Unigeniture in an uncertain world*

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In the division of the kingdom, it appears not which of the dukes he values most; for equalities are so weighed, that curiosity in neither can make choice of either's moiety.

–*King Lear*, Act I Scene i

Abstract

We present a new theory and new quantitative evidence on the incidence of unigeniture. Existing theories hypothesize some sort of indivisibility in wealth, resulting in increasing returns to scale which overcome the testator's inclination towards equal sharing amongst heirs. Examining a micro-level dataset of Seventeenth Century English wills, we find that even after controlling for land and other presumed sources of increasing returns to scale and indivisibility, other variables such as financial wealth still correlate with the incidence of unigeniture. This leads us to propose a model where unigeniture is an efficient way to provide insurance against income shocks. An important implication of the theory is that observed unequal bequests are partially counteracted by ex post transfers. Therefore, inequality of bequests cannot be taken as evidence of inequality of consumption between heirs.

1 Introduction

Inheritance practices have attracted attention since people had wealth to give away. The custom of unigeniture, in particular, has stoked many commentators passions. Numerous authors from Marx and Engels to de Tocqueville have argued that unigeniture[1] was a major impediment to equality with one child reaping all the riches and the others scrambling to survive. The intuition linking inequality and unigeniture carries over to modern work on the subject (Stiglitz, 1969; Blinder, 1973). However, as stressed by Chu (1991), what effect unigeniture has on inequality and mobility

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[1]We use the term unigeniture rather than primogeniture because our model strictly speaking only delivers that one person should have most of the wealth, but it doesn't say who. We thank Joel Mokyr for suggesting it. Goody (1976) uses the term as a way to encompass both primogeniture and ultimogeniture.

depends crucially on what underlying economic mechanism gives rise to the practice. In this paper, we propose a novel explanation for the custom of unigeniture. Namely, that unequal bequests are an effective way to achieve intra-family insurance when there it is difficult for siblings to commit to an insurance scheme. An important implication of our analysis is that inequality in bequests may exaggerate inequality in welfare between family members.

Contra all of the related literature that we are aware of, our model assumes that testers are uncertain about their heirs' future income at the time of bequest. While they would like to insure against income shocks, the only available insurance pool is the family itself. The testator values each of his heirs equally and so would like to smooth consumption across them. However, consumption occurs after bequests are made and income shocks have been realized. Given this timing assumption, the first best allocation from the father's standpoint—equalizing consumption across heirs—cannot be directly implemented at the time of the bequest. We propose a second best alternative. We assume that a costly binding technology exists, which is able to enforce agreements between the testator and heirs after the testators death. Under this assumption, the testator can designate favored heirs ("patrons") who are bound by a contract (the will) to provide insurance for their siblings. In return, the testator may increase his bequest to the patron over that of other heirs.

Given this setup, why would unigeniture arise? Moving from autarky, where there is no insurance, to binding a single heir allows the testator to achieve a large degree of insurance even though part of his bequest is consumed in the cost of using the binding technology. In particular, it insures all heirs against very low consumption relative to the others. Binding more and more people provides only second order benefits in terms of risk sharing while there is a first order cost. This implies that it will be optimal to have unigeniture where only one child controls the whole inheritance but is bound to assist his brothers and sisters. We interpret the prevalence of unigeniture as simultaneously a sign of a large demand for insurance and, at the same time, the difficulty of achieving insurance through the family. We provide primary source textual evidence in some wills which show that the provision of of support of siblings was the condition for receiving the bulk of a testator's inheritance.

Our argument relies on the assumption that there exists a viable commitment mechanism to keep the new patron from forsaking his duties to his siblings after the death of the father. There are many mechanisms that may prevent the patron from "shirking" and hoarding all of the inherited

wealth. For example, some of the binding cost may be consumed in legal maneuvers to ensure participation from the patron. We provide some examples of this maneuvering in written wills. It may also be used to "purchase" a reputation for the patron as family leader within the community. Maintaining this reputation would provide social or commercial benefits to the patron, but would demand providing for less well off family members. Narrative evidence suggests the efficacy of this strategy. This explanation for the institution of unigeniture fits naturally into the transaction costs approach to economic organization (Williamson, 1981).

The model generates some predictions about when unigeniture is advantageous and when it is not. In particular, we show that the scheme dissolves when the ratio of the testator's bequest relative to the heir's outside sources of income is small. The reason for this is that as labor shocks become large relative to the bequest, the father risks placing all of his wealth with the child who will turn out to be the most needing of transfers. Hence, there is no use in paying the cost of binding the patron. This has an implication both within the cross-section and over time. First, those persons whose wealth is small relative to labor income have less incentive to use unigeniture. Second, in the course of economic development, the expectation that future generations will be wealthier than their parents erodes the efficacy of the insurance scheme. Hence, the value of unigeniture falls as well.

Several other theories have been offered to to explain the underlying impetus towards unigeniture and the causes of its decline in popularity. Within economics, most prominent focus on increasing returns to scale in the testator's bequests, often arising from an indivisibility in wealth. We view our theory as complementary to the existing literature, as it is able to explain unigeniture occurring in some cases where it would otherwise be difficult to understand. For example, while constant returns to scale is a logical justification for the practice of unigeniture amongst large land holders, we find a significant proportion of middle and lower class testators also opt for unigeniture. For these testators, uncertainty about the prospects of their heirs may be a more significant concern than maintaining the advantage of scale economies.

For evidence on the relative merits of the increasing returns to scale versus our insurance view of primogeniture, we turn to data on middle and lower class wills from seventeenth century England. We find that the model of unigeniture based on some kind of increasing returns to wealth—although it can explain some instances of unigeniture—is insufficient to explain the practice of unigeniture

in many cases where wealth appears to be easily divisible. Using a sample of wills coded from the original source, we find that even after controlling for divisibility, unigeniture is more common when estates are large. We use three proxies for wealth: bequests of land, bequest of money, and explicitly mentioning servants in the will. While increasing returns to scale could explain more unequal bequests among landholders, this story is unable to explain why all three of our proxies raise the probability of unequal sharing. Further, we add occupational controls and find that occupations that would be more likely to posses assets that exhibit increasing returns to scale and indivisibility of wealth (such as yeoman, shopkeepers and skilled workers) are not more likely to give unequal bequests once we control for wealth. We view this quantitative evidence as an important contribution to the literature, which has tended to rely on stylized facts and regional rather than micro-level variation in bequest practices to motivate theorizing.

The next section provides some background on the theoretical literature and reviews the historical evidence on unigeniture in Western Europe. Section 3 introduces our own model of unigeniture based on intra-family insurance incentives. The remainder of the paper turns to historical evidence to evaluate theories of unigeniture. First, we discuss whether our assumption that testators have access to a costly binding technology is born out in pre-industrial English society. Second, we employ data from Seventeenth century English to document the relationship between wealth and bequest decisions within micro-data. While we compare our theory of primogeniture to others, it's important to note that the choice need not be exclusive, several economic forces can play a role in the bequest decision. We aim to show that some patterns in the data our not adequately explained by other prominent theories and are consistent with our own. We conclude with a discussion of the implications of our model on our understanding of the institution of unigeniture's role in income mobility and inequality.

2 Literature Review

2.1 Theoretical Background

The economic theory of intergenerational transfers was originally studied in Becker and Tomes (1979) and Tomes (1981) in a setting with no risk. These authors suggested that parents would transfer resources to equalize the marginal utility of consumption across children. This does not

necessarily imply that a parent would make equal transfers. In particular, if children have different abilities in terms of earning potential and the parent knows this, then a parent will transfer more to the "economically challenged" children in order to compensate for their lack of ability. However, without further restrictions such a model is not actually testable. If we allow children to be heterogeneous in ability, it can conceivable explain any distribution of transfers. Moreover, changes in inheritance customs are difficult to explain since both equal sharing and unigeniture are knife edge cases. The model would have to imply stark changes in the distribution of abilities across time.

