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The Medium Run

MACROECONOMICS is largely divided into two subfields. One focuses on the short run, on the study of business cycles. The other focuses on the long run, on growth and its determinants. The assumption implicit in this division is that the medium run is primarily a period of transition from business cycle fluctuations to growth. This simplification is clearly convenient, but it is misleading. Modern economies are characterized by medium-run evolutions that are quite distinct from either business cycle fluctuations or steady-state growth.

Two facts make the point. The first is well known: unemployment rates have steadily increased in continental Europe over the past twenty-five years, while remaining largely stable in "Anglo-Saxon" countries. The other is less well known but equally important: capital shares have steadily increased in continental Europe over the past fifteen years, and in many cases currently stand at postwar highs; in contrast, capital shares have remained largely stable in "Anglo-Saxon" countries. The latter fact plays a central role in the story that follows and is documented in figure 1. The upper panel shows the behavior of capital shares in the business sector in Germany, France, Italy, and Spain. Note that after lows in the late 1970s and early 1980s, shares in all four countries stand

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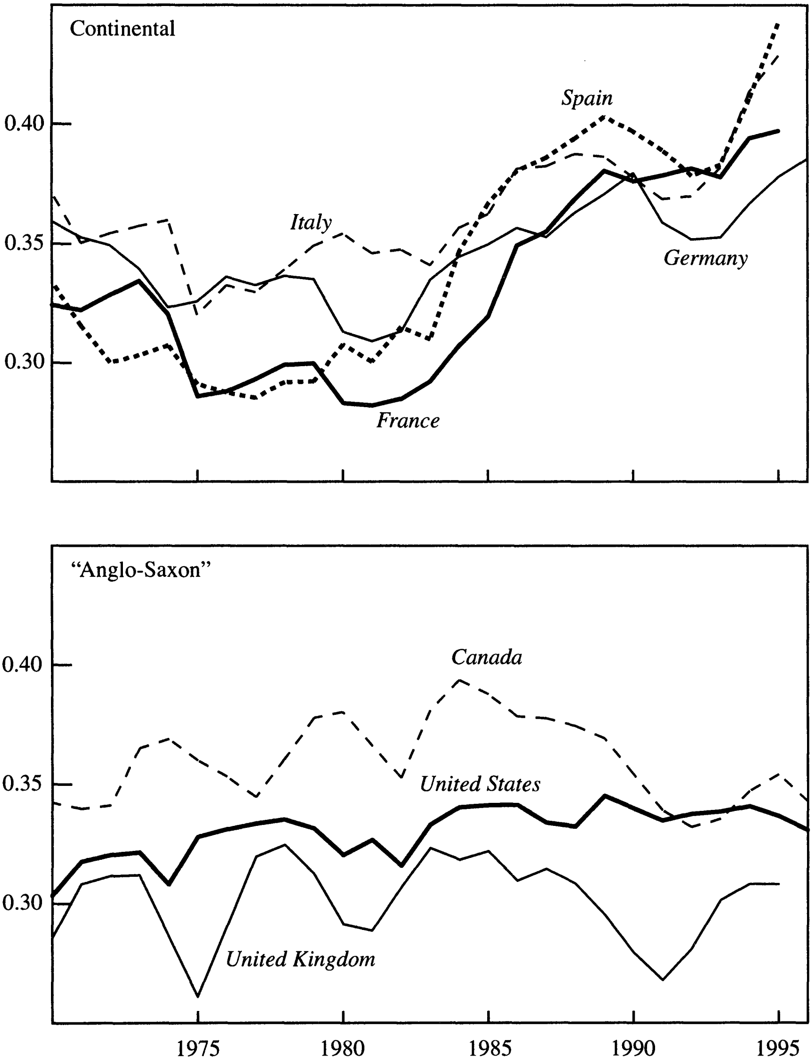
Figure 1. Capital Shares, Continental and "Anglo-Saxon" Countries, 1970–96[a]

Capital income/GDP[b]



Source: Author's calculations, based on data from the Organisation for Economic Co-operation and Development's data diskette *OECD Business Sector Data Base*, 1997/1.

a. Sample period ends in 1996 for Canada, Germany, and the United States; for all other countries, in 1995.

b. All income is ascribed to either capital or labor, so that capital income includes profits, interest paid by firms, and profit taxes.

at high levels today. The average share stood at 41 percent in 1995, up from a low of 31 percent in 1981 and a value of 34 percent in 1970. The lower panel shows the behavior of shares in the United States, Canada, and the United Kingdom. Note that, in contrast to continental Europe, capital shares in those countries have remained stable. In particular, in the United States the old stylized fact of a constant capital share still largely holds true.

This paper offers the following integrated explanation of these two facts. The countries of continental Europe were affected by large adverse shifts in "labor supply" during the 1970s. Specifically, the wage required by workers at a given rate of unemployment and a given level of total factor productivity increased.[1] The causes of these shifts, although not investigated here, have been the subject of much research by others. There is wide consensus that these shifts came from the failure of wages to adjust to the productivity slowdown and the adverse supply shocks of the 1970s. In any case, their initial effect was to decrease profit rates and capital shares. Over time, firms reacted by moving away from labor, leading to a steady increase in unemployment, a recovery, and even an increase in capital shares.

In most Continental countries, labor supply shifts have substantially decreased, if not vanished. But since the early 1980s, their labor markets have been characterized by adverse shifts in "labor demand." Specifically, the real wage offered by firms at a given ratio of labor to capital and a given level of total factor productivity has decreased.[2] There are two potential explanations for this decrease. The first is a shift in the distribution of rents from workers to firms. The second is technological bias: at given factor prices, firms have been adopting

1. Two semantic issues arise here. First, as my definition of a labor supply shift indicates, I do not take "labor supply" necessarily to mean competitive labor supply, but rather (and more generally), the relation between the wage and unemployment implied by wage-setting in the labor market. Other researchers have variously called this the wage curve, the wage-setting relation, or the pseudo-labor-supply curve. Second, in order not to have labor supply and labor demand shift along a steady-state growth path, I look at the wage adjusted for total factor productivity. Thus a slowdown in productivity growth that is not fully reflected in a parallel slowdown of real wages—at a given rate of unemployment—shows up as a labor supply shift.

2. Again, by "labor demand" I do not necessarily mean competitive labor demand, but rather, the relation between the real wage and employment that emerges from the employment and pricing decisions of firms. This is sometimes called the price-setting relation or the pseudo-labor-demand curve.

technologies that use less labor and more capital, thus decreasing the marginal product of labor at a given ratio of labor to capital. It is difficult to distinguish empirically between these two explanations on the basis of aggregate evidence; to the extent that it speaks, this evidence weakly favors the second. Whatever the cause, the effect of this adverse shift in labor demand has been to increase unemployment further, while at the same time increasing capital shares.

By contrast, the ''Anglo-Saxon'' countries appear to have been largely shielded from both the adverse labor supply shifts of the 1970s and the labor demand shifts of the 1980s and 1990s. This accounts for the differences from the Continental countries in the evolution of unemployment and of capital shares.

While it is true that the macroeconomic literature has not typically focused on medium-run evolutions, this is not the first attempt to explore such issues. Michael Bruno and Jeffrey Sachs told the first half of the story, showing how the failure of wages to adjust to lower productivity growth and other adverse shocks could explain the rise in unemployment in the 1970s.[3] The present paper can be seen as an update, emphasizing the role of labor demand shifts since the mid-1980s. One of the purposes of the project led by Jacques Drèze and Charles Bean in the 1980s was to identify the role of capital accumulation in the rise of European unemployment, a theme closely related to that discussed here.[4] More recently, Edmund Phelps has argued that the rise in European unemployment is best understood as a ''structural slump'' distinct from business cycle fluctuations.[5] Finally, the present paper is closely related to the recent work of Ricardo Caballero and Mohamad Hammour.[6] Their analysis of the effects of specificity and labor market institutions on capital accumulation and unemployment—in particular, their explanation of ''jobless growth'' in France—can be seen as providing some of the microeconomic foundations for the shifts that I take instead as primitives.

The paper is organized as follows. With an eye on the evolution of capital shares, the first section documents the evolution of capital, employment, and wage and profit rates since 1970 in fourteen member

3. Bruno and Sachs (1985).
4. Drèze and Bean (1990).
5. Phelps (1994).
6. Caballero and Hammour (1998).

countries of the Organisation for Economic Co-operation and Development (OECD). It starts from the basic proposition that under Harrod-neutral progress, there should be a close relation between the ratio of the profit rate to the wage rate (measured in efficiency units) and the ratio of labor (measured in efficiency units) to capital. It then shows that much of the increase in the ratio of the profit rate to the wage rate—and by implication, much of the increase in capital shares—in the Continental countries over the past fifteen years does not reflect corresponding movements in relative factor quantities. I suggest three potential explanations for this divergence. The first is that there are long lags in the adjustment of factor proportions to factor prices, and one is still seeing the dynamic effects of the earlier adverse labor supply shifts. The other two explanations start from the premise that the relation between factor prices and factor quantities has genuinely shifted. The second explanation attributes the shift to changes in the distribution of rents from workers to firms. The third attributes it to technological change biased against labor.

To explore the logic and the role of these potential explanations, the second section develops a simple model of employment and capital accumulation. Firms are assumed to be monopolistically competitive. There are costs to adjusting capital, as well as to adjusting the ratio of labor to capital. Labor supply is upward sloping: the wage is a decreasing function of the unemployment rate. The interest rate is given and independent of capital demand. That model makes clear how an adverse labor supply shift leads first to a decrease and then to an increase—above its initial level if the elasticity of substitution between labor and capital is greater than one—in the capital share, and to a steady increase in the unemployment rate. It also shows how adverse shifts in labor demand, whether caused by a shift in the distribution of rents or by technological bias against labor, lead to increases in both unemployment and the capital share.

The third section explores how well the model can explain the evolution of a particular country. Relying on my comparative advantage, I focus on the evolution of France since 1970. I construct series for shifts in labor supply, labor demand, and the user cost. Taking those shifts as primitives, I simulate the model. The simulations show how the shifts can explain the evolution of the ratio of labor to capital, the capital share, and unemployment. It would be overambitious at this stage of the research to try to explain the evolution of each individual country. But I perform the same exercise mechanically for each country and give a short assessment of the results.

Having shown the logic of the argument, I return to econometrics. In the fourth section I look for evidence of lags in the response of the ratio of labor to capital to real wages. I find evidence of long lags. But even allowing for such lags, there is substantial evidence of adverse shifts in labor demand in the Continental countries since the early 1980s.

In the fifth section I try to determine whether the shifts in labor demand reflect biased technological progress or changes in the distribution of rents. The empirical strategy is simple. Shifts in the distribution of rents should not affect the production function, bias in technological change should be reflected in shifts in the production function. However, estimating production functions is tricky, and the empirical evidence speaks only weakly. Point estimates suggest technological bias, but they are not tight.

I conclude with a discussion of open issues, including the sources of the shifts in labor supply and demand, the sources of differences between the experiences of Continental and "Anglo-Saxon" countries, and the relation (if any) of the shifts discussed here to shifts in relative labor demand between skilled and unskilled workers.

Factor Prices and Factor Quantities

Movements in the capital share, such as those documented in figure 1, are not a puzzle in and of themselves. Changes in factor proportions lead to changes in factor prices (and vice versa) and—unless the elasticity of substitution between capital and labor is equal to one—to changes in shares. Thus a natural first step is to see whether one can account for the evolution of factor prices—and by implication, of factor shares—by the evolution of factor quantities.

The following benchmark is useful. Suppose that output is a constant returns to scale function of labor and capital. Suppose that technological progress is Harrod-neutral, a natural benchmark, as this is the assumption necessary for balanced growth. Then one can write output, y, as

$$y = y(zn, k),$$

where n is labor, k is capital, and z is the level of productivity. Redefining labor in efficiency units (that is, adjusting for the level of productivity) one can rewrite the production function as

$$y = y(\tilde{n}, k),$$

where $\tilde{n} \equiv zn$.

Under the further assumption that the marginal product of labor is equal to the wage, the following relation holds:

$$(1) \qquad \frac{\pi}{\tilde{w}} = g\left(\frac{\tilde{n}}{k}\right),$$

where π is the profit rate (that is, profit divided by the capital stock in volume) and $\tilde{w} \equiv w/z$ is the wage rate per efficiency unit. Furthermore, g' is greater than zero: an increase in the ratio of labor to capital both increases the profit rate and decreases the wage, and by implication, increases the ratio of the profit rate to the wage. If, for example, the production function exhibits a constant elasticity of substitution (CES), the relation specified in equation 1 is log linear, with coefficient equal to $1/\sigma$, where σ is the elasticity of substitution between capital and labor.

A simple exercise following from this is to examine empirically the relation between the left- and right-hand sides of equation 1. One can then ask: what is the implied elasticity of substitution between capital and labor? Can an elasticity different from one explain the evolution of capital shares in Continental countries in the 1980s? Or was there a shift in the relation between the factor price and the factor quantity ratios during that period?

I perform this exercise for fourteen OECD countries. For most of the analysis below, I divide these into two groups: the first includes Australia, Austria, Belgium, Denmark, France, Germany, Ireland, Italy, the Netherlands, Spain, and Sweden; the second includes Canada, the United Kingdom, and the United States. I refer to these, with some license, as the Continental and the Anglo-Saxon countries, respectively. Assignment to one or other of these two groups is based on the evolution of capital shares. Typically, the period covered runs from the late 1960s to 1995, depending on data availability.[7]

Throughout the paper, the main data source is the OECD data set for the business sector in each country.[8] Value added is net of indirect taxes and is allocated either as labor income or as capital income.[9] Labor income includes the imputed income of self-employed individuals, based on the average wage in the business sector; capital income includes the residual income of the self-employed. Employment is measured as the number of workers, without adjustment for hours worked (so that given the decline in hours per worker, employment growth typically is overstated and productivity growth understated). I make one modification to the data. The OECD data are adjusted for the number of unpaid family workers, who must be deducted from total private employment because their output is not measured. When this adjustment does not start at the beginning of the sample, I extend it to earlier years, assuming a ratio of unpaid family workers to total employment equal to that in the first year for which it is available.[10]

7. For Germany, OECD data refer to West Germany up to 1990 and to Germany as a whole after 1990. Although it turns out not to make much difference, the econometric work below does not use the post-1990 data. Moreover, I have excluded a number of OECD countries from this study, for various reasons. Some—such as Luxembourg, or Norway at the beginning of the sample—are small or have idiosyncratic economic structures. Some—especially the more recent members, such as Greece, Turkey, and Mexico—are at a different level of development. Portugal shows a permanent decrease in the measured capital share by 15 to 20 percent of GDP around the time of its revolution; while this fact is fascinating, I do not know how to interpret it. A similar problem of interpretation arises with Japan, which shows a very large permanent decrease in the measured profit rate in the 1970s.

8. Organisation for Economic Co-operation and Development data diskette *Business Sector Data Base*, 1997/1.

9. Note that capital income here is different from corporate profits; in particular, it includes interest payments by firms, as well as profit taxes. The decrease in nominal interest rates has increased measured corporate profits since the early 1980s in many countries; see Poterba (1998) for a discussion of the evolution of corporate profits in the United States. But this decrease has had no direct impact on the measure that I use.

10. In a parallel study, Dale Jorgenson, Eric Yip, and I use the data constructed by Dougherty and Jorgenson (1996) for the G7 countries, for the period 1960–89. While the methodology used to construct measures of capital and labor is quite different from that underlying the OECD data, the main conclusions reached below also hold for the G7 data set. For France, a study by Cette and Mahfouz (1996) of the statistical issues associated with the measurement of shares yields an evolution of the capital shares in the business sector, in the corporate sector, and in the nonfinancial corporate sector very similar to that based on the OECD data for the business sector share.

Under the assumption that labor is paid its marginal product, one can construct the series for Harrod-neutral technological progress, z, by constructing the Solow residual for each year, dividing it by the contemporaneous share of labor, and integrating it over time. Then one can construct labor in efficiency units by multiplying employment by the constructed z, and the wage in efficiency units by dividing the real product wage (the wage divided by the deflator for business sector GDP) by z.

Figure 2 plots the evolution of average factor price ratios and average factor quantity ratios for the Continental and Anglo-Saxon countries. The averages are constructed with 1980 relative GDPs, using purchasing power parity exchange rates, and each ratio is normalized to equal 1.0 in each country in 1970. This figure makes two points. In the Continental countries, the period up to the early 1980s was characterized both by a decrease in the profit rate relative to the wage rate (in efficiency units) and by a decrease in labor (in efficiency units) relative to capital. Since that time, however, the profit rate has improved relative to the wage, while the ratio of labor to capital has continued to decrease, albeit more slowly. This is what lies behind the increase in the capital share. By contrast, in the Anglo-Saxon countries, the evolutions of the factor price and factor quantity ratios show little or no trend, and the movements appear to reflect business cycle fluctuations rather than medium-run evolutions.

