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## **Marriage Strategy Among European Nobility**

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# Marriage Strategy Among European Nobility\*

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## Abstract

We use a unique dataset to analyze marriage and union patterns of European nobility from the 1500s to the 1800s. Our matching model predicts homophily in title, and that more stringent constraints on the dowries lead to a higher degree of homophily. Historical evidence supports both predictions: nobles tended to marry nobles with identical title; and, German marriages, whose dowry rules were more rigid, were characterized by a higher degree of homophily in titles than English marriages. Moreover, homophily in titles decreased over time for Germans, and remained constant for English nobles.

KEYWORDS: marriage, nobility, class, elite, history, assortative matching.

JEL CODE: C78, J12, J16, N34, Z1.

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## 1. INTRODUCTION

European nobilities provide an example of an elite that maintained its supremacy for several centuries. To ensure that political power and wealth remained in a few hands from one generation to another, nobles followed a number of laws and informal rules. Specifically, they were not to marry outside the nobility (endogamy) and only the eldest son was to inherit his parents' estate and title (primogeniture).<sup>1</sup>

Through marriage, there was intense competition within the nobility to maintain and increase the prestige of the lineage. The reasons are that there was only a handful of young mates on the market at a given time; participants shared the same simple preferences over potential partners, that is, the more prestigious, the better; and, prestige was measured by a simple and observable characteristic, that is, the groom's or bride's family title. The payment of the dowry (from the bride's to the groom's family) further fostered the competition for the best partners. Interestingly, the rules that governed the amount of a "proper" dowry differed from one country to another. While English nobles faced virtually no limitation, the level of dowries were fixed by custom with regards to the bride's family title in Germany.<sup>2</sup>

We use this country variation to identify the impact that the dowry system has on marriage outcomes. The literature offers two main matching models to answer the question: one where utility is not transferable (Gale and Shapley, 1962), and another where utility is fully transferable (Becker, 1973, 1991; Shapley and Shubik, 1971). In the former case, assortative mating arises when all participants have the same ordered preferences, that is, when everyone agrees on whom is the most desirable partner, the second one, and so on. With transfers, assortative mating arises if there are sufficiently strong complementarities between partners.

We encompass these two approaches by proposing a theoretical model in which the degree of transferability is a parameter, also interpreted as an upper bound on the amount of dowries, and we study how it impacts matching in the marriage market. Our model provides conditions for the emergence of positive assortative matching in an intermediate

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<sup>1</sup>Primogeniture has long been denounced as one the main obstacle for the dissemination of wealth. Notably, eminent thinkers like Smith, Tocqueville, Engels or Marx advocated against the law of primogeniture.

<sup>2</sup>Throughout the paper, we will improperly and knowingly use "Germany" to refer to the Holy Roman Empire.

case where utility is only imperfectly transferable across spouses, and assortative mating obtains if the most desirable participants can transfer relatively more utility than the less desirable ones.<sup>3</sup> We show that more stringent constraints on the amounts of dowries (or, equivalently, a lower degree of transferability) lead to (i) homophily in title in England and Germany, and to (ii) a higher degree of homophily in title in Germany than in England. That is, German nobles are expected to marry nobles with the same title in a higher percentage than English nobles.

To explore the predictions of the model, we exploit a unique database of European nobility which allows us to compare marriage patterns in the English and German nobilities in the Early modern period, from the 16th to the 19th century. The dataset has been constructed from the website of Herbert Stoyan, whose information was not in a format directly usable for our empirical analysis. Herbert Stoyan’s website provides records in a “family tree” format: each webpage corresponds to an individual, who is a node connected through hyperlinks to her parents and children. The website provides demographic information, such as name, person identifier, date of birth and death (in a limited number of cases), person identifiers of father and mother, person identifier of partner(s), and descendants for each of the corresponding partner. In our final dataset, *all* persons of higher European nobility are stored and can be linked to their partners and successors.<sup>4</sup> The availability of the entire sample of nobles is crucial for our empirical analysis because it enables us to neglect selection bias issues in the estimation of the homogamy degree.

We apply methods for contingency tables in order to estimate the odds of homogamy in the two marriage markets. First, we provide evidence of the positive assortative matching for the two samples computing the ratio of actual to expected marriages between nobles sharing the same title. Second, we use a log-linear model to measure the trend in the odds of homogamy. In general, the log-linear model for contingency tables is appropriate because it provides estimates of the changing association between couples’ nobility titles while controlling for shifts in their marginal distributions over time.

We find that both marriage markets present a high degree of homophily: in the 1500s English nobles were about 2.7 times as likely to marry someone who shared their

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<sup>3</sup>See [Legros and Newman \(2007\)](#) for a model that provides sufficient conditions for monotone matching in environments where utility is only partially transferable between partners. An empirical framework is provided by [Galichon et al. \(2016\)](#).

<sup>4</sup>The construction of our final dataset is detailed in Section 4.

same title as they were to marry someone who did not. The same odds were about 5 for German nobles. By the 1800s, the odds decreased remarkably in Germany where it became approximately 3. In England, the odds remained quite stable, slightly decreasing in the 1700s and approaching 2.5 in the 1800s. Results also show that odds of crossing title barrier are fairly constant over time in German marriages. Moreover, German data exhibit lower odds of intermarriage than English and hence provide evidence of a more stratified society.

RELATED LITERATURE. Our paper is linked to various strands of literature. We add to existing works on the nobility marriage market. Two recent working papers by [Goni \(2015\)](#) and [Gobbi and Goni \(2017\)](#) investigate assortative matching, fertility, and wealth inequality among nobles in Britain. In particular, [Goni \(2015\)](#), uses the interruption of the London Season occurred in 1861–63 to measure search costs and segregation in the marriage market. [Gobbi and Goni \(2017\)](#) establish the relationship between marriage settlements (as described in [Habakkuk, 1950](#)) and childless rate among peers. [Hamilton and Siow \(2007\)](#) show that endogamous marriages were still prevalent among the descendants of the European nobles who emigrated to Quebec in the 1800s. In contrast with these articles, we make a comparative analysis of German and English marriage markets.

Our paper provides a review of the characteristics of nobility marriages.<sup>5</sup> Building on existing works by historians, we document that, although they shared a number of similarities, English and German nobilities had different rules to guarantee the survival of their elites. We rely on works by [Schutte \(2014\)](#), who shows that marriage patterns of women in the English nobility (in terms of endogamy, rate of marriage, fertility, age of marriage, etc.) were stable from the 1500s to the late 2000s. [Stone \(1961\)](#) studies the institutions governing marriages of political leading English families on the 16th and 17th centuries. [Stone \(1977\)](#) enlarges his previous work to a broader period. [Thomas \(1972\)](#) extends the analysis of marriages in the British nobility to the 19th century. [Hurwich \(1998\)](#) and [Hurwich \(2006\)](#) study marriage strategies and dowry payments in Germany from the 15th to 17th centuries.

There is a blooming and fast-growing literature on the empirical analysis of matching markets.<sup>6</sup> One main issue encountered by econometricians is that agents' preferences

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<sup>5</sup>For a general perspective on the European nobility, see [Dewald \(1996\)](#).

<sup>6</sup>See [Chiappori and Salanié \(2016\)](#), and the many references therein.

cannot be directly identified from the observed matching: man  $A$  may prefer woman  $B$  over woman  $C$  but still gets married to  $C$  because he has been rejected by  $B$ . To circumvent this difficulty, several approaches have been taken in the literature: [Choo and Siow \(2006\)](#) use a structural model of the matching market with transferable utility and impose restrictions on unobserved heterogeneity; [Hitsch and Ariely \(2010\)](#) observe the profiles and the communication of users of an online dating and directly identify preferences; and, [Chiappori et al. \(2012\)](#) assume that multi-dimensional preferences can be summarized by a one-dimensional index.<sup>7</sup>

We take a different approach and show that the characteristics of the nobles' marriage market enable us to bypass most of these concerns: nobles had simple ordered preferences, and there were little to no search frictions. In a sense, we exploit the difference between the institutions that governed marriages in England and Germany as a natural experiment to analyze the impact of the degree of transferability on matching. Close in spirit to our paper is the work by [Abramitzky et al. \(2011\)](#) which uses World War I as a natural experiment to study the impact of a shortage of men on matching and fertility.

Our paper also contributes to the literature on elites as we describe a set of rules and institutions that have successfully helped a small elite to stay in power for centuries. On this topic, [Bergstrom \(1994\)](#) studies the interaction between social stratification, marriage, and fertility decision. [Acemoglu and Robinson \(2008\)](#) explores the interplay between social stratification and the design of political and economic institutions. [Bertocchi \(2006\)](#) analyzes the link between social stratification, inheritance systems, and technological progress.

Elites, and more specifically reproduction of elites, are an important field of study in sociology. [Bourdieu and Passeron \(1990\)](#) show that elites (the "upper class") maintain their domination through both economic and cultural capital. In his classical study of the European civilization, [Elias \(1969\)](#) describes how the aristocracy developed a set of social attitudes and manners to distinguish themselves from the rest of the society.

ORGANIZATION OF THE PAPER. Section 2 describes the historical context. Section 3 provides a simple theoretical model. Section 4 describes the data. Section 5 contains the empirical analysis. Section 6 concludes the paper.

