Women's Rights and Development

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Abstract

Why has the expansion of women's economic and political rights coincided with economic development? This paper investigates this question, focusing on a key economic right for women: property rights. The basic hypothesis is that the process of development (i.e., capital accumulation and declining fertility) exacerbated the tension in men's conflicting interests as husbands versus fathers, ultimately resolving them in favor of the latter. As husbands, men stood to gain from their privileged position in a patriarchal world whereas, as fathers, they were hurt by a system that afforded few rights to their daughters. The model predicts that declining fertility would hasten reform of women's property rights whereas legal systems that were initially more favorable to women would delay them. The theoretical relationship between capital and the relative attractiveness of reform is non-monotonic but growth inevitably leads to reform. I explore the empirical validity of the theoretical predictions by using cross-state variation in the US in the timing of married women obtaining property and earning rights between 1850 and 1920.

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1 Introduction

The last two hundred years have witnessed a historically unprecedented expansion of women's rights, both economic and political. In almost all industrialized countries, women went from being the property of their husbands and/or their fathers, with very few legal rights, to possessing the same political rights and most of the same economic rights as men.[1] Why did this process occur? And, in particular, why does the spread of women's rights across the globe appear to be correlated with economic development?[2]

The objective of this paper is to shed light on the relationship between women's rights and development by focussing on a fundamental economic right: property rights. Property rights include "the legal rights to acquire, own, sell and transfer property, collect and keep rents, keep one's wages, make contracts, bring lawsuits, and, if seeking divorce, maintain some of the marriage assets and keep control and guardianship of the children."[3] These are rights that married women did not exercise in full either in Europe or in the US until the legal system was reformed. Under most legal systems (e.g. those based on Roman civil law, which influenced most of continental Europe, or those based on English common law, like the majority of US colonies), women who married lost, if not ownership then, at a minimum, control over their physical (inanimate) property. Upon divorce, they lost guardianship over their children as well.

Why did married women eventually obtain property rights in the US and in Europe?[4] Why did men lose some of the advantages of their privileged status? This paper examines the hypothesis that, over time, economic development – by which I mean primarily a process of capital accumulation and declining fertility – altered the balance of male interests regarding women's rights. That is, although men in general benefitted from a patriarchal society in which women enjoyed few economic and political rights, they also suffered from the welfare consequences of such a system for their daughters. My hypothesis is that, at a sufficiently high level of wealth and/or at a sufficiently low level of fertility, a man's conflicting interests from being both a husband and a father (of girls as well as boys) were resolved in favor of the latter. This eventually led men to favor granting women greater economic rights. This argument is examined in a dynamic model and its implications are studied empirically by using variation across US states in the timing of married women's property acts.

The theoretical argument is developed in the context of an economy with endogenous growth in which parents care about their own utility from consumption and the average welfare of their children. In this economy, individuals marry and have children. They then

[1] This process is far from complete globally as is clear from various indices of gender equality (see.e.g. the The Global Gender Gap Report 2007). See Duflo (2005) for a review of the literature on gender and development.

[2] Indices that measure women's (lack of) rights in areas as diverse as access to land, access to bank loans, violence against women, abortion policy, etc., show a robust negative correlation across countries with GDP per capita. See Doepke and Tertilt (2009).

[3] See http://www.womeninworldhistory.com.

[4] Women today do not enjoy full property rights in several parts of the world, both de jure and de facto.

produce, consume, and bequeath capital to their children. At each time period, one can compare men's welfare under two systems of property rights. Under a patriarchal system in which married women have no property rights (also denoted the "no rights" regime), the allocation decisions are made entirely by the husband and he obtains, loosely speaking, all the surplus from the marriage. In an economy where women have the same property rights as men (also known at the "equal property rights" regime), the allocation weighs the welfare of both spouses equally.

The theory yields three main predictions. First, it predicts that growth will eventually lead men to prefer the equal rights regime over the patriarchal one. Male preferences over the two regimes will not be, however, a monotonic function of wealth (or capital stock). Starting at a low level of wealth, greater wealth first increases the relative attractiveness of the no-rights regime. Once wealth is above some critical threshold, further increases will decrease the attractiveness of the patriarchal system. Second, the theory predicts that lower fertility will lead to earlier regime change. Thus, ceteris paribus, states with lower fertility should reform their property regime sooner. Third, it predicts that states with legal regimes that are initially more favorable to married women, perhaps surprisingly, should see property rights reform happen later.

The main intuition delivered by the model relies on the asymmetric effect that growing wealth or falling fertility has on the welfare of sons versus daughters. Under the patriarchal regime, both factors improve the welfare of sons more than the welfare of daughters. This is due to the patriarchal system, in effect, imposing a tax on a father's efforts to increase his daughter's welfare. Greater bequests do not increase a daughter's welfare by the same proportion as a son's welfare, since in the case of the former, the benefits from larger bequests are captured primarily by the husband (i.e., by the father's son-in-law). As household wealth increases, the disparity in sons' versus daughters' welfare does as well, exacerbating the welfare cost of the patriarchal regime relative to a system of equal property rights. At some critical level of wealth or fertility, a father is better off sacrificing the consumption benefits he obtains from being selfish with his wife in order to ensure that his sons-in-laws are forced to be generous towards his daughters.

The empirical investigation uses variation across US states in the timing of property rights reform and other key variables. Beginning in the 1840s, US states and territories reformed the laws governing married women's ownership and control of (real and personal) property and earnings. I use Geddes and Lueck's (2002) dating to determine when property acts gave women management and control of their separate estate and earnings. This was a relatively lengthy process beginning with Massachusetts in 1846 and (for the purposes of this analysis) ending in 1920, with all but four out of 48 states having granted these rights by then.

I find that two key predictions of the model are consistent with the data. I show that, ceteris paribus, states with higher "survival-fertility" tended to reform later.[5] Since fertility is an endogenous variable, I also proxy it with child mortality as this allows one to rule out some alternative channels of transmission. The results are robust to the use of this proxy. In addition, as implied by the theory, I find that states with a legal system that was initially

[5] I create a measure of the relevant fertility variable (which I denote "survival fertility") by considering only children above the age of 10 as during this time period there was a high degree of child mortality.

relatively more favorable to women (those with a system of community law) tended to reform their property laws later. The effect of per-capita wealth on the timing of reform, on the other hand, is almost always insignificant. As discussed in the paper, this may well reflect the fact that this theoretical prediction (unlike the other two) is sensitive to the mechanism used to aggregate heterogeneous preferences. All the results are robust to year and state (or regional) fixed effects.

The paper is organized as follows. The next section presents a literature review of the main work in this area followed by some historical background on married women's property rights in the US in the 1800s. Section 3 presents the model, derives the main theoretical results, and discusses the roles of the various assumptions and extensions of the model. Section 4 examines the empirical evidence regarding the relationship between women's property laws between 1850-1920 in the US and state levels of per-capita wealth, survival-fertility, and different legal systems using a variety of estimation methods. Section 5 concludes. An Appendix collects the proofs and presents some moments of the data.

2 Literature and History

In this section I present a review of the literature in this area and a brief historical overview of married women's property rights.

2.1 Literature Review

There is a growing literature that investigates why rights were extended to various segments of society. The general idea that an elite may give up some of its privileges to improve its own welfare can be found in several contexts such as suffrage, slavery, and children's rights, although for reasons unrelated to the ones developed here. For example, the literature on franchise extension mostly argues that suffrage rights were conceded because it became in the self-interest of those in power to do so (see, e.g., Justman and Gradstein (1999), Lizzeri and Persico (2004), Llavador and Oxoby (2005), or Ticchi and Vindigni (2006)).[6] For the interesting case of women's suffrage, a recent paper by Bertocchi (2008) develops the hypothesis that men granted women the vote once industrialization and the ensuing narrower gender wage-gap rendered gender preferences over taxation more similar.[7] There is also a debate as to whether slavery was abolished because it was inefficient and thus no longer in the interests of land-owners (see, e.g. Fogel and Engerman (1974) or Wright (2006)). Other rights, such as education or the prohibition of child labor, have also been studied. Galor and Moav (2006), for example, develop the thesis that educational reform (universal public education) was in the interest of both capitalists and workers and Doepke and Zilibotti (2005) argue that child labor laws became in the interest of working families as their fertility declined.

More closely related to the present paper, the two papers that studied why women obtained economic rights – Geddes and Lueck (2002) and Doepke and Tertilt (2009) – also share the

[6] There are also papers that focus on the threats of revolution or violence (see, e.g., Acemoglu and Robinson (2000) or Jack and Lagunoff (2003)). See the review by Przeworski (2006).

[7] See, e.g., Edlund and Pande (2002) for evidence on the existence of a gender gap in voting behavior.

premise that men granted women rights because it was in the former's self interest. Geddes and Lueck's theoretical reasoning is similar to the economic argument made for the abolition of slavery: they argue that married women's inability to own and control property (including earnings) produced suboptimal effort on their part and that this inefficiency increased with greater capital. The fact that white married women in the US during the second half of the 1800s did not work outside the home renders this argument less persuasive, however.[8] The main contribution of their paper, along with an earlier study by Kahn (1996), however, lies in its use of variation in the timing of when US states granted married women the right to own and control separate estates and earnings.[9] The empirical portion of my paper builds on these important contributions.

Doepke and Tertilt (2009) present a very interesting theoretical analysis regarding women's economic rights that relies on two key ingredients: inefficient investment in children and gender differences in preferences. They assume that the marriage market matches people purely at random and that children are public goods. This necessarily leads to inefficiently low investment in children (in their case, in the form of human capital), as there is no "price" mechanism (i.e. no competition) that allows the marriage market to internalize the utility of the child's future spouse from higher investment. This is a standard result in the marriage literature. The twist comes from the assumption that women discount the welfare of their children less than men do. This implies that if the return to time spent educating children is sufficiently high, men will be better off allowing women to have a greater say in deciding a child's level of education as this ameliorates the investment inefficiency. The authors interpret this result as increasing the incentives that men had to grant women greater rights as these would presumably increase women's bargaining power and thus their ability to influence investment in children. A possible objection, however, is that if this were the main reason to extend rights, it would have been easier and more advantageous for men to simply mandate a higher level of education for all, i.e., compulsory schooling, which in fact also happened over this time period.[10]

The argument developed in the present paper does not require inefficiencies arising either from production or from the marriage market nor does it rely on exogenous gender differences in preferences, which is not to say that these factors did not play a role in the extension of women's rights. Instead, it rests upon the implicit tax fathers faced under a patriarchal system when they attempted to make their daughters better off. It is reassuring, therefore, for the mechanism proposed by this paper that there exists recent evidence showing that daughters influence fathers' legal and political preferences.[11] In particular, two interesting recent papers (Washington (2008) and Oswald and Podthavee (2006)) show that voting preferences and behavior are influenced by the proportion of one's children that are girls.

Washington (2008) uses voting records from the US Congress in 1997-98 and finds that,

[8] As calculated in Fernández (2008), for example, in 1880 the labor force participation of white married women in the US between the ages of 30-40 was below 3% and rose very slowly over the following 4-5 decades.

[9] Kahn investigated the effect of the reforms of women's property rights on women's patenting activity.

[10] The authors are aware of this and develop an extension of their model in which parents and schools are complements in the production of human capital. In this extension, an increase in the return to human capital can make increasing both inputs more attractive.

[11] See Lundberg (2005) for an excellent review of the literature on sons, daughters, and parental preferences.

conditional on the total number of children, a US Congressional Representative is more likely to vote liberally on women's issues the greater the proportion of female children she/he has. Oswald and Podthavee (2006) use the British Household Panel Study data to examine preferences towards political parties in the UK. They find that, for a constant family size, parents with more girls have more "left" wing preferences (i.e., are more likely to identify with voting for either the Labor or Liberal Party). In the model presented here, it will also be the case that a father with more daughters would, ceteris paribus, show a greater preference for women's rights.[12]

2.2 Married Women's Property Laws in 19th Century US

The British colonies based their laws on English common law which, as summarized in the Blackstone Commentaries, stated:

> By marriage, the husband and wife are one person in law: that is, the very being or legal existence of the woman is suspended during the marriage, or at least is incorporated and consolidated into that of the husband; under whose wing, protection, and cover, she performs every thing; and is therefore called in our law-a *feme-covert*.[13]

Under nineteenth century common law, a married woman was bound by the rules of coverture which, as seen above, vested her legal rights in her husband. Upon marriage, a woman's personal possessions became her husband's and he could dispose of them in any way he wished during his lifetime or in his will. He was, in general, also entitled to all the personal property his wife might acquire during the marriage. Although her real property remained under her ownership, the profits from these went to the husband. Furthermore, the husband had the right to manage her land. Thus, a husband controlled his wife's property and earnings (whether from labor or from land). Furthermore, married women were not permitted to enter into contracts without the consent of their husbands nor allowed to engage in trade on their own account as "sole traders". Even children were allocated to their father in the (rare) case of divorce. After 1830, US states began to pass legislation that revised these restrictions. Between then and 1920 there was a large increase in women's rights.[14]

Some of the initial revisions of the law of coverture were in response to the Panic of 1837 and the ensuing depression, particularly in the South.[15] These laws mainly attempted to shield a married woman's property (including slaves) from her husband's creditors. This factor does not explain why the laws evolved over time to allow women to own and control separate property, to write contracts, to own and control their earnings, or to maintain custody over their children. The excellent legal studies literature in this field (e.g., Basch (1982), Chused (1983,1985), Salmon (1986), Shammas (2002), and Warbasse (1987)) discusses multiple causes that range from the desire for codification, the heightened awareness of the similarity in legal

[12] See the extension to a stochastic number of female relative to male children in Section 3.5.