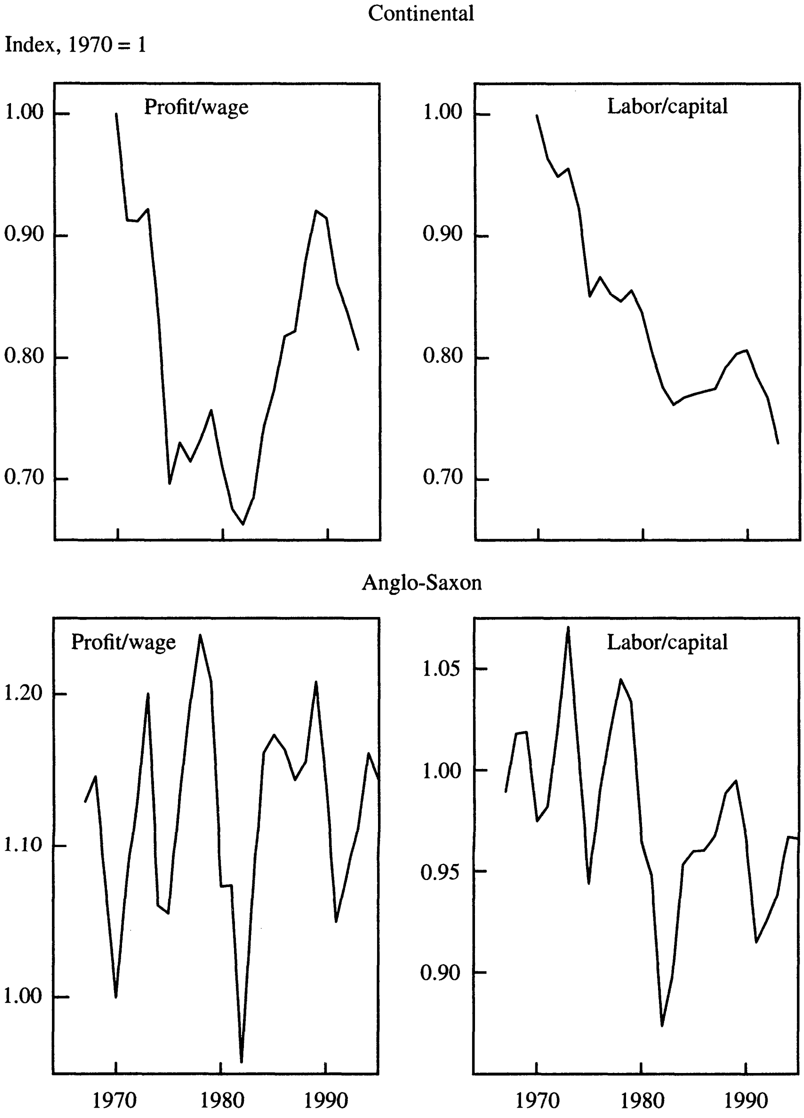
Next, I take a more formal econometric approach, although still in the spirit of data description. Let $pratio_{it} \equiv \ln(\pi_{it}/\tilde{w}_{it})$ be the log of the factor price ratio and $qratio_{it} \equiv \ln(\tilde{n}_{it}/k_{it})$ be the log of the factor quantity ratio, where i is the country and t is time. One can then run the following panel regression:

$$(2) \qquad pratio_{it} = \gamma(qratio_{it}) + x_i + x_t + \epsilon_{it},$$

where x_i and x_t are coefficients on country and time dummies, respectively.

The results for both Continental and Anglo-Saxon countries are reported in table 1 and figure 3. Table 1 gives the estimated coefficient γ and the significance level associated with the test that all the coefficients on the time dummies are equal to zero. Figure 3 plots the time series of estimated coefficients on the time dummies (normalized so that the value in 1970 is equal to zero), along with two-standard-error bands.

Figure 2. Factor Price and Factor Quantity Ratios across Three Decades, Continental and Anglo-Saxon Countries[a]



Source: Author's calculations (see figure 1).

a. The ratio of profit to wage corresponds to $\pi/\tilde{w}$ (the profit rate divided by the wage per efficiency unit). The ratio of labor to capital refers to $\tilde{n}/k$ (labor in efficiency units divided by the capital stock). Cross-country averages weight countries in proportion to 1980 GDP, measured at purchasing power parity exchange rates. For the Continental countries, the sample period is 1970–93; for the Anglo-Saxon countries, 1967–95.

Table 1. Regressing Factor Prices on Factor Quantities, 1961–95[a]

Panel	*Coefficient on log factor quantity ratio*	*p value for time dummies*[b]
Continental countries[c]	0.96 (0.08)	0.00
Anglo-Saxon countries[d]	1.12 (0.07)	0.03

Source: Author's regressions based on data from the Organisation for Economic Co-operation and Development's data diskette *OECD Business Sector Data Base*, 1997/1.

a. The dependent variable is the log factor price ratio (log of the ratio of the profit rate to the wage rate in efficiency units for a given country and year). Independent variables include the log factor quantity ratio (log of the ratio of labor in efficiency units to the capital stock), country dummies, and annual time dummies. Samples are unbalanced panels. For some countries, observations begin as late as 1972; for Germany, the final observation is 1990. Newey-West corrected standard errors are shown in parentheses.

b. Probability of obtaining these data given that time fixed effects are actually zero for all years.

c. Continental countries comprise Australia, Austria, Belgium, Denmark, France, Germany, Ireland, Italy, the Netherlands, Spain, and Sweden.

d. Anglo-Saxon countries comprise Canada, the United Kingdom, and the United States.

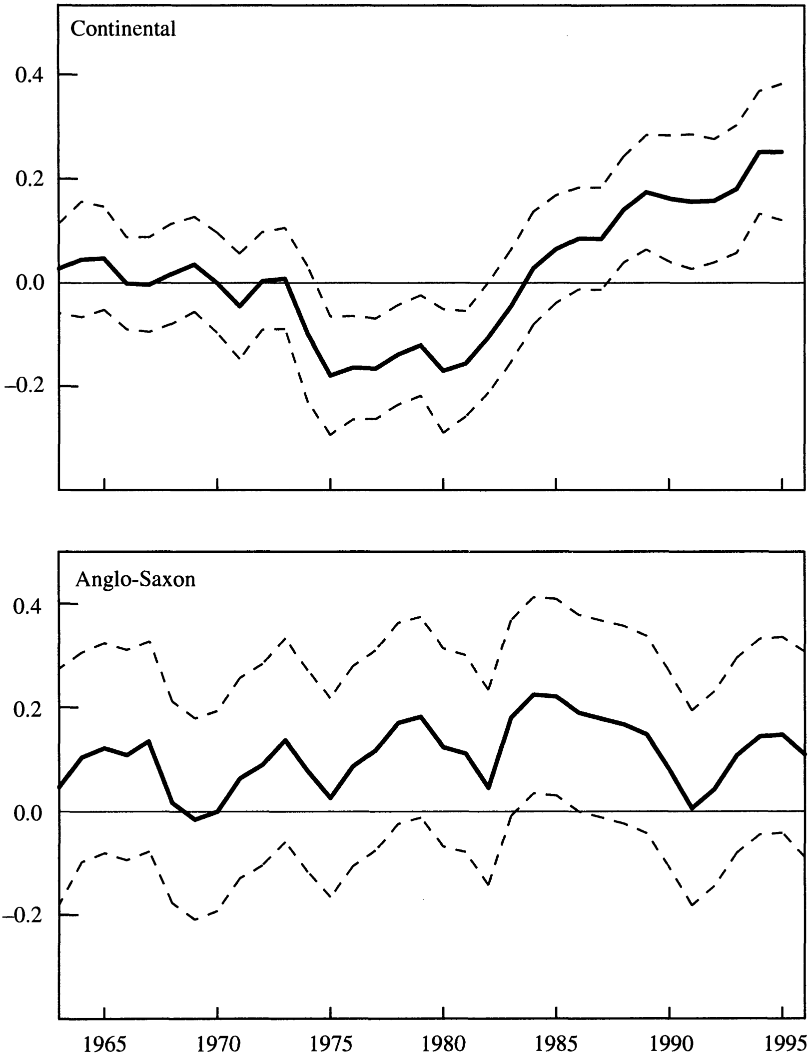
Together, table 1 and figure 3 confirm the visual impressions given by figure 2. For both groups of countries, the estimated coefficient γ is close to one (and by implication, so is its inverse, the elasticity of substitution in the CES case), implying little scope for movements in the share in the absence of shifts in the relation. The time series of estimated time dummies for the Continental countries shows a decrease in the late 1970s and then a steady increase since the early 1980s: the ratio of the profit rate to the wage rate is indeed higher than would be predicted by the evolution in the ratio of labor to capital. The time dummies for Anglo-Saxon countries show no trend.

These conclusions appear robust to a number of variations. For example, allowing the parameter γ to vary across countries yields a range for the coefficient γ_i between 2.10 (for Italy) and 0.29 (for the Netherlands), but does not substantially affect the shape of the series of time dummies. Running the regression in reverse—that is, regressing the ratio of factor quantities on the ratio of factor prices—yields an estimated elasticity of substitution of 0.75 (and thus an implied value of 1.33 for γ), but does not affect the shape of the series of time dummies substantially (up to a sign change). And dropping one country at a time does not much change the estimated parameter; that is, no single country appears to be responsible for the results.

There are various reasons to expect the estimated parameter γ to be biased toward one. Business cycle fluctuations are associated with

Figure 3. Time Variation in Factor Price Ratios, Controlling for Factor Quantity Ratios, Continental and Anglo-Saxon Countries, 1963–96[a]

Log index, 1970 = 0



Source: Author's regressions based on data used in figure 1.

a. Figure plots, for each panel of countries, the time dummy coefficients from a regression of the log ratio of profit to wage on the log ratio of labor to capital, country dummies, and time dummies. Regression corresponds to equation 2 in the text and is described in table 1, note a. For the Continental countries, the sample period ends in 1995; for the Anglo-Saxon countries, in 1996. Dashed lines are two-standard-error bands.

largely spurious fluctuations in measured total factor productivity, and thus spurious fluctuations in both wages and labor, when these are measured in efficiency units. In a boom, measured productivity increases, decreasing the wage in efficiency units and increasing labor in efficiency units; these similar proportional increases on both sides of equation 2 are likely to bias the estimated parameter towards one. As a rough solution to this problem, I have estimated equation 2 using values of $qratio_{it}$ lagged $m, \ldots m+9$ times as instruments, for $m = 3, 4, 5$. The instrumental variable results are largely similar to the ordinary least squares results: γ is equal to 1.03 for $m = 3$, to 1.12 for $m = 4$, and to 1.26 for $m = 5$.[11]

I see four ways of interpreting these results and the apparent shift in the relation between factor prices and factor quantities in the Continental countries:

MISSPECIFIED DYNAMICS. The first interpretation is that while there has been a stable relation between factor prices and factor quantities, it is not the static relation estimated in equation 2, but rather, a dynamic relation in which firms respond to changes in factor prices only over time. Factor proportions are largely embodied in existing capital: technology is putty clay. In other words, the relation in equation 2 is misspecified, and the apparent shifts are artifacts of this misspecification.

The specific argument is the following: Firms have taken a long time to respond to the adverse labor supply shifts of the 1970s by shifting to technologies that use relatively less labor and relatively more capital, to decrease their ratio of labor to capital. As they have done so, profit rates have steadily recovered. Thus the continuing decrease in the ratio of labor to capital in the face of an improving ratio of profits to wages that is seen in Continental countries is simply the result of this long drawn out dynamic adjustment.

SHIFTS IN THE DISTRIBUTION OF RENTS. If one assumes instead that the shifts shown in figure 3 are genuine, logic dictates that they come from one of two sources: shifts in the distribution of rents or biased technological change. I start with the former.

One can think of shifts in the distribution of rents between workers

11. Another source of bias is measurement error in capital, which affects capital and the profit rate—computed as profit divided by capital—in opposite directions. To the extent that this measurement error is highly serially correlated (as is likely), the problem will not be solved by using those instruments; indeed, it is not easy to solve.

and firms generically as changes in the relation between the marginal product of labor and the wage. It is convenient here to define the "markup" as the ratio of the marginal product to the real wage, and to think in terms of changes in this markup.[12] Now suppose that at a given factor quantity ratio, and thus a given marginal product of labor, the real wage decreases—or equivalently, the markup increases. Clearly this will lead to an increase in the factor price ratio (the wage goes down, the profit rate goes up). Thus an increase in the markup can account for the shifts in figure 3. But from where has such an increase in the markup come? Again as a matter of logic, it may have come either from changes in price-setting in the goods market or from changes in wage-setting in the labor market.

Consider the goods market first. If firms take the wage as given, the markup as I have defined it coincides with the markup of price over marginal cost.[13] Thus the shifts in figure 3 could be interpreted as showing that firms have steadily increased their markups in goods markets since the early 1980s. I find this explanation implausible. The period since the early 1980s has been characterized by increased, not decreased, competition—especially so in continental Europe, with the reduction of barriers to trade within the European Union. Phelps has argued that high real interest rates since the early 1980s have led firms to care less about their customer base, and thus to go for higher markups and higher profit margins in the short run.[14] But it is difficult to believe that this effect, to the extent that it has been present, could have offset the effects of steadily stronger competition in goods markets over the past fifteen years.

It seems more plausible that if there has indeed been an increase in the markup, it has come from the labor market. Which model of wage determination best describes the labor market is still very much an open question. But in a number of plausible descriptions of wage-setting, the

12. When there are costs of adjusting labor or factor proportions, as in the previous interpretation, this ratio has to be redefined to include marginal costs of adjustment in addition to the wage. The specifics are better left to the formal model below.

13. Some simple algebra may help here. Let μ be the ratio of price (P) to marginal cost (MC): $P = \mu MC$. If firms take the wage as given, marginal cost is given by the wage divided by the marginal product of labor (MP): $MC = W/MP$. Putting the two relations together gives $P = \mu W/MP$; or, defining the real wage as $w = W/P$, $\mu = MP/w$, which is my definition of the markup.

14. Phelps (1994).

wage need not be equal to the marginal product of labor.[15] In models of "efficient bargaining," for example, the marginal product of labor is set equal to the reservation wage. The wage itself is then set between the average and the marginal products of labor, with the weights depending on the relative bargaining powers of the union and the firm. Under that interpretation, the increased markup reflects the fact that unions have become less powerful in the Continental countries, and that the wage has come closer to the marginal product of labor. To the extent that unions were already weaker in the Anglo-Saxon countries, this may explain the difference in the evolution of the two groups of countries.

Another interpretation is based on a decline in labor hoarding, or featherbedding practices, in the Continental countries. This story would go as follows: In the early 1980s Continental firms were characterized by chronic excess employment; equivalently, workers were employed to the point where the product of the last worker was below his or her wage.[16] As unions have become weaker, firms have been able to reduce this excess employment, thus increasing the marginal product relative to the wage. The markup has risen from a value below one (a marginal product lower than the wage) to a value closer to one.

TECHNOLOGICAL BIAS. Alternatively, shifts in the relation between factor prices and factor quantities may reflect biased technological change; or perhaps more accurately, biased technological adoption, given that technological knowledge is probably largely common among OECD countries. If, since the early 1980s, Continental firms have consistently introduced technologies that use less labor and more capital, the same ratio of labor to capital would correspond to a lower marginal product of labor, and thus a lower wage, and, in turn, a higher factor price ratio.

The question then becomes why the Anglo-Saxon and the Continental countries might have adopted different technologies over time. A tentative answer relies on induced bias in technological adoption, paralleling the argument developed in the misspecification interpretation above. In the same way as labor supply shifts led firms, over time, to move to technologies using less labor and more capital, they may have

15. Dickens (1995) provides a nice review.

16. For a discussion of why bargaining may produce featherbedding, see Johnson (1990).

led firms to develop or adopt new technologies that were biased against labor. Indeed, the distinction between movements along an isoquant (choices among existing technologies) and shifts in the isoquant (development and adoption of new technologies) is probably much sharper in economists' models than in reality.

TRADE AND COMPOSITION EFFECTS. A fourth interpretation dismisses the shifts in the relation between factor prices and factor quantities as reflecting composition effects. A particularly strong statement along these lines is the factor price equalization theorem. Simply put, to the extent that trade leads to factor price equalization, one should not expect any relation between the ratio of aggregate factor quantities and the ratio of factor prices in a country. Thus what I have called shifts in that relation may merely capture the effects of the world factor quantity ratio on domestic factor price ratios—although the difference between factor price evolutions in the Continental and in the Anglo-Saxon countries would appear to be prima facie evidence against the hypothesis of factor price equalization.

One way to explore the relative importance of composition effects is to look at more disaggregated evidence within each country. Under the factor price equalization theorem, the relation between factor prices and factor quantities should hold for each firm but disappear at the aggregate level, because of the composition effects induced by trade. I have started looking at sectoral evidence in France, at roughly the two-digit (by Standard Industrial Classification) level of disaggregation, and find that the increase in the share holds in nearly all tradable sectors. Unless composition effects are only at work at a lower level of disaggregation, this suggests that the factor price equalization theorem is not the main source of the evolutions described above.

Shifts, Capital Shares, and Unemployment

The purpose of this section is to build a simple model that both formalizes the arguments presented above and prepares the way for a quantitative interpretation of medium-run evolutions in the next section.[17]

17. Caballero and Hammour (1998) build a richer model, with explicit putty clay

The Model

The basic structure of the model is a set of demand and supply equations for labor and for capital. The two demand relations are derived from costs of changing capital and costs of changing factor proportions. Capital accumulation depends on current and expected future marginal profits; adjustment in factor proportions, on the relation between current and expected marginal revenue products and wages. On the supply side, the wage is an increasing function of employment, while the interest rate is assumed independent of capital accumulation. The specific assumptions are as follows.

The economy is composed of monopolistically competitive firms. The reason for introducing monopolistic competition is to be able to trace the effects of markup changes, taking these as a stand-in for shifts in the distribution of rents in the economy.

Each firm uses one unit of capital, which it combines with variable amounts of labor to produce output. The production function of a firm is given by[18]

$$y = f(n, 1). \tag{3}$$

The capital stock is thus equal to the number of firms in the economy, and changes in the capital stock correspond to the entry and exit decisions of firms. A continuing firm makes only one decision at any point in time: how much labor to employ. Note that n is both employment in a given firm and the ratio of labor to capital for the economy as a whole. This separation between capital accumulation decisions and factor proportion decisions is inessential; but keeping these decisions sharply distinct is helpful for the discussion of adjustment of capital and labor below.

As noted, each firm is monopolistically competitive in the goods market. The demand for its good is given, in inverse form, by

technology and explicit bargaining in the labor market. This allows them to relate macroeconomic outcomes to institutional changes in the structure of bargaining, unemployment benefit rules, and so on. In this paper, I take a number of shortcuts that keep the model simpler but, admittedly, poorer.

18. Harrod-neutral technological progress can be introduced straightforwardly; all that is needed is to measure labor and wages in efficiency units. For notational simplicity, I leave it out at this stage but reintroduce it when I look at actual economies.

$$p = \left(\frac{y}{\bar{y}}\right)^{-\gamma} ; 0 \leq \gamma < 1,$$

where p is the price charged by the firm relative to the price level, $\bar{y}$ is average output, and γ is the inverse of the elasticity of demand. It follows from this constant elasticity specification that the markup of price over marginal cost charged by a firm will be equal to $\mu \equiv 1/(1 - \gamma)$.