The main competitor to the Becker-Tomes model of inheritance and private transfers is the exchange model elaborated by Bernheim et al. (1985) and tested in Cox (1987); Cox and Rank (1992). It argues that a variety of private transfers are really quid pro quos with parents paying for services rendered from the children such as taking care of them in their old age or simply affection. This should be compared to the Becker-Tomes altruism model, which views these transfers as freely given by parents to improve the welfare of the children that they care about. While distinguishing between these two is an interesting question, it has limited implications for understanding inheritance practices as a whole.[2]

One of the most popular explanations for unigeniture is developed by Bertocchi (2007). She proposes a model where the primary asset is land which is indivisible by assumption. This immediately delivers unigeniture as the optimal solution to dividing up wealth. More broadly, if bequests are in the form of items with indivisibilities, like, say, bed sheets or shoes, it may be optimal to maintain the estate in whole rather than divide it up for the purposes of equity. As the economy grows, financial assets which can be divided become increasingly important and unigeniture falls away. This is also the argument of Alston and Shapiro (1984) who show that unigeniture prevalence in the antebellum US very closely matches the prevalence of plantations which experienced increasing returns to scale (Fogel and Engerman, 1974). However, this theory cannot explain unigeniture

[2]An interesting variation of this model that does address general inheritance issues is Bernheim and Severinov (2003). Taking the Becker model as a starting place, they then add the assumption that children care directly about how much their parents value them relative to their brothers and sisters. In addition, children cannot directly observe a parent's preferences and so must infer them from their parents' actions. Then if parents prefer to appear less partial, parents who care about their children unequally and those that care equally will tend to pool their behaviors as those who care unequally try to obscure their preference for one or the other. The authors show that under other conditions parents wish to appear more partial than they actually are. In this case, the reverse logic holds and unigeniture can be the optimal choice. Exactly as the title suggests, here parents use bequests to signal how much they care about their children.

for any family that doesn't own land. In the data set we use, testators who didn't have land still made other bequests, and many of them chose to divide their bequests unequally. Also, if a testator has both land and some other asset (such as money), they could maintain scale in land and still achieve equality by compensating heirs who do not receive land with a larger money inheritance. We present evidence that the tendency towards unequal bequests was increasing in both land and financial wealth.

Another related explanation is put forth by Chu (1991). His motivating example is the Chinese civil service exam, which was in effect between 1371 and 1904. To successfully pass the test required a huge parental investment in the form of paid tutoring. The investment required to prepare more than one child was simply beyond the realm of possibilities for the vast majority of Chinese families. Passing the exam entailed great rewards in terms of high wages, prestige and job tenure. The assumption of Chu is that investment only makes a return once a certain (high) amount has been sunk. This generates the convexity necessary to overcome the natural inclination towards equality. For example, a father's endowment would be effectively wasted if he split it equally since none of the individual bequests would provide enough to clear the required threshold. However, he could push one child over the threshold by concentrating all of his wealth. This theory predicts increasing incidence of primogeniture as wealth increases as long as wealth is moderately high. For very high levels, this theory would predict equal sharing as a father would then be rich enough to fund massive investments for all of his children. We do not find evidence for this inverted U-shaped pattern in 16^{th} century England (But see Kennedy (1991) for some Irish evidence to the contrary).

There was no parallel to this Chinese exam in Britain at the time though one could imagine a more general explanation relying on the desire of fathers to maximize the chance for their lineage to survive. We interpret this theory as providing similar cross-sectional predictions to Bertocchi's if the underlying economics is slightly different. For example from a completely different setting,[3] Cole and Wolf (1974) write regarding inheritance practices in the tiny Alpine town of Tret, "[The father] would like to see the holding that he has maintained against the world for a lifetime remain essentially intact to provide material basis for perpetuation of the family line." Even Adam Smith, as quoted in Chu (pg. 81), wrote that primogeniture arose "to preserve a certain linear succession."

In many ways, the argument we provide is similar to the theory of Abramitzky (2008) regarding

[3]We thank an anonymous referee for this citation.

the functioning of Israeli kibuttzim. On the kibbutz, the difficulty is in enforcing a system of equal sharing when people have different levels of productivity, much like our setting though we focus on risk. Abramitzky emphasizes the social sanctions stemming from a shared ideology applied by members of the kibbutz. "Social esteem was used as the carrot. In particular, members who were appreciated by their peers were promoted to leadership positions such as the kibbutz secretary, treasurer, and farm manager (Abramitzky, 2008)." In addition, on the kibbutz, social pressures were also used as "sticks" to enforce social norms of hard work.

This issue of how to foster altruism when financial markets are incomplete is also present in Yi (2013). He provides a model very similar to ours with the father facing a tension between equity and efficiency. The solution in Yi's model is to allow the parent to instill altruism at some cost. This insures that while the vast majority of resources are directed towards the more able child initially, that child transfers some of his income to the less fortunate siblings in the end. Yi goes on to provide some empirical evidence for this view from a survey of Chinese twins today. The theory here is not so much about risk as it is investment non-convexities.

2.2 Inheritance Practices in the Western World Over Time

Before turning to our own model for unigeniture, this section briefly reviews the vast historical literature on Western inheritance practices. First, we would like to emphasize a narrow though relatively uncontroversial point that the disinheritance of children has declined between the 17^{th} century and the present day in Western countries.[4] In fact, in the present day, equal sharing is the norm. Menchik and David (1983) suggest that only around 20% of bequests are unequal using modern U.S. data, and others have found similar levels (McGarry, 1999; Wilhelm, 1996). In contrast the proportion of unequal bequests in our data from 17^{th} England is 55%—and this number is likely an underestimate given that primogeniture was the default outcome of those who died intestate. Second, we note that a feature of this literature is that it tends to focus on the prevalence of inheritance practices across cultures and time, rather than on the explanation of variation in inheritance within a particular culture or region. This naturally leads one to tradition and contingency as potential explanations for bequest practices. Such forces are doubtlessly at

[4]Besides our discussion of Chu's work on Chinese practices, we do not discuss these practices in non-Western countries. For a more detailed discussion of these areas, see Freedman (1971) on China and Nakane (1967) for Japan.

play in the wide cross section of inheritance patterns. However, our paper seeks to highlight individual forces which affect inheritance decisions on the margin. Indeed, our dataset of wills clearly documents that unigeniture and equal sharing were practiced side by side, suggesting a role for other forces beyond tradition in bequest decisions.

The record on bequest practices is probably most complete for England.[5] In England, law defined default rules of inheritance if the person died intestate. So if a testator's preferred inheritance pattern did not differ significantly from the the default, he would not leave a will and would not be observed in our sample. The standard custom was primogeniture whereby the first born son would receive the full inheritance of copyhold tenures. The 1540 Statute of Wills allowed for the first time testators to freely divide their freehold land (Shammas, 1987) with the result that many people did leave wills to avoid at a cost the default outcome. However, division was governed by many legal complications which varied by the testators' location and circumstance. For example, so-called dowers' rights for widows guaranteed them up to a third of a husband's inheritance, but could be waived or invalidated in the case of remarriage. Laws could also vary by region, with local statues in certain cases *requiring* equal sharing. On the other hand, some pieces of land were entailed—requiring them to passed down without subdivision, an obvious restriction against equal sharing. Just the same, many times the restrictions were simply ignored by testators and it is difficult to know how judiciously they were enforced. For example, Horwitz (1984) in a sample of wills from late 17th and early 18th century London that over 60% of testators disregarded the custom prior to the 1725 Act abolishing limitations on disinheritance.

Exactly when this shift in inheritance practices occurred within Britain let alone any other Western country is difficult to ascertain. It is easy enough to document legal changes that occurred in Britain over the centuries related to inheritance.[6] However, translating these into how inheritance was affected two difficulties. First of all, many of these legal changes are not unidimensional. Laws such as the 1540 Statute directly affected the ability to pass along land while leaving unchanged the rules for personalty. Other laws provided more testamentary freedom. Should we think of these as contributing to a greater or smaller incidence of disinheritance? Even if the legal implications of laws are clear, could the legal changes themselves be a reflection of a change in inheritance

[5]Grassby (2007) provides an excellent overview of the custom of primogeniture in his study of kinship between the 16th and 18th centuries.

[6]We thank an anonymous referee for highlighting some of the complexities here.

preferences due to some other force, perhaps rising incomes? It is difficult to know, which it brings us to the next difficulty. That is, the relative lack of data necessary to observe the patterns in unigeniture over time. There are observations here and there but nothing comprehensive enough to identify sharply where a break occurs, or even if there is a break at all.[7] For these reasons, we focus on a single time and place where both unigeniture and equal bequests are used. We then seek to leverage this cross-section to understand how variation in a testators circumstances shift his or her bequest decision holding the legal structure and tradition fixed. We believe this represents an important complement to a literature which heretofore has attempted to understand unigeniture through the lens of long-run macro trends.