[13] From Blackstone (1765-69), Book 1, Chap. 15., p. 431.

[14] See Doepke and Tertilt (2009) for a review of the expansion of some of these rights in the US and England.

[15] Mississippi was the first state to pass a married women's property act in 1839.

position of slaves and married women, the greater status of women arising from their growing responsibilities in the domestic sphere, the burgeoning feminist movement, and paternalism. While these may have all played a role, an important question is why did they become critical in the mid to late 1800s rather than earlier or later?

Paternalism is the reason given for reform in this paper in the sense that men's concerns about their daughters' welfare is the key factor that, in combination with economic development, gives rise to women being granted property rights.[16] In light of this, it is interesting to note that in the popular rhetoric of this period, paternalism appears repeatedly. Legislators, for example, would raise the "specter of drunken husbands" to gain passage of married women's property acts. In Warbasse's (1987) discussion of New York's experience, she concludes: "Final passage became assured only when conservatives, convinced that a married women's property acts held definite benefits for their own wives and daughters, dropped their talk of separate interests and family disharmony."[17] The contribution of this paper is to provide an explanation for why paternal concern for a daughter's welfare, presumably always present, finally overcame the benefits associated with man's privileged status in a patriarchal system. As will be shown, a process of capital accumulation and declining fertility eventually realigned a man's interests to favor his daughter.

3 The Model

Below I present a simple dynamic model and use it to study how growth, fertility, and legal regimes that are relatively more favorable to women affect male preferences towards a patriarchal system relative to one in which women have equal property rights. I do not model the intricate legal system that governed the ability to bequeath, the inheritance rights in the case of a spouse's death (dower and curtesy), the differences between the treatment of real and personal property, or the consequences of divorce. Instead, I simplify matters by assuming that the issue is one of control over the allocation of property income, for consumption or for bequests. While this is a considerable abstraction, it hopefully serves to clarify some of the basic implications of the two property systems.

3.1 The Basic Framework

The economy consists of married households composed of a man (the husband h), a woman (the wife w), and their $2n$ children (consisting of n boys and n girls). Throughout the analysis I will keep fertility exogenous and examine how changes in its level affect the relative attractiveness of the two regimes. This assumption makes the model analytically tractable but should not otherwise affect the conclusions. In particular, in a model with endogenous fertility one could still examine the comparative static properties of variables that change desired

[16] Furthermore, as will be made clear in section 3.5, the type of paternalism required by the theory is straightforward. In particular, fathers need not care about their grandchildren via their daughter's utility function as in Doepke and Tertilt (2009) – it is sufficient that they care about their daughter's utility from consumption.

[17] Warbasse (1987, p. 229).

fertility (e.g., by modifying an exogenous component of the cost associated with fertility, such as urbanization).

Individuals have log preferences over the consumption good c and also care about the average welfare of their children. Maximization of a concave utility function implies that all sons will obtain the same utility, U_h'; similarly, all daughters will obtain the same utility, U_w'. The welfare of daughters relative to sons, however, will depend on the property rights regime. Note that a prime $'$ is used to denote variables for the next generation and thus that if U_h, for example, is the husband's utility then U_h' is the utility of his son (himself a future husband). The average welfare of children is thus $\frac{nU_h'+nU_w'}{2n} = \frac{U_h'+U_w'}{2}$ and an individual's utility, U_i, can be written as:

$$U_i\left(c_i, U_h', U_w'\right) = \log(c_i) + \beta\left(\frac{U_h' + U_w'}{2}\right), \qquad 0 < \beta < 1 \tag{1}$$

for $i = h, w$.

Households start out with some inherited capital or property k (these terms will be used interchangeably) which is used to produce output of a single good. The production is assumed to be $Ak, A > 1$. The output is then allocated between consumption of the husband, c_h, the wife, c_w, and inheritances k_i', $i = h, w$, for each son (h) or daughter (w). Once bequests are allocated, sons and daughters enter the marriage market and find a spouse.

The rules governing the household-allocation decision depend upon the property rights regime. Under a patriarchal regime in which women have no property rights (also denoted NR for "no rights"), all the decision power is assumed to rest with the husband. Under the equal property rights regime (also denoted ER for "equal rights"), on the other hand, women and men jointly own and control marital property. To simplify matters, rather than explicitly introduce household bargaining in the model, I assume that the final allocation maximizes the equally weighted sum of the two spouses' utilities. A discussion of this is postponed to the relevant section.

The Marriage Market

Before proceeding to derive the equilibrium allocations under each regime, it is important to specify how spousal matches are formed and what kind of contracts individuals can write. As in most of the literature on marriage we make the (realistic in this historical context) assumption that parents cannot make match-specific bequests, i.e., that parents are unable to write contracts specifying bequests contingent on the amount of capital that the future spouse inherits. This is captured in the timing since bequests precede marriage. Thus, all investments in children are ex-ante.

Will investment in children be efficient? This depends on the specific assumption made about the marriage market. One extreme assumption is random matching. This assumption guarantees inefficiently low investment in children as there is no mechanism that forces parents to internalize the future spouse's welfare gains from investment in the child. At the opposite end of the spectrum, if marriage is modeled as a process of costless search in a large market (as in Peters and Siow (2002) or Iyigun and Walsh (2007a)), there always exists an efficient equilibrium. In particular, perfect competition for spouses implies that the externalities associated with investment in a child are internalized by the return to this investment (in terms of a spouse's characteristics) in the marriage market.

I will assume throughout that the marriage market is perfectly competitive and solve for the efficient equilibrium. This simplifies the algebra and clarifies the mechanism driving the results in the paper by not introducing another source of inefficiency. It is worth noting, however, that the exact matching environment is not critical; the results go through with random matching as well. I will also assume throughout that consumption is not contractable – a reasonable assumption given the difficulty in monitoring this activity. Thus, children receive bequests and then obtain a spouse in a large competitive marriage market knowing that allocation decisions will be made according to the property rights regime that is in place.

An equilibrium in the marriage market consists of assignment of men to women (or vice versa) including the null assignment (i.e. a woman is not assigned to a man or vice versa – they remain single) such that there does not exist a pair of individuals or a single individual that can, by breaking their current assignments (including being single), make themselves better off (with at least one of them strictly better off). We next turn to deriving the equilibrium under each regime.

3.2 Equilibrium Under No Property Rights (NR)

A household begins its married life with an endowment of (inherited) capital for the husband k_h and an endowment for his wife, $\widetilde{k}_h$, where $\tilde{k}_i$ denotes the capital brought to the household by i's spouse, $i = h, w$ (equivalently, married life begins with the capital brought in by the wife, k_w, and the capital endowment of her husband, $\tilde{k}_w$). In the patriarchal (i.e., NR) regime the husband controls the allocation of the income derived from the total capital endowment $k = k_h + \widetilde{k}_h$.

I assume that husbands must guarantee their wives a minimum consumption level $c_w = \underline{c} > 0$. Thus, the husband maximizes (1) subject to:

$$Ak \geq c_h + \underline{c} + nk'_h + nk'_w \tag{2}$$

As noted previously, we solve for the efficient level of investment in children. An easy way to do this is to write the maximization problem *as if* siblings married one another since, in that case, parental investment decisions would internalize both the child's and child's spouse's welfare.[18]

Thus, the value functions V_i must satisfy the recursive relationships:

$$V_h(k_h, \widetilde{k}_h) = \underset{c_h, k'_h, k'_w}{Max} \left\{ \log c_h + \frac{\beta}{2} \left[V_h(k'_h, k'_w) + V_w(k'_w, k'_h) \right] \right\} \tag{3}$$

$$V_w(k_w, \tilde{k}_w) = \log \underline{c} + \frac{\beta}{2} \left[V_h(k'_h, k'_w) + V_w(k'_w, k'_h) \right] \tag{4}$$

where V' has been written as a function of both the investment in a son, k'_h, and in a daughter, k'_w, rather than in a non-related spouse, $\widetilde{k}'_i$, as a way to solve for the efficient equilibrium.

[18] NB: This is a way to solve for the equilibrium allocation of capital; it is *not* a description of the marriage market.

Lemma 1 *The husband's and wife's value functions under the NR regime are log-linear in* $k - \frac{\underline{c}}{A-n}$ *(where* k *is the household's total capital endowment) and take the forms:*[19]

$$V_h^{NR}(k) = a_h + \frac{1-\frac{\beta}{2}}{1-\beta}\log\left(k - \frac{\underline{c}}{A-n}\right) \quad (5)$$

$$V_w^{NR}(k) = a_w + \frac{\frac{\beta}{2}}{1-\beta}\log\left(k - \frac{\underline{c}}{A-n}\right) \quad (6)$$

where

$$a_h = \frac{\left(1-\frac{\beta}{2}\right)\log\frac{A(1-\beta)}{\left(1-\frac{\beta}{2}\right)} + \frac{\beta}{2}\log\underline{c} + \frac{\beta/2}{(1-\beta)}\log\left(\frac{A}{n}\frac{\beta/2}{\left(1-\frac{\beta}{2}\right)}\right)}{(1-\beta)} \quad (7)$$

and

$$a_w = \frac{\frac{\beta}{2}\log\frac{A(1-\beta)}{\left(1-\frac{\beta}{2}\right)} + \left(1-\frac{\beta}{2}\right)\log\underline{c} + \frac{\beta/2}{(1-\beta)}\log\left(\frac{A}{n}\frac{\beta/2}{\left(1-\frac{\beta}{2}\right)}\right)}{(1-\beta)} \quad (8)$$

(the NR superscript denotes the NR regime).
Proof. See the Appendix.|| ■

Returning to the husband's maximization problem and using (5) and (6) yields the first-order condition:[20]

$$-\frac{n}{Ak - \underline{c} - nk'} + \frac{\frac{\beta}{2}}{(1-\beta)}\frac{1}{k' - \frac{\underline{c}}{A-n}} = 0 \quad (9)$$

where $k = k_h + k_w$ and $k' = k_h' + k_w'$. Solving for the husband's consumption and k' yields:

$$c_h^{NR} = \frac{(1-\beta)}{1-\frac{\beta}{2}}A\left(k - \frac{\underline{c}}{A-n}\right) \quad (10)$$

and

$$k_{NR}^{'} = \frac{\frac{\beta}{2}(Ak - \underline{c}) + (1-\beta)\frac{n\underline{c}}{A-n}}{n\left(1-\frac{\beta}{2}\right)} \quad (11)$$

Note that we cannot solve for k_h' and k_w' separately given that under NR individual welfare depends only the total sum of household capital. k' is uniquely determined, however, and it is the only economically relevant variable as, given the allocation rule (NR), it is the only variable that determines welfare.[21] A division of k' into k_h' and k_w' is sustained by the strategies of each type: an individual of type i, $i = w, h$, is willing to marry another individual iff that agent's

[19] We will impose conditions such that the value function is well defined.

[20] The same first-order condition is obtained for k_h' and k_w'.

[21] Note that the multiplicity is only in the division of k' into that which is bequeathed to sons versus daughters. Neither consumption nor welfare is affected by this source of multiplicity and hence we ignore it.

bequest is no smaller that k'_{-i}.[22] Thus if, for example, bequests are given equally to sons and daughters, all men have the strategy to only marry women with $k'_w \geq \frac{k'_{NR}}{2}$, where k'_{NR} satisfies (11). A similar strategy – to only marry men with $k'_h \geq \frac{k'_{NR}}{2}$ – is held by women. Note that although women's consumption does not depend on either their own or their husband's wealth, their welfare is nonetheless an increasing function of the level of household capital as it increases their children's welfare.[23]

Before proceeding to characterize the equilibrium under equal rights, it is important to place some restrictions on the parameters of the model. First, to ensure that the husband is at least as well off as his wife we will require:

$$c_h^{NR} > \underline{c} \tag{12}$$

This assumption makes sense as this is a patriarchal system. This requires the economy to be sufficiently wealthy (or equivalently, that $\underline{c}$ be small enough), something that we will assume that the *initial* condition of the economy satisfies. Using (10), this yields condition $A1$:

$$A1: \qquad k_0 > \frac{\underline{c}}{A}\left(\frac{1-\frac{\beta}{2}}{1-\beta} + \frac{A}{A-n}\right) \tag{13}$$

as a necessary and sufficient condition.

In order for equation (12) to hold at all points in time requires $k_t > \frac{\underline{c}}{A}\left(\frac{1-\frac{\beta}{2}}{1-\beta} + \frac{A}{A-n}\right)$. A sufficient condition, given $A1$, is for the economy to grow over time (which was the case for the historical period of interest). This requires:

$$k'_{NR} > k_{NR} \tag{14}$$

Using (11), the necessary and sufficient condition for (14) to hold, given $A1$, is given by condition $A2$ below:

$$A2: \qquad A > \frac{\left(1-\frac{\beta}{2}\right)}{\frac{\beta}{2}} n \tag{15}$$

Thus, the economy must be sufficiently productive relative to the growth rate of the population. Note that $A2$ will always hold for A sufficiently high. We henceforth assume that the economy satisfies $A1$ and $A2$.