Each firm faces costs of adjusting its ratio of labor to capital; equivalently, its employment level. Rather than explicitly allowing for a putty clay structure of technology, I assume that each firm faces costs of adjusting factor proportions. Specifically, I assume the cost of adjusting n to be given by $(c/2)(dn/dt)^2$, where c is a parameter.

Each firm faces a constant probability of death δ, a real interest rate r, and a real wage (in terms of the price level) w. Under these assumptions, at any point in time, the firm chooses employment so as to maximize its value, given (for time 0) by

$$v \equiv \int_0^\infty e^{-\int_0^t (r_s + \delta) ds} \left[\pi_t - \left(\frac{c}{2}\right)\left(\frac{dn}{dt}\right)^2\right] dt,$$

where

$$\pi \equiv p\,y - w\,n.$$

The first order conditions and the symmetry condition that all firms must charge the same price, so that $p = 1$, are then given by

$$\frac{dn}{dt} = \left(\frac{1}{c}\right) q$$

$$\frac{dq}{dt} = (r + \delta) q - \pi_n$$

$$\pi_n = \left(\frac{1}{\mu}\right) f_n(n, 1) - w.$$

Firms adjust the ratio of labor to capital in response to the present value of marginal profit, denoted by q. Marginal profit is equal to the marginal revenue product of labor (which is itself equal to the marginal product multiplied by the inverse of the markup) minus the wage. In the long run, the marginal product of labor must be equal to the real wage times the markup (equivalently, the marginal revenue product of labor must be equal to the real wage). Denoting steady-state values by a star,

$$f_n(n^*, 1) = \mu\, w^*. \tag{4}$$

Note that from the point of view of determining employment, a higher markup acts like a tax on the marginal product of labor (this is a tax collected by the firm, however, so that its effect on profit is quite different). A higher markup induces firms to choose a lower level of employment, and thus leads to a lower ratio of labor to capital.

As mentioned, the evolution of the stock of capital comes from the entry and exit of firms. To capture the slow adjustment of capital, I assume costs of adjustment for capital: the relative price of capital is an increasing function of the net rate of entry (equivalently, the net change in the capital stock). Specifically,

$$p_k = 1 + h\frac{dK}{dt}, \tag{5}$$

where h is a parameter and K denotes the capital stock. Free entry implies that the following condition must hold:

$$v = p_k,$$

where v is the value of the firm, defined above. If firms could freely choose their initial factor proportions, the model would yield a distribution of factor proportions across firms, with the proportion depending on time of entry. To avoid such heterogeneity, I assume that new firms enter with the same ratio of labor to capital as existing firms. This keeps the model tractable; but it also eliminates the entry and exit of firms as a candidate channel for change in aggregate factor proportions over time.[19]

The value of a new firm must be equal to the price of the machine needed to produce its goods. From the definition of v above, v is characterized by

19. One of the contributions of Caballero and Hammour's (1998) model is that it keeps track of the distribution of firms and its implications, for example, for wage bargaining.

$$\frac{dv}{dt} = (r + \delta)v - \left[\pi - \left(\frac{c}{2}\right)\left(\frac{dn}{dt}\right)^2\right].$$

Entry takes place (equivalently, the capital stock increases) when the value of an existing firm is greater than one. In steady state, $dv/dt = dn/dt = dK/dt = 0$, so that the previous equations imply that

$$\pi^* = p_k^* (r + \delta) = (r + \delta). \tag{6}$$

Profit per unit of capital is equal to the user cost.

This ends the description of the dynamic demands for capital and labor. The aggregate demand for labor is given by $N = nK$, the ratio of labor to capital in each firm times the number of firms.

I specify the supply of factors as follows. I assume the real wage to be a constant elasticity function of the ratio of employment to the labor force, $N/\bar{N}$,

$$w = \theta\left(\frac{N}{\bar{N}}\right)^{\beta}, \tag{7}$$

where β is the elasticity of the wage with respect to employment and θ is a multiplicative constant. And I assume r to be exogenous. This is a strong assumption. In combination with equation 6, it implies that the long-run supply curve of capital is infinitely elastic and the profit rate always returns to the same value: $r + \delta$.

Functional Forms and Parameters

I choose functional forms and parameters as follows. The unit time period is one year. The production function is CES, of the form

$$y = A\left[(1 - a)n^{\frac{\sigma-1}{\sigma}} + a\right]^{\frac{\sigma}{\sigma-1}}. \tag{8}$$

(Capital is implicitly present in the production function, but since each firm uses one unit of capital, it is equal to one.)

The coefficient multiplying capital (a) is 0.3 and the multiplicative constant (A) is 0.5. In the long run, the response of the capital share to an increase in wages depends on the elasticity σ. The evidence below points to a value for σ close to 1.0. Therefore I use 1.0 as the benchmark value, but to show how wage increases can potentially lead to an increase in the capital share, I also examine the case where σ is equal to 2.0.

The probability of death for firms (δ)—equivalently, the depreciation rate—is equal to 0.1 and the real interest rate (r) is equal to 0.05. The initial value of γ is 0, corresponding to the case of perfect competition; this implies a value for the markup (μ) of 1.0.

The value for c is equal to 4.0. In a world in which production was strictly putty clay, only the newly installed capital stock—roughly 10 percent of the total each year—would embody the new desired factor proportions. This would imply a mean lag of adjustment of 4.5 years. In the present case, my chosen value of c implies that firms each year close roughly 17 percent of the gap between desired and actual factor proportions. This, in turn, implies a mean lag of 4.8 years.

The value for h is equal to 10.0. This implies an elasticity of investment with respect to the relative price of capital (p_k) of 1.0. Empirical evidence on the relation of investment to Tobin's q yields lower elasticities, and thus higher implied values for h. But as discussed in that literature, these estimates of h are likely to be biased upward. The instrumental variable approach used by Jason Cummins, Kevin Hassett, and Glenn Hubbard yields an elasticity of about 0.7.[20]

I normalize the labor force to be equal to 1.0. I choose θ equal to 0.35, which implies zero unemployment in the initial steady state. The elasticity of the wage with respect to employment β is equal to 1.0. For an average unemployment rate of 10 percent, this corresponds to an elasticity of roughly 0.1, which is close to the estimates of David Blanchflower and Andrew Oswald for a number of countries.[21] My work with Lawrence Katz suggests that the elasticity is, in fact, lower in the short run and higher in the long run; I ignore those dynamics here.[22]

These parameters and their implications for steady-state values of output and other variables are presented in table 2.

Shifts in Labor Supply, Changes in the Distribution of Rents, and Technological Bias

With the discussion of the previous section in mind, I consider the effects of three different types of shift.

20. Cummins, Hassett, and Hubbard (1994).
21. Blanchflower and Oswald (1994).
22. Blanchard and Katz (1997).

Table 2. Parameters and Steady-State Values

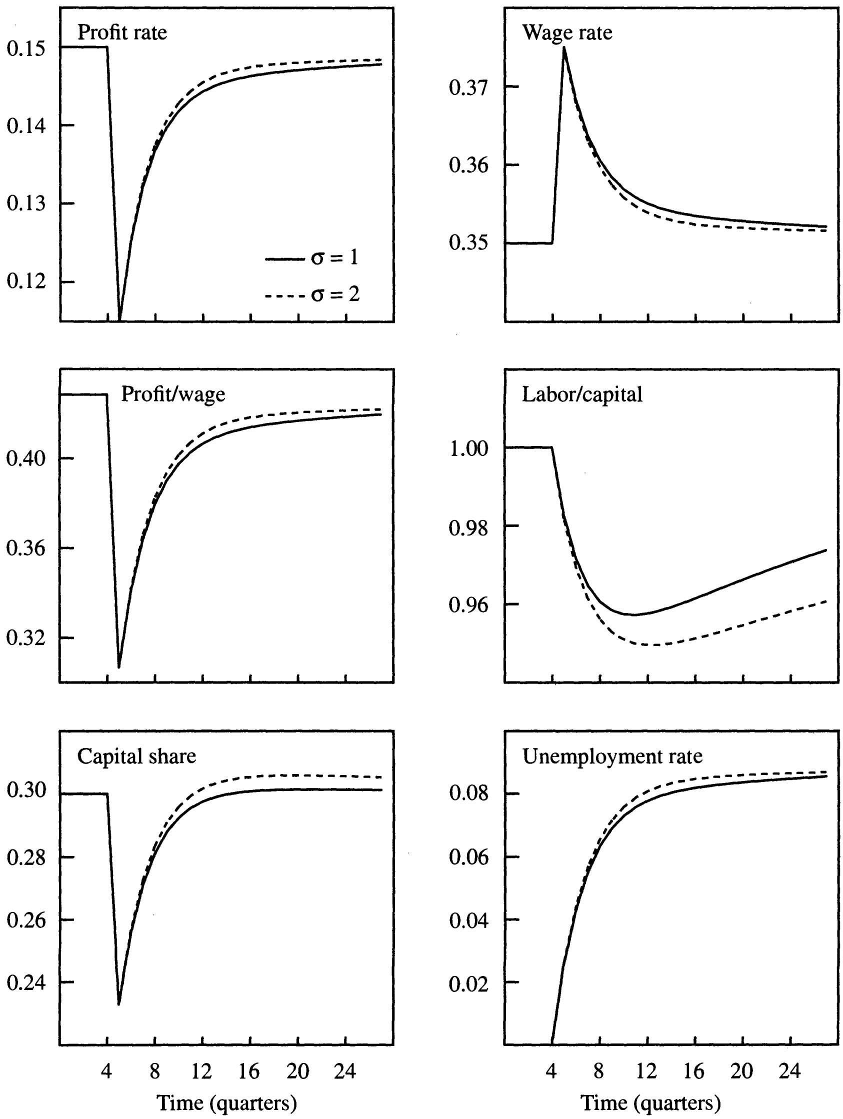
Parameters	
σ Elasticity of substitution	1.0 or 2.0
a Coefficient on capital in production function	0.3
A Multiplicative constant in production function	0.5
δ Depreciation rate	0.1
μ Gross markup	1.0
r Interest rate	0.05
c Cost of adjusting ratio of labor to capital	4.0
h Cost of adjusting capital stock	10.0
β Elasticity of wage with respect to unemployment	1.0
θ Wage at zero unemployment	0.35
Steady-state values	
Output	0.50
Employment	1.00
Capital	1.00
Wage rate	0.35
Profit rate	0.15
Capital share	0.30
Unemployment	0.00

ADVERSE SHIFTS IN LABOR SUPPLY. Figure 4 shows the effects of an unexpected, permanent, adverse shift in labor supply: a 10 percent increase in θ in equation 7. Put less formally, the figure shows the effects of an adverse wage push. Throughout, the model is solved under the assumption of rational expectations. Figure 4 plots the evolution of the profit rate, the wage rate, the ratio of the profit rate to the wage rate, the ratio of labor to capital, the capital share, and the unemployment rate, for two values of σ: 1.0 and 2.0.

At the initial ratio of labor to capital, the increase in wages leads to a corresponding decrease in the profit rate, as well as a decrease in the capital share. This triggers two dynamic responses. First, firms shift away from labor over time, leading to a decrease in the ratio of labor to capital. This, in turn, leads to a partial recovery of the profit rate and, if the elasticity of substitution is greater than one, to a more than full recovery of the capital share. Second, lower profit leads, over time, to a net exit of firms and a decrease in the capital stock.

Both lower capital and a lower ratio of labor to capital lead to lower employment, higher unemployment, and a decrease in the wage. The effect of the initial wage push on the wage is steadily offset by the effect of higher unemployment. In the long run, the profit rate must

Figure 4. Dynamic Effects of an Adverse Labor Supply Shift[a]



Source: Author's calculations, as described in text.

a. Graphs show simulated dynamic effects of a 10 percent increase in the parameter θ; the increase occurs in quarter 5. Solid line results when elasticity of substitution is set to one; dashed line, when elasticity is set to two. All other parameters take the values given in table 2.

return to its initial value. This implies that the wage must also return to its initial value. Given the unit elasticity of the wage with respect to employment, both employment and capital decrease by 10 percent. The capital share returns to its initial value, and the unemployment rate increases to 10 percent.

In summary, adverse labor supply shifts can generate both an increase in unemployment over time and the kind of movement in the capital share that has been observed in the Continental countries—namely, an initial decrease followed, in the medium run, by a more than full recovery. But to the extent that unemployment puts pressure on the wage to return to its initial value, the medium-run increase in the capital share is quite small. In the simulation corresponding to $\sigma = 2.0$, the capital share never rises much above its initial level.

INCREASE IN THE MARKUP. Figure 5 shows the effects of an unexpected, permanent, increase in the markup: a 10 percentage point increase in μ.[23] Recall that the markup acts like a tax on labor. Thus in response to an increase in the markup, firms decrease employment over time. This leads to an increase in unemployment, and higher unemployment, in turn, leads to a decrease in the wage. As a result of both of these effects, the capital share increases. Thus in the medium run, the markup shift leads to both an increase in the capital share and an increase in unemployment.

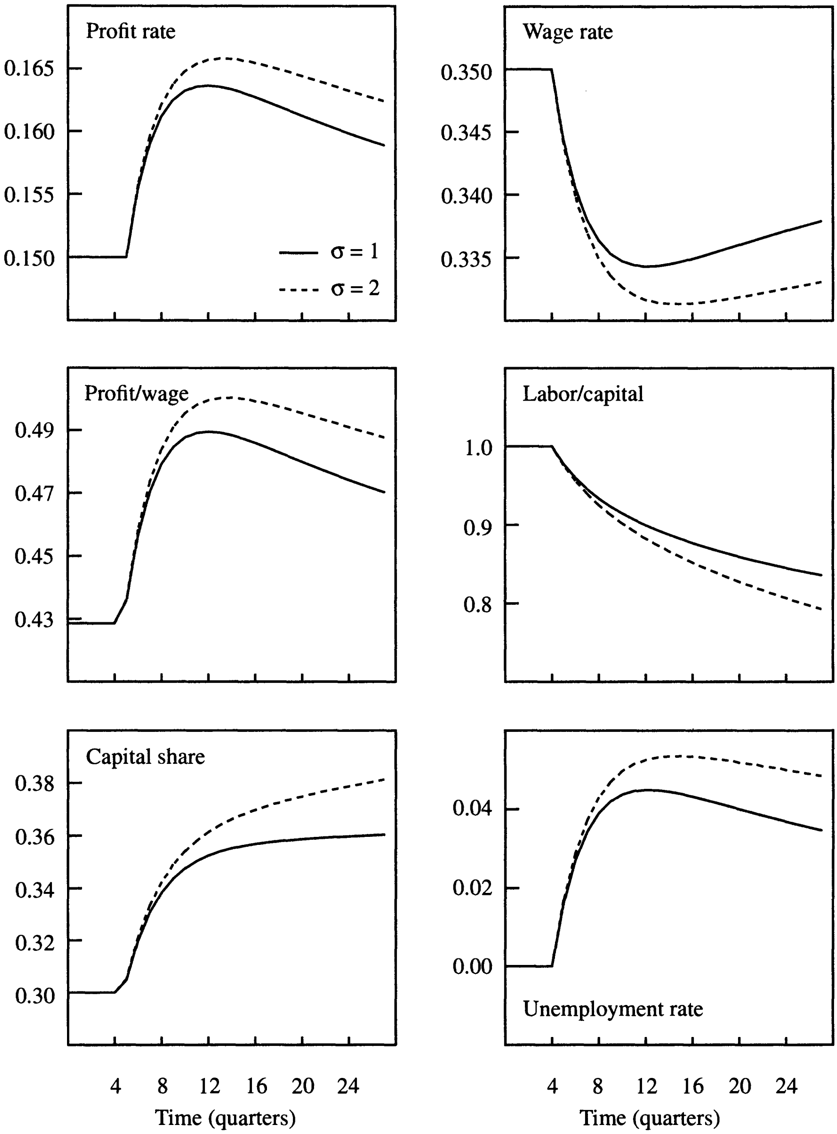
The decrease in the wage, in turn, leads to an increase in the profit rate. Thus a second mechanism comes into play: the entry of firms in response to the higher profit rate. Unemployment, after its initial increase, starts to fall; the rise in the number of firms dominates the decrease in the ratio of labor to capital in each individual firm.

In the long run, the implication of free entry and a given interest rate is that the profit rate must return to its original value. Thus to a first approximation, the wage also must return to its initial value, as must unemployment; the effect on employment of a lower ratio of labor to capital in each firm is offset by a larger number of firms, a larger capital stock.[24] The capital share, however, remains permanently higher, as the ratio of labor to capital is lower at any given wage rate.

23. Rotemberg and Woodford (1991, 1998) draw attention to the role that changes in markups play in business cycle fluctuations. This paper draws attention also to their potential medium-run implications.

24. "To a first approximation" means that the result holds for small changes in the

Figure 5. Dynamic Effects of an Increase in the Markup[a]



Source: Author's calculations, as described in text.

a. Graphs show simulated dynamic effects of a 10 percent increase in the markup (the parameter μ); the increase occurs in quarter 5. Solid line results when elasticity of substitution is set to one; dashed line, when elasticity is set to two. All other parameters take the values given in table 2.

While the markup in the model comes from monopoly power in the goods market, any change in the distribution of rents that leads to an increase in μ will have similar effects. Consider, for example, an increase in μ coming from a decrease in featherbedding practices. The dynamics will be identical to those shown in figure 5.[25] At a given wage, firms want to reduce employment, and they do so over time. This leads to an increase in unemployment, but also a higher profit rate and a higher capital share. Over time, the increase in the profit rate leads to entry of firms and capital accumulation, and consequently unemployment decreases until it has returned roughly to its initial level. By this time, the profit rate has returned to its normal level, but the capital share remains high.

In summary, in the short and medium runs increases in the markup lead to an increase in unemployment and an increase in the capital share. Unemployment does eventually return to its initial value but, as the simulation shows, this takes a very long time. Thus upward markup shifts—or, more generally, shifts in the distribution of rents from workers to firms—appear potentially able to explain the evolutions in the Continental countries since the early 1980s.