Taking a broader view, European societies presented a vast array of inheritance practices with which to examine the causes of unigeniture. Indeed, the general pattern of impartible inheritance in around the 17^{th} century was somewhat unique to Britain. "With primogeniture, the default under intestacy [in Britain], and the prevalence of impartible division among copyhold tenures, one son usually inherited a disproportionately large share of an estate. In Europe, it seems, partible inheritance more often dominated" (Shammas, 1987).[8] However, it is clear that unigeniture was practiced to some degree in many areas. Thirsk (1976) provides a particularly arresting figure to this point showing the distribution of these practices over Western Europe. Interestingly, variation in inheritance practices was prominent even among very small regions that shared similar climates (Cole and Wolf, 1974), which may highlight the role of tradition and contingency in these practices.[9]

While the historical record is far from complete, it is interesting to note some of the geographic variance in bequest practices across Europe continued into later periods. In France, for example, the Civil Code outlawed the disinheritance of any sons–effectively outlawing unigeniture. Within the American colonies, there was huge variation in the laws regarding inheritance even with the inheritance of many English laws and customs (Alston and Shapiro, 1984). States divided along lines that mirrored the incidence of slavery. Gagan (1976) highlights the prevalence of primogeniture in the 19th Century Canada and O'Grada (1980) for unigeniture in Ireland around the Famine. Our theory makes predictions about cross-sectional patterns at the micro-level that we test with

[7] This is even putting aside the question of how to interpret the fact that only a fraction of testators ever wrote wills or parts of a testator's wealth not reported on the wills.

[8] We thank an anonymous referee for this reference.

[9] These differences in practice with little difference in geography are difficult to explain with a theory of unigeniture that relies heavily on the returns to scale such as in Bertocchi (2007).

our dataset of wills. Applying the theory to understand comprehensive cross-country patterns in the 17th century and later is simply infeasible given the paucity of data available at the moment.

3 A Model of Unigeniture and Intra-Family Insurance

We now present our theoretical model which explains unigeniture as the outcome of a second-best insurance scheme. The model is motivated by narrative evidence, which we review below, that indicates that bequests were not the only intra-family transfers which occurred in many pre-industrial societies. In addition to bequests, kin would often make transfers to each other based on immediate need. However, it was common for a family patron to control most of the family's wealth and be responsible for ensuring other family members avoided poverty. Social reputation prevented the patron from abandoning his kin. While stylized, our model proposes that bequests can establish the patrons by providing them with the bulk of inheritance and "bind" them through legal and reputational means to the care of their siblings.[10] In return for having a higher expected utility than their siblings, the patron must allow transfers of his own wealth to those siblings who ask for help. The central friction in our setting is that while a testator would like his children to insure each other against shocks. Once the testator is gone, he cannot force them to make transfers among themselves. Hence, the testator opts for a second–best solution by offering a contract to his children that allows for some risk sharing.

If such a scheme is in place, heirs who receive a large inheritance will routinely make transfers to their poorer siblings. In the model, this is achieved through the establishment of an insurance pool, but it is easy to think of the patron as serving as the pool's manager. As a result, heirs' final inheritance will differ from their stated bequest, so the level of bequests may exaggerate intra-family inequality. To verify that the scheme is operational, we look for evidence of intra-family transfers from heirs who receive large bequest to heirs that receive small (or no) bequest. We discuss this evidence in Sections 4 and 5. The remainder of this section formally proposes a model to develop the intuition for when such a scheme is optimal, and when it is not. We find that the incentive for a unigeniture based insurance scheme is strong when the bequest represents a large portion of heir's expected income.

[10] Note the parallel here to kibbutz case where social sanctions play a key role in avoiding moral hazard problems (Abramitzky, 2008).

We consider the following model of a testator and his N children. Like in Becker-Tomes, the testator's objective is to maximize total expected welfare of his children. As is standard, children's utility is assumed to be concave in consumption. However, in addition to their bequest, each child will receive an exogenously determined amount of labor income that is private information revealed after the bequest.[11] A father with total wealth W decides upon a bequest to each child, and a number of "patrons" to appoint. If an heir agrees to be designated a "patron" he will be bound to enter into an insurance scheme at some cost to the father at the time of inheritance, whereas non-patron heirs are free to decide whether or not to participate in the scheme after observing their own labor income. If a child opts not to enter the scheme, she consumes her bequest plus her labor income. If she does enter the scheme, her income is revealed to all players and transfers are made according to the rules described below.

We first note that this model focuses on the decision of the number of patrons to appoint but not whom to appoint. Why unigeniture often took the form of primogeniture is an interesting question, but is outside the scope of the model since all heirs are symmetric. Briefly, if heirs were not symmetric, then it seems likely that it would be optimal father would choose the heir with the highest expected income to be the patron. In practice, it could be that the oldest male was often the heir with the best labor income prospects at the time of the bequest. At the same time, we view this question as of second order importance relative to the incidence of unigeniture. In any *ex ante* sense, there is no loss to primogeniture conditional on unigeniture. Now *ex post* after information about the various siblings is revealed, it might be optimal to give the bequest to someone other than the first born. We would still submit that the gains or losses involved in this pale in relation to the possible gains or losses of unigentiture itself.

We now discuss the insurance scheme. The patrons are bound to share their resources (both labor income and inheritance) with any siblings who opt to participate in an insurance pool after labor incomes are revealed. Appointing a patron involves two costs. The heirs appointed as patrons must agree to be bound ex ante. To make them accept the responsibility *ex ante*, the father makes an initial side payment b to each of the patrons, which they get to consume with certainty. This

[11] The fact that labor income is exogenously determined abstracts away from the issue of moral hazard on the part of the heirs. Were agent's able to affect their own labor income distribution, any insurance scheme might incentivize them to take more risks. This question relates to the optimal level of insurance rather than how insurance can be efficiently provided.

side payment is endogenously determined to ensure patrons weakly prefer being patrons to non-patrons. In addition, the father must take steps to ensure that the patrons do not shirk on their commitments. We assume the existence of a commitment technology that ensures patrons will participate in the insurance pool if father pays a binding cost d per patron. This cost reduces the total value of his bequest to be distributed. This commitment technology could be interpreted as the cost of lawyers or contract writing to make use of the legal system to ensure contractual commitment. It could also be expenditure to build a patron's reputation which would make it costly for him to shirk his insurance obligations following the bequest.[12] It is not critical that costs be linear, they must simply be increasing in the number of bound patrons.[13]

We assume all children have identical expectations about future income. Hence, if the father chooses to not appoint a patron, then the father maximizes his expected utility by splitting his wealth equally between his children at the cost of providing no insurance. If there is at least one patron, then someone is required to always enter the pool and contribute their labor income along with the father's endowment (net of costs and side payments). Non-patrons after observing their (random) labor income can choose to either consume it or join an insurance pool that's "managed" by the patrons.[14] If an heir joins the pool (either voluntarily or because he is bound), he contributes all of his income to the pool and then receives an equal share in the total pool.[15]

Let X denote the total amount of money in the insurance pool, if there are n non-patron children participating in the pool along with P patrons, then each of n non-patrons consumes $\frac{X}{n+P}$ whereas each patron will consume $c^P = \frac{X}{n+P} + b$, where b is the additional side payment offered to patrons to compensate them for always participating in the pool. Meanwhile, those heirs who opt

[12] In Section 4 we discuss the evidence for both of these commitment technologies being in operation in pre-Industrial England.

[13] A more general model might endogenously determine this cost based on a repeated game between the heirs. Because we are focused on the choice of the testator, we abstract away from this repeated interaction and allow d to be set exogenously. As we will see, our basic result is not sensitive to the value of d as long as it is sufficiently positive.

[14] This sort of arrangement sounds strikingly like the bylaws of a kibbutz (Abramitzky, 2008), and it seems reasonable that families would operate in a similar way.

[15] One might be concerned that a non-patron would renege on the pool once he learned he would actually have to transfer money to other family members. In practice, the equilibrium of the model implies that, since the full inheritance is given to the patron of the family, non-patrons are very unlikely to lose money by participating in the pool. In the vast majority of cases the insurance pool implies transfers from patrons to non-patrons. In addition, the model could be extended so that patrons and non-patrons earn a stream of income and learn about their labor productivity over time, as in Abramitzky (2008). We adopt our simpler model of the insurance pool to focus on inter-generational transfers and the establishment of the patron rather than intra-generational transfers taking the patron as exogenous.

not to enter the pool will consume their bequest plus their labor income. If at least one patron is appointed, it is easy to see that it is optimal for the father to give his entire bequest to the patrons, so that it is passed directly into the insurance pool. Therefore, we associate unigeniture with the father appointing a single patron and giving his entire bequest to that person.