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<sup>7</sup>Sorting on one dimension has been investigated by a large number of authors: [Weiss and Willis \(1997\)](#), [Qian \(1998\)](#), [Pencavel \(1998\)](#), [Silventoinen et al. \(2003\)](#), among others.

## 2. MARRIAGES IN THE ENGLISH AND GERMAN NOBILITIES

In the European nobility, marriage and inheritance were intimately linked: the main goal of marriage was to ensure the production of an heir and the continuity of the lineage. Accordingly, marriage strategies should be understood in view of the rules and institutions governing both marriage and inheritance.

**TITLE AND INHERITANCE.** In the early Medieval Ages, the custom among European aristocracies was that sons were to inherit equally and no privilege was enjoyed by the elder. However, this resulted soon in the fragmentation of families' wealth and estate. In order to maintain social stability and to keep the wealth, power and social standing in the hands of as few people as possible, primogeniture was progressively established by law. The law of primogeniture stipulated that only the eldest son should inherit the title and the family's possessions. Accordingly it guaranteed the continuity of the family name, title, and estate if there was a male heir.

The establishment of primogeniture followed different paths in England and Germany. In England, the origin of primogeniture can be traced back to the reign of William I in the 8th century who imposed it to his vassals. It was then enacted in 1115 by King Henry I, and remained mandatory until 1925.<sup>8,9</sup> The eldest son was considered as a nobleman and the sole heir to the paternal estates, while younger sons and their descendants were excluded from inheritance right. To further strengthen primogeniture, special arrangements (known as "strict settlements") were signed at the marriage of the eldest son. Three generations were involved in such settlements: the groom, his father (and current holder of the title), and his future first grandson. They established that family estate remained in the hands of the eldest son by limiting the heir's interest into that of life tenant and entailing it to his first descendant ([Habakkuk, 1950](#)).

Primogeniture was established *de jure* or *de facto* in Germany only in later years.<sup>10</sup> The German nobility borrowed from Saxon law (*Sachsenspiegel*) an inheritance system that granted equal shares to sons. This custom could quickly result in the fragmentation of the family's wealth and estate in a few generations.<sup>11</sup> German nobles however found

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<sup>8</sup>"The ancestral fee of the father is to go to the first-born son", *Leges Henrici Primi*, 1115.

<sup>9</sup>See [Stanhope \(1878\)](#) and [Rockley \(1895, Chap.2\)](#) for further details.

<sup>10</sup>See [Rockley \(1895, Chap. 5\)](#) and [Hurwich \(2006, Chap. 2\)](#).

<sup>11</sup>For instance, Saxony was split up into Saxe-Weimar, Saxe-Eisenach, Saxe-Gotha, Saxe-Meiningen, Saxe-Coburg, Saxe-Eomhild, Saxe-Eisenberg, Saxe-Saalfeld, Saxe-Hildburghausen.

ways to circumvent Saxon Law (Hurwich, 1993). For instance, younger sons were often discouraged to marry, or were given the permission to marry only if they found an heiress. German noble families also had the unique capacity to enact “house” laws that superseded German and Roman laws.<sup>12</sup> A number of noble families made use of this possibility to establish primogeniture. Accordingly, it progressively became the norm in the 16th century. Finally, in order to further consolidate primogeniture, German legalists borrowed the *fideicommissum* from the Roman law, an institution similar to the English strict settlement.

ENDOGENY AND RANK OF SPOUSES. To preserve the purity of the group and avoid dissemination of wealth, a set of rules limited marriages outside the nobility. This resulted in a high degree of endogamy in the marriage decision. Quoting the German historian Karl-Heinz Spiess, Hurwich (2006) underlines that the duty of a noble family was to “maintain and elevate the lineage” and, accordingly, “the social criteria for the choice of marriage candidates aimed at partners who were as equal as possible in rank or even of higher rank”. Similarly for England, Stone (1977) noted that “the greatest fear in a society so acutely conscious of status and hierarchy was of social derogation in marriage, of alliance with a family of lower estate or degree than one’s own”.

Based on Hollingsworth (1957), Thomas (1972) and his own calculations, Cannon (1987) found that, in England, from 1650 to 1759, the rate of endogamous marriages varied from 61.8 to 69.9 percent. Hollingsworth (1957) showed that marriages of eldest sons were characterized by a higher degree of endogamy than marriages of younger brothers. Moreover, Schutte (2014) showed that marriage patterns were remarkably stable in England from the 16th to 20th century, despite considerable change in the organization of society. The proportion of women who married within the aristocracy remained in the range of 50 to 60 percent until the 19th century, and started only then to fall down. She also noted that the higher a woman was in the hierarchy, the more likely she was to marry endogamously.

When social control was not enough to enforce endogamy, legal barriers were imposed to discourage unequal marriages. In Germany, a marriage between spouses of different social origins was considered *unequal* and carried the legal disability of inequality of birth. An unequal marriage could be valid under canon and civil law but the rules governing

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<sup>12</sup>See [www.heraldica.org/topics/royalty/g\\_change.htm](http://www.heraldica.org/topics/royalty/g_change.htm).



inheritance were a private matter: each family could decide whether to limit or nullify the rights of inheritance of the lower-ranking spouse and her children. The rules were different among families: the children of non-noble women could never inherit; in addition, in some families of the upper nobility, even women from the lower nobility were excluded from inheritance.<sup>13</sup> There was no such explicit law in England. Yet the Hardwicke’s Marriage Act of 1753 strengthened parental control over spouse choice and its objective was very clear: “[...] we should contribute to a poor lord’s being always sure of matching himself with some rich heiress, and thereby restoring the lustre and the independency of his family” (Harth, 1988).

THE QUEST FOR PRESTIGIOUS MARRIAGES. If nobles clearly avoided marrying outside the aristocracy, they also spent considerable effort finding “prestigious” spouses for their offsprings. There was indeed a clear hierarchy between nobles *within* the aristocracy. In England and Germany, titles made this hierarchy explicit, as shown in Table 1.<sup>14</sup> For instance, the title “Duke” was more prestigious than “Earl”, which itself was more prestigious than “Baron”.<sup>15</sup> Since title was hereditary, the only way to improve the family’s lineage was for a noble to marry *upward*, that is with someone from a more prestigious family.

Table 1 – Titles Ranked by Prestige

Rank	English Titles	German Titles
1	King, Prince, Emperor	König, Kaiser, Prinz, Kronprinz
2	-	Erzherzog, Grossherzog, Fürst, Kurfürst
3	Duke	Markgraf, Herzog, Pfalzgraf
4	Marquess, Earl	Landgraf, Graf, Gräfin
5	Viscount, Baron	Freiherr, Altgraf, Burggraf
6	Lord, Knight, Sir	Edler, Edler Herr, Ritter, Herr
7	no title	no title

Historians emphasize that prestige outweighed any other criterion in spouse’s choice, including financial motives. Schutte (2014) stressed that in England, though “money was an important factor in the marital decisions of aristocratic women, rank was consistently

<sup>13</sup>See [www.heraldica.org/topics/royalty/g\\_morganat.htm](http://www.heraldica.org/topics/royalty/g_morganat.htm)

<sup>14</sup>This was not necessarily the case in other European countries. In France, for instance, quarters of nobility were of prime importance.

<sup>15</sup>This ranking between titles does not imply that a noble of lower rank should obey a noble of higher rank. Difference in titles reflects almost only difference in terms of prestige or precedence.

of greater import". Similarly, [Hurwich \(2006\)](#) explained that "the emphasis on status rather than wealth was true of the German nobility in general".

Finally, mutual attraction, or even love, was not disregarded but simply considered largely irrelevant: marriage was primarily about "companionship". Furthermore, it is only in the early 20th century that parents stopped supervising their children spouse's choice.

**DOWRY.** An important component of marriage was the payment from the bride's family to the groom's family. The rules and traditions governing the size of dowries used to vary from one country to the other. In general, the bride's dowry was paid in cash and also included a *trousseau* in clothing, jewellery, etc. In exchange, the father of the groom had to provide support to the bride in case of widowhood.

In the German system, dowries were fixed by custom within very narrow limits ([Hurwich, 2006](#), Chap. 2). The idea was that the payment of dowries should not burdened the family's wealth at the expense of the future male heirs. The range of acceptable dowries was fixed by house regulations and depended on the bride's social rank. For instance, dowries of baron's daughters ranged from 3000 to 5000 gold coins, but from 6000 to 10000 gold coins for daughters of higher nobility ([Hurwich, 2006](#), p. 45). Nobles from the lower nobility were *de facto* forbidden to marry their daughters upward since they could not align on the dowry paid by nobles of higher rank. As noticed by [Hurwich \(2006\)](#), this practice remained remarkably stable and "helped to maintain strong barriers against intermarriage between different social orders".

In England, the size of dowries suffered of no such limitations: dowries were very sensitive to the "law of supply and demand". Indirect evidence of this fact can be found in [Stone \(1961, 1965, 1977\)](#) and [Habakkuk \(1950\)](#). [Stone \(1961\)](#) states that "between the second quarter of the 16th and the third quarter of the 17th century, portions given with daughters of the aristocracy increased approximately ten times," keeping pace with the general rise of agricultural prices in the 16th century. For the 17th and 18th centuries, [Freed \(1995\)](#) justifies the increase in dowries by a shortage of eligible husbands among the English aristocracy. Moreover, the bride's rank had an impact on the amount of dowry: "a duke's daughter was a good catch for any family while a baron's daughter would need a substantial dowry to make her appealing to a marquess" ([Schutte, 2014](#)). [Stone \(1961\)](#) also explained that "the physical and mental defects of a girl" had to be

monetary compensated for. At some point in time, it was even possible to buy from the King an “option” on a noble’s son (*wardship*).