BIASED TECHNOLOGICAL CHANGE. I formalize the effects of biased technological change as an increase in the coefficient on capital (a) in the production function given by equation 8. In the Cobb-Douglas case, this takes the simple form of an increase in the exponent for capital and a corresponding decrease in the exponent for labor. This formalization captures the idea that new technologies save on labor, and has the advantage that the bias is well defined even in the Cobb-Douglas case.[26]

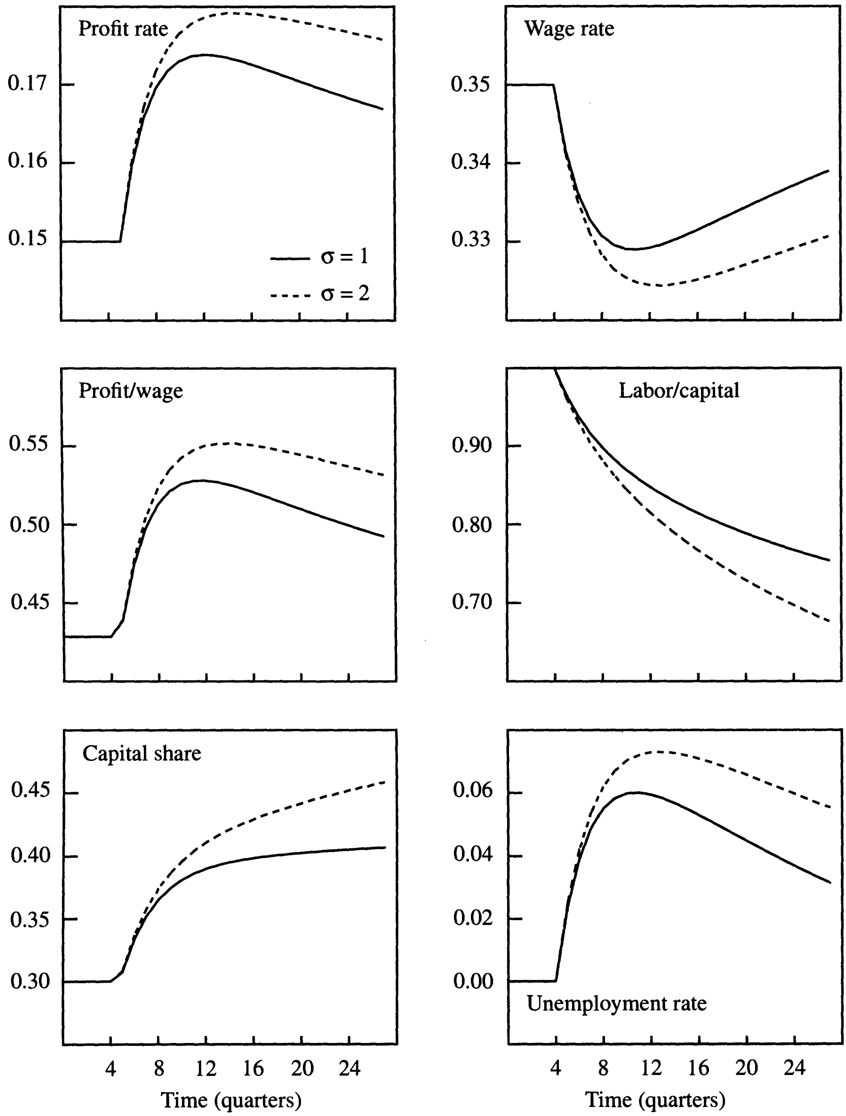
Figure 6 shows the effects of a 10 percentage point increase in the

markup, starting from an initial value of 1.0 (that is, there are no distortions at the start). For larger changes, or if one starts from a value of μ greater than one, the wage rate ends up a bit lower and the unemployment rate a bit higher.

25. The welfare implications will be different, however. An increase in the markup coming from increased monopoly power (that is, an increase in μ above one) represents an increase in distortions. The elimination of featherbedding (that is, an increase in μ toward one from a lower value) represents a decrease in distortions.

26. A while back, Houthakker (1956) showed how one could think of the Cobb-Douglas production function as the result of aggregation of Leontief functions, with the coefficients of the underlying functions jointly Pareto-distributed. The same justification applies in the present context. Firms introduce new technologies that increase the proportion of relatively capital-intensive methods of production, and thus the value of the coefficient on capital in the aggregate production function is increased.

Figure 6. Dynamic Effects of Biased Technological Change[a]



Source: Author's calculations, as described in text.

a. Graphs show simulated dynamic effects of an increase in the coefficient on capital in the production function: a is increased from 0.3 to 0.4 in quarter 5. Solid line results when elasticity of substitution is set to one; dashed line, when elasticity is set to two. All other parameters take the values given in table 2.

coefficient a, from 0.3 to 0.4.[27] It is striking how much figure 6 looks like figure 5—the effects of technological bias are nearly identical to those of an increase in the markup. At the initial ratio of labor to capital, the change leads to an increase in the profit rate and an adverse shift in labor demand. This, in turn, triggers the same dynamics as an increase in the markup, resulting in increases in both unemployment and the capital share.

Thus this last simulation offers two lessons. First, technological bias provides another potential explanation for the evolutions in the Continental countries since the early 1980s. And second, it may be difficult to distinguish these effects from those of markup shifts, unless one looks directly at the production function, which is affected by technological bias but not by changes in the distribution of rents.

Looking at Evolutions in Specific Countries

The next step is to see whether and how the model can explain observed evolutions in specific countries. It would be overambitious and space-consuming to analyze each country individually in this paper. Therefore I present the results for one country—France—and then summarize the results for the others.

Constructing the Shifts

I first construct empirical series for labor supply shifts, labor demand shifts, and shifts in user cost (which are present in the sample, although I have not focused on them so far) with which to simulate the model.

SHIFTS IN LABOR SUPPLY. I start from equation 7. Allowing for Harrod-neutral technological progress, taking logarithms, and approximating the difference between the log of the labor force and the log of actual employment by minus the unemployment rate, that equation becomes

27. In changing relative marginal products, one must be careful not to introduce productivity-level effects. In general, if the ratio of labor to capital is different from 1.0, the change in coefficients will change productivity, unless offset by a change in the multiplicative constant. This issue does not arise here, as in the initial steady state the ratio of labor to capital is equal to 1.0.

$$\ln \tilde{w} = \ln \theta - \beta u, \tag{9}$$

where u is the unemployment rate and $\tilde{w}$ is, again, the wage in efficiency units. I first construct the series for the wage in efficiency units.[28] I then construct the series for (log) labor supply shifts as $\ln \theta \equiv \ln\tilde{w} + \beta u$. Finally, I normalize this series to equal zero in 1970.

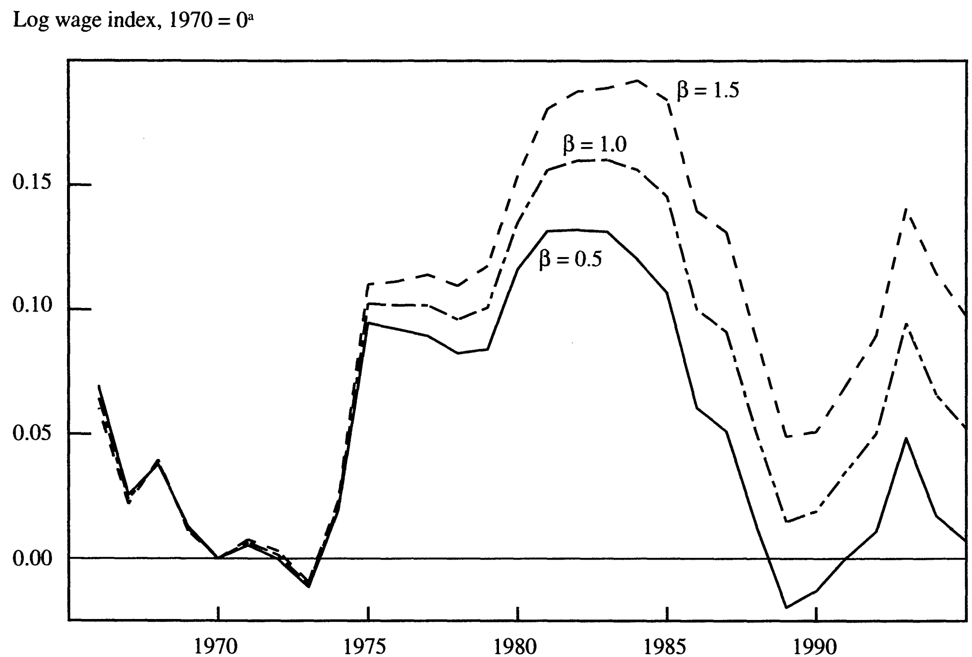
By constructing labor supply shifts in this way, I do not mean to imply that the "true" labor supply relation has the form of equation 9. As mentioned above, the true labor supply or wage relation has richer dynamics—from overlapping wage-setting to hysteresis—and includes many other variables. Thus the labor supply shifts that I construct are combinations of these dynamic effects and movements in these other variables. The best way to think about equation 9 and these labor supply shifts is as giving the distance of the wage from that which, in the absence of other shifts, would allow the economy to return to its 1970 unemployment rate.

Figure 7 shows labor supply shifts in France for three values of β: 1.0 (the value that I use above and again in the simulations below), 0.5, and 1.5. All three series show a large increase in the early 1970s, with the wage increasing much faster than measured total factor productivity; a peak at around 15 percent (for the intermediate case) in the early 1980s; and a subsequent decline. In 1996, the value of labor supply shifts stands between 1 and 10 percent, depending on the value of β. Put another way, French wages in efficiency units are lower today than they were in 1970; but they would be too high if unemployment decreased, subjecting them to upward pressure. How high is "too high" depends on the assumed value of β, the effect of unemployment on the wage.

Relating these labor supply shifts to specific changes in the economic environment and in labor market institutions must wait for another paper. But based on the large amount of research on European unemployment, I do not think that there is any great mystery about what lies

28. Robert Hall has shown that if the markup is different from one, the computation of total factor productivity growth must be modified to take account of the effect of the markup on the shares; see, for example, Hall (1990). The results reported here are derived under the assumption that the average markup during the period is equal to 1.0. I have carried out the same exercise under the assumption that the average markup is equal to 1.2, with very similar results.

Figure 7. Labor Supply Shifts under Alternative Wage Elasticity Assumptions, France, 1966–95[a]



Source: Author's calculations (see figure 1).

a. Figure plots the shift in the labor supply relation ($\ln \theta$), normalized to equal zero in 1970. Using equation 9 in the text, $\ln \theta$ is constructed as $\ln \tilde{w} + \beta u$, where $\tilde{w}$ is the wage per efficiency unit, u is the unemployment rate, and β is the elasticity of the wage with respect to unemployment. The three lines in the figure correspond to alternative assumptions about the value of β.

behind them.[29] The slowdown in productivity growth starting in the mid-1970s and the increase in oil prices were not instantaneously reflected in lower real wage growth, as a result of which the wage increased relative to total factor productivity during the 1970s. In response to higher unemployment, labor market institutions were changed so as to protect employed workers against the risk of unemployment and improve the welfare of the unemployed. Those changes lessened the effect of unemployment on wages. Since then, oil prices have returned to their 1970s levels and workers have presumably adjusted their expectations to the lower rate of productivity growth. And indeed, this is reflected in the decline in labor supply shifts since the early 1980s. As to why the shifts have not been fully undone, hysteresis is probably relevant. Labor market institutions are not the same as those in 1970. In France the treatment of unemployment, for example, is now considerably more generous. Also, long-term unemployment has marginalized many workers, reducing the weight of the long-term unemployed in wage determination.

SHIFTS IN LABOR DEMAND. I take labor demand shifts to be shifts in the markup. As I make clear below, if one were to interpret these as the result of technological bias the constructed series would be identical, and the simulation results would be largely similar (as shown above).

I define the markup above as the ratio of the marginal product to the wage, ignoring the costs of adjusting the ratio of labor to capital. Assuming that the production function is CES with elasticity of substitution σ, this relation takes the form

$$\text{(10)} \qquad \ln \tilde{w} + \ln \mu = \text{constant} + \ln(1 - a) - \left(\frac{1}{\sigma}\right) \ln\left(\frac{\tilde{n}}{y}\right).$$

The right-hand side gives the logarithm of the marginal product of labor. The left-hand side gives the logarithm of the real wage times the markup. Given a value for σ, and under the maintained assumption that the parameter a is constant, one can construct a series for the log markup (up to a constant term) using equation 10.[30]

29. See, for example, Nickell (1997) for a recent assessment.

30. Under the additional assumption $\sigma = 1.0$, the change in the log markup is equal to minus the change in the log of the share of labor—a convenient fact for back-of-the-

This equation is only correct, however, in the absence of costs of adjusting factor proportions. If it is costly for firms to adjust those proportions, an increase in the wage will be associated with little contemporaneous change in $\tilde{n}/k$, and thus little change in $\tilde{n}/y$. This, in turn, will lead to a decrease in the measured markup. I show below (in the upper panel of figure 8, with the series corresponding to $\lambda = 0.0$) that this is indeed what happens in the case of France: absent a correction for costs of adjustment, markup shifts turn out to be highly negatively correlated with the labor supply shifts constructed above.

To take account of the dependence of factor proportions on the history of wages as well as on the current wage, I replace the current wage ($\tilde{w}$) by a weighted average of current and lagged wages ($\tilde{w}^a$). This is a simpler but rougher approach than trying to account for both past and expected future values of the wage, as implied by the model of the previous section.[31] Specifically, I construct the log markup (up to a constant) as

$$\ln \mu = -\ln \tilde{w}^a - \left(\frac{1}{\sigma}\right) \ln \left(\frac{\tilde{n}}{y}\right), \tag{11}$$

where

$$\ln \tilde{w}_t^a = \lambda \ln \tilde{w}_{t-1}^a + (1 - \lambda) \ln \tilde{w}_t$$

and λ is a parameter reflecting the speed of adjustment of factor proportions. In line with the parameters chosen for the model above and the empirical evidence presented below, I choose a value of σ equal to 1.0 and a value of λ equal to 0.8, implying a mean lag of four years in the adjustment of factor proportions to the wage. Figure 8 plots labor demand shift series for these values of σ and λ, and for two sets of alternative values of these parameters.

The three series presented in the upper panel of figure 8 correspond to different values for λ: 0.0 (corresponding to no costs of adjustment), 0.8 (the benchmark), and 0.9; in each case, σ is set equal to 1.0. Under the assumption of zero costs of adjustment, the markup series shows

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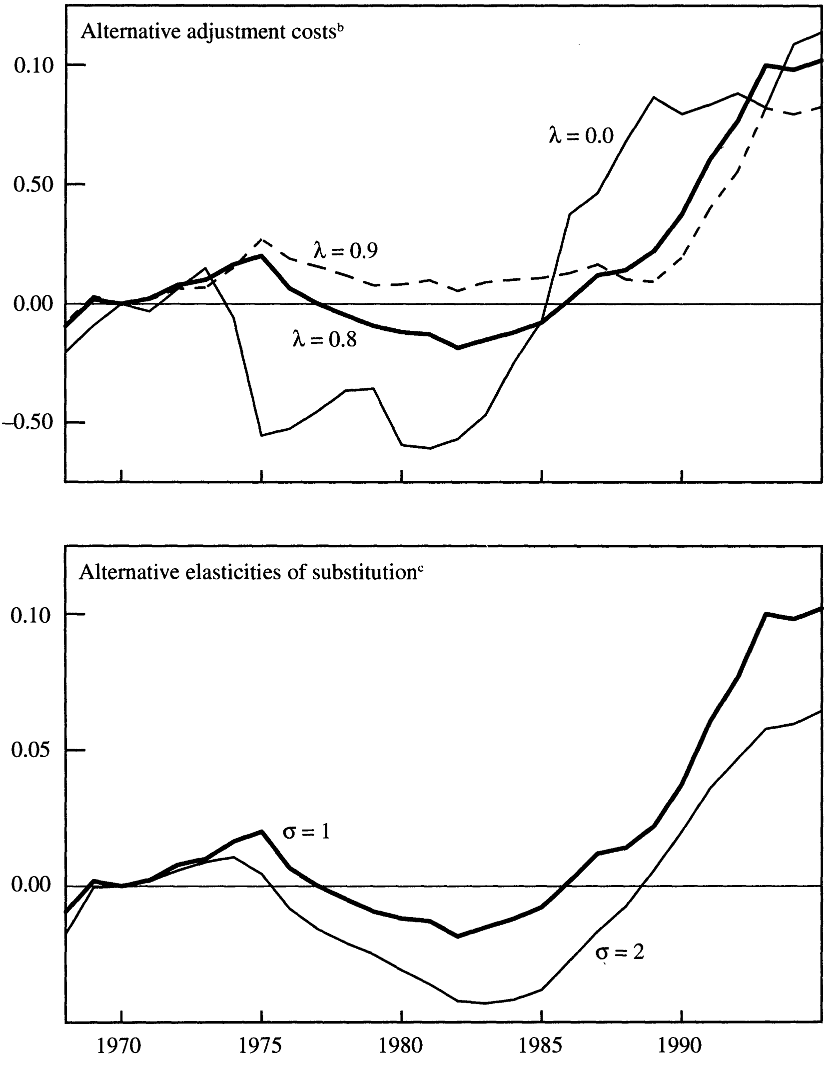
envelope computations. For example, a decrease in the labor share from 0.7 to 0.6 implies an increase in the markup of roughly 15 percent.

31. For a detailed discussion of this and other issues in the construction of the markup, see Rotemberg and Woodford (1998).

Figure 8. Labor Demand Shifts under Alternative Elasticity and Adjustment Cost Assumptions, France, 1968–95[a]

Log markup index, 1970 = 0[a]



Source: Author's calculations (see figure 1).

a. Figure plots the log of the markup (ln μ), normalized to equal zero in 1970. Using equation 11 in the text, ln μ is constructed as $-\ln \tilde{w}^a - (1/\sigma) \ln (\tilde{n}/y)$, where σ is the elasticity of substitution, $\tilde{n}$ is effective labor, and y is output. The series $\ln \tilde{w}^a_t$, in turn, is constructed as $\lambda \ln \tilde{w}^a_{t-1} + (1-\lambda) \ln \tilde{w}_t$, where $\tilde{w}_t$ is the wage in efficiency units and λ is a parameter capturing the speed of adjustment of factor proportions.

b. In each case, σ = 1.

c. In each case, λ = 0.8.

large negative values beginning in the mid-1970s and then turns positive in the mid-1980s. But the other two graphs show that the initial decrease is largely spurious, coming from the slow adjustment of firms away from labor in the face of the wage push. For λ equal to 0.8, the markup shows a small decline in the late 1970s and a large increase since the late 1980s. For λ equal to 0.9, the increase only starts in 1990. Note that in all three cases, the value of the markup shift is large and positive at the end of the period; the value of λ affects only the timing of the increase.