We now analyze how non-patrons determine whether to enter the pool or not. Let labor income for person i be denoted by η_i which we assume is a lognormal random variable with mean μ and variance σ^2. The size of the pool X is given by,

$$X = W - P(d+b) + \sum_{i=1}^{P} \eta_i + \sum_{i=P+1}^{n+P} \eta_i,$$

where W is the size of the father's bequest, d is the cost to bind a patron to enter the pool, b is a side payment to each patron to ensure his participation, n is the number of people who select themselves to enter the pool, and η_i is labor income for each heir. The difference between b and d is that b is an endogenous variable which the father sets as low as possible while still satisfying the patron's participation constraint. In contrast, d is an exogenous variable which encompasses administrative, reputation, and bargaining costs related to binding the patron. Without loss of generality we re-order heirs based on whether they are patrons, select into the insurance scheme, or opt for autarky.

Non-patron i with labor income η_i will choose to enter the pool if,

$$\mathrm{E}\left[u\left(\frac{X}{n+P}\right) | i \text{ Enters}\right] \geq u(\eta_i).$$

Non-patrons make their choice to enter the pool simultaneously without knowing the labor incomes of other agents. We assume that the outcome is a symmetric Bayesian Nash equilibrium. The optimal strategy for each will be a cutoff level of income z where for higher levels of income, they go off on their own and for lower values they enter the pool. The cutoff for entering the pool z will be implicitly defined by,

$$\mathrm{E}\left[u\left(\frac{X}{n+P}\right) | i \text{ Enters}\right] = u(z). \tag{1}$$

We can then write a non-patron's consumption as,

$$c^{NP} = \begin{cases} \frac{X}{n+P} & \eta_i < z \\ \eta_i & \eta_i \geq z \end{cases}.$$

Finally, note that the number of non-patrons that enter the pool n will be a binomially distributed random variable based on the (endogenous) probability of entering the pool.

Given this, the father's problem is to maximize,

$$\max_{b,P} \mathrm{E}\left[\sum_{i=1}^{P} u(c^P) + \sum_{i=P+1}^{N} u(c^{NP})\right] = P\mathrm{E}u(c^P) + (N-P)\mathrm{E}u(c^{NP}),$$

subject to c^P, c^{NP} as defined in (1). The side payment b is determined by a participation constraint for each patron,

$$\mathrm{E}[u(c^P)] \geq \mathrm{E}[u(c^{NP})].$$

This constraint simply states that the patron must weakly prefer his position to that of not taking the contract and becoming a non-patron. This constraint is stricter than forcing the patron to prefer his position to being in autarky. In order to avoid wasting some of his wealth, it is clear that the father will choose b such that this constraint exactly binds if he appoints a patron. Note that the expectation on the left hand side is taken over possible realizations of a patron's income (i.e. before his labor income is realized), and that the budget constraint is already incorporated it through our formulation of X.

3.1 Simulations

Unfortunately, the model, while simple, does not admit a closed form solution due to the discrete number of heirs. However, this feature of the model is important since we are investigating incentives to name a single heir among a family with a small number of heirs. Therefore, we undertake a series of simulations to study the model's implications. We choose the following values for the parameters for all the simulations. First, to insure a motive for insurance, we choose $u(c) = \sqrt{c}$. Of course, other choices for the utility function will control how valuable insurance is for the father. The key driver of outcomes, however, is the ratio between W and $\mathrm{E}\eta$ which we vary in our simulations. It

is particularly difficult to choose a value for σ_η^2 since we have little hard evidence on the degree of income uncertainty in pre-Industrial Europe. For expositional purposes we choose $\sigma_\eta^2 = 1$, but our results are reasonably insensitive to changes in this parameter. We set the number of children N to 5, which is not unreasonable based on our data.[16] We have experimented with modest changes in all of these parameters, and have found the qualitative results to be robust.

In the various panels of Figure 1, we show how utility changes as we increase the number of patrons. For the purposes of exposition, we normalize the full insurance utility to 1 and set utility in autarky equal to 0. On each graph, we show the results for 4 different binding costs, d. Note that for the case with no binding costs, we get the obvious result that it's optimal to bind everyone. This maximizes the degree of risk sharing with no associated cost aside from b, which is small in this case because a non-patron is almost certain to enter the pool upon observing η_i. We also have the intuitive result that increasing the binding cost decreases the value of having patrons. However, what's of interest is that fact that the marginal benefit of each additional patron is declining. In other words, the overall utility function of the father is concave in the number of patrons.

The logic for this is twofold. First of all, there is an initial large jump in insurance moving from 0 to 1 by making the whole amount of the endowment available for insurance. When there are 0 patrons, then there is no way to smooth ex post labor incomes shocks. This lack of insurance is costly for the father. However, the value of diversification is not linear in the number of children. In some sense, the father's objective is to maximize something like the Sharpe ratio of a child's consumption. This is related to the standard deviation of the size of the pool conditional on some number of people n entering. It is easy to calculate this standard deviation as $\frac{\sigma_{\tilde{w}}}{\sqrt{n}}$. Hence, his "criterion" is concave in the number of people that enter the pool all else equal.

What this concavity implies is that we need only a very small linear binding cost to make unigeniture optimal and this is what we see in the pictures as we increase the cost of binding to 5% of the endowment per patron. Of course, if the costs become too large relative to the endowment, then autarky becomes optimal. But a single patron appears to be a robust prediction across a variety of values.[17]

[16] In our data, the median number of sons and daughters is 3 with a range from 1 to 9. Of course, nieces, nephews, and grandchildren are also sometimes mentioned as heirs.

[17] Note that the fact that the utility function looks linear for more than one patron is an artifact of the scale and the fact that the insurance value is changing very little. This means that utility changes here are basically driven by the binding cost with little difference coming from the added insurance value of more patrons.

Next we consider the effect of increases in expected labor income by comparing the three panels of Figure 1. In Panel 1, the heirs' expected total expected labor income is equal to the bequest–so under equal sharing, bequests would account for about half of each heirs total lifetime income. We increase the heir's labor prospects to 5 in Panel 2 and 10 in Panel 3. So bequests are becoming a less significant source of heirs' income. We find that, as labor wealth increases, the maximum binding cost under which the insurance scheme is optimal falls despite the fact that the agents are getting richer. As labor income increases, the insurance benefits of the pool decrease. The reason for insurance is in the main to eliminate the possibility of very small values for consumption. With a very high average labor income, this probability of this outcome is basically nil. Hence, testators are unwilling to pay the binding costs to smooth consumption fluctuations that have second-order importance.

Finally, we examine how the insurance scheme alters the distribution of consumption amongst heirs, which after all is the key driver of the testator's utility. Figure 2 plots the distributions of heir utility under autarky, the (optimal) one-patron scheme, and (unachievable) costless full-insurance when expected labor income is 1 and the binding cost is d is .05. The insurance scheme fails to achieve full insurance by having a higher density of very rich heirs. These are fortunate heirs who receive a large labor income and then opt out of the insurance pool. However, having a single patron is sufficient to eliminate the low consumption outcomes that are possible in autarky. For low values of utility, the density for full insurance looks nearly identical to that of a single patron. For the father who cares about all of his children, avoiding these disastrous outcomes is critical.

4 Narrative Evidence

This section attempts to provide some narrative evidence for our assumption about central members of a family playing the role of a patron to support other family members. We discuss some possible direct legal costs later by considering some examples from wills that appear to encumber a particular heir's use of the testator's property. First, we wish to highlight the strong position of non-immediate family kin in pre-industrial and industrial England in general. Families at this time were themselves networks that could stretch between cities to offer mutual aid. Grassby (2007) argues effectively that these kinship networks held sway over their members beyond the scope of individual self interest,

(p. 33) "The patronal family and kinship networks coexisted with possessive individualism." In his study of London business families between 1580 and 1740, Grassby (2007) finds that 10 percent of these households housed resident kin, who frequently came to live with extended family after a death in their immediate family. In his work on English families between 1780 and 1870, Morris (2009) notes that the extended family network was a useful tool for spreading risk in the English middle class. His work includes several direct anecdotes, told through letters and other primary sources which indicate the operation of a network quite similar to the one envisioned by our model. This provides some evidence for the sort of intra-family insurance activity which our model attempts to capture.

One possible reason for such activity is the existence of tight knit family networks whose members felt genuine affection for each other. However, we do not wish to rely on family members' filial care for each other alone. Indeed, historians point to strong reputational reasons for patrons to take care of their extended families. Reviewing the story of Sarah Stocks, a women whose husband became bankrupt, possibly due to drunkenness, Morris (2009) writes, (p 304)

> The care which both [kinsmen] took of Sarah Stocks suggested that reputation, both within the network and of the network, depended on the ability to sustain the network's dependent women at a minimal standard...In all this a key figure emerged. The networked family was dominated by a number of 'patrons'. These were always adult males. There position defined by practice and by the status accorded them by others...The patron's advice and approval were sought on many topics. He was expected to help with a wide variety of problems. The existence, effectiveness and authority of the 'patron' could have an important influence on the fortunes and ability to sustain risk of many members of the network.