### 3. THEORETICAL MODEL

The historical background suggests that one of the main difference between the English and German marriage markets was that dowries were more constrained in Germany than in England. To use the terminology of the matching literature (Roth and Sotomayor, 1992), utility was “more transferable” in England than in Germany. In what follows, we build a simple theoretical model to understand how the level of transferability impacts the matching in a marriage market where participants have the same preferences.

We are not aware of any paper that builds such a theory. However, much is known in the two extreme cases where utility is not transferable (NTU) or fully transferable (TU). In the NTU case, positive assortative matching (PAM) obtains when men and women have the same ordinal preferences, that is when everyone agrees on who is the most desirable partner, the second one, and so on. In the TU case, PAM obtains under a more stringent condition: the joint surplus has to be supermodular (Becker, 1973). When utility is imperfectly transferable, Legros and Newman (2007) show that PAM obtains when utility is more transferable between men and women who are higher in the preference ranking.

MODEL. There are two men and two women. Men and women only differ by their titles: one man and one woman have title  $h$ , and the other man and woman have title  $l$ . Title  $h$  is considered more prestigious so that everyone prefers *a priori* to marry someone with title  $h$ . A match between man  $i$  and woman  $j$ ,  $(i, j) \in \{l, h\}^2$ , creates positive surplus  $u_{ij}$  to the man and  $v_{ij}$  to the woman. In addition, bride  $j$  must pay a non-negative dowry to groom  $i$ . Agents are risk neutral and have quasi-linear preferences. They only care about the sum or the difference between the match surplus and the dowry. An unmatched agent gets a payoff of 0, regardless of his or her type. We assume further that:

- (i) men and women have homogenous preferences:  $u_{ih} > u_{il} > 0$  and  $v_{hi} > v_{li} > 0$ , for all  $i \in \{l, h\}$ ;
- (ii) there exists  $\lambda \in [0, 1]$  such that, if woman  $j$  is married to man  $i$ , the dowry  $d$  must be such that  $0 \leq d \leq \lambda v_{ij}$ . We call  $\lambda$  the *degree of transferability*.

When  $\lambda = 0$ , utility is non-transferable; when  $\lambda = 1$ , utility is transferable and man  $i$  married with woman  $j$  must receive at least  $u_{ij}$ . We follow the literature in assuming that a matching is pairwise-stable in equilibrium.

RESULTS. If  $\lambda = 0$ , the only possible match is PAM: man  $h$  prefers to marry woman  $h$  and woman  $l$  cannot compensate this with a dowry. Proposition 1 below shows that the same logic applies for the case in which  $\lambda$  is small enough.

PROPOSITION 1. *There exists  $\hat{\lambda} \in (0, 1)$  such that, for all  $\lambda < \hat{\lambda}$ , PAM is the unique equilibrium outcome.*

*Proof.* See Appendix B.1. □

It remains to understand what happens for higher values of the degree of transferability. Note first that PAM does not necessarily obtains when  $\lambda = 1$ : the joint surplus must be supermodular. However, when PAM is an equilibrium for a high degree of transferability, it is also an equilibrium for lower degrees of transferability:

PROPOSITION 2. *Let  $\lambda \in (0, 1)$ . Suppose there is an equilibrium in which PAM obtains when the degree of transferability is  $\lambda$ . Then, for all  $\lambda' \leq \lambda$ , there exists an equilibrium in which PAM obtains when the degree of transferability is  $\lambda'$ .*

*Proof.* See Appendix B.2. □

The proof of Proposition 2 is not very informative. It is however intuitive. For high values of  $\lambda$ , PAM is an equilibrium only if there is sufficiently large complementarities between types: the logic of the TU case is at stake. Then, there are two cases to consider for lower values of  $\lambda$ : either  $\lambda$  is small enough so that Proposition 1 applies; or,  $\lambda$  is high but complementarities are strong enough to compensate for less stringent constraints on dowries.

PREDICTIONS OF THE THEORETICAL MODEL. Propositions 1 and 2 together suggest that one is more likely to observe assortative mating in environments where the degree of transferability is small. In the context of marriage between nobles, theory therefore delivers:

- PREDICTION 1: homophily in title in England and in Germany;
- PREDICTION 2: a higher level of homophily in title in Germany than in England.

In the following sections, we describe the data, and we compare the predictions of the model to the observed marriage matching in England and in Germany.

#### 4. DATA

The data have been constructed from the website of Herbert Stoyan.<sup>16</sup> The information is recorded in family trees, and it is in a format that cannot be directly used for our empirical analysis. Substantial work has been done to collect the data and render them compatible with standard statistical softwares. Each webpage of Stoyan’s website corresponds to an individual, who is a node connected through hyperlinks to her parents and children. The set of variables includes name, person identifier, date of birth and death (in a limited number of cases), person identifiers of father and mother, person identifier of partner(s), and descendants for each of the corresponding partner. The original dataset contains information for about 700,000 individuals in Europe over nine centuries.

The construction of the final dataset, used for our empirical analysis, required several steps. We started from a dataset where the information on each individual includes her name, birth/death date and relatives’ identifiers. The name of an individual is a chain of characters that may provide, in no particular order, the first and last name, the title(s), etc. From this string, we deduced the gender, the country of origin, and the nobility title. For example, for “Hermann VII. Markgraf v.Baden”, we know that *Hermann* is a male German first name; *Markgraf* is a male German title; *v.* stands for the German preposition *von*; and *Baden* is a German city. However the identification is not always as simple. For instance, an individual may have multiple first names with different countries of origin. To solve these issues, we developed a simple algorithm that allowed us to determine the most likely country of origin.

In summary, each individual has been identified by combining several sources of information: (i) a list of first names guided us to the identification of her country and gender;<sup>17</sup> (ii) a list of prepositions allowed us to pin down the country (e.g., *zu* as German indicator); (iii) the list of nobility titles led us to identify country and gender (e.g., *Duke* and *Duchess* are male and female English titles respectively). In case of ambiguity, we checked the information of the individual’s family members. For instance, if we found that the two parents came from England, we deduced that their children were also

<sup>16</sup>The source of the data is <http://ww-person.com/cgi-bin/wwp/LANG=engl/?1>.

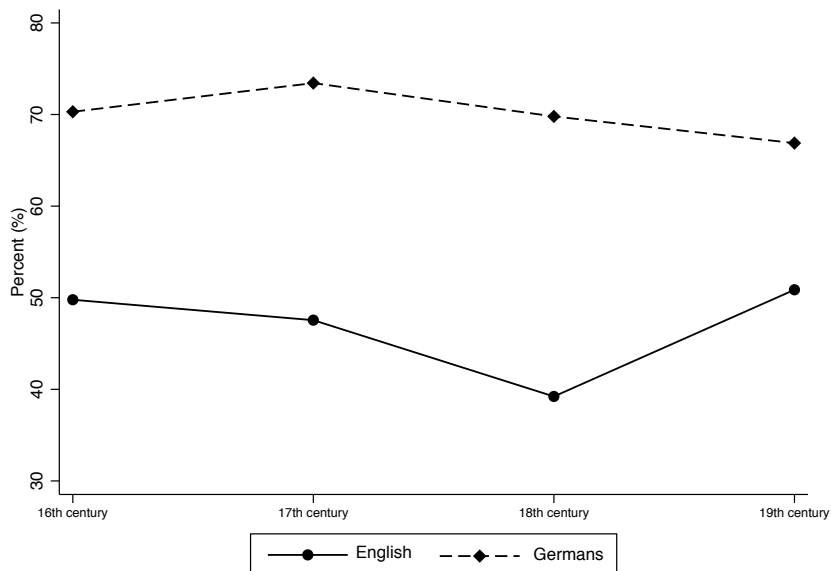
<sup>17</sup>The list is available at [www.lexique.org](http://www.lexique.org).

English. Other information has been employed, such as the list of the English peerage and a list of German territories.

When an individual had more than one title, we opted for the highest one, based on the title ranking. It should be noted that the vast majority of individuals had not title, because only few members of a noble family inherited one.<sup>18</sup> Moreover, in most cases daughters did not officially hold a title. As we are interested in the assortativeness of marriages in titles, we identified a woman's title with that of her father.

We have information on birth years. British nobles were born from 1053 to 1961, with 80 percent of the individuals born after 1600. German nobles were born from 1028 to 1974, with 90 percent of them born after 1600. We restricted the analysis to individuals born from 1500 to 1900 because only few individuals were born before 1500. Lastly, we excluded from our sample nobles from the top tier of the nobility (categories 1 and 2 in Table 1). By focusing on marriages between nobles of lower ranks, we would like to exclude marriages driven mainly by political considerations.