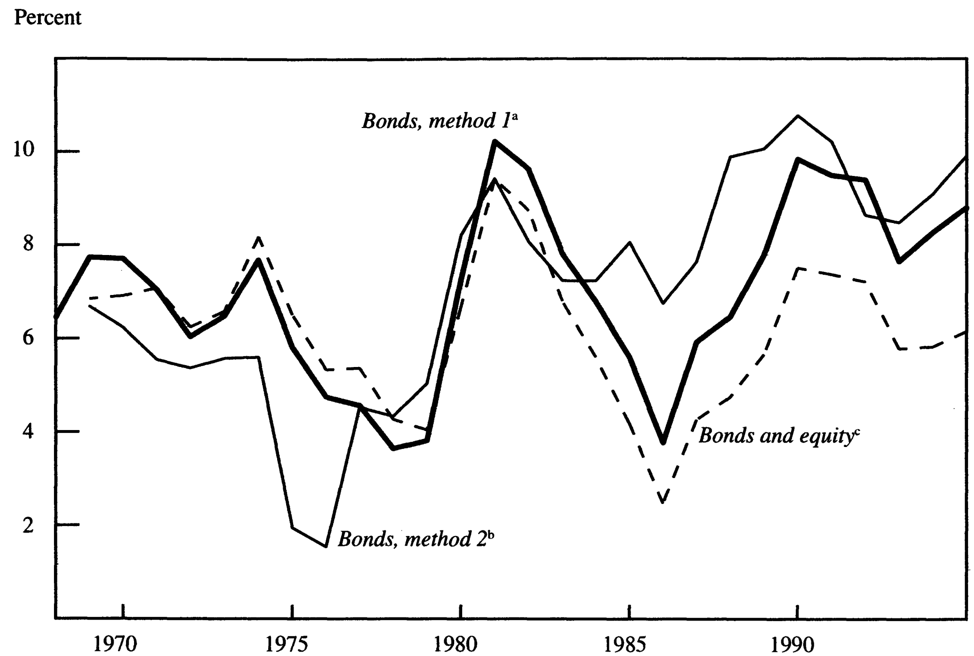
The two graphs in the lower panel of figure 8 correspond to different values of σ: 1.0 (the benchmark) and 2.0. In both cases, λ is set equal to 0.8. The higher value of σ yields a more pronounced decline in the 1980s and a smaller value of the shift at the end of the period.

The series for the markup shifts is derived under the assumption that the production function is time invariant (up to Harrod-neutral technological progress); in particular, $\ln(1 - a)$ is constant in equation 10. But these shifts could equally have been called technological bias shifts, corresponding to changes in the coefficient a, with μ remaining constant. Equation 10 makes clear that if one looks only at labor demand, changes in $\ln \mu$ and changes in $-\ln(1 - a)$ are observationally equivalent. Thus one could equally interpret figure 8 as showing technological bias in favor of capital—an increase in a—since the mid-1980s. I discuss below whether and how one can use other evidence to distinguish between the two explanations.

SHIFTS IN USER COST. To construct the time series for shifts in the cost of capital $(r + \delta)$, I use the depreciation ("scrapping") rate from OECD data for δ. I construct r in three different ways. Figure 9 presents the resulting user cost series for France.

In the series that I use for simulations below, I construct r as equal to the long nominal interest rate minus the average rate of inflation over the previous five years. This is labeled "bonds, method 1" in figure 9. The second series uses the nominal interest rate minus the inflation rate over the previous year, and is labeled "bonds, method 2." The third series, "bonds and equity," constructs the required rate of return as a weighted average of the real interest rate on bonds—which, in turn, is constructed as the nominal interest rate minus a five-year average of inflation—and of the required rate of return on equity—which itself is constructed as the sum of the ratio of dividends to prices plus a five-

Figure 9. Real User Costs, Bond and Bond plus Equity Finance, France, 1968–95



Source: Author's calculations, based on data from the Organisation for Economic Co-operation and Development's data diskette *OECD Business Sector Data Base*, 1997/1, and for ratios of dividend to price, from the CITIBASE electronic database, available from Citicorp Database Services.

a. Interest rate on long bonds (as defined by OECD) less average inflation rate over previous five years.

b. Interest rate on long bonds less average inflation rate over previous year.

c. Weighted average of real long bond rate (using five-year inflation rate) and required rate of return on equity. Weights are 0.7 on bonds and 0.3 on equity. The required rate of return on equity is measured as the ratio of dividend to price plus the average rate of output growth over the previous five years.

year average of past output growth (an admittedly rough proxy for the expected rate of growth of dividends). The weights are 0.7 on bond finance and 0.3 on equity finance.

All three series show a low user cost in the 1970s, a peak associated with disinflation in the early 1980s, and another peak in the early 1990s, associated with German reunification and the ''Franc fort'' policy. The user cost using one year of lagged inflation rather than a five-year average is higher during most of the 1980s and a little higher at the end of the series. The user cost assuming bond and equity finance shows little trend and finishes lower than the other two series. This is because the steady decrease in the ratio of dividends to prices and in the growth rate over the past fifteen years imply a steady decrease in the estimated required rate of return on equity over that period.[32]

Simulating the Model

Figure 10 plots, for France, the evolution over 1970–96 of the profit rate, the wage rate per efficiency unit, the ratio of the profit rate to the wage rate (per efficiency unit), the ratio of labor (again in efficiency units) to capital, the capital share, and the unemployment rate. These are the facts to be explained. For ease of comparison, I normalize each variable to have a 1970 value equal to that in the steady state of the model. Thus in 1970, the profit rate is normalized to 0.15, the wage rate to 0.35, the ratio of profit rate to wage rate to 0.428, the ratio of labor to capital to 1.0, the capital share to 0.30, and the unemployment rate to 0.0. The basic evolutions are by now familiar; in particular, the increases in the capital share and in unemployment.

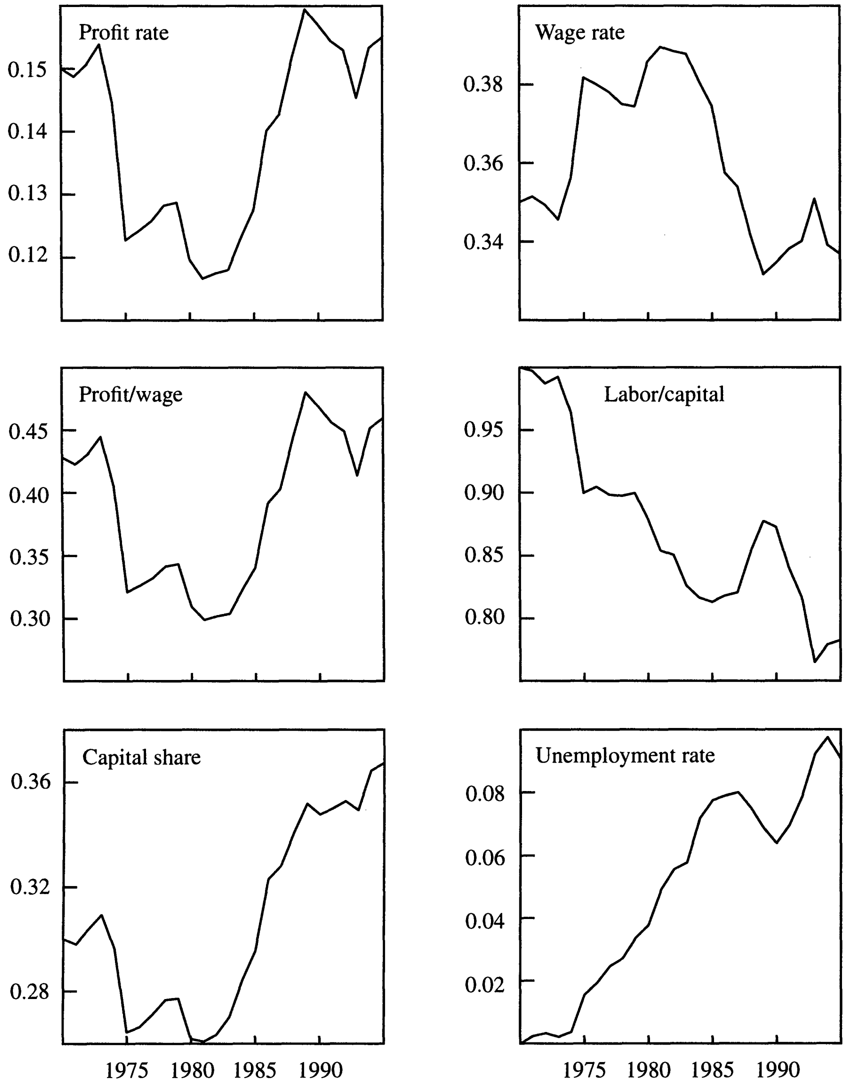
The simulations described below assume zero values for the shifts before 1970 and actual values thereafter. They are run under rational expectations, with expectations of future shifts equal to their current values. The corresponding figures show simulation results under two alternative assumptions about the value of σ: 1.0 and 2.0.

Figure 11 presents the results of a first simulation, allowing for shifts in labor supply and the cost of capital but ignoring shifts in labor

32. I have so far ignored the trend decline in the relative price of capital, which is absent from the model above but is empirically relevant for a number of OECD countries. In France, however, this factor is not very important. The relative price of investment goods has decreased by only 6 percent since 1970.

Figure 10. Historical Paths of Variables, France, 1970–95

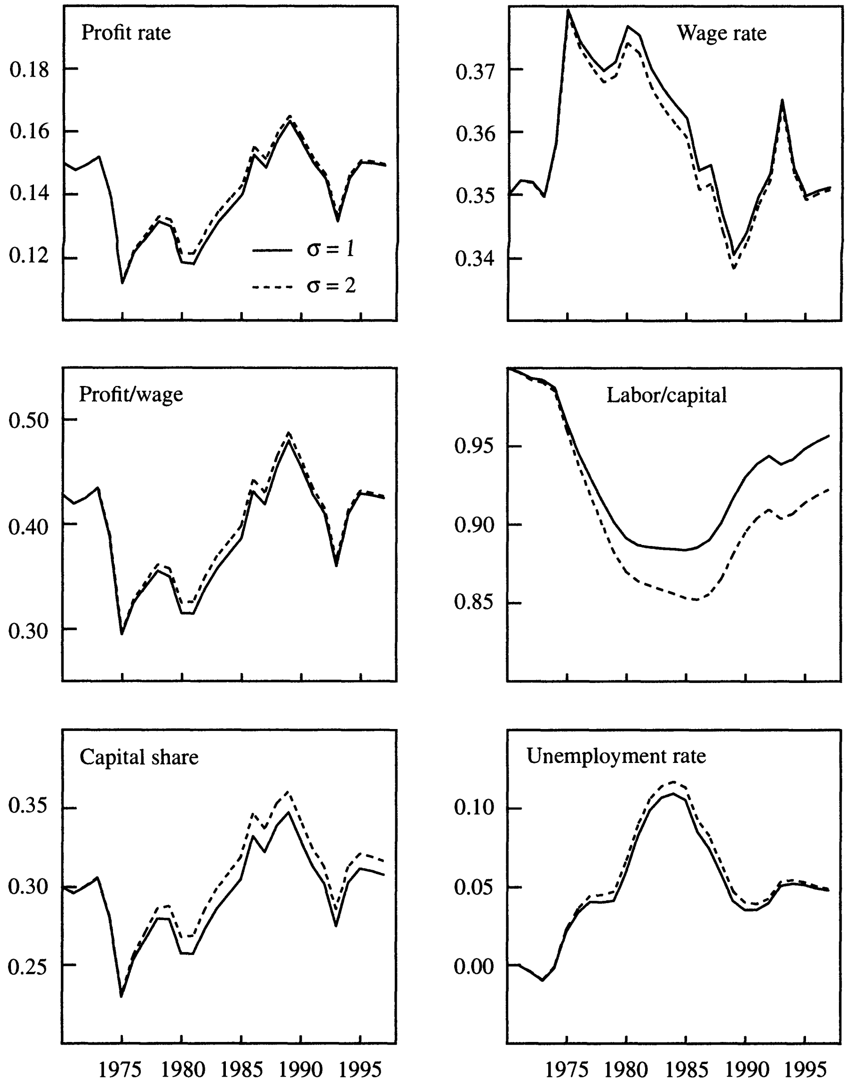
Index[a]



Source: Author's calculations (see figure 1).

a. Each variable is normalized so that its 1970 value corresponds to the steady-state value assumed in the model; see table 2 for parameter and steady-state values.

Figure 11. Simulated Effects of Historical Labor Supply and User Cost Shifts, France, 1970–96[a]



Source: Author's calculations (see figure 1).

a. Graphs show the paths that variables follow in response to the constructed labor supply and user cost shifts that occurred in France over the sample period. The construction of the time series of these shifts is described in the text and in the notes to figures 7 and 9; the user cost series is constructed using long bond rates deflated by the inflation rate over the previous five years. Solid line results when elasticity of substitution (σ) is set to one; dashed line, when elasticity is set to two. All other parameters take the values given in table 2.

demand (markup or technological bias shifts). It is clear the adverse labor supply shocks can explain the increases in unemployment and the capital share up to the mid-1980s. But they are unable to explain the further increases in unemployment and the capital share since the mid-1980s. Instead, as labor supply shifts decrease in magnitude and factor proportions adjust, the ratio of labor to capital turns around, leading to reductions in unemployment and the capital share.

Figure 12 depicts the effects of all three shifts combined. It shows how the adverse labor demand shifts since the early 1980s help to account for the subsequent evolution of both unemployment and the capital share. In contrast with the previous simulation, the ratio of labor to capital declines throughout the period (as it does in the data), despite the fact that due to the decrease in labor supply shifts and the downward pressure from unemployment, the wage (in efficiency units) is below its initial value. Unemployment remains high, and so does the capital share.[33]

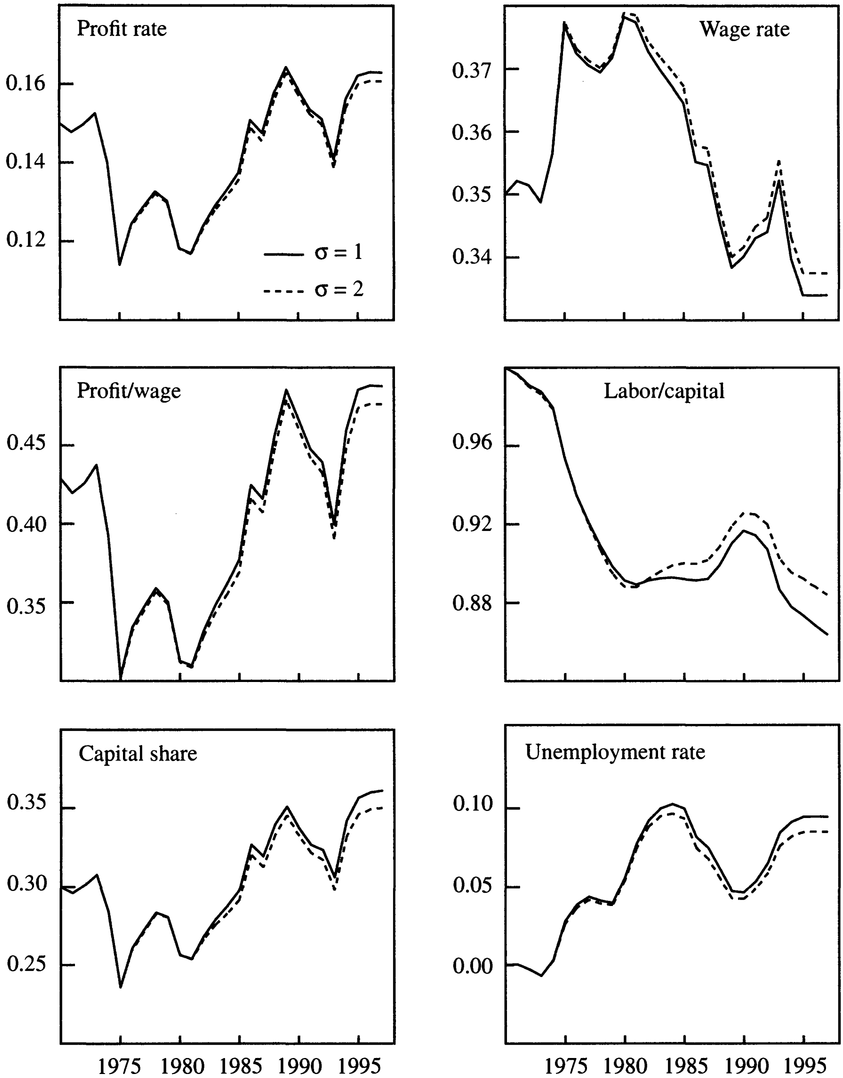
A Glance at Other Countries

For the other thirteen countries in my sample, I have carried out the same exercise mechanically, without any attempt to fine tune, even when the simulations results are poor. Fine tuning would take me beyond the scope of this paper, and so I leave it to later work. Table 3 summarizes the results.[34] For each country, the table reports the change in constructed labor supply and labor demand shifts for the subperiods 1970–81 and 1981–95. And for each subperiod and country, it also gives both the change in the unemployment rate implied by the simulation and the actual change. To interpret the numbers for labor supply

33. The fit between the actual evolutions in figure 10 and the simulated evolutions in figure 12 is clearly very good. This, however, is largely by construction. Recall that the series for the labor supply and demand shifts are constructed so as to make the labor supply and the labor demand relations fit exactly. If the model had no internal dynamics, the overall fit would be perfect. To the extent that the model determines the dynamics of capital accumulation and factor proportions endogenously, the fit can still turn out to be poor. Table 3 below, which reports the simulation results for each of the other thirteen countries in the sample, shows that predicted unemployment can differ substantially from actual unemployment.