He further notes that being an effective patron could raise status both inside and outside the family.[18] This quote almost exactly exemplifies the role of the patron in our model and how these behaviors were supported.

Thus far we have offered some evidence on the existence of intra-familial insurance backed by a

[18] It is important to note that these observations come from a case that unfolded between 1823 and 1825, 200 years after the wills we study. However, primogeniture was common practice in England up to the beginning of the 20th century. Indeed, primogeniture was the default form of inheritance in England until 1926.

patron attempting to manage a reputation for supporting his extended family members. We now provide direct evidence for both the existence of insurance and patrons from the wills themselves. First of all, while informal mechanisms for enforcing risk sharing agreements are potentially quite powerful, it is still useful for family members to have some legal fall back if necessary. In fact, wills were frequently written with this sort of enforceability in mind. Now as Morris (2009) notes (p. 94), "the concept of contract applied to a will only in a partial fashion, because, by its nature the 'contract' became operational when one party to the bargain was dead. Enforceability was by proxy..." Nonetheless, Morris (2009) describes the ways in which will writers were able to enforce their agreements from beyond the grave. These include placing estates into trusts, explicitly stating that kinsmen should be allowed to live rent free. Burdening inheritances with obligations to other relatives whether in terms of explicit annuities or implicit injunctions "to act as a protector and friend to his younger brothers and sisters." (p. 95). Similar sorts of excerpts from wills appear in the review of the wills of London businessmen by Grassby (2007). All of these created claims on some heirs even if the legal enforceability was tenuous.

The wills also show the existence of risk sharing through inheritance practices. One example of this is the frequent use of annuities and conditional statements, which call upon one heir to pay the others on a yearly basis or otherwise insure other heirs. [19] Those receiving large inheritances were expected to be there to support their brothers and sisters when times were difficult. For example,

> FRANCIS TAYLER of Laxfield, yeoman 12 May 1613 ... To son William and heirs, messuage or tenement with lands, free and copyhold, in Cookley, late occupied by William Stimson; ... To son John, towards his maintenance during his life, £4 annuity to be paid and assured to him every half year by equal portions out of the lands late occupied by William Stimpson ... Sons Henry and Nathaniel to be exors; they to be kind and natural to their brother John.

Other wills enjoined patrons to offer food and housing to their siblings. This clearly cautions against interpreting unequal bequests as evidence of unequal consumption on the part of heirs. This is very similar to what Spufford (1974) obsered in her study of Cambridgeshire with the distinction between unigeniture and partible inheritance "a very blurred one." Now we should be

[19] Of course, we are unable to verify that these post-bequest transfers did actually occur. On the other hand, the absence of indicators about post-bequest transfers does not imply that they did not occur.

clear that the non-contingent nature of annuities does not exactly match the type of contingent insurance we discuss in our model. However, the effect is largely the same by providing income in bad times and good. Because the equilibrium bequest in our insurance scheme is to give all of the testator's wealth to the patron, the vast majority of post-bequest transfers are from patrons to non-patrons. This is precisely what this qualitative evidence confirms.[20]

In some cases, testators not only specified a lifetime annuity but made specific provision if the annuity was defaulted that the primary heir forfeited his inheritance. This is evidence not only of the insurance scheme but also that wills could be used to constrain the patron to accede to the father's wishes. For example,

> ROBERT SHARMAN of Shadingfield, yeoman, 26 March 1620 . . . To eldest son Robert Sharman, all lands, tenements, and hereditaments in Westhall and all ready money and bonds whatever. He paying his brother Thomas and sister Ellen £30 each in 18 months. To youngest son Thomas and to daughter Ellen, £4 a year to be paid out of lands in Westhall, for life. If there be default in payment of annuity, or in the foresaid £30, then they to have power to enter lands at Westhall and distrain . . .

Whether the testator actually believed that this default condition could actually be legally enforced, we will never know. Again the law was somewhat obscure on this matter, but the fact that these types of conditional clauses appeared frequently suggests to us that testators believed that they had some power to shape actions after they were deceased. As Howell (1976) wrote about inheritance in the Midlands, "[S]o long as land remained the sole source of family income, it was regarded as family property and was expected to support all adult members, either supplying each with a share of land, or by supporting one nuclear family and a number of [...] adults."

One sees similar behavior in other areas of Western Europe. For example, Cooper (1976) writing about large landowners in 16th century Spain, "fathers solemnly charged eldest sons to cherish their sisters' and brothers' interests." He goes on to offer examples to the same effect for France and Italy. Cooper quoting an earlier author, in Naples "[T]he eldest brother succeeds and the care to maintain their sisters...lyes upon the brother's inheritance.'" What is interesting about the example of Italy is that it was a country considered to follow an equal sharing custom in the 14th century.

[20]We also note that in our model non-patrons almost always wind up entering the pool so even though their transfers are contingent, they get them with probability close to one like an annuity.

Cooper again quoting an earlier writer, Cina da Pistoia, "In England, the custom is that the eldest has all the property, but in Italy that all sons succeed equally." Yet the evidence adduced here from British wills suggest that maybe much of the difference between the countries was more apparent than real.

This is not to say that there were not differences in family structure. Quoting Fynes Moryson on late 16th century Italy, "Never did I observe brothers to live in such unity as in Italy, so as the father being dead, many of them ordinarily live in house together, not deciding their patrimony, but having all goods in common or as they call it in brotherhood." It is not surprising from the viewpoint of our theory that there is a tight relationship between household structure and partible inheritance.Berkner (1976) provides evidence for this link from 17th century Germany. He finds that in Calenberg, a region of Germany where impartible inheritance dominated, only about 2/3 of families were nuclear without relatives. On the other hand, in the almost bordering region of Göttingen where partible inheritance dominated, almost 90% of households were nuclear. Here it seems that intra-familial insurance took the very extreme form of sharing a household "only" inherited by one sibling. The general point is that we must be particularly careful in not simply assuming that an *ex ante* unequal distribution of inheritance leads to *ex post* differences in welfare of the sibilings.

Others such as Laslett (1984) have argued against this idea of extended families at least in certain regions and times. For example, citing his earlier work (Laslett, 1977), he notes that only about 10% of households contained extended family members in a sample from Britain between 1622 and 1854. In addition, little more than 5% of households had 3 or more generations present in them. The evidence now seems rather overwhelming that the British practiced a form of "neo-localism" where children would marry and then setup a household living in it until death. "Two brothers living together after marriage and collaborating in the work on the same farm have never made an appearance in the English record" (Laslett, 1984). While interesting that so few people lived together in the same household as a family, methods for providing aid to siblings were more varied than just sharing a household. Even Laslett admits that "it was quite common for [widows to live with their children]." He goes on to write that "the wider kin ...frequently appear when it was a question...of raising capital."

This section has explored support for the assumption that a patron could be expected to not

shirk his duties and provided examples of post-bequest transfers between family members, the two key ingredients of our bequest-as-insurance model. None of these mechanisms were entirely foolproof, but all of them in concert could provide compelling reasons for the patron to execute his duties effectively. We next turn to quantitative evidence from a primary source of Seventeenth century British wills.

5 Quantitative Evidence from 17th-Century Wills

We now examine some evidence for the model from a data set of seventeenth century wills from the Archdeaconries of Suffolk and Sudbury in England on the incidence of unigeniture. The wills present a unique historical record that allow us to examine bequest decisions at a micro-level. For this analysis we use a subset of a primary source data collected by the Suffolk Records Society (Evans, 1987; Allen, 1989). It consists of wills proved in the Archdeaconries of Suffolk and Sudbury, two neighboring archdeaconries which together comprise the county of Suffolk. Under the English legal custom of the time, wills were proved in the ecclesiastical courts, of which the archdeaconries were the lowest level. Typically, the wills that fall in our sample are those of merchants, skilled and unskilled laborers, yeomen, and husbandmen–roughly the middle and lower classes of the time. The wills of the rich were usually proved in the higher Consistory Court of the bishop, owing to the fact that these testators typically held lands in more than one archdeaconry (Allen, 1989).