It is worth making a few remarks at this point. First, given $A1$ and $A2$, the value functions V_j^{NR}, $j = h, w$, given in (5) and (6) are well-defined since these conditions ensure $(A-n)\,k - \underline{c} > 0$.[24] Second, V_j^{NR} is concave. Third, this economy exhibits endogenous growth.

[22] We are assuming throughout that the equilibrium welfare from marriage exceeds that of being single (which is easy to ensure by adding a constant to the welfare from marriage).

[23] See Gall, Legros, and Newman (2009) for a more general discussion of when efficiency obtains in models with non-transferable utility.

[24] To see this right away, note that if a father with capital k were to bequeath each son-daughter pair $k' = k$ as well, this would yield him consumption $c_h = Ak - nk - \underline{c}$ This expression must be positive since, by $A2$, $k' > k$ and by $A1$, $c_h > \underline{c}$.

3.3 Equilibrium Under Equal Property Rights (ER)

Under the ER regime husbands and wives are assumed to jointly own and control marital property and the equilibrium allocation is assumed to maximize the equally weighted sum of both spouses' utilities. Thus, the solution must satisfy:

$$\begin{aligned} V_h(k_h, k_w) + V_w(k_w, k_h) &= \underset{c_h, c_w, k'_h, k'_w}{Max} \{\log c_h + \log c_w + \beta [V_h(k'_h, k'_w) + V_w(k'_w, k'_h)]\} \quad (16) \\ & s.t. \quad A(k_h + k_w) - c_h - c_w - n(k'_h + k'_w) \geq 0 \end{aligned}$$

Note that the weight placed on future generations' welfare in (16) is twice that in the NR regime as the allocation maximizes the sum of the husband's and wife's utility as opposed to only the husband's. On the other hand, the wife's consumption is no longer a constant and instead the allocation must maximize the sum of the log consumptions in addition to the continuation value. As before, in order to solve for the efficient investment in children, the value functions are written as if siblings married one another.

Lemma 2 *The husband's and wife's value functions under the ER regime are equal and log-linear in k (where k is the sum of each spouse's capital endowment) and take the form:*

$$V_h^{ER}(k) = V_w^{ER}(k) = \phi + \frac{1}{1-\beta} \log k \quad (17)$$

where

$$\phi = \frac{\log (1-\beta) \frac{A}{2} + \frac{\beta}{(1-\beta)} \log \beta \frac{A}{n}}{(1-\beta)} \quad (18)$$

Proof. See the Appendix.|| ∎

Returning to the maximization problem in (16), and substituting (17) for V'_h and V'_w, yields the first-order conditions:

$$-\frac{n}{Ak - c_w - nk'} + \frac{2\beta}{(1-\beta)} \frac{1}{k'} = 0 \quad (19)$$

and

$$-\frac{1}{c_h} + \frac{1}{c_w} = 0 \quad (20)$$

where $k = k_h + k_w$ and $k' = k'_h + k'_w$.

Solving for consumption and k' yields:.

$$c_h^{ER} = c_w^{ER} = \frac{1-\beta}{2} Ak \quad (21)$$

and

$$k'_{ER} = \beta \frac{Ak}{n} \quad (22)$$

Note that, as in the NR regime, only the aggregate bequest left to a household by the parents and parents-in-law is determined, rather than the separate amounts. In this case, the multiplicity arises because under ER allocation rules, only the total amount of household capital affects outcomes, rather than how this is divided initially between spouses. As before, all variables of interest (consumption, investment or individual welfare) depend only on the aggregate level of household capital. The strategies that sustain this equilibrium are analogous to the ones for the NR regime. If, for example, bequests are given equally to sons and daughters, all men have the strategy to only marry women with $k_w' \geq \frac{k_{ER}'}{2}$, where k_{ER}' satisfies (22). A similar strategy – to only marry men with $k_h' \geq \frac{k_{ER}'}{2}$ – is held by women. Also note that the equilibrium for this economy is the same as that obtained in the usual Ak growth model with infinitely lived individuals except that consumption is shared between two individuals – the spouses – (hence the 2 in (19)) and the capital bequest is divided among n households.

We can also require that this economy grow over time, as we did for the NR regime, i.e.,

$$k_{ER}' > k_{ER} \tag{23}$$

Using (22), the necessary and sufficient condition for (23) to hold is given by:

$$A > \frac{1}{\beta} n \tag{24}$$

but this condition is not binding given $A2$.

3.4 Growth, Fertility, and Regime Change

This section analyzes the circumstances under which men would prefer the ER over the NR regime. Rather than introduce a full-fledged political economy model, we ask the question: if men faced a once-and-for-all choice between the patriarchal regime or switching to the equal rights regime, which regime would they prefer? This is equivalent to asking whether $V_h^{ER}(k)$ is greater than $V_h^{NR}(k)$. This framing eliminates any strategic considerations by limiting the choice to one of electing between patriarchy forever or switching right away to the ER regime. It would be easy to modify the model, however, and allow each generation to face the option of switching or postponing the choice to the following generation (as in Acemoglu and Robinson (2000,2001)).[25] This would preserve the comparative static results presented in the three key propositions of this section.

It is useful to start by summarizing the allocation differences across regimes in a lemma.

Lemma 3 *(i)* $c_h^{NR} > c_h^{ER}$; *(ii)* $c_w^{NR} < c_w^{ER}$; *(iii)* $k_{NR}' < k_{ER}'$.

Proof. These follow directly from comparing equations (21) and (10), and (22) and (11).|| ■

Thus, not surprisingly, a husband's consumption is higher whereas his wife's consumption is lower under NR relative to ER. Capital accumulation (growth) is higher under ER. There are two opposing forces determining the latter. On the one hand, the value of an additional unit of investment in a child's household (for any given level of k') is higher under ER than

[25] An easy way to modify the model is to assume that it takes a period to implement the reform. This would prevent each generation from prefering to postpone voting in favor of the reform and having the next generation carry it out.

under NR since the marginal unit will benefit equally one's daughter and one's son. That is, the implicit tax faced by a father trying to make a girl better off under NR is absent as an additional unit of capital increases a daughter's consumption utility directly rather than only indirectly via her children's welfare. On the other hand, the desire to bequeath is lower under ER as, ceteris paribus, a man's consumption is smaller (since both spouses now consume equally), rendering the marginal utility of consumption higher.

We next turn to the first of our three main propositions. In this proposition we establish that the reform of the property rights regime will happen in finite time and characterize how a man's utility differential across regimes changes over time.

A few preliminary definitions. Henceforth, we will use $\Delta V_h(k)$ to denote the difference in men's welfare in the NR versus ER regime at a capital stock of k, i.e.,

$$\Delta V_h(k) \equiv V_h^{NR}(k) - V_h^{ER}(k)$$

Since the patriarchal system is supposed to be in men's advantage, we will henceforth restrict our attention to initial values of the capital stock, k_0, such that $\Delta V_h(k_0) > 0$, i.e., men start out strictly preferring the NR regime.[26]

It will also be useful to define two levels of k. In particular, let $\widehat{k}$ be defined as:

$$\widehat{k} = \frac{2}{\beta} \frac{\bar{c}}{A-n} \tag{25}$$

and define k^* as:

$$\Delta V_h(k^*) = 0 \tag{26}$$

Proposition 1 *(Wealth):* ***i.*** *$\forall k < \widehat{k}$, $\Delta V_h(k)$ is increasing in k; $\forall k > \widehat{k}$, $\Delta V_h(k)$ is decreasing in k.* ***ii.*** *Reform happens in finite time, i.e., $\exists\ k^*$, $\widehat{k} < k^* < \infty$, such that $\forall k > k^*$, men strictly prefer the ER to the NR regime.*

Proof. i. Taking the derivative of $\Delta V_h(k)$ with respect to k yields the necessary and sufficient condition below to ensure that the derivative is positive:

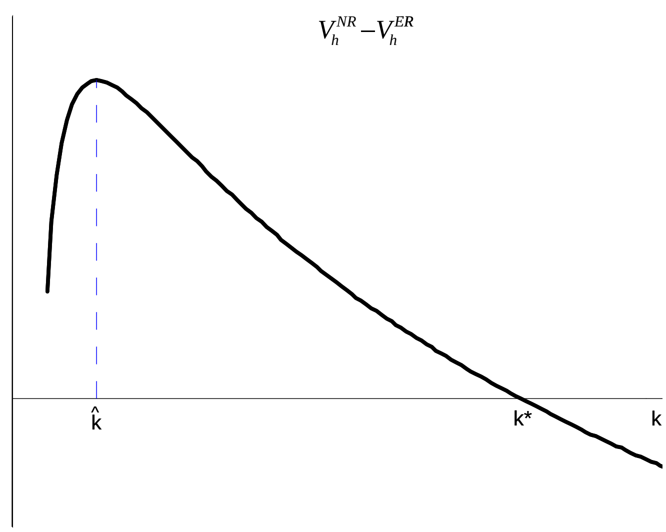
$$k < \frac{2\underline{c}}{\beta(A-n)} = \widehat{k} \tag{27}$$

ii. To show that eventually there will be a reform of property rights, note that we can write $\Delta V_h(k)$ as $a_h - \phi + \frac{1-\frac{\beta}{2}}{1-\beta} \log\left(k - \frac{c}{A-n}\right) - \frac{1}{1-\beta} \log k$. Taking the limit as k goes to infinity (which is valid as the capital stock does not converge in this model) yields $\lim_{k \rightharpoonup \infty} \Delta V_h = a_h - \phi + \left(\frac{1-\frac{\beta}{2}}{1-\beta} - \frac{1}{1-\beta}\right) \lim_{k \rightharpoonup \infty} \log k + \left(\frac{1-\frac{\beta}{2}}{1-\beta}\right) \lim_{k \rightharpoonup \infty} \log\left(1 - \frac{c}{(A-n)k}\right) = -\infty$. Thus, reform will happen at some finite k, henceforth denoted $k^*(n)$. Note that since $\widehat{k} < k^*$, (i) implies that once the reform is passed, it will never be overturned.|| ■

[26] Note that modifying the utility function to include an endowment of a household good z so that $U_i = u(z_i) + \log c + \beta\left(\frac{U_h' + U_w'}{2}\right)$, $z_w + z_h = z$, guarantees $V_h^{NR}(k) > V_h^{ER}(k)$ for z sufficiently large. Under the NR regime, the husband would set $z_h = z$, whereas under ER, $z_h = z_w = z/2$.

Thus, the path of $\Delta V_h(k)$ is as depicted in Figure 1. The intuition for this shape is as follows. At low levels of income (i.e., low k), consumption is relatively low. Hence, increases in the capital stock have a relatively large impact on a husband's welfare in the NR regime since the marginal utility of consumption is high and the consumption is not shared with his wife. In the ER regime, on the other hand, although the marginal utility of consumption is even higher (since the husband's consumption is lower), any additional income used for consumption is shared with the man's wife. Hence there is a range of k where the relative attractiveness of the NR regime is increasing.[27] Once k is greater than $\widehat{k}$ however, this is no longer the case. At that point, a man would be better off sacrificing some of his own consumption in favor of his wife's if his sons-in-law agreed to do the same vis a vis their spouses. This is a contract he cannot enforce, however. Thus, for $k > \widehat{k}$, the relative attractiveness of the NR regime is decreasing in k. For k sufficiently large, i.e., for all $k > k^*$, a man would be better off under the ER regime, where k^* satisfies (26).

Figure 1



We next establish a relationship between fertility, the relative attractiveness of the two regimes, and the timing of reform.

Proposition 2 *(Fertility):* ***i.*** *For any level of household wealth k, there exists a critical value of fertility, $n^*(k)$, such that $\forall\ n \in (0, n^*(k))$, men strictly prefer the ER to the NR regime.* ***ii.*** *Reform happens sooner if n is lower.*

[27] This can also be seen by taking the partial derivative of $\log c_h^{NR} - \log c_h^{ER}$ with respect to k (which, by the envelope theorem, equals $\frac{d\Delta V_h}{dk}$).

Proof. i. We start by showing that $\Delta V_h(k;n)$ is increasing in n. Taking the derivative with respect to n yields $\frac{d\Delta V_h(k;n)}{dn} = \frac{\frac{\beta}{2}}{(1-\beta)^2}\frac{1}{n} - \frac{1-\frac{\beta}{2}}{1-\beta}\frac{\underline{c}}{(A-n)((A-n)k-\underline{c})}$. For this to be positive requires:

$$(A-n)\left((A-n)k-\underline{c}\right) > \frac{(1-\beta)(1-\frac{\beta}{2})}{\beta/2}n\underline{c} \tag{28}$$

By $A1$ and $A2$, $(A-n)k-\underline{c} > Ak-nk'-\underline{c} = c_h > \underline{c}$. Thus, (28) holds iff $(A-n)\underline{c} \geq \frac{(1-\beta)(1-\frac{\beta}{2})}{\beta/2}n\underline{c}$ or

$$\frac{\beta}{2}A \geq \left(1-\beta\left(1-\frac{\beta}{2}\right)\right)n$$

As the RHS of this expression is increasing in n, we can substitute for n with its highest value as implied by $A2$. This yields the condition $1-\frac{\beta}{2} \geq \frac{1}{2}$, which holds $\forall \beta \in [0,1]$.