Figure 1 – Percent Homogamous Marriages



DESCRIPTIVE STATISTICS. Tables 3 and 4 in Appendix C show the distribution of husband's and (father's) wife's titles from 1500 to the end of the 1800s. We can see that English nobles without title tended to marry together in an increasing number. The same

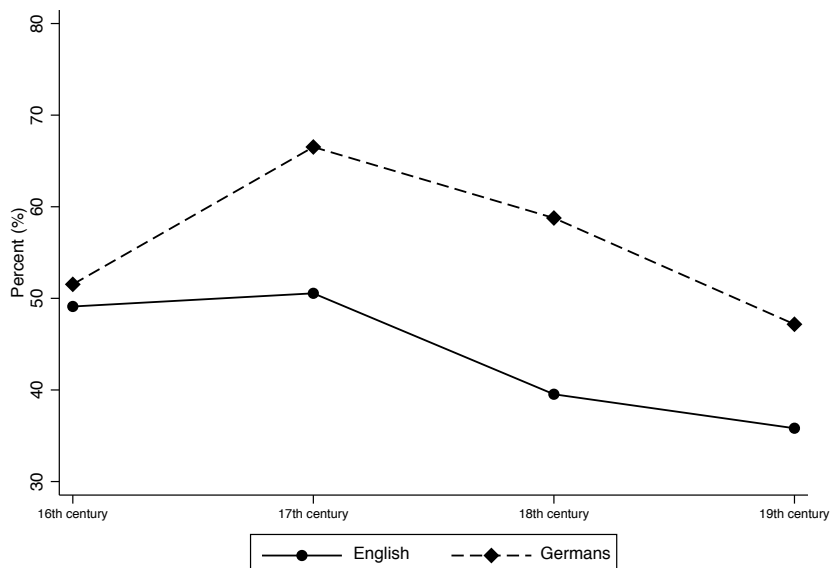
<sup>18</sup>See the discussion in Section 2.

is not true for Germans, where the percentage of marriages between nobles without title went from about 50 percent in the 1500s to roughly 12 percent in the 1800s.

A simple measure of change in the resemblance between spouses is the change in the proportion of couples who share the same title (homogamous marriages). Figure 1 shows this trend. It appears to be constant for Germans, and decreasing for English until the 1700s. The last century shows a reversal in the trend, with a percentage of English homogamous marriages similar to that of the 1500s.

To further describe the trends, in Figure 2 we plot the percentage of couples in which the wife has a higher title than the husband (hypergamous couples), among those who do not share the same title (heterogamous couples). We can see that the tendency for men to marry down follows an “inverted U” pattern which peaked in the 1600s. Germans and English started out in the 1500s with about the same percentage of hypergamous marriages (roughly 50 percent), but it increased to almost 70 percent for Germans (as discussed in Hurwich, 1998) and only to 51 percent for English in the next century. In the 1700s, both Empires show a decrease in the percentage of hypergamous marriages: about 47 percent for Germans and only 36 percent for English.

Figure 2 – Percent Hypergamous Marriages Among Heterogamous Marriages

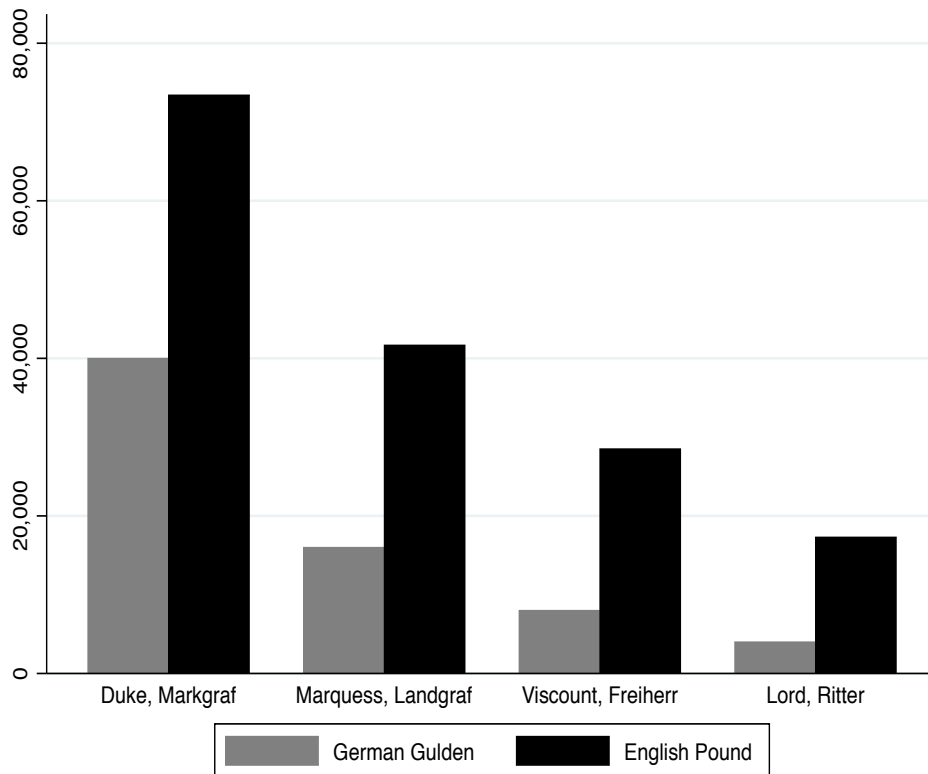


Two remarks are in order here. First, many changes occurred in the 19th century that could have affected marriage choices, in particular the expansion of the *bourgeoisie*

subsequent to the Industrial Revolution and the aftermath of the French Revolution. Second, these trends should be interpreted with caution, as they may be highly influenced by changes in the marginal distributions of husbands' and wives' titles. To determine whether this trend is altered once we control for shifts in the marginal distributions of husbands' and wives' titles, we use log-linear models in the next section.

**WEALTH.** Though dominated by prestige, wealth could play an important role in the marriage decision.<sup>19</sup> A drawback of our data is the lack of information on wealth, revenues, or land properties. To overcome it, we made use of other sources to recover the amount of lands approximately owned by German and English nobles from which we deduce rough amounts of nobles' wealth from the 16th to the 19th century. Data are summarized in Figure 3.

Figure 3 – Average annual income by title



Until the 19th century, most nobles relied on landownership as their principal economic resource. For English noble families of the 19th century, exhaustive information on the size of lands and on yearly income are available from [Bateman \(1883\)](#). For German noble

<sup>19</sup>See the discussion in Section 2



families, we inferred the average level of wealth in the 15th and 16th century from the amounts of dowries. Indeed, in Germany, dowries used to represent about half of the annual income from the father's estate. Dowries of German knights ranged from a few hundred gulden to about 1200 gulden, while members of the lower nobility usually gave around 2000 gulden; counts and barons gave dowries that ranged between 3000 and 5000 gulden; dowries between 6000 and 10,000 gulden were given by families of wealthy counts who aspired to a status equal to princes [Hurwich \(2006\)](#).

It seems plausible to say that wealth and titles were highly correlated. Moreover, this correlation is of similar magnitude in England and in Germany, that is 0.96 for the former and 0.93 for the latter. This consideration allows us to focus on the exclusive role of title to explain matching patterns.

## 5. EMPIRICAL ANALYSIS

### 5.1. Main Result

To assert the pattern of assortative mating, we apply methods for contingency table analysis, including log-linear models. In the first part of the empirical analysis, we construct a contingency table for both English and German couples (Table 2), to provide an overview of the marriage sorting pattern of the whole sample. In the second part of the empirical analysis, we describe changes over time in patterns of title sorting by using log-linear models. This model provides estimates of the changing association between couples' nobility title characteristics while controlling for shifts in their marginal distributions.

A contingency table is a matrix in which the groom's title is arrayed across rows  $i$ , and the wife's title is arrayed across columns  $j$ . Each cell in the contingency table has two entries. The first entry contains the fraction of husband-wife couples where the husband's title is at the  $i$ th level and the wife's title is at the  $j$ th level. The second number displays the fraction that would occur if matching was random and title played no role at all in partner choice. We assume that the expected frequencies are realizations of discrete uniform random variables. It is equal to  $(T_i T_j)/T$ , where  $T_i$  is the total for the  $i$ th row;  $T_j$  is the total for the  $j$ th column; and,  $T$  is the total number of observations. The cells on the main diagonal represent men marrying women with the same title as theirs. Next,

we take the sum along the diagonal for each of these two types of matches, actual and random. Finally, we compute the ratio of the actual to random matches which can be interpreted as a measure of title homogamy.