Our data focuses only on the middle and lower classes of a particular area of England in the early 17th century. In some ways, this is an advantage. For example, the complicated customs of entail, which are prevalent in the aristocracy of this time, do not affect out sample.[21] Rather than attempt to use the data to explain wide trends across time and population, we take a micro approach to see how differences in the makeup of wealth affect the bequest decisions of testators in a population where both equal giving and unigeniture are present. This enables us to test how competing theories of unigeniture predict the decisions of people on the margin of their bequest decision.

Unfortunately, there are some complications to interpreting the data on wills for insight into the practice of unigeniture. First and foremost, not every bequest decision was recorded in a will. In a

[21] A full model of inheritance practices might attempt to endogenize these customs, however that is clearly outside the scope of our current work.

study of between 1558 to 1723, Vann (1979) estimates that around a quarter of possible testators actually wrote a will. According to the custom of primogeniture in force in England during this period, the landed property of any man who did not leave a will and had no widow passed to his first born son. This creates a clear selection bias in our data towards equal giving in our sample of wills. However, the subpopulation of people who created wills can be thought of as those most interested in their bequest outcomes, so they themselves represent a population of interest. Furthermore, along some dimensions the people that wrote wills look no different on observables than the general population. For exmaple, Spufford (1974) and Howell (1976) have found little correlation between wealth and writing a will. Instead the only factor that appears to predict will writing is—surprise—age. Still vver half of the testators in our sample gave unequal bequests, so it is not the case that writing a will was the exclusive reason to avoid the default outcome of unigeniture.

In the data, we consider only those wills where the testator reported having at least two heirs and no spouse. We focus on testators with no surviving spouse because of the complicated legal ramifications of dower rights, under which a widow could reject the will and claim one-third of the testator's real assets. If the widow were to then remarry, this property would pass into the hands of the new husband. While we do not know whether dower rights were claimed on a will, it does appear that the custom affected how wills were written. Wills were frequently constructed with conditional clauses on whether a widow remarried, and widows were frequently paid annuities by other heirs rather than given land (this would prevent real property from leaving the testator's family on the event of remarriage). Also, a wife's portion of the inheritance might be explicitly redistributed amongst her children in the event of her remarriage or death. As such, it becomes even more difficult to evaluate whether wealth is equally or unequally distributed between children. This is true even putting aside the fraught question of whether the wife should be included as an heir in our model.

Our subsample of the original data includes 350 wills. We extend a data set transcribed from the primary source by McGranahan (2000)[22] and code an additional variable to determine whether or not the portion of a testator's bequest was distributed equally or unequally amongst their children. To determine whether an inheritance has been equally or unequally divided, we follow

[22]See her work for a longer discussion of this source.

a taxonomy beginning with lands, followed by money and precious metals, and then household goods. An inheritance is judged unequal if an inequality at the highest level is not obviously offset by a reverse inequality at a lower level. Bequests to grandchildren and in-laws were included in the bequest to the child. An example of an unequal bequest in Allen (1989) is the following.

> JOHN MANCER of Levington, sailor. 16 December 1624. Weak. Soul to the hands of Almighty God. To daughter Elizabeth Mansur, £5 in 4 years, ... To son Robert, 50s. in 5 years ... Movable goods in the house to be prised and shared equally between children. To son John Mancer, lands and tenements and all unbequeathed goods and chattels, he to be exor.

We use the following as an example of a will in Allen (1989) with equal sharing.

> ELIZABETH BARKER of East Berghold, widow. 31 May 1623. Sick. soul to hands of Almighty God and maker and to Jesus Christ, savior and sanctifier. To son George Barker £10 in 1 year. To Son Robert Barker, £10 in 1 year. To daughter Elizabeth, wife of John Piddington, cupboard that stands on the chamber and certain pieces of pewter and linen, presently. To daughter Ann, wife of George Rivett, £10 in 12 months. To daughter Mary Barker, £10 in 1 year, posted bedstead, trundle bedstead and coverlet, great copper cauldron, dansk chest, best gown and hat. To grandchild John Piddington, £5 when 21. To grandchild Elizabeth Piddington, £5 when 21; the use of these two portions to go to daughter Elizabeth for education and upbringing of two said children till they be 21, and if either child die before receipt of portion, survivor to inherit. Rest of goods and household stuff whatsoever, once debts and funeral costs be paid, go to son George Barker, he to be exor.

These wills are typical in that they do not disclose the age or occupation of the heirs at the time of the bequest. As a result, it is impossible to know how often unigeniture took the form of primogeniture. There are further complications because many testators leave money or goods to their grandchildren, friends or even the poor (McGranahan, 2000). In the coding, we count money left to grandchildren as going to their parent if the grandchildren appear to be fairly young. We exclude money left to the poor.

Clearly the coding is subject to some subjectivity.[23] The wills were coded by the authors separately and a subset was cross-checked to ensure consistency. We have also kept records of which will was coded by which author and have used this data to check for systemic differences in coding. These coding variables have not been significant in any regression we have run. Others such as Howell (1976) have used similar techniques.

Our key explanatory variables of interest relate to the makeup of wealth for a testator. For this, we follow McGranahan (2000) and use binary indicators for the will mentioning land, money, and the presence of servants. These serve as proxies for the amount and divisibility of wealth. Importantly, if divisibility alone is the primary driver of bequests decisions—as suggested by the returns to scale model—then land wealth would be associated with unigeniture but money wealth (which is easily divisible) would not be. While we would prefer to have an accurate accounting of the actual value of individual bequests, it would be too difficult to attempt to discern valuations for the wide variety of land and goods mentioned in the wills and the quality of individual items is not clear from their brief descriptions. Therefore, we confine ourselves to binary measures.

While none of these proxies is perfect—in particular, land can vary in value by a great deal, and servants can cost a wide variety of amounts and may not always be mentioned in a will—they are reasonable proxies as long as they are positively correlated with testator's wealth. We have checked these proxies by regressing the log of the total amount of money bequested when available against dummies on whether the agent has land or money. The result shows that amount of money bequested is highly correlated with with these dummy variables, bequested money is 117 percent higher when a testator has servants and 148 percent higher when a testator gives land. To the extent that these proxies introduce measurement error into our results, it biases us against finding a significant relationship between wealth and bequest outcomes. Summary statistics for the main variables used in the analysis are presented in Table 1.

Our model of unigeniture-as-insurance suggests that the propensity towards unigeniture is increasing in wealth holding heir's labor income constant. Unfortunately, the wills lack clear information on the labor income of heirs. Since it is reasonable to expect that the ratio of testator's wealth to heir's labor income is increasing less than one-for-one with the testator's wealth, we would expect that not controlling for heir's labor income his would lead us to underestimate the impact of wealth

[23] In 68 cases, we were unable to make a clear determination and so we dropped these wills from the analysis.

on the tendency towards unigeniture.[24] So this source of bias would work against our result that wealthier testators are more likely to choose unigeniture. Nonetheless, to control for heir's labor income as best as possible, we will use the occupation of the testator, which is recorded in the wills, as a proxy to control for heir's occupation and labor income. That is, if the sons of shopkeepers can be expected to have similar labor incomes, then the impact of wealth on unigeniture can be deduced by comparing the bequest decisions of shopkeepers of different levels of wealth.

5.1 Quantitative Results

We now consider several regressions to test our theory of unigeniture relative to the other competitors. Our model makes a strong predictions in the cross-section that there should be increasing incidence of primogeniture as we increase the testator's wealth relative to heir's labor income. This result is not due to increasing returns to scale in a production function, but because of the greater possibility for insurance in this scheme. More precisely, if we control for land wealth, there should still be an effect of other types of wealth on primogeniture.

Our primary results are presented in Table 2. Specification I considers a linear probability model regressing our three wealth proxies on whether or not a bequest gave the bulk of inheritance to one heir. All three of our wealth proxies have strong positive coefficients, increasing the probability of an unequal transfer between 18 and 25 percent each. We interpret this outcome to mean that it is wealth in general, rather than any particular component of wealth, say, land that is driving testators to choose unequal sharing. This, coupled with the qualitative evidence in the previous section, is consistent with insurance motives driving the decision to give unequal bequests. In Specification II, we add controls for other variables which might drive the unigeniture decision. We include controls for two-heir families, sex of the testator, and testator literacy (judged by whether or not they signed their will with an "X"). If one believed there were increasing returns in bequests, one might expect that smaller families are more likely to result in equal sharing since the per capita bequest would be larger, but we find only weak evidence for this. The insurance scheme we put forth can operate as long as the number of heirs is two or more, but does not make any prediction on the likelihood of unigeniture as the number of children grows.