Next, we show that $\lim_{n\longrightarrow 0}\Delta V_h(k;n) = \gamma + \lim_{n\longrightarrow 0}\left(\frac{\beta/2}{(1-\beta)^2}\log n + \frac{1-\frac{\beta}{2}}{1-\beta}\log\left(k-\frac{\underline{c}}{A-n}\right)\right) = -\infty$ $\forall k > k_0$, (where γ is a finite constant). Thus, the ER regime dominates the NR regime at a low enough level of fertility. Lastly, we can solve for $n^*(k)$ by solving:

$$\Delta V_h(k;n^*) = 0 \tag{29}$$

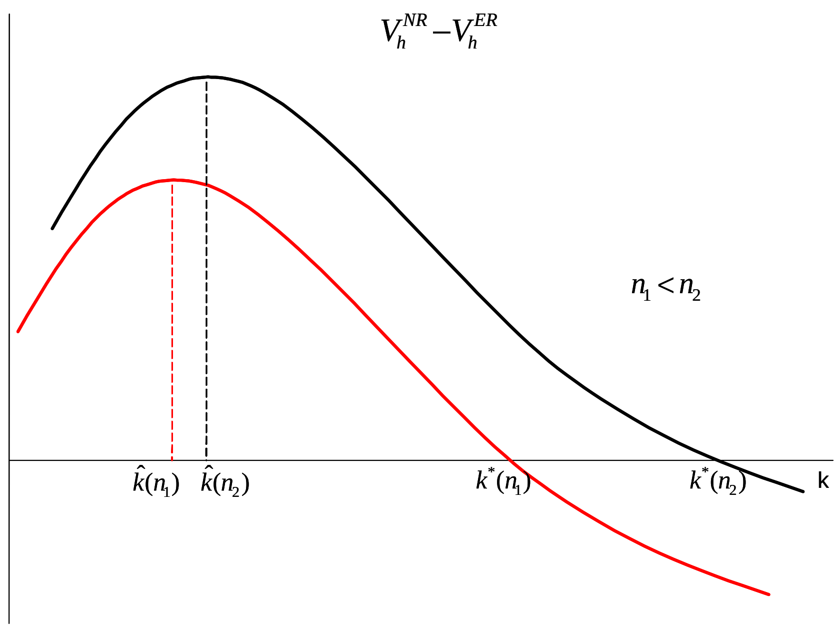
which by the first part of this proposition must be unique.

ii. To show that reform happens sooner when fertility is lower, it is sufficient to show that k^* is an increasing function of n and that k'_{NR} is a decreasing function of n (i.e., it takes a higher level of the capital stock in order for men to be indifferent and the growth rate of the economy is slower). Using the implicit function rule on (26) yields $\frac{dk^*}{dn} = -\frac{\partial\Delta V_h/\partial n}{\partial\Delta V_h/\partial k}$. Note that in (i) we established that $\Delta V_h(k;n)$ is an increasing function of n and, from Proposition 1, we have that $\Delta V_h(k,n)$ is a decreasing function of k, $\forall k > \widehat{k}(n)$. Since $k^* > \widehat{k}$, it follows that $\frac{dk^*}{dn} > 0$. Next, differentiating k'_{NR} with respect to n yields, after some manipulation and using $A2$, $\frac{dk'}{dn} < 0$.|| ■

The proposition above establishes that the reform of women's property rights will happen earlier if fertility is lower. This effect can be seen graphically in Figure 2. The effect of a decrease in n is to decrease both $\widehat{k}$ (the point at which the welfare differential becomes decreasing in k) and k^* (the point at which men are indifferent between the two regimes), and to accelerate the pace of investment, leading reform to occur sooner.

The conclusion above follows from the concavity of the utility function over own and children's consumptions. As fertility decreases, the amount bequeathed to each household will increase. Under NR, this increases a son's welfare both by increasing his consumption and by increasing the welfare of his offspring. The welfare of a daughter, on the other hand, only increases because of the second channel. Thus, although the welfare of both sons and daughters increases, so does the disparity in their welfare levels. In particular, the difference between $\log c_h$ and $\log \underline{c}$ is increasing as n falls. Concavity implies that the gains to equalizing the consumption of the spouses is increasing in this gap, thereby increasing the attractiveness of the ER regime. Thus, at some critical level of fertility, $n^*(k)$, a father is better off sacrificing the consumption benefits he obtains from being selfish with his wife in order to be able to ensure that his sons-in-law are equally generous towards his daughters.

Figure 2



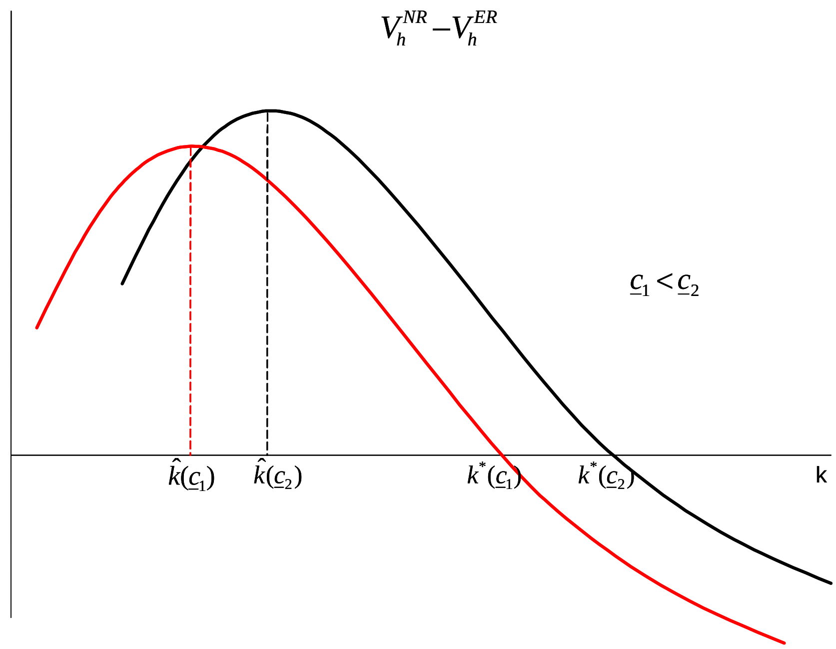
We now turn to the last main proposition that precedes the empirical section. Here we examine the implications of an NR regime that for some reason (e.g. higher outside options or a legal system more favorable to women) provides married women with a higher level of consumption, i.e., $\underline{c}$ is larger. Will such a system, which decreases husbands' consumption benefits from patriarchy, lead men to reform the property rights system sooner? Perhaps surprisingly, the answer is no.

Proposition 3 *(Wife's welfare): A higher level of* $\underline{c}$ *delays the reform of women's property rights.*

Proof. The proof proceeds by showing that an increase in $\underline{c}$ increases k^* and decreases k'_{NR}. Differentiating $V_h^{NR}(k)$ with respect to $\underline{c}$ yields $k < \widehat{k}$ as the condition to obtain $\frac{\partial V_h^{NR}}{\partial \underline{c}} < 0$. Thus, in this range, a husband's utility is decreased by the higher level of $\underline{c}$ (though, by definition of k_0, he still prefers the NR regime). As capital accumulation continues eventually k will be larger than $\widehat{k}$. As of this point, a larger $\underline{c}$ implies a higher value of $V_h^{NR}(k), \forall k > \widehat{k}$, which also implies that k^* is larger. Next, differentiating k'_{NR} (in (11)) with respect to $\underline{c}$ yields, after some manipulation and using $A2$, $\frac{dk'_{NR}}{d\underline{c}} < 0$.|| ■

Diagrammatically, the effect of an increase in $\underline{c}$ can be seen in Figure 3. An increase in $\underline{c}$ decreases the attractiveness of the patriarchal regime at low levels of wealth $(k < \widehat{k})$ and increases it at higher levels of wealth $\left(k > \widehat{k}\right)$. Intuitively, when income is low, a husband is made worse off sacrificing more of his income to his wife although it improves his daughters' welfare (as they too enjoy the higher level of $\underline{c}$). The opposite is true once income is high enough and this renders the NR regime relatively more attractive since the disparity between sons' and daughters' welfare is smaller. Thus this increases k^*, the level of wealth at which men are indifferent between the two regimes. Furthermore, the pace of capital accumulation slows down at all levels of k as more income is diverted to the wife's consumption.

Figure 3



3.5 Discussion of Assumptions and Extensions

The model made several assumptions, some merely for simplicity and notational ease whereas some play a more fundamental role. For example, all consumption in the household is assumed to be private, parents care about their sons and daughters equally, and the ER regime places equal weight on the welfare of both spouses. None of these assumptions are central to the main results of the paper. In particular, one can easily introduce a household public good g over which individuals have preferences $\log g$, which then ensures that some portion of women's consumption is increasing in step with their spouse's consumption. It is also trivial to assume that parents value sons more (or less) than daughters, or that the weight placed on a wife's welfare under ER is less (or more) than half. The "non-paternalistic" dynastic welfare assumption is also very easy to relax. In general, any formulation in which parents have concave utility over their children's consumption will work.

The use of log preferences over consumption allows the model to be solved analytically. One cost of using logs, however, is that it requires one to assume that the man places no weight on his spouse's utility as otherwise her consumption will grow at the same rate as his and thus the utility differential will remain constant. This is not a property of preferences in general, however, and thus not particularly troubling. Furthermore, one could preserve the log formulation and assume that there is (ex ante unobservable) heterogeneity across men in how much they value their wives (i.e., in the weight that they attach to a spouse's welfare). A father would then fear that his daughter might marry a man who would mistreat her (i.e., allocate her a low level of consumption). At some critical level of wealth or fertility, a father would be better off eliminating the possibility of this outcome by guaranteeing married women their property rights. Hence, this alternative formulation would yield similar comparative statics results. Theoretically, preferences need to satisfy the property that the welfare cost in terms of the disparity in children's consumption outweighs at some point the consumption benefits from being selfish with one's wife (i.e., not sharing consumption equally with her). What this requires is easiest to understand in a simpler setting with 2 periods and no allocation decisions. Suppose that under NR a husband consumes $y-x$, $x < y/2$, his sons consume $Ay-x$, $A > 1$, and his daughters (and his wife) consume x, whereas under ER their consumptions are given by, respectively, $y/2$, $Ay/2$, and $Ay/2$. Comparing the utility differential under the two regimes, yields:

$$\Delta V_h = u(y-x) - u(y/2) + \beta/2 \left(u(Ay-x) + u(x) - 2u(Ay/2) \right)$$

Differentiating this with respect to y yields the comparative statics with respect to higher income. If the marginal utility of consumption becomes sufficiently low at high levels of y, then eventually this expression is guaranteed to become negative. If x is increasing with y, then its rate of increase needs to be sufficiently small so that, in the long run, it is outweighed by the difference in marginal utilities under the two regimes.

The assumption that the marriage market is large and competitive (yielding efficient bequests given to children) is also not essential. Assuming that matching is random, for example, yields inefficient investment in children but the basic results of the model still hold.[28]

Introducing endogenous fertility while preserving an analytical solution could be achieved by modifying the model so that (i) parents obtain utility from the number of children they have (e.g., $\log n$); (ii) investment is in children's human capital (with a time cost so as to obtain the traditional quality-quantity tradeoff); and (iii) the production function is Cobb-Douglas in male and female human capital (see, e.g., Doepke and Tertilt (2009)). The disadvantage of this alternative is that it makes an interpretation of growth in any sector other than home production, difficult.

It is also possible to extend the model to a population with an initial non-degenerate distribution of capital, $G(k_0)$. After some work, one can show that the marriage pattern would be perfectively assortative. The comparative statics results with respect to k established above would now hold for the cross-section at any point in time rather than for the dynamic process. This extension can generate results such as the existence of time periods in which both rich and poor men are relatively more favorable towards the ER regime than men in the middle of the wealth distribution (if, for example, poor men have capital significantly below $\widehat{k}$, rich men have significantly greater capital than $\widehat{k}$, and men in the middle of the distribution have capital that is close to $\widehat{k}$). Although the data that I present in the next section do not allow me to examine the cross-sectional predictions of heterogeneity in household wealth, it is nonetheless important to keep these results in mind since this source of heterogeneity (unlike

[28] See Fernández and Zilberman (2010) on the relationship between marital systems and growth.

heterogeneity in fertility as discussed below) implies that the predictions of the model are sensitive to the exact political economy model used to aggregate preferences.[29]

Preferences over the property rights regime will also vary across the population if a household's ratio of sons to daughters is stochastic. Suppose that families have the same number of children, $2n$, $n \in \{1, 2, ..\overline{n}\}$, but now allow the sex to be determined by a random draw. Taking the probability of a girl to be 1/2 and iid, a proportion $p_n \equiv \sum_{k=n+1}^{2n} \binom{2n}{k} \left(\frac{1}{2}\right)^{2n}$ of the population will have more girls than boys and the same proportion will have more boys than girls. Thus, the median preferences in the population will be held by those individuals who have the same number of girls as boys, i.e. a proportion $\binom{2n}{n} \left(\frac{1}{2}\right)^{2n}$. Hence, one can interpret the preceding theory as an analysis of the regime preferences of the median voter, i.e., those corresponding to those individuals with equal numbers of boys and girls.