When the ratio of observed to expected cases is high, it means that partners with those characteristics are marrying each other in larger numbers than would be expected if their matching was random. In our case, the ratio is larger than one implying that there is positive assortative mating (Prediction 1). Moreover, the ratio is higher (Prediction 2) for Germans (i.e.  $1.84 = 70.21/38.12$ ) than for English (i.e.  $1.39 = 46.54/33.57$ ), and the Chi-Square test is such that the null hypothesis of no relationship between titles can be rejected.<sup>20</sup>

Table 2 – Marital Sorting by Title in England and Germany, 1500 - 1900

<i>Highest groom's title</i>	<i>Highest bride's father's title</i>									
ENGLISH	Duke		Marquess, Earl		Viscount, Baron		Lord, Knight, Sir		No title	
Duke	<b>2.15</b>	<b>0.83</b>	3.25	<i>3.41</i>	0.49	<i>0.39</i>	0.31	<i>0.35</i>	1.10	<i>2.30</i>
Marquess, Earl	5.64	<i>5.04</i>	<b>24.71</b>	<b>20.82</b>	2.64	<i>2.40</i>	2.51	<i>2.18</i>	8.95	<i>14.00</i>
Viscount, Baron	0.67	<i>0.78</i>	3.62	<i>3.24</i>	<b>0.61</b>	<b>0.37</b>	0.18	<i>0.34</i>	1.84	<i>2.18</i>
Lord, Knight, Sir	0.61	<i>0.62</i>	3.00	<i>2.59</i>	0.25	<i>0.30</i>	<b>0.55</b>	<b>0.27</b>	1.10	<i>1.74</i>
No title	2.27	<i>4.06</i>	12.26	<i>16.74</i>	1.41	<i>1.931</i>	1.35	<i>1.75</i>	<b>18.52</b>	<b>11.28</b>
Marginal	11.34		46.84		5.40		4.90		31.51	
Pearson chi2(16) = 216.4674										
GERMANS	Markgraf, Herzog, Pfalzgraf		Landgraf, Graf, Gräfin		Freiherr, Altgraf, Burggraf		Edler, Edlerr Herr, Ritter		No title	
Markgraf, Herzog, Pfalzgraf	<b>1.92</b>	<b>0.12</b>	1.06	<i>1.55</i>	0.01	<i>0.30</i>	0.01	<i>0.04</i>	0.56	<i>1.54</i>
Landgraf, Graf, Gräfin	0.92	<i>1.46</i>	<b>33.47</b>	<b>19.69</b>	3.58	<i>3.83</i>	0.21	<i>0.51</i>	6.69	<i>19.46</i>
Freiherr, Altgraf, Burggraf	0.05	<i>0.34</i>	3.73	<i>4.59</i>	<b>2.96</b>	<b>0.90</b>	0.16	<i>0.12</i>	3.61	<i>4.56</i>
Edler, Edler Herr, Ritter	0	<i>0.03</i>	0.20	<i>0.41</i>	0.02	<i>0.08</i>	<b>0.03</b>	<b>0.01</b>	0.69	<i>0.41</i>
No title	0.37	<i>1.30</i>	5.23	<i>17.52</i>	1.95	<i>3.42</i>	0.73	<i>0.46</i>	<b>31.83</b>	<b>17.40</b>
Marginal	3.25		43.68		8.53		1.15		43.38	
Pearson chi2(16) = 6.5e+03										

We now proceed to analyze the trend of the title assortative marriage, and see if the

<sup>20</sup>The size of the relative sum of diagonals is in line with the findings of [Greenwood et al. \(2014\)](#).

above findings are persistent over time. Previous studies on marriage across religions, ethnicities, and educational attainments have made use of a number of models for analysis of intermarriage using log-linear models for contingency tables (Agresti, 2002 and Schwartz and Mare, 2005). Our two contingency tables are produced by cross-classifying husband's highest title with (father's) wife's highest title by century (16th, 17th, 18th, 19th). We obtain two  $5 \times 5 \times 4 = 100$  cells tables.

In our benchmark model (Model I) we assume that the association between husband's and wife's title is time-invariant. The model is:

$$(5.1) \quad \log \mu_{ijl} = \lambda + \sum_{i=1}^5 \lambda_i^H H_i + \sum_{j=1}^5 \lambda_j^W W_j + \sum_{l=16th}^{19th} \lambda_l^C C_l + \sum_{i=1}^5 \sum_{l=16th}^{19th} \lambda_{il}^{HC} H_i C_l + \sum_{j=1}^5 \sum_{l=16th}^{19th} \lambda_{jl}^{WC} W_j C_l$$

where  $H$  is an indicator variable for husband's title ( $i = 1, \dots, 5$ ),  $W$  is an indicator variable for father's wife's title ( $i = 1, \dots, 5$ ), and  $C$  is an indicator variable for century ( $l = 16th, \dots, 19th$ ).  $\mu_{ijl}$  is the number of marriages between husbands with title  $i$  and wives with title  $j$  in century  $l$ .

In Model II we add an homogamy parameter  $\gamma_l^{OC}$ :

$$(5.2) \quad \log \mu_{ijl} = \text{Model I} + \sum_{i=1}^5 \sum_{j=1}^5 \sum_{l=16th}^{19th} \gamma_{ijl}^{OC} O_{ijl} C_l$$

with  $O_{ijl} = 1$  if husband's title equals father's wife's title, and 0 otherwise. The homogamy parameter estimates the change in the odds of homogamy in century  $l$  relative to the baseline century (16th). In Model III we allow for variation in homogamy parameters across the main diagonal, that is, we construct title-specific homogamy indicator variables for each century.

Table 5 in Appendix D provides the model specifications and fit statistics of our log-linear models. Smaller BIC statistics indicate a better fitting model. The benchmark model (Model I) fits the data poorly relative to models that allow for changes in title assortative marriage. Model II is the homogamy trend model (5.2), which parameterizes the trend as a change in the likelihood that husbands and wives share the same title. By the BIC, adding these terms improves the fit of the model relative to Model I, indicating

that the tendency for couples to marry within the same title category has changed significantly over the period we examine. This simple model, however, may conceal significant variation in trends across different type of title. To address this, Model III allows for variation in homogamy trends across the main diagonal. By the BIC, Model III fits the data better than Model II only for Germans, thus indicating that trends in the odds of German homogamy cannot be adequately described by a single parameter.

Figure 4 – Odds of Homogamy, 1500 - 1900

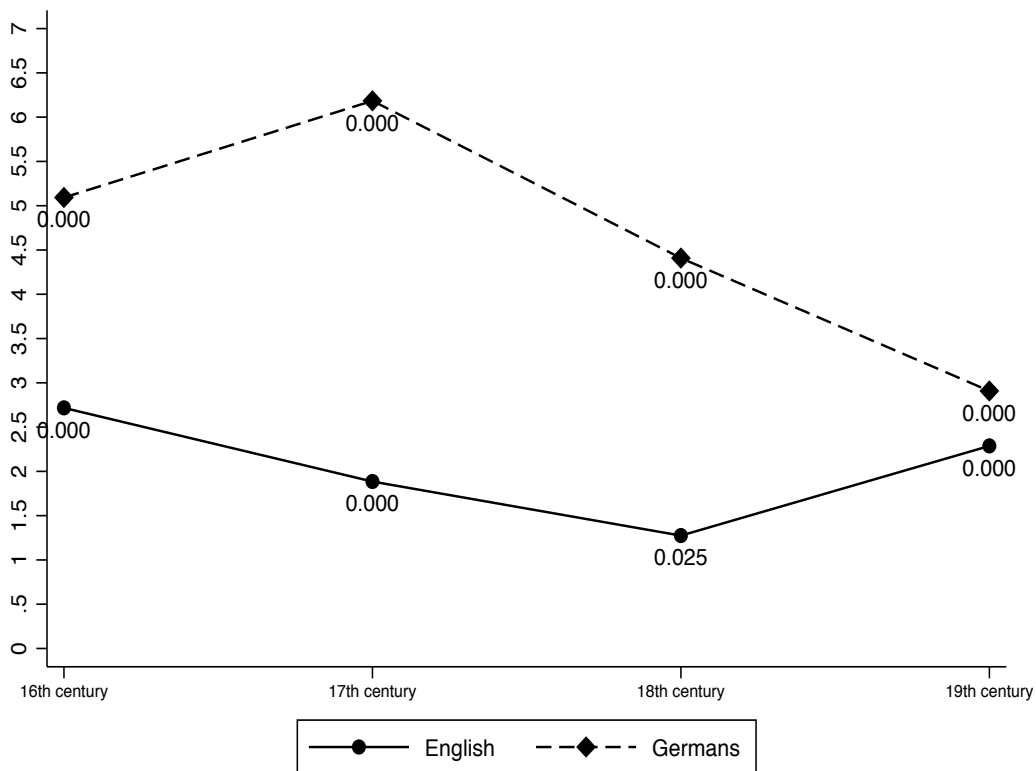


Figure 4 shows the trend in the odds that husbands and wives share the title estimated from Model II. Coefficients are graphed at their mid-point and P-values are reported for each coefficient.<sup>21</sup> Net of changes in the marginal distributions of husband's and wife's title, the odds of homogamy for noble marriages dropped from the 1500s to the 1800s. All odds are significant at the 1-percent level. In the 1500s, English husbands and wives were roughly 2.7 times as likely to have a spouse who shared their title as they were to be married to someone who does not, down to slightly more than 1 time the odds in the 1700s, and reaching a value of 2.4 in the 1800s. The stability of the English odds ratio

<sup>21</sup>The estimation procedure is as in [Schwartz and Mare \(2005\)](#). Full regression results are available under request.

is supported by [Schutte \(2014\)](#). In the 1500s, German husbands and wives were 5 times as likely to have a spouse who shared their title as they were to be married to someone who does not, it peaked to 6 in the 1600s, and dropped to roughly 3 in 1800s. This result is in contrast with the trend in [Figure 1](#), where the percentage of German homogamous marriages remained fairly constant over time.

The results of Model II are qualitatively consistent with the relative ratios of the diagonals from the contingency [Table 2](#), and support Prediction 1 and 2 of the theoretical model. Both Germans and English tended to marry nobles with the same title (Prediction 1), and title endogamy of German nobles was significantly higher than the degree of title endogamy of English nobles (Prediction 2). Moreover, the log-linear model tell us that German odds of homogamy were twice as high as English odds of homogamy in the 1500s, but they converged towards the same value of about 3 in the 1800s.