34. I was unable to solve the model for Spain and the United Kingdom, apparently because of large negative real interest rates in the mid-1970s. The simulations reported for these countries assume a constant user cost.

Figure 12. Simulated Effects of Historical Labor Supply and Demand and User Cost Shifts, France, 1970–96[a]



Source: Author's calculations (see figure 1).

a. Graphs show the paths that variables follow in response to the constructed labor supply, labor demand, and user cost shifts that occurred in France over the sample period. The construction of the time series of these shifts is described in the text and in the notes to figures 7, 8, and 9. Solid line results when elasticity of substitution (σ) is set to one; dashed line, when elasticity is set to two. All other parameters take the values given in table 2.

Table 3. Labor Supply and Demand Shifts and Implied and Actual Unemployment Rate Changes, 1970–95[a]
Percentage points

	1970–81				1981–95			
			Change in unemployment rate				Change in unemployment rate	
Country	Labor supply shift	Labor demand shift	Implied	Actual	Labor supply shift	Labor demand shift	Implied	Actual
Continental								
Australia	12	−4	5	4	−5	3	8	3
Austria	23	0	13	1	0	6	5	4
Denmark	22	0	15	8	−13	8	0	0
France	16	−1	7	6	−10	11	3	4
Germany[b]	19	−6	6	5	−10	3	−2	−1
Netherlands	7	−3	7	6	−12	8	−1	1
Spain[c]	39	−5	20	13	−3	11	10	8
Sweden	21	−3	9	2	−3	5	5	5
Belgium	30	−9	17	9	−1	4	9	3
Ireland	3	−3	−3	5	−18	8	−1	2
Italy	6	−2	−4	3	−4	8	7	5
Anglo-Saxon								
United States	−1	−3	−3	2	−4	0	−1	−2
Canada	4	11	2	2	20	−4	22	1
United Kingdom[c]	11	1	4	7	−10	−6	−4	0

Source: Author's calculations, based on data used in table 1.
a. Labor supply shifts are changes in ln θ times 100. Labor demand shifts are changes in the log of the markup (ln μ) times 100. Both series are constructed as described in text and in notes to figures 7 and 8. Numbers shown in this table use $\sigma = 1$ and $\lambda = 0.8$. Implied changes in the unemployment rate are taken from dynamic simulations using the constructed shifts in labor supply and demand and in user cost that occurred over the sample period, and the parameter and steady-state values given in table 2.
b. Sample period ends in 1990.
c. Assuming constant real interest and depreciation rates.

and demand shifts, it is useful to recall that over a period of five to ten years, the effect of 1 percent adverse shift in labor supply is to increase the unemployment rate by about 0.8 percentage points. Over the same period, a 1 percent adverse shift in labor demand increases the unemployment rate by about 0.4 percentage point. Table 3 suggests a number of conclusions.

The model does a decent job of explaining unemployment evolutions across countries and across subperiods. The cross-country correlation between predicted and actual changes in unemployment is 0.60 for the first subperiod and 0.36 (excluding Canada, 0.65) for the second subperiod.

For a large number of countries, however, the model overpredicts the increase in the unemployment rate from 1970 to 1981. The worst case is Austria, with a predicted increase of 13 percentage points versus an actual increase of only 1 percentage point. Similarly, the predicted increase for Spain is substantially larger than the already large actual increase. The origin of these overpredictions points to an important shortcoming of the model. The model assumes that each economy was on its steady-state growth path in 1970. Starting from such a balanced path, any increase in the wage above that implied by total factor productivity growth must lead to higher unemployment. But a country that is below its steady-state growth path experiences an increase in the ratio of capital to labor, which allows wages to grow faster than total factor productivity without adverse effects on unemployment. This appears to have been true of Austria, where the profit rate was unusually high in the early 1970s and has declined steadily as the ratio of capital to output has increased. Likewise for Spain, although in this case the increase in wages has been much larger than was warranted either by convergence to the steady-state path or by factor productivity growth.

Some other large discrepancies point to potential data issues as much as to deficiencies of the model. The proximate cause of the very large predicted increase in unemployment in Canada since 1981, for example, is the large constructed adverse shift in labor supply since that date. This shift reflects wage growth in excess of low measured total factor productivity. The low measured factor productivity growth, in turn, can be traced to very high measured capital growth in the 1980s, which leads to a small Solow residual. And the low measured capital growth comes from a very large decrease in the measured price of investment goods, leading to high measured capital accumulation in volume, given observed capital accumulation in dollars. According to the data, the relative price of capital goods has decreased more than twice as fast in Canada as in the United States. This does not seem plausible.[35]

35. The OECD is not to blame, as its data on the price of investment goods are consistent with those published by Canada. According to Statistics Canada, the price of producer's durable equipment relative to the GDP deflator has decreased from 100 in 1970 to 33.8 in 1995 (compared with 62.9 in the United States, according to the Bureau of Economic Analysis). Part of the problem appears to be the OECD's use of an implicit price deflator for Canada, but a chain index for the United States. Canada has now introduced a chain index and its evolution is much closer to that of the United States. I could not, however, use this new index in my simulations, as it only goes back to 1981.

Leaving aside such problems and puzzles, table 3 suggests that the increase in unemployment in the Continental countries is typically explained by adverse labor supply shifts in the first subperiod and adverse labor demand shifts in the second. Just as has been seen for France, these later adverse labor demand shocks also explain the increase in capital shares. It is interesting to note that the model suggests that labor demand shifts have played a more limited role in Germany than in France: most of the decrease and later recovery of capital shares in Germany is accounted for simply by the dynamic response of factor proportions to factor prices.

Lags in Labor Demand

In this section, I return to econometrics and look at dynamics of labor demand. The important role played by these dynamics in the analysis so far raises two related questions. First, is there evidence for the lags assumed in the model and the construction of markup shifts? Second, when such lags are allowed and estimated, how much evidence remains of shifts in labor demand since the mid-1980s? There is a large literature on the dynamics of labor demand in general, and of labor demand in the context of European unemployment, in particular.[36] My goal here is simply to provide a description of the data and attempt to separate dynamics and time effects.

For each of the two groups of countries—Continental and Anglo-Saxon—I run the following panel regression:

$$\ln\left(\frac{\tilde{n}}{k}\right)_{it} = \phi(L)\ln\tilde{w}_{it} + x_i + x_t + \epsilon_{it}, \tag{12}$$

where i denotes a country; t denotes time; $\tilde{n}$ is labor in efficiency units;

To see the potential effects of shifting to a better index, I have redone the simulations for Canada using the U.S. relative price of investment instead of the Canadian one to compute the evolution of the capital stock in volume, total factor productivity, and so on. The labor supply shift for 1970–81 decreases from 4 (in table 3) to −6, and for 1981–95, from 20 to 10; the increase in the unemployment rate over 1981–95 is 12 percent—still too high, but roughly half the number in the table.

36. On labor demand in general, see, for example, Hammermesh (1993); in the context of European unemployment, see, for example, Layard, Nickell, and Jackman (1991).

Table 4. Regressing Factor Quantity Ratios on Current and Lagged Wage Rates, 1961–95[a]

Panel and estimator	Time dummies	Coefficient on wages: Current	$t-1$	$t-2$	Sum: $t-3$ to $t-9$	Sum: $t-1$ to $t-9$	p values[b]: Lagged wages	p values[b]: Time dummies
Continental								
OLS	No	−0.14	−0.51	−0.31	−1.31	−2.27	0.00	...
OLS	Yes	−0.74	−0.35	−0.30	−1.09	−2.47	0.00	0.00
IV[c]	No	−0.51	−0.44	−0.44	−1.40	−2.79	0.00	...
IV[c]	Yes	−0.87	−0.37	−0.32	−1.13	−2.69	0.00	0.00
Anglo-Saxon								
OLS	No	−1.19	−0.49	−0.16	−0.10	−1.94	0.00	...
OLS	Yes	−1.09	−0.34	−0.32	−0.20	−1.95	0.00	0.09
IV[c]	No	−1.30	−0.47	−0.16	−0.03	−1.96	0.00	...
IV[c]	Yes	−1.37	−0.33	−0.60	0.79	−1.51	0.00	0.05

Source: Author's regressions (see table 1).

a. The dependent variable is the log factor quantity ratio, ln $(\tilde{n}/k)_{it}$, where $\tilde{n}$ is labor in efficiency units and k is the capital stock in country i and year t. Independent variables include current and lagged values of the log wage per efficiency unit, ln $\tilde{w}$, in addition to country and time fixed effects. Equation estimated is (12) in the text. Samples are as described in notes to table 1.

b. Probability of obtaining these data given that all lagged wage or time dummy coefficients are zero. Covariance matrix is Newey-West corrected.

c. Estimated using constructed labor supply shifts (see figure 7), lagged zero to nine years, as instruments for wages in efficiency units.

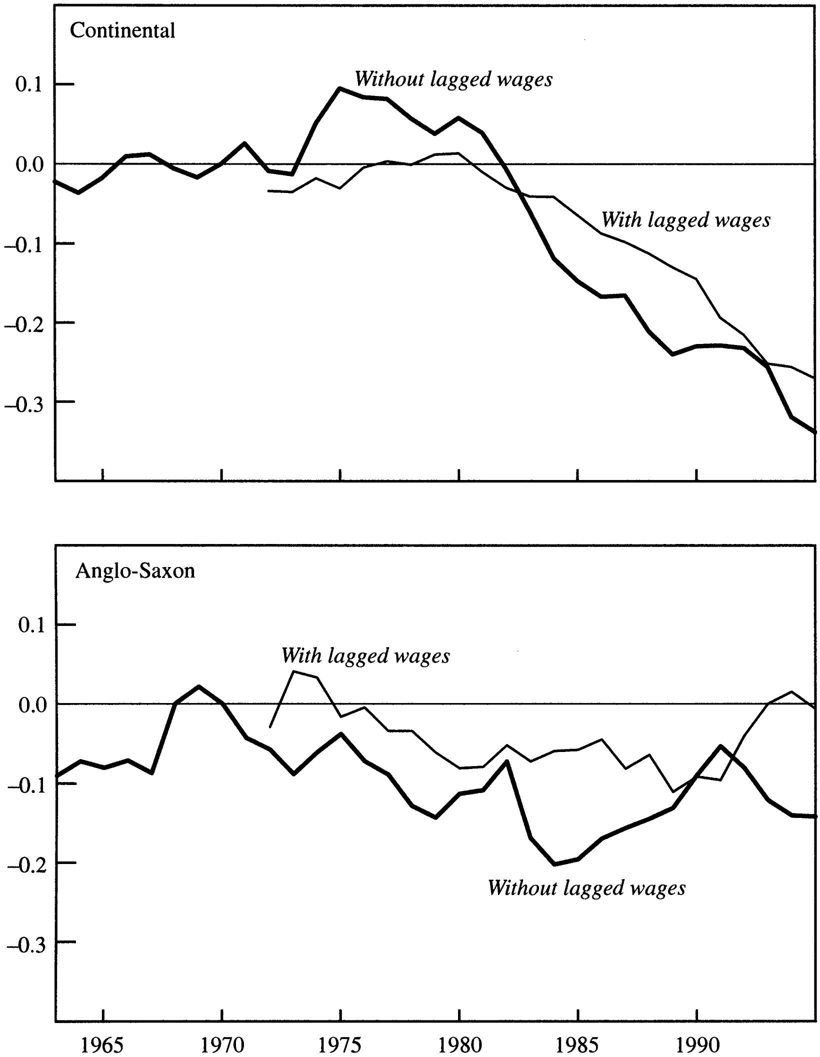
k is capital; $\tilde{w}$ is the wage per efficiency unit of labor; x_i and x_t are country and time fixed effects, respectively; and $\phi(L)$ is a lag polynomial. As is well known, this log-log specification does not hold exactly, except in the Cobb-Douglas case—this is why the estimation above relied instead on a log-log relation between factor price and factor quantity ratios, which holds for the CES case—and must be thought of as a log approximation. Under that interpretation, the sum of estimated coefficients on current and lagged wages, $\phi(1)$, is approximately equal to the ratio of the elasticity of substitution to the share of capital, σ/a. This fact is useful for interpreting the results below.

The results of this estimation are reported in table 4 and figure 13. Table 4 presents four sets of results for each group. Two are obtained by ordinary least squares, with and without time dummies. The other two are obtained using instrumental variables, with and without time dummies. For the present purposes, the labor supply shifts constructed earlier are natural instruments.[37] The regression results yield two conclusions.

37. Another issue arises from the fact that business cycles generate a correlation

Figure 13. Time Variation in Factor Quantity Ratios, Controlling for Wage Rates, Continental and Anglo-Saxon Countries, 1963–95[a]

Log index, 1970 = 0



Source: Author's regressions, based on data used in figure 1.

a. Figure plots, for each panel of countries, the time dummy coefficients that result when the log ratio of labor to capital is regressed on the current log wage in efficiency units, country dummies, and time dummies. Where indicated, regression also includes lagged values of the log effective wage. Regression corresponds to equation 12 in the text and is described in the notes to table 4; the figure presents results from the instrumental variables estimation.

First, there is evidence of long lags in labor demand. While the best lag length varies across specifications, the results suggest that up to nine years are needed to capture the dynamics of adjustment. If one takes the average capital share to equal 0.35, the sum of coefficients on current and lagged wages implies an elasticity of substitution a little under 1.0, which is unable to yield a significant medium-run increase in the capital share in response to adverse labor supply shifts.

Second, even allowing for lags, time dummies remain highly significant for the Continental countries, but are only marginally so for the Anglo-Saxon countries. More information is given in figure 13, which plots the series of time fixed effects estimated by instrumental variables, for each group. For comparison, it also plots the series of time effects from a regression that allows only for current wages—and country dummies. For the Anglo-Saxon countries, the shifts are small, whether or not one allows for lags in labor demand. For the Continental countries, allowing for lags reduces the size of shifts in the 1970s but does not otherwise change the general shape of the shifts: there is still a large unexplained adverse shift in labor demand increasing from the early 1980s to the present.

The Source of Shifts in Labor Demand

A key unanswered question is whether the source of the labor demand shifts lies in technological bias away from labor or changes in the distribution of rents. A similar question has been discussed in the context of the shift in demand for skilled relative to unskilled labor. The prevalent view is that this shift reflects technological bias away from unskilled workers. But some argue that it may reflect institutional change; for example, the weakening of unions leading to an increase in

between the ratio of labor (in efficiency units) to capital and the wage (in efficiency units), due either to deviations of the marginal product from the wage or to mismeasurement of total factor productivity. A demand-driven boom is typically associated with high measured total factor productivity growth. High measured productivity growth leads to a large increase in labor measured in efficiency units ($\tilde{n}$) and a large decrease in the wage per efficiency unit ($\tilde{w}$). In order to alleviate some of the business cycle effects, I have tried using only values of the labor supply shifts lagged by three or more years. The resulting pattern of estimated coefficients is typically nonsensical.

wage differentials across workers.[38] The approach in this debate has been to look at cross-country or cross-sectoral evidence and try to link the shifts to factors that are more likely associated with one or the other explanation. For the question at hand, there would appear to be a more direct approach. Under the hypothesis of technological bias, one should see changes in the production function; under the hypothesis of changes in markups, one should not. This suggests a simple test.

Consider the following example. Suppose that the production function is Cobb-Douglas, with exponent a on capital, and that except for possible changes in a over time, technological progress is multiplicative:

$$y = z\,(\psi\, n)^{(1-a)}\, k^{a}, \tag{13}$$

where ψ is a constant that depends on the units in which labor is measured. One typically ignores units in production functions, as a change in units merely changes the constant term. But in the present context, where one wants to allow for changes in a, the units do make a difference: one does not want the effect on y of a given change in a to depend on whether labor is measured in thousands or in millions of workers.

Suppose that the markup is equal to μ and assume away costs of adjustment, so that the wage times the markup is equal to the marginal product of labor. It is straightforward to derive that the capital share will be equal to $\alpha \equiv 1 - (1/\mu)(1 - a)$. Assume that, initially, μ is equal to one, so that α is equal to a.

Suppose that one observes an increase in the share of capital, α. This could be due to one of two factors (or a combination of them). One hypothesis (H0) is that it comes from technological bias; that is, an increase in a, reflected one for one in an increase in α. The other hypothesis (H1) is that it comes from an increase in the markup, μ, increasing α given an unchanged value of a, denoted $\bar{a}$.

Under H0, the production function is given by

$$y = z\,(\psi\, n)^{(1-\alpha)}\, k^{\alpha}.$$

Or, taking logs and rewriting,

$$\ln\left(\frac{y}{k}\right) = (1 - \alpha)\ln\left(\frac{n}{k}\right) + (1 - \alpha)\ln \psi + \ln z.$$

38. See, for example, Fortin and Lemieux (1997).

Similarly, under H1 the production function is given by

$$y = z\,(\psi\, n)^{(1-\bar{a})}\, k^{\bar{a}}.$$

Or, taking logs and rewriting,

$$\ln\left(\frac{y}{k}\right) = (1 - \bar{a}) \ln\left(\frac{n}{k}\right) + (1 - \bar{a}) \ln \psi + \ln z.$$

In essence, under H0 the change in the share should be reflected in a change in the effect of the ratio of labor to capital on the ratio of output to capital; under H1 it should not.

One can nest these two hypotheses by writing

$$\ln\left(\frac{y}{k}\right) = \phi(1 - \alpha) \ln\left(\frac{n}{k}\right) + (1 - \phi)(1 - \bar{a}) \ln\left(\frac{n}{k}\right) + [\phi\,(1 - \alpha) + (1 - \phi)(1 - \bar{a})] \ln \psi + \ln z.$$

Or, rearranging,

$$(14)\quad \ln\left(\frac{y}{k}\right) - (1 - \bar{a}) \ln\left(\frac{n}{k}\right) = \phi(\bar{a} - \alpha) \ln\left(\frac{n}{k}\right) + [1 - \phi\alpha - (1 - \phi)\bar{a}] \ln \psi + \ln z.$$

A value of ϕ equal to zero implies that the change in the share is due to markup changes. A value of ϕ equal to one implies that the change in the share is due to biased technological progress.