Introducing a non-degenerate distribution of fertility, with heterogeneity in the number of children across families, is also straightforward. Ceteris paribus, men with fewer children would be more in favor of reform. It is important to note however that, unlike in the case of wealth heterogeneity (in which wealth increases could either strengthen or weaken a man's preferences for the NR regime depending on his initial wealth level), a decrease in the number of children affects all men's preferences in the same direction – i.e., they all become less favorable to the NR regime.

4 Empirical Analysis

The objective of the empirical analysis is to use variation across states in the timing of reform of women's property rights to study the empirical validity of the key correlations implied by the model. In particular, the model predicts that lower fertility should be correlated with a higher probability of reform whereas differences across states that impact positively on married women's welfare should be correlated with a lower probability of reform. The relationship of wealth to the timing of reform is, on the other hand, non-monotonic since more capital is associated first with a lower probability of reform and later with a higher probability.[30]

The next sections introduce the main empirical variables, discuss the sample, and conduct a Probit and linear probability analysis using state fixed effects. A subsequent section proxies survival-fertility (FERTILITY10) with child mortality. The empirical analysis concludes with a robustness analysis.

4.1 Data, Key Variables, and Sample

The empirical analysis requires extensive use of state-level data from the Census, the construction of an appropriate fertility variable, and the dating of the property and earnings reforms. Below I discuss the key variables constructed for each decade between 1850-1920 and some

[29] This is discussed in greater length in the discussion section following state fixed effects.

[30] One can think of the timing of reform as being probabilistic by adding a random variable ε_{it} to the relative welfare of the two regimes, ΔV_h, in state i at time t.

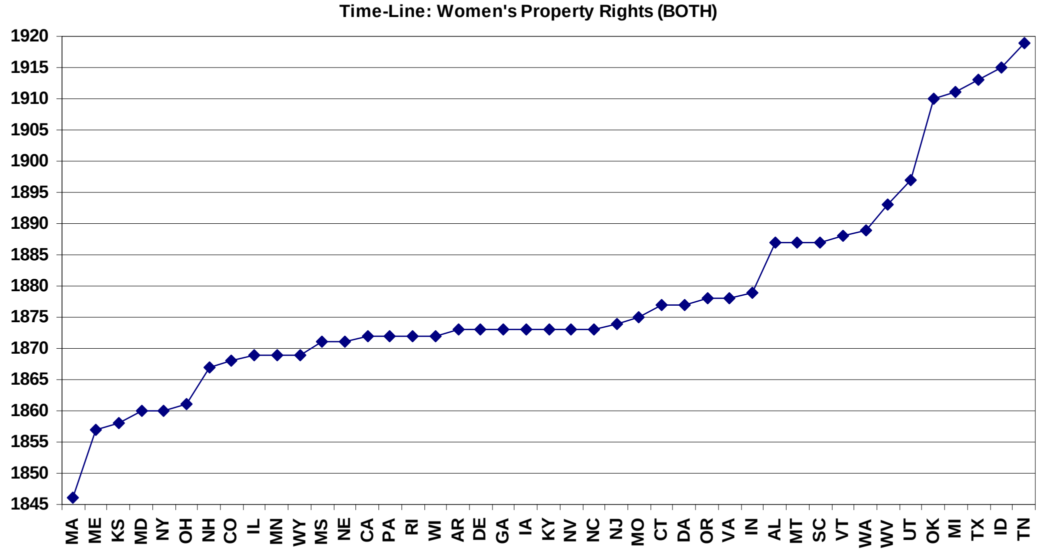
characteristics of the sample before presenting the empirical analysis. Tables A1 and A2 in the Appendix shows the means, standard deviations, and correlations of the main variables.

Married Women's Property Rights

The property rights variable is from Geddes and Lueck (2002).[31] The authors used legal treatises and original state session laws to determine the dates for which a property act gave women management and control of their separate estate and when they obtained ownership and control of their earnings.[32] I use the same property/earnings rights outcomes as the authors, employing a dummy variable denoted "BOTH" which takes the value one when *both* of these rights have been granted (and a zero otherwise).

There was considerable time variation in the granting of property rights to women. The first state to grant both property rights was Massachusetts in 1846 and the last was Louisiana in 1980. By 1920, all states with the exception of four (Florida, Arizona, New Mexico, and Louisiana) had passed both property acts. Although the exact date that should be imputed to the last four states to grant these rights is debatable since the legal system affecting women had changed radically over this long time period, we can ignore these complications by ending the analysis in 1920s (as in Geddes and Lueck). Figure 4 shows the time-line for adoption of these rights from 1845 to 1920 and Figure 5 provides a map of the US with the timing of the reforms.[33]

Figure 4
Time-Line: Women's Property Rights (BOTH)

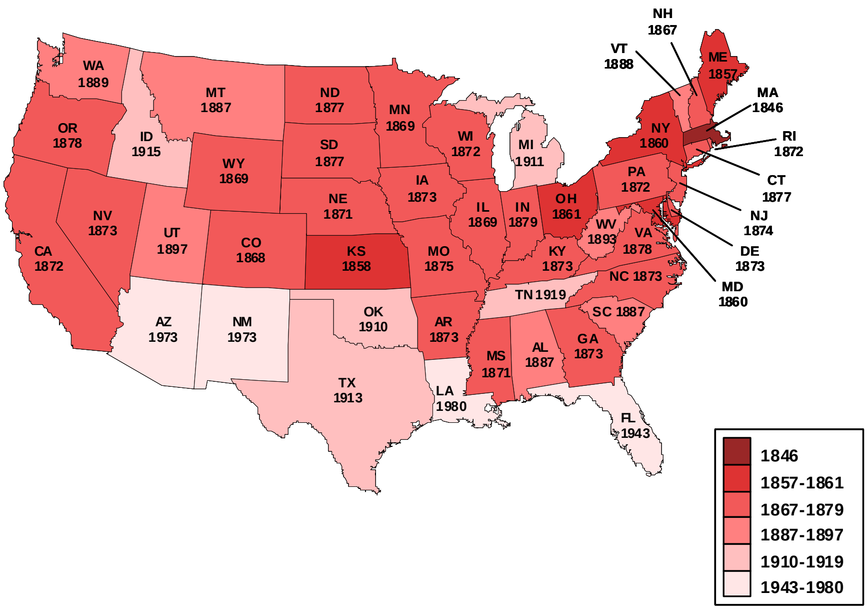


[31] I thank the authors for providing me with the data set containing the timing of the reforms and several state variables.

[32] See their working paper (2000) for details on the construction of this variable.

[33] Alaska and Hawaii are excluded from the analysis.

Figure 5
USA MAP



Survival-Fertility and Wealth

According to the theory, the variable of interest is not fertility, but rather the number of sons and daughters that survive to adulthood. In particular, fathers care about the consequences of the property laws as they apply to *married sons and daughters* which requires children to survive to that age. During the eighty years that concern us, the mortality of infants and young children decreased significantly in the US. Infant mortality (for whites), for example, is estimated to have dropped from 216.8 (per 1000 births) in 1850 to 110.8 in 1900 and then to 82.1 in 1920.[34] Thus, it would be a mistake to examine fertility measures (e.g. "children ever born" or a total fertility rate) that did not take into account childhood mortality. This is fortunate as the US Census did not ask women how many children they had ("children ever born") until 1900.[35]

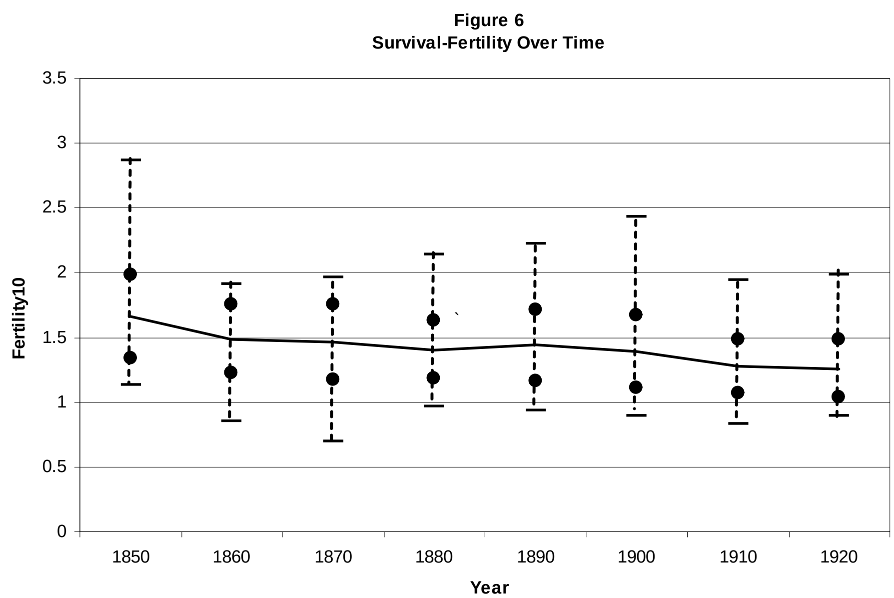
To obtain a measure of survival-fertility, I use the number of (older) children per woman residing in the state as this variable can be constructed by using state census data from the relevant decade (1850-1920). Since the computation of a children-per-woman ratio requires data only on the population by age and sex, it provides an index of fertility when reliable birth statistics are not available and is consequently widely used in the demographic and

[34] See Haines (2008). The decrease in mortality was large in every decade with the exception of 1880.

[35] While it is possible to use the answers provided by different cohorts in 1900 to obtain an estimate of how fertility varied across states before then, there are some significant problems with doing so. In particular, there is selection bias arising from survival which is especially large for the earliest decades. Another problem is the absence of information on where the woman lived during her child-raising years. This complicates the state-assignment problem, especially for those women who reside in a state different from that of their birth.

development literature. I include in children all individuals between the ages of 10 to 19 years and in women I include all females between the ages of 20 to 39 years.[36,37] I restrict the sample to whites (non-blacks) as men in this racial category were the ones with political power. This variable, hereafter denoted FERTILITY10, has the advantage that, by using older children, it alleviates most reasonable concerns about reverse causality (i.e. women's fertility behavior responding to the reforms) since these children would have been born before the reform was instituted.

There is considerable variation in FERTILITY10, not only over time, but also across states. FERTILITY10 went from an average across states of 1.66 in 1850 to 1.26 in 1920. Figure 6 shows, for each decade in the period 1850-1920, the evolution of the average value of FERTILITY10 across states (the bold line), its range (as given by the upper and lower bars), and its standard deviation (as shown by the dots) for all the states-years in the sample.



As a proxy for capital I use "taxable" wealth per capita (WEALTHpc) deflated into 1982 dollars.[38] WEALTHpc is the value of all private real and personal property and excludes such "exempt" property as government, charitable, and religious property. The mean of WEALTHpc over the sample is \$13,664 with a standard deviation of \$9579. Throughout the regression tables, this variable is divided by 10,000.

[36] A more traditional definition is to include women from age 15 to 44 but I use a tighter age range since I am looking at changes from decade to decade. As shown in the robustness section, the results are robust to the choice of alternative age ranges.

[37] I wish to thank Michael Haines for providing me with the raw census data to perform these calculations.

[38] This variable was constructed by Geddes and Lueck (2002) to test their hypothesis. The wealth data is available from a special Census publication published in 1924 that compiled all Census wealth estimates from 1850–1922 (Wealth, Public Debt and Taxation: 1922). See Geddes and Lueck (2000) for details on how the data was deflated to 1982 dollars.

Variation Across States: Territorial Status and Legal System

During this time period, the territorial organization of the United States was still evolving. In particular, several states belonged during a portion of this period to some organized territory and a few to an unorganized territory. Although states that belonged to a territory were able to reform their property rights laws before becoming independent states (e.g. Wyoming in 1869 and Colorado in 1868), they may nonetheless differ in important ways from independent states. Consequently, the empirical analysis will control for territorial status.[39]

Another potentially important difference across states is with respect to their legal systems. The vast majority of states closely followed English common law.[40] Under common law, all property except land and improvements (realty) were owned by the women's husband and the woman's realty (and its profits) came under the husband's control. If a child had been born during the marriage, then a husband continued to possess his wife's real estate for life (a practice known as "curtesy"). If a wife survived her husband, she was guaranteed a dower of one-third of the profits from the realty he owned during the marriage.