### 5.2. Other Results

In order to describe trends in title resemblance of spouses, we add interactions between spouses' titles. Models IV through VI analyze the difficulty of crossing the barrier: Model IV captures variation in crossing title barriers across the title distribution; Models V and VI provide odds of marrying a wife or a husband with a higher title (among spouses with different titles), respectively. Model IV is

$$(5.3) \quad \log \mu_{ijl} = \text{Model I} + \sum_{i=1}^5 \sum_{j=1}^5 \sum_{l=16th}^{19th} \gamma_{ijl}^{SC} S_{ijl} C_l$$

where  $S_{ijl}$  is equal to 1 if  $i < z$  and  $j \geq z$  or  $j < z$  and  $i \geq z$  for  $z = 1, \dots, 5$  and 0 otherwise. Models V and VI include a hypergamous coefficient:

$$(5.4) \quad \log \mu_{ijl} = \text{Model I} + \sum_{i=1}^5 \sum_{j=1}^5 \sum_{l=16th}^{19th} \gamma_{ijl}^{HC} H_{ijl} C_l$$

where  $H = 1$  if  $i < j$  among couples with different titles in Model V,  $H = 1$  if  $i > j$  in Model VI, and 0 otherwise.

Model IV is the crossings trend model [\(5.3\)](#) which adds terms to capture variation in the difficulty of crossing title barriers across the title distribution. By the BIC, the crossings model provides a better fit to the data than the previous models, especially for

German marriages. These results suggest that trends in assortative marriage are better explained by variation in the strength of barriers to intermarriage across title boundaries. Models V and VI improves the fit of English data, but the same is not true for Germans.

Figure 5 – Odds of Crossing Title Barrier, 1500 - 1900

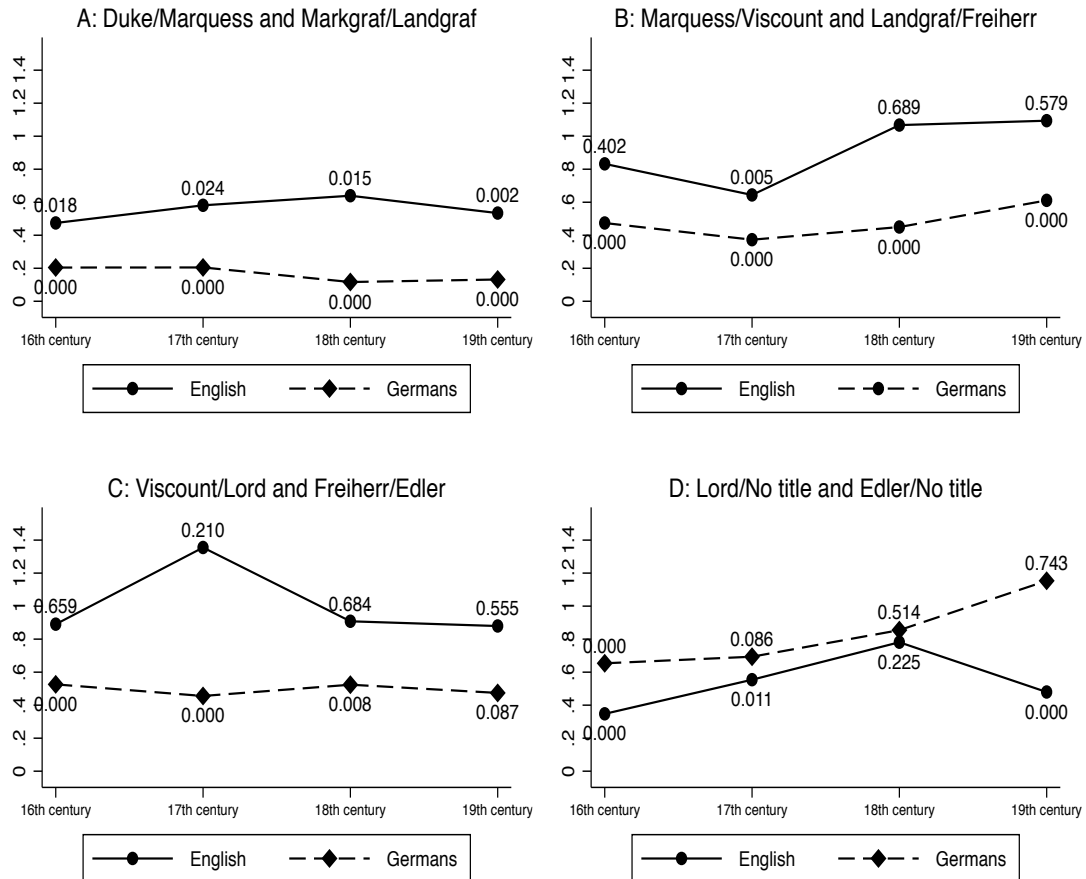
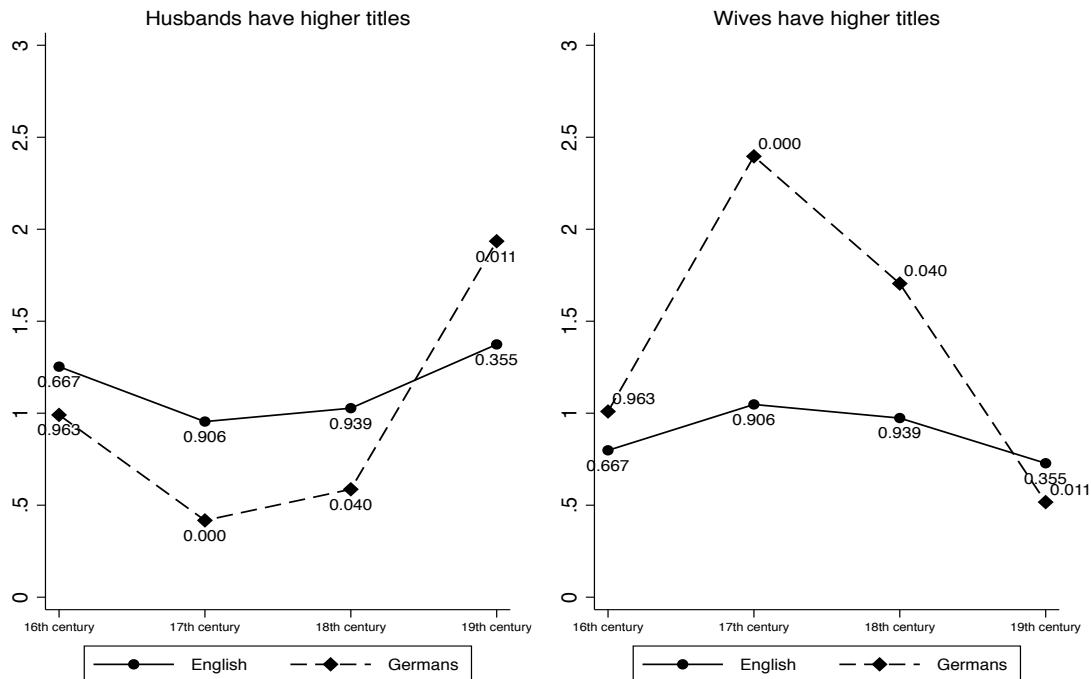


Figure 5 shows trends in difficulty of crossing adjacent title barriers estimated from Model IV. Larger crossings coefficients correspond to higher odds of intermarriage and thus indicate more permeable barriers. Smaller numbers correspond to lower odds of intermarriage and indicate less permeable barriers and a more stratified market. The odds of intermarriage between husbands and wives separated by more than one title barrier are the products of the odds ratios for each barrier that a marriage crosses. The odds are higher for English in panel A, B, and C but they are significant only in panel A. In panel D, the trend is reversed and the odds is statistically significantly higher for Germans than for English in the 1500s. We remark higher barriers in Germany intermarriage market at

the highest title category (panel A) and lower odds of intermarriage in England between nobles with and without titles.

Figure 6 – Odds of Hypergamy, 1500 - 1900



In Figure 6 we plot the odds of hypergamy in the case where husbands have higher titles than wives (left panel), and wives have higher titles than husbands (right panel). The trend of odds in the right panel is consistent with the percentages in Figure 2, but they are not significant for English marriages. We can observe that odds of wives of marrying down have remarkably increased for German nobles in the 1600s. This finding is consistent with Hurwich (2006) who, on page 247, claims that “they consistently followed a hypogamous marriage pattern in which son married up and daughters married down”.

## 6. CONCLUSION

We illustrated the role of institutions like marriage, primogeniture, and dowry in the social ascension of English and German nobles. Our objective was to provide some novel theoretical insights on the matching mechanism that characterizes a group with homogeneous preferences over titles. We showed that more stringent constraints on the amounts of dowries (or, equivalently, a lower degree of utility transferability) lead to

homophily in title in England and Germany, and to a higher degree of homophily in title in Germany than in England.

We added to the existing literature on elites by constructing and analyzing an original dataset of nobility lineages. The predictions of our theoretical model were tested in a log-linear model for contingency tables. Results showed that both Germans and English nobles tended to marry nobles with the same title. In particular, German nobles did it at a higher rate for the entire period of time under analysis, that is from the 1500s to the 1800s. Over time, odds of homogamy decreased in Germany and remained quite constant in England, in support of [Schutte \(2014\)](#)'s findings for English nobles.