Another concern about our initial result relates to our reliance on female testators. Due to the

[24] We thank John Parman for making this point.

fact that we use only testators with no surviving spouse, our sample is 50 percent female while only 21 percent of the original sample of testators are female. Fortunately, controlling for the sex of the testator has little impact on our parameters of interest. While female testators are slightly less likely to split their inheritance unequally, controlling for female testators does not seem to affect the relationship between our wealth proxies and unigeniture. Finally, we may be concerned that our wealth variables are proxying for education or social class, and the tendency towards more unigenture reflects a difference in preferences for equality across classes. While we cannot perfectly control for these factors, we include a dummy for literacy as a crude proxy for educational attainment. We find that it has no significant impact on the propensity towards unigeniture, nor does its inclusion appear to affect the importance of all three wealth variables.

Specification III adds occupation controls to the regression.[25] These controls serve to control for all unobserved variation due to testator's occupation and focus our results on wealth differences for a given occupation. As discussed above, occupation controls can serve as a rough proxy for an heir's labor income potential, which is not available in our data but is likely related to the testator's occupation. Moreover, to the extent that different social strata are related to the testator's occupation, these controls also account for these differences in willingness to split inheritance equally. Adding these controls do not change the qualitative results of our estimation, that both divisible and non-divisible wealth increase the tendency towards unigeniture.

Taking the occupation controls a bit further, one might argue that if increasing returns to scale were an important driver of unequal giving, occupations that involve occupation specific capital to be more likely to give unequally. For example, yeomen (who own land), shopkeepers (who own shops), and skilled workers (who own trade tools) would give unequally so that the instruments of their trade remain intact. However, no such relationship appears in the results. Indeed, less skilled workers appear to have the highest propensity towards unigeniture (controlling for wealth), while husbandman and shopkeepers have the least. However, the results are statistically quite weak. We cannot reject the hypothesis that all occupation controls are jointly zero, so to the extent that some occupations are proxies for indivisible property (farms, tools, shops) these do not seem to impact the propensity to give unequal bequests. Specifications IV-VI, repeat the regressions using a probit

[25]Occupation controls were coded by McGranahan (2000). The reference group for this regression is those wills for which no occupation was recorded, these make up 10.6 percent of the sample. Moreover, the occupation "widow" is highly correlated with being female, so we drop sex from this specification.

rather than linear probability model, we see that this does not change the qualitative results.

To reiterate, the strong positive result for possessing money and servants, even controlling for land, provides important evidence in support of our theory versus the competing theory that unequal bequests are due primarily to increasing returns to scale in the possession of land or other indivisible items. Even those testators whose wealth came from money alone were more likely to give unequal bequests than poorer testators.

5.2 Robustness Checks

As discussed above, the empirical results of Table 2 rely on proxies, are subject to selection, and may imperfectly control for some factors in the bequest condition. Still, they provide some empirical support for our model. To further probe the robustness of the relationship between divisible wealth and bequest inequality, we now present a few of the robustness checks we have run that support our empirical conclusions. First, we consider an interaction between owning wealth and owning land. Because we use dummy variables as our wealth indicators, one might be concerned that bequeathing money might be a proxy for bequeathing a larger plot of land. Specification I of Table 3 shows this is not the case. When we include a land-wealth interaction bequeathing money independently remains a driver of unigeniture. Indeed, it is the land coefficient which experiences a precipitous fall, contrary to what we might expect if divisibility were driving the decision to bequeath unequally. Moreover, note that having both land and money makes one even more likely to split their inheritance unequally. According to the model, bequeathing land alone increases the propensity of unequal giving by 10 percent, while bequeathing money alone increases it by 16 percent. Bequeathing land and money together increases the propensity by 35 percent.[26] We believe the super-additive cumulative effect of land and money is due to the presence of both proxies being indicative of particularly high wealth status. This provides further evidence that increased wealth is an important driver of bequest decisions.

In Specification II, we revisit our concern that, in selecting only testators with no spouse, we have strongly biased our sample towards female testators.[27] While we control for the gender of the

[26] Note that we include the interaction term in the regression rather than divide testators into exclusive categories, so all three dummy variables are "on" when testators bequeath both land and money. The overall impact of having both land and money is statistically significant at the .05 level.

[27] Interestingly, there is one testator in the general sample who was a married women, her husband explicitly signed the will giving his consent to her passing on property.

testator in the original regressions, here we run the regressions on the subsample including only male testators. The results are similar to those of the full regressions: possessing land and money have positive coefficients in the general regression.

Another possible confounding factor in the analysis is gender inequality among the heirs. While our model assumes that the testator favors all heirs equally, it may be that the testators in Seventeenth Century England simply preferred male heirs, and that the higher rates of inequality in wealthy families may be related to a higher portion of male heirs (perhaps due to additional labor resources or not having to pay dowries). Another difficulty with daughters is that they may be treated differently based on their marital status and whether they've received a dowry. Dowries or intra-vivos transfers generally have the potential bias our empirical analysis if daughters are receiving large transfers for their dowry which cause unmarried daughters to be compensated through bequests. This could then make equal sharing look unequal if much of the wealth has already been transferred in the form of a dowry before the will is signed.

To address these issues, we propose two robustness checks that focus on male heirs. In Specification III, we recode the will to determine whether the bequest was split equally between sons, disregarding other heirs. For example, suppose a testator split the bulk of its between two sons, and gave a paltry sum to a single daughter. While our original coding would have called this an unequal bequest, it will be considered an equal bequest in Specification III.[28] Of course, we can now only analyze testators with at least two sons, which reduces the sample size to 176 wills.[29] The results in Column III maintain the signs and rough magnitude of the original regressions. As would be expected, the standard errors are larger, but t-statistics are generally above one, supporting the conjecture that both divisible and indivisible wealth are associated with unequal bequests. In Specification IV, we go even further, restricting the sample to those families where all heirs are male. This drastically reduces the sample to only 38 observations.[30] While on average these families are more likely to give equal bequests than the population as a whole (as reflected by the

[28] We thank an anonymous referee for suggesting this specification.

[29] Interestingly, the share of unequal bequests in this sample is 58 percent, relative to 54 percent in the full sample. The inequality rate in this subsample is higher even though our re-coding has the effect of making the criteria for unequal coding more stringent. The reason for this is that we drop those wills where no son is present, in which equal sharing is the dominant outcome. Only 30 percent of wills split an inheritance unequally when no son is mentioned.

[30] Of course, it still may be the case that the testator has daughters that are not mentioned in the will. However, the fact that only 38 wills appear with no daughters mentioned gives us some comfort that daughters were not routinely excluded from the text of wills.

constant), point estimates still indicate that wealth is a strong driver of unequal giving. Indeed, this regression seems to indicate that the money and servants proxies are somewhat better drivers of unequal giving than the land proxy, echoing what we saw in Specification I. Although these regressions corroborate our earlier results, the sample size is quite small, so it's difficult to draw sharp conclusions.

Finally, we consider the subjectivity of our coding of the indicator variable for unequal sharing. In our original coding of the data, we refrained from coding those wills about which we were unable to make a determination as to whether the bequest was unequal or not, instead dropping those wills from the data set. As an added precaution, we coded a second indicator for bequest inequality which we assigned only if we could determine that the bequest was equal or unequal with "high confidence." This removes 65 additional wills from our data set. When we run the regressions on this restricted sample, our main results remain strong. These results are reported in Specification V of Table 3. This provides at least some comfort our results are not due to our particular classification choice in creating the unequal bequest indicator.[31]

Even after considering these subsamples, the broader problem remains that our overall picture of the family is limited to what is contained in the will. There is no guarantee that the will need mention all the living children of a testator, those that receive nothing may be just not noted in the document. Moreover, it might be that a small inheritance is offsetting a large investment made in another child's welfare earlier in life. We take some comfort in the fact that, in reading the wills, we did not find a reference to a bequest being high or low to offset unequal human capital investment. Despite these caveats, the wills represent our best chance to study inheritance practices on a micro level. Our analysis provides the strong suggestion that the presence of wealth—both divisible and indivisible—was associated with greater prevalence of unequal giving.

6 Conclusion

We developed a novel theory to explain why unigeniture may be optimal even if a parent values each child equally. The theory revolved around the possibility of one child providing some insurance for the rest of his brothers and sisters. We also showed that this generates novel cross-sectional

[31] We reiterate that we have also run regressions with a dummy variable for the identity of the coder, the results are robust to the inclusion of this control, which is not significant.

predictions for how the prevalence of unigeniture depends on wealth, risk and outside sources of income. The mode findd some quantitative support in a dataset of 17th century English wills. At a minimum, the data seem to imply a model based on increasing returns to scale in land alone is an insufficient explanation for unigeniture. We also document a number of examples from primary sources pointing to the insurance provided by the child receiving all of the inheritance.