Estimating equation 14 requires the specification of z, the technological level.[39] I assume that $\ln z_{it}$ (for country i at time t) is equal to a country-specific quadratic trend, $f_i(t)$, plus a stationary component, ϵ_{it}. If one assumes that $\bar{a}$, the underlying constant value of a under H1, is equal to the mean value of the share in the sample, one can construct the time series for the dependent variable, $X1 \equiv [\ln(y/k) - (1 - \bar{a}) \ln(n/k)]$, and the first right-hand-side variable, $X2 \equiv [(\bar{a} - \alpha) \ln(n/k)]$, and run the following panel regression:

39. In this case, it is not possible to express variables in efficiency units and eliminate z from the regression, as I have done above, because the weights needed to construct z depend on which of H0 and H1 holds.

Table 5. Regressions to Distinguish between Technological Bias and Markup Changes, Fourteen-Country Panel, 1961–95[a]

Estimator	*Estimated technological bias parameter*[b]	*p value: equality across countries*[c]
OLS	0.98 (0.17)	0.03
IV1[d]	1.47 (0.35)	0.00
IV2[e]	0.69 (0.39)	0.73

Source: Author's regressions (see table 1).

a. Equations estimated correspond to (15) in the text. Sample includes both Continental and Anglo-Saxon countries; for details, see notes to table 1.

b. The coefficient ϕ from equation 15. A value of zero implies that changes in capital shares are due to markup changes; of one implies that they are due to biased technological change.

c. Probability of obtaining these data if the parameter ϕ is the same across countries.

d. Estimated using current and lagged values of constructed labor supply shifts (see figure 7) as instruments.

e. Estimated using current and lagged values of user cost (see figure 9) as instruments.

$$X1_{it} = \phi\, X2_{it} + x_i + \rho_i \alpha_{it} + f_i(t) + \epsilon_{it}. \tag{15}$$

Table 5 presents the results of this estimation. All fourteen countries are pooled together, as there is no obvious reason to treat the two groups separately in this context.[40] The first line gives the results of ordinary least squares estimation, reporting the estimated value of ϕ and also the test of the constraint that when allowed to differ, ϕ_i is the same across countries. The second and third lines report the results of instrumental variable estimation; the second uses current and lagged labor supply shifts, whereas the third uses current and lagged shifts in user cost. To the extent that the user cost is dominated by movements in the world interest rate, it is a good candidate instrument.

Point estimates of ϕ are significantly closer to one than to zero. This argues for technological bias (which corresponds to $\phi = 1$) rather than markups. Allowing for country-specific values of ϕ, however, yields a wide range of estimated values, from -2.5 to 4.0. These have large standard deviations: equality of all ϕ's is rejected only at the 3 percent level in the ordinary least squares case, and is not rejected at all in the second instrumental variables case.

The great variation in the coefficient ϕ_i across countries—even if

40. The results are very similar if only the Continental countries are used. The test has little power for the Anglo-Saxon countries, because their shares do not vary very much.

the variation is not always significant—makes me uneasy about the results in table 5. One reason for the variation may be that the assumptions underlying this approach (a Cobb-Douglas production function and no costs of adjustment, so that the share is the right measure of the effect of capital on output under H0) are overly strong. I suspect, however, that aggregate data may not be able to speak precisely. In effect, the question is whether, given total factor productivity, an increase in the ratio of labor to capital has a larger effect on the ratio of output to capital in those countries where the capital share has increased. But little is known about the exact process of factor productivity, nor are there large changes in the ratio of labor to capital that would yield sharp estimates. Thus further progress will probably have to rely on the cross-sectoral evidence.

Conclusions

In the 1970s, most of the Continental countries were affected by large adverse shifts in labor supply. The initial effect of these shifts was to decrease profit rates and capital shares. Over time, firms reacted by moving away from labor, which led to a steady increase in unemployment and the recovery of capital shares. In most of these countries labor supply shifts have now abated, and in some they have vanished altogether. But since the early 1980s, they have been replaced by adverse shifts in labor demand. These shifts explain why unemployment has remained high, and also explain the further rise in capital shares.

By contrast, the Anglo-Saxon countries have largely been shielded from both the adverse labor supply shifts of the 1970s and the later labor demand shifts. This accounts for their different evolutions—both in terms of unemployment and in terms of capital shares—from the Continental countries.

These findings yield a mixed message for the future course of unemployment in the Continental countries. On the one hand, labor moderation—defined as the disappearance of the adverse labor supply shifts—may no longer be sufficient to ensure a quick return to low unemployment. On the other hand, one should expect that the adverse effects of labor demand shifts on unemployment will disappear over time. The decline in the ratio of labor to capital should eventually be offset by the entry of new firms and an increase in capital. Thus, assuming no further adverse labor demand shifts (which is more likely to hold if such shifts come from changes in the distribution of rents than if they come from technological bias), my results imply a slow decline in unemployment in the future.

Even if the story presented in this paper is broadly correct, many questions need to be examined before forecasts or policy advice can be given with much confidence. I discuss two of these here.[41] First, can one relate shifts in labor supply and demand to underlying observable variables? Identifying the source of the adverse shifts in labor supply may be the easiest part, as it builds on a large body of research. There is wide consensus that these shifts come both from a combination of economic events (such as increases in oil prices, the slowdown in total factor productivity growth) and induced changes in labor market institutions (such as more generous treatment of unemployment, increases in employment protection, minimum wage legislation). One of the puzzles faced by previous research was how to reconcile the fact that unemployment has remained high while oil price hikes have been more than reversed, workers by now must have adapted to slower underlying productivity growth, unions appear to have become weaker, and governments have started tightening social insurance programs. My findings that labor supply shifts have indeed largely decreased, and that the persistence of high unemployment is a result of shifts in labor demand since the mid-1980s, offer a resolution to the puzzle. Indeed, the paper makes a more general methodological point. Much of the econometric research on the increase in unemployment has involved estimating, across countries and time, a reduced-form equation for the unemployment rate as a function of a number of observable variables.[42] I suggest

41. Those who have read an early version of the present paper (Blanchard, 1996) may note the absence of a theme developed there: the relation between inflation and markups. My initial work showed a strong time-series relation between the increase of the measured markup and the decrease in inflation. Now that I have adjusted the construction of markups to take into account lags of adjustment of factor proportions, the relation remains but is weaker. And when time effects are allowed in panel regressions of factor prices on factor quantities, domestic inflation for each country is only marginally significant. For these reasons, I have left the exploration of a potential relation between markups and inflation to further work.

42. See, for example, Jackman, Layard, and Nickell (1996).

instead a potentially more productive approach: to distinguish supply and demand shifts and then try to explain each of them separately.

Identifying the source of the more recent labor demand shifts may be more difficult. The attempt to distinguish between shifts in the distribution of rents and biased technological adoption in this paper is inconclusive. As a next step, I have started looking at cross-sectoral evidence for France. I find that labor demand shifts are present in most sectors, but I have not yet made progress in relating relative shifts to potential underlying factors, such as the initial level of rents, the estimated initial degree of labor hoarding, the initial structure of bargaining, and so on.

There may also be something to be learned from the cross-country evidence. Based on the numbers in table 3, the cross-country correlation between the labor supply shifts over 1970–81 and the labor demand shifts since 1981 is 0.40: countries that had larger adverse labor supply shifts in the 1970s typically have also suffered larger adverse demand shifts since. It is tempting to see this relation as causal. Firms in countries where labor supply shifts were stronger may have decided to adopt technologies that use less labor and more capital. The lags in introducing these new technologies may be even longer than those associated with changing factor proportions within the set of existing technologies.[43]

This correlation between labor supply shifts and labor demand shifts also suggests a tentative explanation for the differences between the experiences of the Anglo-Saxon and the Continental countries. In the Anglo-Saxon countries, the slowdown in productivity growth was smaller, and the induced adjustment of labor market institutions was more limited. Building on the argument of the previous paragraph, smaller adverse labor supply shifts from 1970 to 1981 may then explain why adverse shifts in labor demand have also been more limited since 1981.

The second question that must be answered is: what is the relation of the shifts between labor and capital documented in this paper to the shifts between skilled and unskilled labor documented in recent research in labor economics? It is an intriguing fact that relative demand shifts between skilled and unskilled workers appear to have been particularly

43. A number of recent papers tell of endogenous bias in technology adoption along broadly related lines; see, for example, Acemoglu (1997) and Zeira (forthcoming).

strong in the Anglo-Saxon countries, and relative demand shifts between labor and capital appear to have been particularly strong in the Continental countries. One wonders whether there may be an integrated explanation; whether the Anglo-Saxon countries have seen a shift from unskilled workers to skilled workers, whereas the Continental countries have seen a shift from unskilled workers to capital.

A preliminary look at numbers, however, does not seem to indicate that the increase in the capital share in the Continental countries since the early 1980s has come primarily at the expense of unskilled labor. Data for France constructed by Jean Pierre Laffargue and Anne Saint-Martin, for example, imply that the decrease in the labor share from 68 percent in 1982 to 58 percent in 1990 has come not only from a reduction from 10 percent to 7 percent in the share of unskilled workers (defined as blue collar workers plus unskilled employees), but also from a reduction of the share of skilled workers, from 58 percent to 51 percent.[44] In general, the data from France and other countries appear to suggest two largely unrelated evolutions: a general and steady shift away from unskilled labor and, in continental Europe, a shift away from labor as a whole since the early 1980s. A next step will be to extend the exercise of this paper to three factors of production: skilled workers, unskilled workers, and capital.

44. Laffargue and Saint-Martin (1997). I thank Jean Pierre Laffargue for making those data available to me.

Comments and Discussion

William D. Nordhaus: In this paper, Olivier Blanchard struggles with one of the major puzzles of current macroeconomics. Why do the economies of Europe and North America look so different? The paper contains many interesting insights and a few remaining puzzles. I organize my comments around three topics: the facts, the model, and the explanations.

Begin with the facts, which concern the returns to capital and labor. Blanchard examines the capital share and the relative returns to labor and capital in a number of OECD countries. He concentrates on the business sector. The major findings are the following: First, the behavior of factor shares looks quite different in the "Anglo-Saxon" countries of the United States, Canada, and the United Kingdom from in the continental European countries of Germany, France, Italy, and Spain (Blanchard's list of Continental countries is longer, but nothing is lost by focusing on these four). Whereas capital shares have been quite stable in the Anglo-Saxon countries, in the Continental countries, they fell sharply in the 1970s and then have risen even more sharply since the early 1980s. Second, as is well known, unemployment trends differ in the two groups of countries. Unemployment is roughly trendless in the United States, while it has been increasing steadily in continental Europe.

I see no reason to quarrel with the basic facts, although the business sector is an unfortunate target for this kind of analysis. It contains too much that muddies the statistical picture if one really is interested in the return to capital. For example, in the United States the business sector contains the services to owner-occupied housing, earnings of proprietorships, government enterprises, and farming. For 1995, in the corporate sector the share of labor in national income (or, national output at factor cost) was 80 percent. In the proprietor's sector, that share was 32 percent, while in "other private business"—which is primarily the imputed profit that you and I get renting our houses to ourselves—the share of labor was 3.4 percent. These animals are so different that I would keep them in different cages for the statistical analysis. And one sometimes forgets that the profits of financial institutions include the seigniorage earned by the Federal Reserve.

As long as one is beating up on the data, it is useful to remember that the denominator of these return numbers is the net stock of reproducible capital at replacement cost. And the numerator includes not only the implicit return on owned capital but also any return to owned land, subsoil assets like oil deposits, intangibles, and goodwill, as well as any monopoly power or excessive managerial compensation; furthermore, it omits the substantial capital losses on capital that have been experienced in recent years. It is interesting to note that the post-tax return is close to the weighted average cost of capital for this period.

Just for fun, I have compared the data on U.S. rates of return and shares for nonfinancial corporations taken from the National Income and Product Accounts (NIPA) with Blanchard's U.S. data from the OECD. The property share and rate of return data are significantly different. Blanchard's share and rate of return series show statistically significant positive time trends, whereas the NIPA data show statistically significant negative time trends. Over the 1960–95 period, Blanchard's estimated rate of return rises from 11.2 percent to 17.7 percent, but the NIPA return falls from 8.6 to 8.2 percent; and Blanchard's estimated share of property income rises from 27.3 percent to 33.3 percent, but the NIPA share falls from 19.6 to 17.1 percent. The NIPA data are clearly a cleaner concept for these purposes, but I am puzzled by the difference. Most of that difference comes from the fact that Blanchard includes depreciation, which seems ill advised in an analysis of trends in factor shares and rewards. Moreover, it does not make much sense to apply stories about labor rigidities, biased technological change, labor unions, labor hoarding, and constraints on hiring and firing to owner-occupied housing or sole proprietorships run by neurosurgeons. Blanchard's story might well survive translation to the property income of nonfinancial corporations in different countries, but until that is shown, my enthusiasm will remain somewhat dampened.

Because profits are such an intoxicating topic, consider two other points. First, what has happened to the post-tax corporate rate of return in recent years? Complete data are available only through 1995, but it might come as a surprise that the rate of return is basically trendless. In fact, the 1995 post-tax return of 6.0 percent was only marginally above the 1960–95 average of 5.7 percent. There is no brave new world of capitalism in the rate of return data—but no falling rate of profit either. What has happened to the average tax rate on corporate capital, however, is striking. After the corporate tax rate had averaged about 35 percent from 1965 through 1980, the supply-side revolutionaries lowered it to 20 percent in 1982, and it had only risen to 26 percent as of 1995. If Arthur Laffer had been paid his marginal private product as chairman of the tax-cutting committee of corporate America, he would have earned $350 billion in the 1980s alone.

Blanchard accounts for these strange developments in capital shares and profit rates by developing an interesting new calibrated model of the medium run and then using it, along with some simple econometrics, to compare his theory with developments in the two groups of countries. His model has four features. First, there is a conventional production structure, in which output is produced by a Cobb-Douglas (or sometimes, a CES) production function in capital and labor. Second, there is a reduced-form labor supply relationship, in which the employment rate depends on the real wage. Third, there is a price markup over labor costs, which in the model reflects multiple little monopolies, so that the markup is determined by the price elasticity of demand. Fourth, there is a novel set of assumptions regarding firms and adjustment dynamics for firms, capital, and labor.

In the long run, the model behaves like standard supply and demand functions for labor. (Just to protect everyone's reputation here, I should—although I do not—use quotation marks each time I write labor supply and labor demand because, as Blanchard emphasizes, these are not the usual competitive functions, but reflect more complicated market structures, institutional details, and so forth.) The new twist is that labor supply determines the employment rate, or employment relative to a benchmark level of employment, which is a moderately elastic function of the real wage. Given the parameters of the model, the demand for labor is an infinitely elastic function of the real wage rate; the labor demand curve shifts down with an increase in the rate of interest, the rate of capital taxation, the depreciation rate, and the Cobb-Douglas share of capital. The steady-state properties are that adverse or upward shifts in labor supply have no effect on real wages but do increase the "unemployment rate." Adverse or downward shifts in labor demand are fully reflected in a lower real wage and also produce a steady-state change in the unemployment rate.

Blanchard uses the model to simulate the impact of different shocks to the system. He suggests that Continental countries suffered from a series of adverse labor supply shifts in the 1970s. These would clearly lead to increases in the unemployment rate. (Be warned that the unemployment rate is a mixture of voluntary unemployment, efficiency wage and wait unemployment, and classical unemployment, but no real cyclical unemployment of the Keynesian variety.) Blanchard's model also shows that these shocks lead to a decrease in capital shares, although I am not convinced that this result is robust to changing the modeling dynamics.

The new piece of the story concerns the last decade. Since the early 1980s, according to Blanchard, continental Europe has suffered a number of adverse labor demand shocks. There is some question in his mind as to whether these represented biased technological change or shifts in the markup, although his econometrics leads him to the conclusion that they are likely to have been biased technological change, which increased the Cobb-Douglas coefficient on capital. As for the Anglo-Saxon world, Blanchard writes: "By contrast, the 'Anglo-Saxon' countries appear to have been largely shielded from both the adverse labor supply shifts of the 1970s and the labor demand shifts of the 1980s and 1990s. This accounts for the differences from the Continental countries in the evolution of unemployment and of capital shares."

I conclude by reflecting on which of the explanations for these phenomena seem plausible and consistent with the cross-section of human experience. To do so, I round up both the usual suspects and those chosen by Blanchard. The augmented list of suspects comprises the business cycle, the cost of capital, markups and market power, international trade, biased technological change, and labor market rigidities.

On the issue of the business cycle, profits and profit rates are highly cyclical. This is probably a good part of the recent profits surge in the

United States, but given the great depression in continental Europe, it can hardly explain the rising capital share and rate of profit there. I would have liked some attention to cyclical issues, but given the paper's focus on the medium term, this is a pardonable offense.

The paper does not discuss the cost of capital or increases in capital taxation as possible reasons for the higher profit rate or capital share. It would, in fact, be hard to make this case given the stock market boom, the unprecedented rise in Tobin's q, and the declining tax rate of corporate capital around the world. So this suspect is let off the hook.

Blanchard has some kind words to say about the possibility that higher capital shares in the Continental countries resulted from higher markups. I find this part of the discussion confusing. Blanchard's markup is, by definition, the ratio of price to marginal cost. (By the way, this is different from the usual markup—that is, the relationship between price and some measure of standardized average cost—as it is generally used by industrial firms or recognized by those responsible for the marking up.) Under the usual simplified conditions, the Blanchard markup is the usual function of the price elasticity of demand. If one is to take his model literally (which he does not), the implication is that the increase in the capital share is due to an increase in monopoly power or a decrease in the demand elasticity in Europe. This idea would be immediately thrown out of court, and rightly so. If anything, competition has grown in continental Europe as a result of increasing openness to international trade. If anything, the movement to a single market should drive down Blanchard markups in Europe relative to those in the United States, which unified its market two centuries ago. There may be different interpretations of the markup, but the obvious one would seem to be unrealistic on prima facie grounds.

In terms of the impact of increased openness on different countries, there has been much debate about the effect on the structure of wages, and, on balance, the evidence seems to suggest that unskilled labor (a close substitute for inputs that are abundant in developing countries) has had its wages depressed. Little attention has been paid to the beneficiaries of the increased imports. The usual view is that the capital and skilled labor of the OECD are relatively scarce in the world as a whole, and that these factors should benefit from increased openness. I would emphasize, instead, that the really scarce factor in the world economy is able and ruthless managerial talent in multinational corporations. If so, the opening of high-income markets over the past two decades has had the effect of increasing the return and share of capital income in large corporations. Moreover, to the extent that Europe was closed relative to the United States, profits will have been more benefited in that region than in the United States.