Our results also paint a picture of a German upper class that was relatively more stratified and less open than the English one, in that there were higher barriers to intermarriage in Germany than in England. This finding is consistent with [Acemoglu and Robinson \(2012\)](#)'s hypothesis that, in the 19th and early 20th, the difference in economic development between England and Germany was partly explained by the fact that Germany was run by a narrow elite that promoted “extractive” institutions, whereas “inclusive” institutions were implemented in England.



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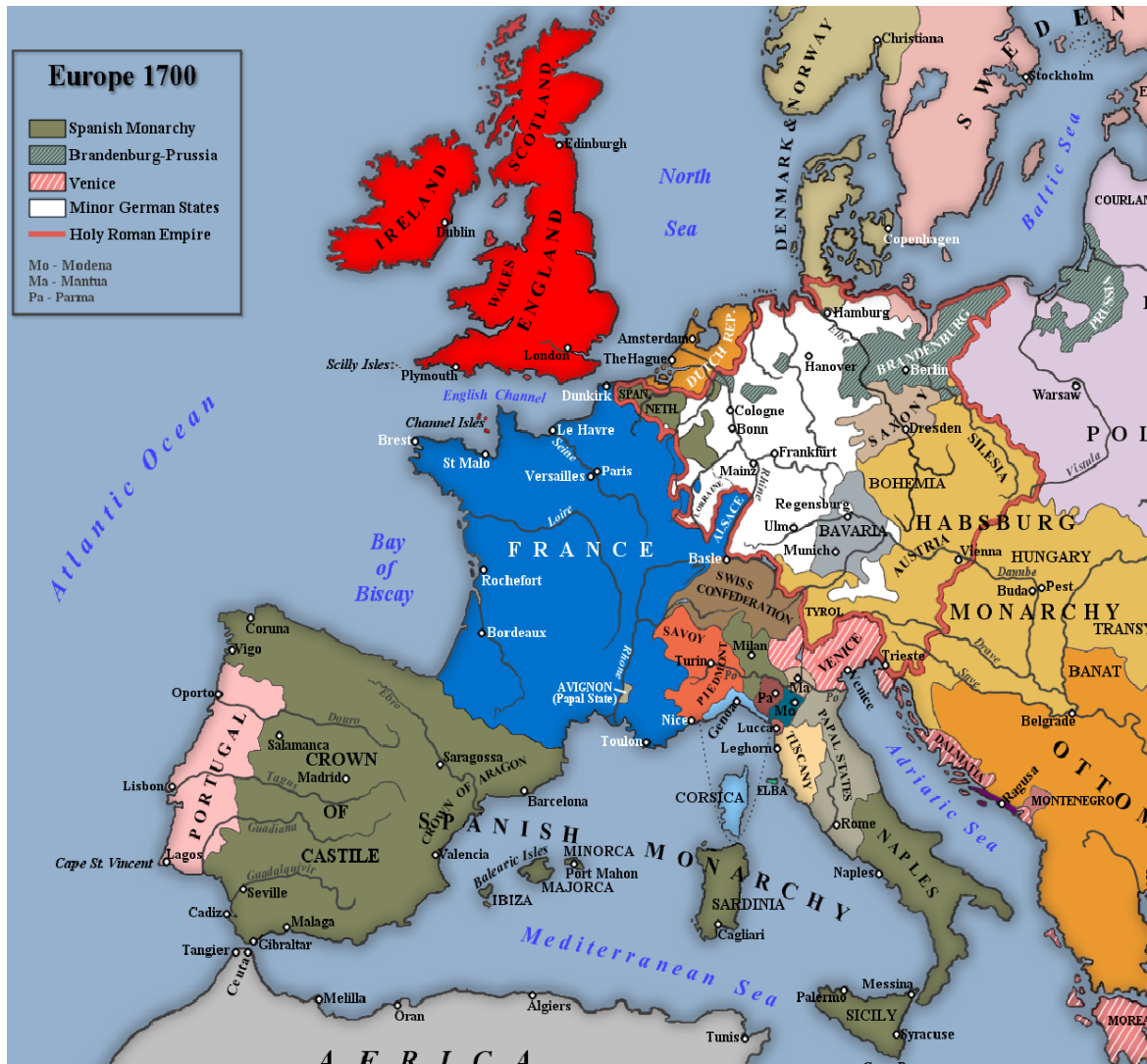
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A. APPENDIX: MAP

Figure 7 – Europe in 1700 (Source: Wikimedia Commons)



## B. APPENDIX: PROOFS

## B.1. Proof of Proposition 1

Define  $\hat{\lambda}$  as follow

$$(B.1) \quad \hat{\lambda} = \min \left\{ \frac{u_{hh} - u_{hl}}{v_{hl}}, \frac{u_{lh} - u_{ll}}{v_{ll}}, 1 \right\},$$

and suppose that  $\lambda \leq \hat{\lambda}$ . Let us show that there exists a PAM equilibrium in which woman  $i$ ,  $i \in \{l, h\}$ , pays dowry  $d_i = 0$  to marry man  $i$ .

Notice first that woman  $l$  cannot outbid woman  $h$ . Indeed, in order to attract man  $h$ , woman  $l$  should pay at least  $d_h + u_{hh} - u_{hl} > d_h + \lambda v_{hl} = \lambda v_{hl}$ , where the inequality comes from the fact that  $\lambda \leq \hat{\lambda}$ .

Then, notice that woman  $h$  is not willing to outbid woman  $l$ . In order to marry man  $l$ , woman  $h$  has to pay a dowry higher than  $d_l - (u_{lh} - u_{ll}) \leq \lambda v_{ll} - (u_{lh} - u_{ll}) \leq 0$ , where the second inequality comes from the fact that  $\lambda \leq \hat{\lambda}$ . Say differently, woman  $h$  does not have to “pay” to marry man  $l$ : man  $l$  would accept any offer from woman  $h$ . However, since  $v_{hh} - d_h = v_{hh} > v_{lh}$ , woman  $h$  is better off staying with man  $h$ .

To conclude, notice that NAM cannot be an equilibrium if  $\lambda \leq \hat{\lambda}$ . Indeed, if it were the case, woman  $h$  could outbid woman  $l$  by offering  $d = 0$  to man  $h$  and man  $h$  would accept this offer.

## B.2. Proof of Proposition 2

Let  $\lambda \in (0, 1)$  and suppose that PAM is an equilibrium. Let us prove that, for all  $\lambda' < \lambda$ , PAM is an equilibrium. We can assume w.l.o.g. that  $\lambda$  and  $\lambda'$  are greater than  $\hat{\lambda}$ , where  $\hat{\lambda}$  is defined by equation (B.1) in the proof of Proposition 1.

Let  $d_h$  (resp.  $d_l$ ) the dowries paid by woman  $h$  (resp.  $l$ ) to man  $h$  (resp.  $l$ ) in this equilibrium, i.e. when the degree of transferability is  $\lambda$ . Dowries  $d_h$  and  $d_l$  must be such that (i) woman  $l$  is not willing or cannot outbid woman  $h$  for marrying man  $h$ ; and (ii) woman  $h$  is not willing or cannot outbid woman  $l$  for marrying man  $l$ .

- CONDITION (i) In order to attract man  $h$ , woman  $l$  must offer a dowry higher than  $d_h + u_{hh} - u_{hl}$  ( $\geq 0$ ). Therefore, woman  $l$  cannot outbid woman  $h$  if

$$(B.2) \quad \lambda v_{hl} \leq d_h + u_{hh} - u_{hl}.$$

If she could pay such a dowry, woman  $l$  would be better off staying with man  $l$ , if:

$$(B.3) \quad v_{ll} - d_l \geq v_{hl} - (d_h + u_{hh} - u_{hl}).$$

In equilibrium, inequalities (B.2) or (B.3) must hold. Accordingly, the following condition must hold in equilibrium:

$$(B.4) \quad d_h \geq \min\{\lambda v_{hl}, d_l + v_{hl} - v_{ll}\} - (u_{hh} - u_{hl}).$$

- CONDITION (ii) Woman  $h$ , on the other hand, is always able to outbid woman  $l$ : she can offer higher dowries ( $\lambda v_{lh} > \lambda v_{ll}$ ) and man  $h$  prefers her to woman  $l$  ( $u_{lh} > u_{ll}$ ). Precisely, the minimum dowry to marry man  $l$  is  $\max\{0, d_l - (u_{lh} - u_{ll})\}$ . Therefore,

a necessary condition for PAM to be an equilibrium is that woman  $h$  is better for staying with man  $h$ :

$$(B.5) \quad d_h \leq v_{hh} - v_{lh} + \max\{0, d_l - (u_{lh} - u_{ll})\}.$$

Let  $\mathcal{D}_\lambda = \{(d_l, d_h) \in \mathbb{R}^2 : 0 \leq d_l \leq \lambda v_{ll} \text{ and } 0 \leq d_h \leq \lambda v_{hh}\}$  and  $\mathcal{I}_\lambda = \{(d_l, d_h) \in \mathbb{R}^2 : (d_l, d_h) \text{ satisfy conditions (B.4) and (B.5)}\}$ . By assumption  $\mathcal{I}_\lambda \neq \emptyset$  and  $\mathcal{D}_\lambda \cap \mathcal{I} \neq \emptyset$ . In particular, when the degree of transferability is  $\lambda$ , PAM can be sustained with minimal dowries  $\tilde{d}_l = 0$  and  $\tilde{d}_h = \min\{\lambda v_{hl}, v_{hl} - v_{ll}\} - (u_{hh} - u_{hl})$ .