In England, a special court known as chancery court had developed over the centuries to deal with the rigidities of the common law and the hardships it imposed on special cases. Equity law – the jurisprudence dispensed through the chancery court – allowed a woman, with her husband's consent, to transfer property to be administered by trustees either prior to or after the marriage. This arrangement primarily allowed wealthy women (or their fathers) with strong bargaining position relative to their spouses to shield the family's property.[41]

Fourteen states had equity courts.[42] As equity law afforded more protection to women's property, the theory predicts (Proposition 3) that this would tend to delay the reform of property rights. On the other hand, since this provision primarily benefitted a small minority of wealthier women and since some states did not enforce equitable doctrines relating to married women's separate estates, it may not have had much of an impact on the timing of reform.[43]

Another potentially important source of legal differences is that some states with French or Spanish influence did not adopt a common law arrangement for family property and instead chose or inherited a community property system (as in most of continental Europe and Mexico).[44] The continental (civil law) model, like the common law model, gave tremendous power to the husband over the wife, but it treated property (at least what was acquired during marriage) as joint. This system was thus more favorable to wives as they automatically inherited half of marital property relative to the third that was customary under common law.

[39] Note that it is important not to over-represent states by assigning to each one individually the variable outcome that belongs to the aggregate territory. There is an error in this respect in Geddes and Lueck (2002), though it does not appear to affect the conclusions of the analysis – see table 2.

[40] Basch (1982, p. 16-17) cites 19th century legal analysts as noting that in no other area was the correspondence between the American and English legal systems closer than in the law of wife and husband.

[41] See Bishop (1875) for a thorough discussion of how common law and equity differed.

[42] The states are: CT, DE, ME, MD, MA, MI, MN, NJ, NH, NJ, NY, RI, SC, and VT.

[43] See Salmon (1986) and Chused (1983).

[44] The states are: AZ, CA, ID, LA, NV, NM, TX, and WA. See Warbasse (1987) for the experience of Louisiana which was the sole state that had this system in the first quarter of the 19th century. See Glaeser and Shleifer (2002) for a discussion of the important differences in other arenas between the English common law and French civil law.

The theory would predict, in this case, that reforms would happen later in these states.

The legal system of the states did not change during this period with the exception of Nevada, Idaho, and Washington which went from being under common law while they were territories to having a community law system once they became independent. Thus, when one includes state-territory fixed effects, the presence of an equity system will be absorbed and the effect of community law relative to common law will be identified only by these three states changing their legal system.

The Sample

The sample consists of all those states-years (including those states that belonged to territories) for which data was available for the key variables. For any regression specification that required wealth, there are 356 state-year observations.[45]

Table 1		Both women's rights?	no		yes	
			mean	# obs	mean	# obs
1850	real wealth per capita		4707	33	9586	1
	fertility10		1.69	33	1.14	1
	community states			4		0
	common law states			18		0
1860	real wealth per capita		9908	33	6856	5
	fertility10		1.53	33	1.32	5
	community states			5		0
	common law states			20		1
1870	real wealth per capita		6162	35	8581	11
	fertility10		1.51	35	1.32	11
	community states			8		0
	common law states			20		6
1880	real wealth per capita		7895	15	11511	31
	fertility10		1.44	15	1.36	31
	community states			6		2
	common law states			6		20
1890	real wealth per capita		12333	11	15735	37
	fertility10		1.57	11	1.38	37
	community states			5		3
	common law states			5		23
1900	real wealth per capita		11745	9	16569	39
	fertility10		1.49	9	1.34	39
	community states			5		3
	common law states			3		25
1910	real wealth per capita		16188	8	21180	40
	fertility10		1.35	8	1.25	40
	community states			5		3
	common law states			2		26
1920	real wealth per capita		19333	4	23394	44
	fertility10		1.33	4	1.24	44
	community states			3		5
	common law states			1		27

Notes: 356 observations; fertility10 = # of children between 10 to 19 / # of women between 20 to 39. Source: US Census.

[45] If wealth was not required, then the sample size could be increased by three observations. Since the increase was so small, I keep the same 356 sample throughout.

Table 1 summarizes the mean FERTILITY10 and WEALTHpc levels for each decade between 1850 and 1920, dividing the sample into those states/territories which had already granted women property rights, i.e., BOTH = 1 (the column headed by "yes"), and those that had not (the column headed by "no"). The number of observations in each category is also reported.[46] As can be seen, for every decade, states in which women had obtained property rights on average had lower FERTILITY10. Furthermore, with the exception of 1860, per-capita wealth levels were also on average higher in those states.

4.2 Regression Analysis: Probit and OLS

The basic empirical exercise consists of estimating the probability that women had been granted both types of property rights in a given state/territory in a given decade, i.e.,

$$\begin{aligned} y_{it}^{*} &= x_{it}'\beta + d_t + \varepsilon_{it} \quad \text{where } i = 1, ..., n; \quad t = 1850, 1860, ..., 1920 \\ y_{it} &= \begin{cases} 1 \text{ if } y_{it}^{*} > 0 \\ 0 \text{ if } y_{it}^{*} \leq 0 \end{cases} \end{aligned}$$

where y_{it} is the observed state law variable BOTH in state i at time t and y_{it}^{*} is the unobserved legal rights "response" in that state and year, x_{it} is the column vector of exogenous variables, d_t is a year t dummy, and ε_{it} is normally distributed. Thus a state/territory is observed a maximum of eight times.

Before proceeding with the analysis, I first examine the effect of contemporaneous per-capita wealth at the state level (WEALTHpc) on the probability that both reforms were undertaken without including FERTILITY10. The purpose of this exercise, reported in Table 2, is to verify that the data replicates the main finding of Geddes and Lueck (2002) who argued that the reforms were a result of the greater inefficiency associated with increased wealth under the system of coverture. The coefficients reported in this table (as in Table 3) are the marginal effects of the independent variables, where the latter are evaluated at their mean values.

As shown in Probit analysis reported in Table 2, the marginal effect of per-capita wealth is always positive and significant. The first column includes only wealth as a control and the second column adds a year fixed effect to the Probit estimation. The third column introduces a dummy variable for whether the state was still a territory that year since, as explained previously, many present-day states were organized into territories during some of the time under consideration and they may have characteristics that differ from independent states. The introduction of this variable, absent in Geddes and Lueck, doesn't change the magnitude and significance of wealth though it is associated with a delay in married women's rights.

The last column in Table 2 controls for important differences in legal systems across states . In particular, I control for whether the state had a common law system either with or without an equity court (the latter is the omitted variable) or a community property system. As discussed earlier, the equity court made it easier for wealthier women to contract around

[46] The number of observations changes over time since some states were not yet part of the US in some decades and because wealth data was unavailable for some states (territories) in the earliest decades.

coverture whereas a community property system stipulated that spouses equally owned property acquired during marriage although only the husband had control of joint property and wealth. Thus, married women were, ceteris paribus, better off in these states, which would decrease the pressure to give women fuller property rights. Indeed, as shown in the Table, territories and states with a community property system were slower to adopt both reforms (they were 62% less likely to do so than an equivalent state under common law). The effect of an equity court, on the other hand, is statistically insignificant. In the last specification, an increase in per-capita wealth of $6000 (a bit over the standard deviation of the variable net of the variation due to year fixed effects) is associated with approximately a 13% increase in the probability that the reform is adopted (where all variables are evaluated at their mean).[47]

Table 2 - Wealth and Property Rights

Probit: dependent variable = BOTH

	(1)	**(2)**	**(3)**	**(4)**
WEALTHpc	0.264**	0.124*	0.124*	0.224**
	(2.69)	(2.25)	(2.09)	(3.53)
TERRITORY			-0.454**	-0.297+
			(3.24)	(1.76)
EQUITY				0.088
				(1.01)
COMMUNITY				-0.623**
				(7.27)
Year dummies	no	yes	yes	yes
Obs.	356	356	356	356
Pseudo R^2	0.16	0.37	0.41	0.52

*+ significant at 10%; * significant at 5%; ** significant at 1%; robust z statistics in parentheses. Notes: marginal effects evaluated at the mean of the independent variables; WEALTHpc is wealth per capita divided by 10000.*

I next turn to the main analysis that incorporates all the variables of interest. Table 3 displays the results of the Probit estimation. As in Table 2, the first column shows the simple negative correlation that exists between FERTILITY10 and BOTH and the second column adds year fixed effects. The third column includes per-capita wealth. This variable, however, is no longer statistically significant at conventional levels. The fourth columns adds a dummy variable for whether the state belonged to a territory at that time, and the fifth column controls for state differences in legal system. Belonging to a territory or possessing a community property system are negatively correlated with changing the property rights regime. A community property system, ceteris paribus, reduces the probability of a reform by 64%; belonging to a territory decreases the probability of reform by 48%. The effect of an equity court is now negative but still statistically insignificant. Throughout, the effect

[47] Throughout, instead of using the raw standard deviation of the variable, I use the standard deviation of the residuals from a regression of the pertinent variable (e.g. wealth) on the relevant fixed effects (e.g., on year dummies or on both year and state dummies). The magnitudes of these are reported in table A1.

of FERTILITY10 is always negative and significant, as predicted by the theory. In the last specification, a decrease in FERTILITY10 by 0.12 children per women (this is a one-standard-deviation decrease in the variable where the variation is net of year fixed effects) is associated with a increase in the probability of women's property rights of around 12 %. This is larger than in the specification without controls for differences in legal systems, indicating that on average states with community and equity systems had lower FERTILITY10 levels.

Table 3 - Property Rights: Probit Analysis

Dependent variable = BOTH

	(1)	(2)	(3)	(4)	(5)
FERTILITY10	-0.902**	-0.690**	-0.627**	-0.875**	-0.979**
	(7.45)	(5.36)	(4.15)	(5.02)	(5.00)
WEALTHpc			0.036	0.002	0.098
			(0.71)	(0.04)	(1.64)
TERRITORY				-0.531**	-0.481**
				(4.34)	(3.22)
EQUITY					-0.13
					(1.18)
COMMUNITY					-0.644**
					(7.46)
Year dummies	no	yes	yes	yes	yes
Obs.	356	356	356	356	356
Pseudo R^2	0.14	0.39	0.39	0.46	0.56

*+ significant at 10%; * significant at 5%; ** significant at 1%; robust z statistics in parentheses. Notes: FERTILITY10 is the number of children between 10 to 19 divided by the number of women between; 20 to 39; see Table 2 for additional notes.*

Table 4 - Property Rights: OLS

Dependent variable = BOTH

	(1)	(2)	(3)	(4)	(5)	(6)
FERTILITY10	-0.769**	-0.369**	-0.323**	-0.401**	-0.378**	-0.357**
	(9.39)	(4.75)	(3.58)	(4.41)	(3.22)	(3.01)
WEALTHpc			0.03	0.012	0.056+	0.121*
			(0.94)	(0.38)	(1.71)	(2.00)
WEALTHpc^2						-0.012
						(1.43)
TERRITORY				-0.391**	-0.247**	-0.246**
				(4.95)	(3.11)	(3.08)
EQUITY					-0.041	-0.044
					(0.80)	(0.86)
COMMUNITY					-0.383**	-0.379**
					(6.43)	(6.34)
CONSTANT	1.663**	0.648**	0.556**	0.729**	0.716**	0.654**
	(14.39)	(4.73)	(3.35)	(4.40)	(3.30)	(2.91)
Year dummies	no	yes	yes	yes	yes	yes
Obs.	356	356	356	356	356	356
Adj. R^2	0.17	0.44	0.44	0.49	0.56	0.56

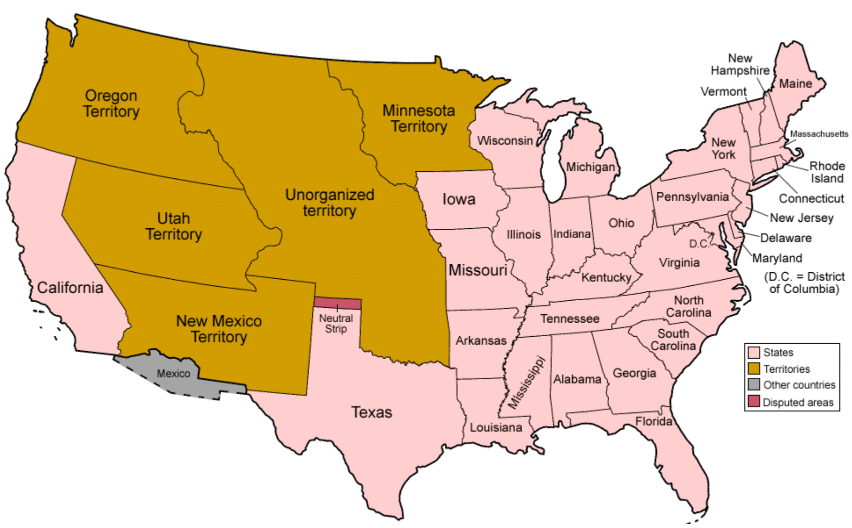
*+ significant at 10%; * significant at 5%; ** significant at 1%; robust t statistics in parentheses; see Tables 2 and 3 for additional notes.*

Table 4 repeats the same set of exercises using a linear probability model instead. The pattern of results is very similar. Fertility continues to be statistically significant and negatively associated with the probability of changing women's property rights regime as is the existence of a community property legal system or belonging to a territory. Introducing wealth squared (Wealthpc^2) in the last column doesn't change the results concerning the remaining variables. The effect of wealth, however, is now positive and statistically significant whereas its square is negative and statistically significant. Evaluated at the mean, the effect of a marginal increase in per capita wealth on the probability of reform, ceteris paribus, is positive. The results for wealth, however, do not survive the introduction of state fixed effects, as shown below.

