain, whose production quota was set at only 2,000 tons per annum of starch, which is too small to be attractive to produce.

In the local market, potato starch is, as we have observed above, a close substitute for maize starch; therefore, we conclude that:

It is appropriate that the production refunds for potato starch are set at the same level as those for maize starch, especially since there is no ready reference price for comparative purposes outside the Community.

The situation regarding export refunds is different. The export price for native potato starch (which accounts for a mere 2% of non-EU starch demand, and thus tends to be regarded as a premium niche starch outside the Community) is at a premium to the export price for native maize starch, which implies that the two starches are not close substitutes in the international arena. Therefore, we conclude that:

The system of export refunds, which applies the same refunds to maize and potato starch, has encouraged the exportation of potato starch. This may be seen from the much higher share of potato starch output destined for export markets than the shares for other starches. During the interviews undertaken for this Evaluation, local end-users often complained that they felt that their supplies of potato starch were reduced in order to give priority to export sales.

After examining the relativities between domestic and export prices for native starches, and between the production and export refunds paid on maize and potato starches, we conclude that the appropriate export refunds on potato starch are lower than those provided on native maize starch. Indeed, by chance, the appropriate compensation, on the export of potato starch appears to be close to the production refund.

A major attraction of the starch potato sector is that it is comparatively labour-intensive in its agricultural operations, and its processors tend to be located in rural areas, close to potato growers. We analysed Eurostat regional data in order to determine the influence of the starch potato *filière* upon the development of rural regions.

However, from the Eurostat data we were unable to draw any conclusion as to whether starch potato growing districts were underprivileged in terms of any of a number of alternative measures of economic, social and rural development.

The final cost-benefit approach that we considered towards the contribution of the potato starch sector to the development of rural areas of the Community was to estimate the net direct and indirect budgetary costs for the Commission of creating one full time job in the sector, in relation to the alternative of creating one full time job in cereal farming and processing. The additional costs linked to the potato sector have been mentioned in the past few paragraphs, and comprise the direct payments (which are contrasted with the area payments for cereals) and the starch premium. (It should be noted that the production and export refunds are not mentioned, since they are applied at the same rates to maize and potato starch.).

The direct payment may, in turn, be considered to have two distinct elements: first, the divergence created per ton of starch since 2000/01, by the decision to grant potato farmers compensation for 75%, rather than 48.4%, of the reduction in the intervention price under Agenda 2000; and second, the higher payment made per hectare via direct payments for potatoes than the area payments made to cereal or oilseed farmers.

We conclude that, if one takes account only of the budgetary costs of potato starch premia and of the divergence created by the different compensation criteria since 2000/01, then one finds that the net budgetary costs of creating one full time job in rural areas as a result of the measures in support of policy in the starch potato sector is currently in the region of €8,000 per annum.

If, instead, one takes the view that policy is increasingly being determined in terms of harmonised area payments, and takes the current cereal area payments as the point of reference, we conclude that the net budgetary cost of creating one full time job in rural areas as a result of starch potato policies will be in the region of €18,000 per annum by 2002/03.