Let  $\lambda' < \lambda$ . Let us prove that PAM is an equilibrium when the degree of transferability is  $\lambda'$ . There are three cases to consider.

- **FIRST CASE:**  $\lambda v_{hl} \leq v_{hl} - v_{ll}$  ( $\lambda$  “small”). Since  $\mathcal{I}_\lambda$  is non-empty,  $\tilde{d}_h$  satisfies constraint (B.5):  $\lambda v_{hl} - (u_{hh} - u_{hl}) \leq v_{hh} - v_{lh}$ . It follows that  $\lambda' v_{hl} - (u_{hh} - u_{hl}) \leq v_{hh} - v_{lh}$  and, therefore,  $(0, \lambda' v_{hl} - (u_{hh} - u_{hl})) \in \mathcal{I}_{\lambda'}$ :  $\mathcal{I}_{\lambda'}$  is non-empty. Notice that, since  $\lambda' \geq \hat{\lambda}$ , we have  $\lambda' v_{hl} - (u_{hh} - u_{hl}) \geq 0$ . Then, since  $\lambda' v_{hl} - (u_{hh} - u_{hl}) \leq \lambda' v_{hh}$ , dowries  $(0, \lambda' v_{hl} - (u_{hh} - u_{hl}))$  also belong to  $\mathcal{D}_{\lambda'}$ . In the end,  $\mathcal{I}_{\lambda'} \neq \emptyset$  and  $\mathcal{D}_{\lambda'} \cap \mathcal{I}_{\lambda'} \neq \emptyset$ : PAM is an equilibrium when the degree of transferability is  $\lambda'$ .
- **SECOND CASE:**  $\lambda v_{hl} > v_{hl} - v_{ll}$  and  $\lambda' v_{hl} \leq v_{hl} - v_{ll}$  ( $\lambda$  and  $\lambda'$  “high”). Then  $\mathcal{I}_\lambda = \mathcal{I}_{\lambda'}$ . Since, by assumption  $\lambda' v_{hl} > v_{hl} - v_{ll}$ , we have in particular  $\lambda' v_{hh} > v_{hl} - v_{ll} - (u_{hh} - u_{hl})$ . Therefore, dowries  $(0, v_{hl} - v_{ll} - (u_{hh} - u_{hl})) \in \mathcal{D}_{\lambda'}$  and  $\mathcal{D}_{\lambda'} \cap \mathcal{I}_{\lambda'} \neq \emptyset$ : PAM is an equilibrium when the degree of transferability is  $\lambda'$ .
- **THIRD CASE:**  $\lambda v_{hl} > v_{hl} - v_{ll}$  and  $\lambda' v_{hl} < v_{hl} - v_{ll}$  ( $\lambda$  “high” and  $\lambda'$  “small”). Since  $\lambda' v_{hl} < v_{hl} - v_{ll}$ , we also have  $\lambda' v_{hl} - (u_{hh} - u_{hl}) < v_{hl} - v_{ll} - (u_{hh} - u_{hl}) \leq v_{hh} - v_{lh}$ , where the last inequality comes from the fact that  $\mathcal{I}_\lambda$  is non-empty. Therefore, in particular, dowries  $(0, \lambda' v_{hl} - (u_{hh} - u_{hl}))$  satisfy inequalities (B.4) and (B.5):  $\mathcal{I}_{\lambda'}$  is non-empty. Then, since  $\lambda' v_{hl} - (u_{hh} - u_{hl}) \leq \lambda' v_{hh}$ , dowries  $(0, \lambda' v_{hl} - (u_{hh} - u_{hl})) \in \mathcal{D}_{\lambda'}$  and  $\mathcal{D}_{\lambda'} \cap \mathcal{I}_{\lambda'} \neq \emptyset$ : PAM is an equilibrium when the degree of transferability is  $\lambda'$ .

## C. APPENDIX: DESCRIPTIVE STATISTICS

Table 3 – Distribution of Marriages by Title in England, 1500 - 1900

	<i>Highest groom's title</i> <sup>22</sup>					<i>Highest bride's father's title</i>
	Duke	Marquess	Viscount	Lord	No title	
16th century:						
Duke	2.24	2.69	0.00	0.45	1.35	6.73
Marquess	4.48	20.18	4.48	5.83	5.38	40.36
Viscount	0.00	6.28	0.45	0.00	3.14	9.87
Lord	0.45	3.59	0.00	3.59	1.35	8.97
No title	0.45	6.28	1.79	2.24	23.32	34.08
Total	7.62	39.01	6.73	12.11	34.53	100.00
						N=223
17th century:						
Duke	2.02	4.32	0.86	0.86	0.58	8.65
Marquess	5.19	36.02	2.02	3.75	8.93	55.91
Viscount	0.58	5.19	0.86	0.58	3.46	10.66
Lord	0.29	3.17	0.29	0.29	1.15	5.19
No title	1.44	7.20	1.73	0.86	8.36	19.60
Total	9.51	55.91	5.76	6.34	22.48	100.00
						N=347
18th century:						
Duke	2.46	4.31	0.41	0.21	1.44	8.83
Marquess	7.60	25.87	2.67	1.85	10.47	48.46
Viscount	1.23	3.29	0.41	0.21	1.64	6.78
Lord	0.21	2.67	0.21	0.00	1.82	3.90
No title	2.87	16.63	0.82	1.23	10.47	32.03
Total	14.37	52.77	4.52	3.49	24.85	100.00
						N=487
19th century:						
Duke	1.92	1.92	0.52	0.00	1.05	5.40
Marquess	4.70	18.64	2.26	1.05	9.06	35.71
Viscount	0.52	1.92	0.70	0.00	0.52	3.66
Lord	1.22	2.96	0.35	0.00	1.22	5.75
No title	2.96	13.94	1.57	1.39	29.62	49.48
Total	11.32	39.37	5.40	2.44	41.46	100.00
						N=574

<sup>22</sup>Marquess includes “Marquess, Earl”; Viscount includes “Viscount, Baron”; Lord includes “Lord, Herr, Knight, Sir”.



Table 4 – Distribution of Marriages by Title in Germany, 1500 - 1900

<i>Highest groom's title</i> <sup>23</sup>	<i>Highest bride's father's title</i>					Total
	Markgraf	Landgraf	Freiherr	Edler	No title	
16th century:						
Markgraf	3.02	1.15	0.05	0.00	0.82	5.04
Landgraf	1.30	16.03	2.74	0.48	3.98	24.52
Freiherr	0.10	2.74	1.73	0.29	4.22	9.07
Edler	0.00	0.62	0.10	0.05	1.58	2.35
No title	0.67	4.03	2.64	2.21	49.47	59.02
Total	5.09	24.57	7.25	3.02	60.08	100.00
						N=2,084
17th century:						
Markgraf	3.03	1.99	0.00	0.00	0.60	5.62
Landgraf	1.32	27.16	3.99	0.20	5.66	38.33
Freiherr	0.00	2.03	2.91	0.04	4.47	9.45
Edler	0.00	0.04	0.00	0.04	0.72	0.80
No title	0.44	2.75	1.95	0.36	40.29	45.79
Total	4.79	33.98	8.86	0.64	51.74	100.00
						N=2,507
18th century:						
Markgraf	1.13	0.79	0.00	0.00	0.45	2.37
Landgraf	0.56	40.59	4.06	0.06	7.95	53.21
Freiherr	0.06	3.44	3.66	0.28	3.89	11.33
Edler	0.00	0.06	0.00	0.00	0.28	0.34
No title	0.11	6.14	1.63	0.45	24.41	32.75
Total	1.86	51.01	9.36	0.79	36.98	100.00
						N=1,774
19th century:						
Markgraf	0.27	0.13	0.00	0.04	0.36	0.80
Landgraf	0.40	51.12	3.53	0.09	9.38	64.51
Freiherr	0.04	6.79	3.62	0.09	1.88	12.41
Edler	0.00	0.09	0.00	0.04	0.13	0.27
No title	0.22	8.39	1.56	0.00	11.83	22.01
Total	0.94	66.52	8.71	0.27	23.57	100.00
						N=2,240

<sup>23</sup>Markgraf includes “Markgraf, Herzog, Pfalzgraf”; Landgraf includes “Landgraf, Graf, Gräfin”; Freiherr includes “Freiherr, Altgraf, Burggraf”; Edler includes “Edler, Edlerr Herr, Ritter”.

D. APPENDIX: LOG-LINEAR MODELS OF ASSOCIATION BETWEEN  
HUSBAND'S AND WIFE'S TILE

Table 5 – Log-Linear Models

Model	English		Germans	
	df	BIC	df	BIC
(I) HY, WY	56	-15	48	4056
(II) Model I + OY	52	-146	44	310
(III) Model I + MY	38	-145	29	77
(IV) Model I + CY	40	-148	32	47
(V) Model I + HHY	34	-121	25	72
(VI) Model I + HWY	34	-121	25	73