State Fixed Effects

A more challenging test of the theory is posed by introducing state fixed effects. To construct these, I use the configuration of states and territories that existed in September 1850 as shown in figure 7.[48] At this point in time, all but 16 states have their actual borders. If a current-day state was also a state in 1850, it is assigned its own (state) fixed effect. If, on the other hand, it was part of a territory in 1850, I assign it a fixed effect based on the territory to which it belonged to then. Hence Washington, Oregon, and Idaho are assigned to Oregon territory; Utah and Nevada are assigned to Utah territory; New Mexico and Arizona are assigned to New Mexico territory; Montana, Wyoming, Colorado, Nebraska, Kansas, and Oklahoma are assigned to the same unorganized territory; and lastly North Dakota, South Dakota, and Minnesota are part of the Minnesota territory.[49] If a state belonged to two territories in 1850, I assign it to the territory that encompassed most of its land.

Figure 7
US Territory Configuration, September 9 1850



The results of the linear probability model with state/territory fixed effects are shown in the first five columns of Table 5.[50] Comparing these results with those reported in Table 4,

[48] See http://en.wikipedia.org/wiki/Territorial_evolution_of_the_United_States.
[49] At this point in time, North and South Dakota are not distinct – they constitute Dakota.
[50] Using a Probit specification instead drops over 100 observations.

the inclusion of state fixed effects leaves almost unchanged the negative effect of belonging to a territory as well as the insignificant and close to zero effect of per-capita wealth. It also decreases somewhat the magnitude of the coefficient associated with FERTILITY10, though the variable remains economically and statistically significant. A one-standard-deviation decrease in FERTILITY10 is now associated with approximately a 6.5 % increase in the probability of property-law reform.[51] As discussed earlier, equity is absorbed with state fixed effects whereas the community property system is identified only off the three states that switched once they became independent. Not surprisingly, the statistical significance of the latter effect is smaller but the coefficient is still negative and quantitatively important – the presence of a community property system is now associated with an almost 19% decrease in the probability of property rights reform.

Table 5 - Property Rights: OLS with State or Regional Fixed Effects

Dependent variable = BOTH

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
FERTILITY10	-0.218*	-0.205+	-0.266*	-0.307*	-0.307*	-0.309**	-0.247*	-0.314**	-0.366**
	(2.17)	(1.87)	(2.23)	(2.55)	(2.56)	(2.98)	(2.14)	(2.71)	(3.06)
WEALTHpc		0.01	-0.024	-0.018	0.022		0.047	-0.001	0.009
		(0.29)	(0.76)	(0.54)	(0.33)		(1.21)	(0.02)	(0.27)
$WEALTHpc^2$					-0.007				
					(0.79)				
TERRITORY			-0.260*	-0.266*	-0.258*			-0.314**	-0.284**
			(2.30)	(2.40)	(2.33)			(3.35)	(3.25)
EQUITY									-0.044
									(0.56)
COMMUNITY				-0.187+	-0.188+				-0.399**
				(1.76)	(1.77)				(6.02)
CONSTANT	0.403+	0.38	0.505+	0.578*	0.572*	0.641**	0.523**	0.660**	0.770**
	(1.65)	(1.46)	(1.82)	(2.05)	(2.03)	(4.01)	(2.81)	(3.55)	(3.52)
Year dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes
State dummies	yes	yes	yes	yes	yes	no	no	no	no
Region dummies	no	no	no	no	no	yes	yes	yes	yes
Obs.	356	356	356	356	356	356	356	356	356
Adj. R^2	0.64	0.64	0.65	0.65	0.65	0.51	0.51	0.53	0.57

*+ significant at 10%; * significant at 5%; ** significant at 1%; robust t statistics in parentheses; see Tables 2 and 3 for additional notes.*

Column 5 repeats the non-linear specification for wealth from Table 4. The coefficients on the other variables are basically unchanged and the effect of wealth is insignificant. It should be noted that omitting FERTILITY10 also yields statistically insignificant coefficients for wealth and wealth squared as do all state fixed-effect specifications that include a year dummy.[52]

[51] The standard deviation of fertility net of the variation from year and state fixed effects is 0.21.

[52] I have also experimented with using other measures that may proxy for wealth. For example, columns 7 and 8 in Table 8 in the robustness section control for the percentage of school-age children (excluding slaves) that attend school. Column six includes only girls and column seven adds boys. As shown, FERTILITY10 and community property law remain negative and statistically significant and neither schooling measure is significant.

One can also repeat the regression analysis using regional fixed effects instead of state fixed effects. Columns 6-9 of Table 5 show the results, employing the 9 regional dummies used by the US Census. The pattern of results is very similar to those with state fixed effects and to those obtained in Table 4. A one-standard-deviation decrease in FERTILITY10 is now associated with approximately a 7% increase in the probability of property-law reform. A community property law system is associated with a 40% decrease in the probability of reform relative to a common law system.

Discussion

The results show a robust partial correlation between several of the key variables of the model – namely, married women's property rights reform and both survival-fertility and the presence of a community property system – as predicted by the model. On the other hand, the empirical results do not show a U-shaped relationship between wealth and the probability of reform. A possible reason for the asymmetry between the results for fertility and those for wealth may lie in how the model responds to heterogeneity.

As discussed in section (3.5), if individuals have on average fewer children, this will make them all more in favor of reform, regardless of their personal wealth or the number of children they have. Thus, heterogeneity either in wealth or in the number of children does not affect the qualitative predictions of the model regarding a response to decreases in survival-fertility. The effect of an increase in everyone's wealth, on the other hand, will differ along the wealth distribution. In particular, a small increase in individual wealth results in poorer individuals becoming more in favor of the patriarchal regime and richer individuals more against it. How it affects individuals in the middle of the distribution will depend on how their high wealth is relative to $\widehat{k}$ (see the discussion in section (3.5)). Thus, the sign of the effect of a wealth increase on regime preferences depends both on the distribution of capital and on how the political system aggregates preferences.[53] Hence, obtaining the theoretically correct partial correlation between wealth and reform would require getting the political economy aggregation mechanism "right," something that is not required for the survival-fertility predictions.

4.3 Endogeneity

The analysis presented above shows that, as predicted by the theory, there is a robust negative correlation between women's property rights and both FERTILITY10 and community property law even after controlling for various covariates such as per-capita wealth levels, the status (territory or statehood) of a jurisdiction, or some general indicators of education. This is an important finding as it indicates that theories that attempt to address the issue of women's economic rights should be capable of generating these partial correlations. We next turn to the issue of endogeneity.

It may be that the presence of a community property law (which reflects either Spanish or French influence) also signals a more favorable attitude in general towards women. To the extent that this is true, however, the results demonstrate that these attitudes do not accelerate the reform of women's property rights. Instead, as predicted by the model, they delay granting women the ability to manage and control their property and earnings.

[53] Unfortunately, wealth distribution indices by state do not exist for the earlier decades of this period.

Fertility is an endogenous variable. This raises the question as to whether FERTILITY10 is simply proxying for an omitted variable. To the extent that the main variable driving fertility is wealth, the analysis attempts to distinguish between it and FERTILITY10 by including them simultaneously in the regression analysis. To eliminate other concerns, however, requires an instrumental variable. It is hard to think of a candidate for an instrument that might not have a direct causal effect on women's rights (e.g., the degree of urbanization, the ratio of men to women, etc.). Rather than insist on an instrument, in this section I instead use child mortality as a proxy for FERTILITY10. Since it is a proxy rather than an instrument, causality cannot be inferred. Nonetheless, this exercise serves as an additional check on the results and rules out some potential channels through which an omitted variable might be driving the results.

Child mortality is potentially a good proxy for FERTILITY10. To see why, we can start with the definition of survival-fertility below:

$$\frac{surviving\ children}{women} \equiv avg.\ fertility\ per\ woman \text{ x } (1 - child\ mortality\ rate) \tag{30}$$

Thus, survival-fertility is a function of the child mortality rate both directly and through any effect it may have on average fertility. If a family desires to have some ideal number of children, for example, a higher child mortality rate makes it costlier to achieve this ideal, leading to a lower number of surviving children. If there is a higher than expected child mortality, this will also lead families to have a lower number of surviving children.[54] Thus, both expected and unexpected higher levels of child mortality may tend to be associated with a lower number of surviving children per woman (i.e., with FERTILITY10). In any case, this is an empirical question. As will be shown below, for any given decade the correlation between the two variables is negative.

During this period in US history, both fertility and child mortality dropped rapidly. Using statistics reported for the US in Haines (2008), between 1850 to 1920 white infant mortality decreased by 62.1% whereas the total fertility rate for white women decreased by 41.5% (alternatively the white birth rate – births per 1000 population per annum – decreased by 37.9%).[55] As can be seen from equation (30), whether the number of surviving children per woman increases or decreases is determined by whether the percentage increase in the child survival rate (1 minus the child mortality rate) is greater or smaller than the percentage decrease in fertility. For the numbers given above, the percentage change in children's survival rate is smaller (in absolute value) than the percentage change in children born, giving rise to the decreasing FERTILITY10 pattern that we saw in the data in figure 1.

Unfortunately it is very difficult to find numbers for infant/child mortality by state over most of this time period. I rely on estimates provided by Murphy, Simon, and Tamura (2008) for child mortality prior to the age of 10.[56] The authors construct their estimates using official

[54]On the other hand, if there is variance in the child mortality rate, risk aversion may lead to a positive correlation.

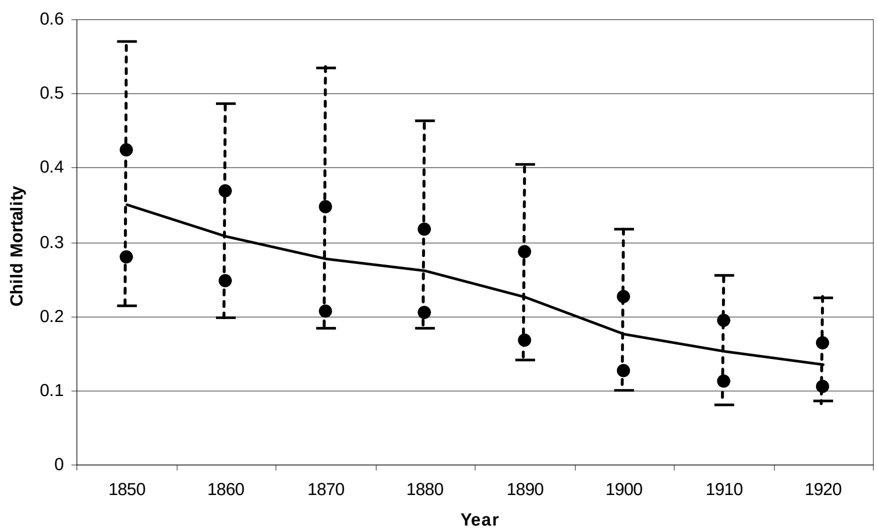
[55]The American experience is distinctive from most other Western countries in that its fertility decline started very early (in the late 18th or early 19th century) and it preceded the mortality decline. See Haines (2008).

[56]I wish to thank Robert Tamura for very kindly making this data available to me.

death registrations (which first become available in 1890 for some states and are reported in the *Statistical Abstract of the United States*) and the Census (which is less reliable since it is based on answers to survey questions rather than official data).[57]

Child mortality varies significantly by state/territory and by decade as can be seen in figure 8; it averaged 35% across states in 1850 and decreased to a mean of 13% in 1920. Over this time period the leading causes of children's death were gastrointestinal diseases (e.g., cholera infantum, enteritis, and diarrhea), respiratory diseases (e.g., pneumonia and bronchitis), and other infectious diseases (e.g. measles, scarlet fever, diphtheria, whooping cough, and smallpox).[58] Much of the decline in infant mortality came from improvements in overall hygiene, the water supply, the construction of sewers, and the quality and cleanliness of the milk supply.

Figure 8
Child Mortality Over Time



The correlation between FERTILITY10 and child mortality is positive over this time period since both variables are decreasing over time. Once year dummies are introduced, however,

[57] The authors use a fairly complicated procedure to produce their estimates. For each state/territory, they run a quadratic specification of the infant survival rate on time for the years 1890 to 2000 using the number of observations that exist in the official death registration data (this ranges from a maximum of 12 observations for Massachusetts to 7 for Texas). This allows them to obtain extrapolated predictions for infant mortality for each state between 1850 and 1920. They then combine these predictions with the Census data on infant mortality between 1850 and 1920 for each state, and find the convex combination, for each census year, that when aggegated (with appropriate population weights) across states best matches the national infant mortality rate reported in the *Historical Statistics of the United States*. This procedure yields, for each state and year, their estimate of infant mortality. For measures of mortality to age 10, they apply the same weights obtained for infant mortality on the age-appropriate Census data and death registration extrapolations. See Murphy, Simon, and Tamura (2008) for more details.

[58] See Preston and Haines (1991) for a thorough account.

the correlation between the variables is negative as can be seen by comparing columns 1 and 2 of Table 6. In particular, in every decade, the cross-state correlation between FERTILITY10 and child mortality is negative.