Our model suggests inequality in bequests may be the logical outcome of a desire to equalize utility across heirs in an environment with limited commitment. As such, the custom of unigeniture alone should not be taken as *prima facie* evidence of a preference towards particular heirs, which would be troubling from a normative standpoint. In the end, what matters is the final distribution of consumption not the initial distribution of wealth. Of course, the insurance scheme discussed here is a second-best mechanism when the first best of equal inheritance is hard to achieve. In particular, intra-family dynamics were not explicitly modeled, and patrons may have had more control over their siblings than would be optimal in the first best. Nonetheless, our model suggests how an initially unequal distribution of bequests may serve to further the goal of equalizing, rather than exacerbating, *ex post* differences in consumption. Goody (1976) summarized this nicely, "[The] exclusion of other siblings is rarely if ever total...the other children...may insist upon equality in value as distinct from equality of object."

The idea of unigeniture-as-insurance leads to a number of natural explanations for the decline of unigeniture over time in Western countries. For example, the value of this mechanism is inversely related to the quality of insurance markets. As these markets develop, it becomes much more sensible for the testator to share equally and let the children insure themselves through markets. These explanations are in principle testable, though it would require assembling much more detailed individual datasets on inheritance and access to financial markets. While outside of our focus in this paper, we view this type of work as a potentially very profitable way forward for understanding in more detail the role played by economic forces in inheritance practices through history.

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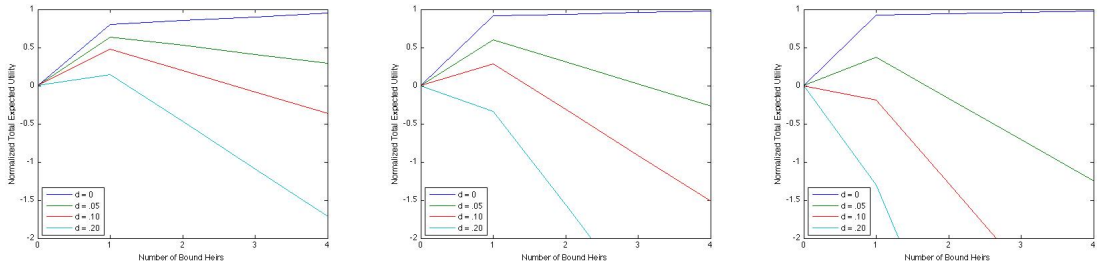

(a) (b) (c)

Figure 1: Utility for low, E$\eta = 1$, medium E$\eta = 5$, and high labor income E$\eta = 10$.

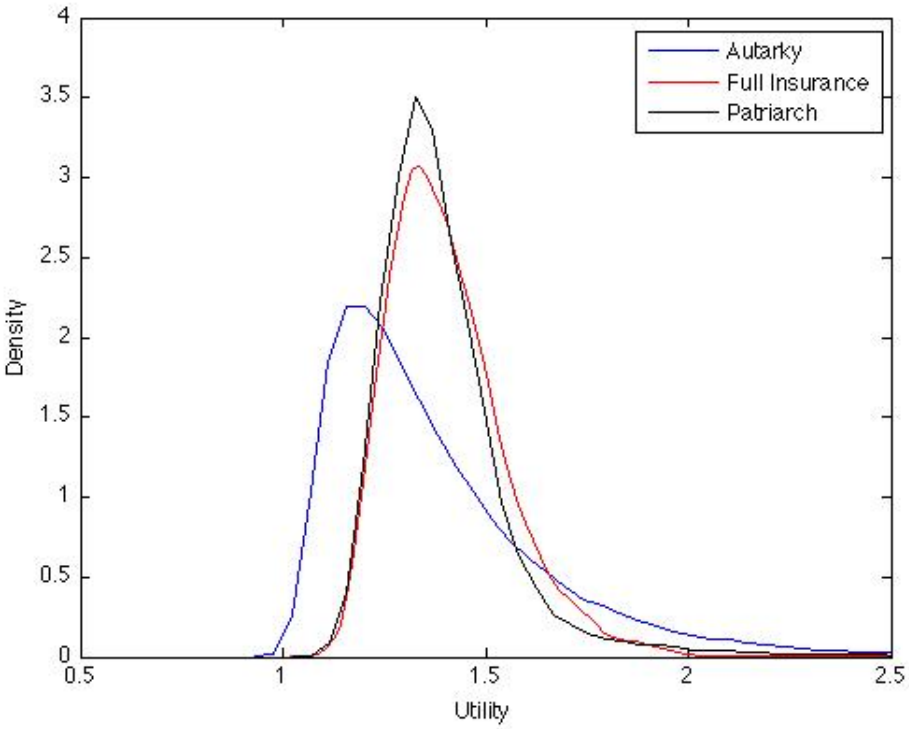

Figure 2: Distribution of consumption: $E\eta = 1, d = .05$.

Variable	Mean	Std. Dev.	N
Unequal Bequest	0.546	0.499	282
Unequal Bequest (conservative coding)	0.59	0.493	217
Bequeathed Land	0.371	0.484	350
Bequeathed Money	0.786	0.411	350
Will Mentions Servants	0.091	0.289	350
3+ Childrem	0.64	0.481	350
Testator is Female	0.509	0.501	350
Testator is Illiterate	0.569	0.496	350

Table 1: Summary statistics

	I	II	III	IV	V	VI
Bequeathed Land	0.178*	0.157*	0.148*	0.481*	0.428*	0.414*
	(0.058)	(0.066)	(0.066)	(0.158)	(0.174)	(0.177)
Bequeathed Money	0.188*	0.178*	0.151^{+}	0.490*	0.463*	0.398^{+}
	(0.078)	(0.079)	(0.081)	(0.209)	(0.212)	(0.217)
Will Mentions Servants	0.250*	0.252*	0.248*	0.766*	0.771*	0.770*
	(0.080)	(0.081)	(0.081)	(0.288)	(0.289)	(0.287)
More Than 2 Heirs		0.046	0.051		0.120	0.145
		(0.073)	(0.074)		(0.192)	(0.196)
Female		-0.041			-0.108	
		(0.065)			(0.171)	
Illiterate		0.007	0.006		0.019	0.011
		(0.033)	(0.033)		(0.088)	(0.091)
Less Skilled Worker			0.214			0.679
			(0.185)			(0.653)
Husbandman			-0.180			-0.516
			(0.143)			(0.393)
Shopkeeper			-0.124			-0.346
			(0.207)			(0.547)
Skilled Craft Worker			-0.040			-0.104
			(0.143)			(0.377)
Widow			-0.034			-0.088
			(0.099)			(0.262)
Yeoman			0.062			0.164
			(0.105)			(0.287)
Constant	0.298*	0.289*	0.305*	-0.532*	-0.554^{+}	-0.522
	(0.070)	(0.105)	(0.126)	(0.194)	(0.284)	(0.339)
Model	Linear	Linear	Linear	Probit	Probit	Probit
Log-Likelihood	-191.25	-190.79	-188.40	-181.85	-181.42	-178.91
R-squared	0.083	0.086	0.101			
N	282	282	282	282	282	282

Robust standard errors in parentheses

* p<0.05, $^{+}$ p<0.1

Table 2: Regression results for the full sample of testators, dependent variable is propensity to split inheritance unequally.

	I With Interaction	II Only Male Testators	III Inequality Between Male Heirs	IV Only Male Heirs	V Conservative Coding
Bequeathed Land	0.099	0.199*	0.137^{+}	0.049	0.270*
	(0.164)	(0.085)	(0.074)	(0.167)	(0.063)
Bequeathed Money	0.164^{+}	0.266*	0.149	0.337^{+}	0.203*
	(0.090)	(0.125)	(0.104)	(0.182)	(0.087)
Land and Money	0.091				
	(0.175)				
Will Mentions Servants	0.249*	0.222*	0.170	0.306^{+}	0.208*
	(0.080)	(0.100)	(0.113)	(0.174)	(0.088)
Constant	0.318*	0.236*	0.378*	0.166	0.305*
	(0.079)	(0.113)	(0.097)	(0.172)	(0.078)
Log-Likelihood	0.084	0.110	0.044	0.118	0.126
R-squared	282	143	176	38	217

Robust standard errors in parentheses

* p<0.05, $^{+}$ p<0.1

Table 3: Robustness Checks: Linear probability model with dependent variable propensity to split inheritance unequally.