Blanchard puts forward the novel argument that the rise in capital's share in continental Europe is due to biased technological change. In his framework, biased technological change is simply an increase in the Cobb-Douglas coefficient on capital in the production function. This argument strikes me as completely implausible. To the extent that this is technological change rather than substitution, one would expect it to affect almost all comparable countries, including those classified as Anglo-Saxon. What are these German labor-saving inventions that have not crossed the English Channel? Has a French chef discovered a labor-saving recipe for *pommes frites* that has not yet been translated by McDonald's? Martin Baily and his associates at the McKinsey Global Institute have uncovered evidence that continental Europe has actually lagged behind the United States and Japan in introducing the latest technologies over the past decade or so. Lagging behind hardly seems a likely route for a region-specific burst of technological change.

A more promising line of argument about biased technological change would look to the information and computer revolution. The use of computers could easily be seen as capital saving (lowering the ratio of capital to output) through the increased efficiency in management of production. The miraculous ways in which computers allow better management of airline, railroad, and trucking fleet, of oil refineries, of overnight delivery services, and of inventories are well known. There is, however, only weak evidence of a decline in the ratio of chain-weighted capital to output for the United States.

The final issue concerns institutional labor market policies, which seem closest to what Blanchard calls labor supply shocks. In this category are union density and coverage, benefit levels and the duration of unemployment insurance and welfare policies, the strength of employment protection and limitations on separations, and the structure and level of labor and other taxes. I believe that it is here, rather than along linguistic or geographical lines, that one might find the source of the puzzling movements in labor and capital shares. Blanchard's Anglo-

Saxon countries are actually a subset of those with relatively free labor markets; his Continental countries are high on the list of those with major labor market rigidities. For example, consider the following OECD ratings. Ranked on unemployment protection—using an inverse French grading scale, where 1 affords the least employment protection (the United States) and 20 affords the most (Italy)—the three Anglo-Saxon countries have an average score 3.7, while France, Germany, Italy, and Spain average 16.5. On the labor standards rating (a scale from 0 to 7), the Anglo-Saxon countries average 0.7, while these four Continental countries average 6.5. In terms of unemployment insurance, these four Continental countries have a generosity rate (replacement rate times maximum duration) of 180 percent-years, while the Anglo-Saxon countries average 79 percent-years, a difference of almost 2 1/2 times.[1] It would therefore be more plausible to classify the Anglo-Saxon countries as the "FreeLabs" (those with largely free labor markets) and the Continental countries as the "RegLabs" (those with heavily regulated labor markets).

This distinction would resolve half of the distributional puzzle, that concerning the labor market, but the profit puzzle remains unsolved. Unless the elasticity of substitution of capital for labor is greater than one, there is no simple and robust story about why the RegLabs would experience increasing profit rates or capital shares while these were relatively stable in the FreeLabs. There may be lots of unemployment in Europe, but there is still much work to be done by future Brookings Panels on this fascinating and important issue.

Edmund S. Phelps: The main advance of this paper is that it introduces wage and markup behavior explicitly into the analysis of the evolution of unemployment together with that of factor shares. To date, most economists have been doing reduced-form analyses of the unemployment rate with only an implicit consideration of wage rates. Since looking at wages and factor shares provides a useful check on the consensus explanation of the rise of European unemployment, this is a very worthwhile exercise. The real importance of the paper, however, lies at the level of theory wars. Blanchard, who used to stick to a Keynesian approach fortified by hysteresis in dealing with secular

1. These numbers are drawn from Nickell (1997).

change in unemployment, seems now to have switched, as have several others, to the intertemporal equilibrium endogenous natural rate approach, in which neither money nor hysteresis is required.

I want, first, to explain that Blanchard's results are in line with the consensus that has emerged on the rise of unemployment in Europe. Even the equational model is based on off-the-shelf theoretical components, such as incentive wage models underpinning the wage curve. Unfortunately these foundations are sometimes obscured or even obfuscated—for example, when the wage curve is called "labor supply" (Blanchard's quotation marks). Second, I argue that the paper seriously misleads when it portrays the experience of the "Anglo-Saxon" countries as radically different from that of the core Continental countries.

The existence of a consensus on European unemployment is demonstrated by the symposium forthcoming in the May 1998 issue of the *Economic Journal*, and can be outlined as follows. Early in the convergence of views, most investigators came to believe that the large expansion of the welfare state in the 1960s and 1970s had shifted up the wage curve above where it would otherwise have been by the mid-1970s, which, taken alone, must have raised the natural rate of unemployment. Since welfare entitlements—the various social insurance and social assistance programs—were generally not contingent on the beneficiary being employed, they operated to devalue earning; the resulting deterioration of employee performance (that is, more quitting, shirking, absenteeism, and so forth at a given unemployment rate) directly raised employee costs, as employers raised wages to shore up employee incentives, or accepted lower performance, or both. Further, the increase in payroll taxes that financed this expansion of welfare also pushed up the wage curve in terms of hourly labor costs—wage and nonwage costs. The reason is that the after-tax wage rates required for optimum incentives will not drop sufficiently to accommodate the tax as long as the private wealth and social entitlements of workers have not fallen in proportion to the decline in the after-tax wage. Only in the long run, as wealth decumulates in response to the decline in the after-tax wage, might there be a full accommodation of the downward shift in the after-tax demand wage. Indeed, it is possible that one is seeing the fruits of such an accommodation in the 1990s.

The two energy price shocks of the 1970s could also have pushed up the wage curve, raising labor's share of value added at given levels of employment in nations where domestic workers' real private wealth and real entitlements did not fall in proportion to the drop in their marginal productivity, either because these workers owned shares in energy firms or because the government owned or taxed energy.

In the latest stage of the consensus, it has become accepted that some portion of the rise of unemployment in continental Europe in the 1970s was the result of the sharp slowdown of productivity growth from the extraordinary heights of the economic miracle to the sluggish rates that have prevailed since 1974. After that fateful year, accumulated wealth, which had been barely able (in some countries, unable) to keep pace with productivity, began to rise to a new level relative to productivity. And that gradual accumulation of wealth relative to the wage rates that employers could afford put mounting upward pressure on the wage curve, and thus drove up the natural rate. Furthermore, the prospect of slower growth in employee productivity lowers the "marginal efficiency" of hiring, thus reducing demand for labor

The "labor supply" shifts—that is, computed shifts of the wage curve—that Blanchard calculates occurred in the 1970s (see table 3 and figure 5) appear to corroborate the tenets of the consensus described above. In most cases, the computed adverse shift of the wage curve was quite large. Where it was small—the United States, Canada, Ireland, and Italy—the productivity slowdown was slight and the welfare state was relatively narrow, focused on old people and young mothers. The finding that much of the shift was later given back may be due to a decumulation of wealth, following the decline of after-tax wages brought by tax increases, and, in some countries, to the eventual scaling back of entitlements.

The consensus on unemployment adds two shocks to labor demand in the 1980s. Without these shocks, as Blanchard notes, the theory would imply a full, or at least substantial, recovery after the 1970s. One shock, the huge rise in the early 1980s in the average expected long-term world real interest rate, which remains somewhat elevated to this day, immediately reduced labor demand through two channels. First, the higher cost of capital dampens the willingness of employers to invest in either new employees (so they hire fewer of them) or new customers (so they stop keeping their markup low, and thus the product wage that they are willing to pay is reduced). Consequently, labor's share is driven down as firms earn a better return on their existing employees and customers, and the natural rate is driven up. One can call this markup increase, such as Blanchard talks about, but I am talking about markup increases that are induced by the elevation of real interest rates. Second, there is obviously a physical capital channel from real interest rates to labor demand, which may operate only very gradually.

The other suspect shock is hard to get a handle on, although the paper makes some strides toward doing so. This shock is the new or intensified labor-saving bias in technical change that set in around the end of the 1970s. A slowdown of the marginal productivity of labor coupled with a speed-up of the marginal productivity of capital (relative to the old bias of technical progress) that leaves growth in total factor productivity unchanged will slow labor demand at any given capital stock, but at first the wage curve will not slow in tandem. Thus the natural rate will be gradually pushed up.

In Blanchard's computations, the labor demand shifts from 1981 are indeed adverse in almost all of the OECD countries studied, and they are fairly large. (Interestingly, for reasons that I do not understand, there tend to be some positive labor demand shifts in the 1970s; so, the net change is even larger.) I am very pleased to see that the consensus view, into which I have put a lot of effort, comes out quite well here. Nevertheless, in places Blanchard seems to want to cast doubt on some of these ideas.

In regard to the real interest rate hypothesis, in figure 9 Blanchard uses a time series for France that depicts the real rate as having by 1986 returned all the way to its low levels of the late 1970s. If those data were correct, the rise of real rates would be short-lived and one could hardly ascribe any durable part of the rise of unemployment from 1980 onward to real interest rates. I think this peculiar series ("bonds, method 1") is the result of Blanchard weighing distant inflation rates, including the very high rates around 1980–82, as heavily as more recent ones when calculating the real interest rate from the nominal interest rate. (Lest there should be any doubt about the apparent importance of the real rate, if one juxtaposes the graph of the evolution of the unemployment rate in the United Kingdom and that of the world real interest rate from the 1960s to recent times, it is difficult not to be impressed by the fit.)

At another level, Blanchard pays close attention to the phenomenon of adjustment costs smoothing out expansions and contractions in firms' workforces. He leaves the impression that this mechanism is capable of providing a new basis for the wage curve. The idea seems to be that whenever new workers are hired, managers and their employees have to learn how best to divide their labor and the bits and pieces of capital among the workers. So, there is some marginal adjustment cost when new workers are hired and, very plausibly, the marginal adjustment cost per new hire is greater the faster the rate of hiring. There is also a marginal adjustment cost of downsizing, which also makes sense, as the employees that survive the cuts have to learn how best to use the bits and pieces released by the employees who have been let go. But this story does not generate incentive wages above the market-clearing level, nor, as a corollary, involuntary unemployment. (For example, in this model no expensive learning or training is involved in replacing a worker who has quit; the replacement worker will immediately be up and running, slotted in at no cost among the bits and pieces already optimally set up. So, the employer does not need to pay incentive wages to dampen quitting.) Thus the wage curve is left unfounded. In fact, even the terms "wage curve" and "incentive wage" are missing.

My comments so far have been quibbles. But there are more serious problems in the paper: its results, and thus the thrust of its message, are seriously misleading in certain respects. One of the problems stems from the entirely aggregate analysis of unemployment. The paper reports that in the Anglo-Saxon countries, the unemployment rate by 1996 had returned to its level in the early 1970s, or fairly close to that. It would seem that there has been full or substantial recovery from the "great slump" of the 1980s. (And in those countries, capital's share in the business sector is reported to have subsided in the 1990s to the levels of the early 1970s.) But one knows that within categories of educational attainment—high school dropouts, high school graduates only, some college, and college graduates—unemployment rates generally have risen, except in the top group. In the United States, for example, the unemployment rate for adult men in the bottom group rose from about 5 percent in the early 1970s to the neighborhood of 11 percent in 1996. How can it be that the average unemployment rate recovered while almost all within-group rates increased? Part of the answer, my research suggests, is that the low paid—especially men—have been leaving the labor force in huge numbers. Another part of the answer is substantial movement up the educational ladder. Fewer and fewer workers have left education before receiving a high school diploma, and fewer and fewer spent no time in college.

In principle, one way to allow for this phenomenon in the analysis would be to work with a fixed-weight index of unemployment rates constructed from within-group wage rates (and likewise, a fixed-weight index of wage rates). For both the United States and the United Kingdom, such an unemployment index will show a far larger rise over the past twenty-five years than does the measured average unemployment rate: an additional increase of about 2 percentage points in the United States and about 1.5 percentage points in the United Kingdom, according to research with Gylfi Zoega.[1] And the index of within-group hourly compensation will show a far smaller rise in the United Kingdom and a far greater fall in the United States than does average hourly compensation. But to write a paper parallel to this using these indexes would require an index of within-group output per manhour, and such data do not exist.

Another way of proceeding would be to look at the evolution of unemployment and wage rates in a particular educational group. But likewise, one could not expect Blanchard to determine whether the unemployment of dropouts, for example, has soared because they have priced themselves out of the market or because they have suffered from reduced demand as a result of higher markups or increased labor-saving bias in technological change, since there do not exist the output and capital series for high school dropout workers that his type of calculation would require.

There is one final problem with the paper. The recovery and subsequent swelling of capital's share in the 1980s among the Continental countries are presented in the paper as strong evidence for the thesis that markup increases—perhaps prompted by the elevation of world real interest rates, or a shift toward more labor-saving technology, or some combination of both—are major forces behind the rise of the natural rate of unemployment in Europe since 1980. But the failure of capital's share to show a cumulative rise in the Anglo-Saxon countries encourages the inference that if the rise in world real interest rates did not push up capital's share in the United States and the United King-

1. Phelps and Zoega (1996).

dom, it did not push up the unemployment rate in those countries—or in continental Europe either. Similarly, if global technological change did not develop a new labor-saving bias that changed capital's share in the United States and the United Kingdom, then it did not push up unemployment there—or in continental Europe. Since I believe that the world real interest rate is a very consequential factor in the United States, and I also incline toward the view that a new or increased bias in technological change is also a factor throughout the West, I need now to deal with these bothersome facts.

First, a rise in capital's share is no smoking gun and it would not necessarily be visible—or visible forever—after an increase in the world real interest rate. In Blanchard's model, for example, where profits are a return only on physical capital, a permanent rise in capital share would result from the rise of the real rate of interest only if the substitution elasticity was less than one. And it could very well be that most Continental countries have a much lower elasticity of substitution than does the United States. The paper's estimates of the substitution elasticity are all over the place, ranging from 3.45 in the Netherlands to 0.48 in Italy. Furthermore, it is clear that after world real interest rates rose in 1981, the profit share stopped falling and strongly reversed direction, even if it did not ultimately post a very large net cumulative rise since 1970.

Second, capital's share is not driven by one factor alone. It is subject to many influences, certainly to those of the real exchange rate as well as the world real interest rate. Currencies were weak in Europe relative to the dollar in the 1980s and they are somewhat weak again in the late 1990s. A strong dollar operates to reduce the markups set by U.S. firms that produce tradables. So, the fact that capital's share is not booming in the United States as it is in continental Europe is not cause to reject the hypothesis that the elevation of real interest rates has contributed to the unemployment problem.

Third, I suspect that the huge shift in the educational composition of the labor force plays a role here too. Suppose that the thinning out of workers on the lower rungs of the educational ladder has a beneficial effect on quit rates, absenteeism, shirking, and so forth. Such an effect, in turn, must operate to narrow the margins between price and unit cost that are needed to cover turnover training outlays in replacing workers who quit and the costs of monitoring and supervising workers who are otherwise likely to lie down on the job or worse. Thus on this account, the educational broadening in the American and British labor forces, taken alone, must have raised labor's share and lowered the natural rate. This development was not so strong in the Continental countries; in Italy, for example, the differentials in unemployment rates between educational groups are not so pronounced, or even go the wrong way. It may also be true that desk jobs do not need as much physical capital per worker as do production line jobs.

Fourth, the greater number of American workers with some educational credentials certainly increases the wage bill in the economy, since the employer will pay these an educated worker's wage on the prospect of recovering the cost when their wider knowledge and greater versatility are needed. But the eventual payoff from their greater "promise," which justifies the wage premium, may be a long time in coming. Although wages go up, productivity may increase only much later, after the introduction of a new technology, a reorganization of the workforce, or entry into a new market—that is, when the workers' knowledge and versatility are really needed. On this account, then, labor's share may grow for some time, as the fraction of the labor force that is paid on its promise keeps rising. The fact that capital's share does not rise in the United States and the United Kingdom therefore is not evidence that the influence of world real interest rates on capitals share is absent or weak.

To conclude, I do find this paper quite stimulating. In the end, though, it leaves me wiser but in the same place.

General discussion: Robert Gordon was doubtful of Phelps's view that the reduction of the U.S. unemployment rate in recent years largely reflects a change in the relative importance of educational groups, and that the aggregate rate masks a substantial increase in unemployment, controlling for education. He asserted that it would require an implausibly large compositional change to explain the fall in the unemployment rate, and argued that if Phelps were correct, productivity should have risen by a corresponding amount, which it has not. Gordon recalled a Brookings conference organized by Charles Schultze a decade ago that identified the minimum wage, unemployment insurance, and other institutional rigidities as culprits of Europe's high levels of unemployment, and he saw these factors explaining the difference between the Continental and the Anglo-Saxon experiences. Both sets of countries have been exposed to globalization and shifts of technology, but the labor market structure of the Continental countries has delivered lower inequality and higher unemployment. He also suggested that labor market differences help to explain why there are more low-wage workers in the United States, and hence why service sector productivity in the United States is relatively low. With a plentiful supply of low-cost workers, firms have little incentive to substitute capital for labor. Gordon cited anecdotal evidence from Europe—the absence of grocery baggers in stores, busboys in restaurants, and attendants in parking lots—that accords with this explanation. Nordhaus observed that the huge difference between continental Europe and the United States in rent-seeking institutions in the labor market is another important reason for differences in labor market reaction to shocks.

N. Gregory Mankiw believed that the paper should have paid more attention to the possible role of skill-biased technical change in explaining labor market performance. Although such change may have been common across countries and may have caused a decline in the demand for unskilled workers in all of them, the effect on employment and wages should reflect the structural differences emphasized by Gordon. In the United States, unskilled wages have gone down, whereas the welfare states of Europe have provided a higher floor to unskilled wages. As a result, European countries experience great unemployment and the United States experiences increased inequality. Mankiw noted that this explanation relies on only a single shift and one institutional difference, instead of the multiple shifts discussed in Blanchard's paper.

Robert Hall observed that the different experiences of Europe and the United States highlight the importance of different theoretical models. Search models, which explain how workers who have lost jobs become reemployed, are essential for understanding the U.S. economy, whereas models explaining the determination of the efficiency wage are essential for understanding the Continental experience.

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