The factors responsible for the cross-state variation in the reduction of child mortality are not clear. It mostly seems to be driven by idiosyncratic differences in the diffusion of knowledge and best practice across municipalities. Preston and Haines' (1991) book, *Fatal Years,* a fascinating study of child mortality in the 19th century US, cites the description given by the first professor of pediatrics at Harvard in 1891 about the state of knowledge of childhood diseases: this consisted of "a poor subterfuge of unreal facts forming structures of misleading results which in the scientific medicine of adults would not for a second be tolerated."[59] For many people (including doctors), the high death rates of infants and young children seemed to be the result of a natural and inevitable vulnerability in this stage of life. Preston and Haines' analysis concludes that there was relatively little differentiation in child mortality levels according to father's occupation, so that (controlling for race) it is unlikely that state differences in the distribution of income played an important role. Large cities, on the other hand, had higher child mortality levels and thus a variable capturing urbanization will be included in the regression analysis as well as differences in per-capita wealth. State fixed effects will capture geographic differences and differences in racial composition. Nonetheless, as I am unable to rule out the existence of an omitted variable, the exercise must be treated as suggestive.[60]

Table 6 - Child Mortality as a Proxy for FERTILITY10

Dependent variable = FERTILITY 10

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CHILD MORT.	0.416**	-1.557**	-1.108*	-1.144**	-1.353**	-1.253**	-1.253**	-1.109**
	(2.68)	(7.11)	(2.57)	(2.73)	(3.31)	(3.24)	(3.24)	(2.91)
WEALTHpc				-0.111**	-0.128**	-0.116**	-0.115**	-0.112**
				(4.66)	(4.87)	(4.23)	(2.78)	(4.45)
WEALTHpc^2							0.000	
							(0.01)	
TERRITORY					-0.163*	-0.161*	-0.161*	-0.153*
					(2.37)	(2.49)	(2.47)	(2.43)
COMMUNITY						-0.212*	-0.212*	-0.236**
						(2.37)	(2.37)	(2.77)
CITY								-0.004**
								(3.41)
CONSTANT	1.307**	2.224**	2.281**	2.280**	2.354**	2.316**	2.316**	2.247**
	(37.37)	-23.97	(14.41)	(14.91)	(15.38)	(15.81)	(15.75)	(15.88)
Year dummies	no	yes	yes	yes	yes	yes	yes	yes
State dummies	no	no	yes	yes	yes	yes	yes	yes
Obs.	356	356	356	356	356	356	356	356
Adj. R^2	0.02	0.29	0.56	0.63	0.64	0.66	0.66	0.67

*+ significant at 10%; * significant at 5%; ** significant at 1%; robust t statistics in parentheses.*
Notes: CHILD. MORT. is the fraction of children who died prior to the age of 10;
see Tables 2 and 3 for additional notes.

[59] Preston and Haines (1991), p. 12.

[60] What then is driving the variation in child mortality across states? From my reading of the literature, there appears to have been a great deal of idiosyncratic variation in the rate in which municipalities adopted sanitation reforms though it would be good to have sytematic evidence for this.

The OLS regressions showing the relationship between the FERTILITY10 and child mortality inclusive of state and year fixed-effects are given in Table 6, columns 3-8. As shown, child mortality enters negative and statistically significant throughout as does per capita wealth and territorial status. In column 8, a decrease in child mortality by one standard deviation (net of the variation due to state and year fixed effects) is associated with an increase in FERTILITY10 of close to 0.1, which is almost 50% of the standard deviation in this variable (likewise net of variation due to fixed effects). A one-standard-deviation increase in per-capita wealth is associated with a decrease in FERTILITY10 of about 0.12. Belonging to a territory or having a community property law system relative to common law system also decreases FERTILITY10 by 0.15 and 0.24 children per women respectively. The variable CITY measures the percentage of the population in the state that lived in cities with more than 100,000 inhabitants. A one-standard deviation increase in this variable (net of the variation due to year and state fixed effects) is associated with a reduction in FERTILITY10 of 0.01. The relationship between child mortality and FERTILITY10 remains economically and statistically significant in all specifications.

Table 7 - Property Rights: Uses Proxied Value of FERTILITY10

Dependent variable = BOTH

	(1)	(2)	(3)	(4)	(5)
FERTILITY10	-2.008*	-1.955*	-1.474*	-1.645*	-1.737*
	(2.21)	(2.26)	(2.41)	(2.50)	(2.28)
WEALTHpc		-0.184+	-0.175+	-0.168+	-0.175+
		(1.74)	(1.96)	(1.88)	(1.77)
TERRITORY			-0.427**	-0.452**	-0.460**
			(2.60)	(2.89)	(2.77)
COMMUNITY				-0.491*	-0.530*
				(2.46)	(2.33)
CITY					-0.003
					(0.82)
CONSTANT	3.833*	3.710*	2.808*	3.124*	3.281*
	(2.20)	(2.25)	(2.40)	(2.49)	(2.28)
Year dummies	yes	yes	yes	yes	yes
State dummies	yes	yes	yes	yes	yes
Obs.	356	356	356	356	356

*+ significant at 10%; * significant at 5%; ** significant at 1%; robust t statistics in parentheses. Notes: FERTILITY10 is proxied by CHILD MORT. and other covariates as indicated in the appropriate column of Table 6; see Tables 2 and 3 for additional notes.*

The results from using the proxied value of FERTILITY10 (the equivalent of a second-stage regression in an IV analysis) are shown in Columns 1-5 of Table 7. In all specifications, the effect of survival-fertility remains negative and statistically significant. In the most complete specification shown in column 5, a one-standard-deviation decrease in FERTILITY10 is associated with an increase in women's rights of a bit over 36%. The presence of a community legal system is associated with a decrease in the probability of reform of 53%. Higher levels of per-capita wealth are now associated with a (marginally significant) decreased probability of women's property rights.[61]

The exercise above used child mortality as a proxy for FERTILITY10. Although the inability to specify with certainty the source of exogenous variation prevents one from interpreting the results in a causal fashion, it is interesting to note nonetheless that the more likely sources of endogeneity (discussed below) will bias the survival-fertility estimates upwards (i.e., in the direction opposite to the one predicted by the theory).

One might speculate, for example, that states in which women had more political influence might have both earlier reform of property rights and better children mortality outcomes. Indeed, as shown recently in a very interesting paper by Miller (2009), states that granted women suffrage saw large increases in local public health spending and declines in child mortality. This would imply that states in which child mortality was lower, ceteris paribus, should also have earlier reform of their property rights regime. We find the opposite relationship, however. Those states with higher child mortality, and hence with lower levels of FERTILITY10, see earlier reform. Thus, this channel of endogeneity cannot be driving the results although it may bias the estimate towards zero.

Similarly, it may be that both women's rights and public health (or concern about children's welfare) are normal or luxury goods. This would lead wealthier states (measured presumably in ways not captured by our per-capita wealth variable) to have both lower levels of child mortality and a higher probability of reform. Once again, we find the opposite relationship: states with higher levels of child mortality, ceteris paribus, reform their property rights system sooner. Thus, this channel cannot be responsible for the results although once again it might bias the coefficient on FERTILITY10 towards zero.

4.4 Robustness

In this section I examine the robustness of the basic results to the inclusion of additional variables and alternative measures of some key variables.

Timing of Property Rights Reforms

Throughout the empirical analysis, the reform of property rights is said to have been observed in year t if it occurred after year $t-10$ but before year t, $t = 1850,...,1920$. An alternative is to assign to each decade all the events that occurred in a symmetric ten-years interval around it, e.g. 1860 is assigned all observations of married women's property rights that occur between 1855-1864. This alternative timing strategy yields very similar results. Column 1 of Table 8 shows the result for the full specification including time and state fixed effects. The quantitative effect of survival-fertility is slightly higher with this timing alternative as is the territorial effect. The community system is insignificant given the few observations with state fixed effects. If regional dummies are employed instead, the alternative specification once again yields a large and statistically significant coefficient for the community variable in both the Probit and the OLS estimations.

[61] Including wealth squared renders the coefficient on both wealth variables negative and insignificant.

Alternative Hypotheses and Controls

The degree of urbanization across states varied significantly over this time period. Urbanization was associated with both greater wealth, lower FERTILITY10 and, at least for the first few decades of this time period, higher child mortality (see Table A2). Higher urbanization also tends to be associated with lower welfare levels for married women since these women were more likely to be isolated from extended families and widows were less likely to be able to support themselves.[62] We can include a proxy for this variable, denoted CITY, that measures the percentage of the population in the state that lived in cities with more than 100,000 inhabitants. Including this variable in the regression analysis does not affect the main results as shown in column 2 of Table 8, though it lowers a bit the magnitude of FERTILITY10. The degree of urbanization is positive and statistically significant. A one-standard-deviation increase in CITY (net of variation from fixed effects) is associated with an increased probability of reform of 0.4%.[63] This finding may reflect the theoretical prediction of the model that places in which women were worse off would have earlier reforms or it may simply be that it is easier to coordinate and plan reforms in states where people are more concentrated in large urban areas.

An alternative hypothesis is that women obtained rights as their bargaining position in society grew stronger. One variable that may affect women's bargaining power is their relative scarcity in society. In particular, it is often speculated that states in which females were scarce might try to make themselves more attractive to women by altering the legal system, particularly as pertaining to married women's property rights. Thus, it may be of interest to include a variable that measures the percentage of the population that is male. Column 3 in Table 8 shows that introducing this variable, denoted MALE, and defined as the percentage of the white population between 20 and 59 that is male, does not affect the results and that the variable is statistically insignificant.

As an additional test of women's bargaining power hypothesis, it is also interesting to note that if voting rights are a good indicator of the women's bargaining power, then the extremely low correlation (.038) between the reform of women's property rights and women's voting rights indicates that this factor is unlikely to have played a role.[64] Regressing BOTH on a decade dummy and a (female) suffrage dummy for each state yields a (statistically insignificant) coefficient of zero on suffrage. As shown in column 4 of Table 8, including other variables such as FERTILITY10 and per capita wealth, leaves the main results unchanged with a statistically insignificant coefficient of -0.07 on suffrage.

[62] See Chused (1983).

[63] Recall, however, that when included in the regression in which child mortality is used to proxy survival-fertility, urbanization only entered significantly in explaining the latter and did not have independent explanatory value in explaining the probability of reform (see tables 6 and 7).

[64] To calculate the correlation, the states that voted against women's suffrage and were forced to allow women to vote when the 19th ammendment was passed in 1920 were assigned 1930. Similar results are obtained if they are assigned the year 1925. For the regression analysis, the states that voted against women's rights were assigned a zero in 1920. Note that in general property rights preceded voting rights: only five states allowed women to vote prior to the reform of property rights.

Table 8 - Robustness

OLS: dependent variable = BOTH

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
FERTILITY10	-0.317**	-0.274*	-0.295**	-0.308*			-0.304*	-0.281*
	(3.08)	(2.21)	(2.64)	(2.52)			(2.58)	(2.40)
CITY		0.003+						
		(1.90)						
MALE			0.004					
			(0.93)					
SUFFRAGE				-0.068				
				(0.89)				
CHILDBORN					-0.072*			
					(1.98)			
FERTNEW						-0.152*		
						(2.13)		
FSCHOOL							-0.001	0.01
							(0.57)	(1.29)
MSCHOOL								-0.011
								(1.49)
WEALTHpc	0.026	0.006	0.027	0.03	0.001	0.031	0.04	0.042
	(0.40)	(0.08)	(0.40)	(0.44)	(0.01)	(0.45)	(0.58)	(0.62)
WEALTHpc^2	-0.011	-0.004	-0.008	-0.007	-0.001	-0.006	-0.009	-0.01
	(1.43)	(0.43)	(0.91)	(0.91)	(0.08)	(0.74)	(1.08)	(1.23)
TERRITORY	-0.376**	-0.261*	-0.258*	-0.258*	-0.212+	-0.230*	-0.252*	-0.240*
	(3.47)	(2.37)	(2.19)	(2.33)	(1.69)	(2.06)	(2.19)	(2.03)
COMMUNITY	-0.13	-0.163	-0.218+	-0.198+	-0.14	-0.17	-0.187+	-0.224*
	(1.20)	(1.51)	(1.94)	(1.91)	(1.23)	(1.60)	(1.76)	(2.03)
CONSTANT	0.534*	0.528+	0.318	0.566*	1.043**	0.460+	0.601*	0.603*
	(2.03)	(1.85)	(0.94)	(1.99)	(5.32)	(1.69)	(2.07)	(2.11)
Timing	closest date	standard	standard	standard	standard	standard	standard	standard
Year dummies	yes	yes	yes	yes	yes	yes	yes	yes
State dummies	yes	yes	yes	yes	yes	yes	yes	yes
Obs.	356	356	356	356	322	356	355	355
Adj. R^2	0.65	0.65	0.65	0.65	0.63	0.65	0.65	0.65

*+ significant at 10%; * significant at 5%; ** significant at 1%; robust t statistics in parentheses.*
Notes: Column (1) modifies the timing of property rights; CHILDBORN is defined in the text; CITY is the percentage of the population in the state that lived in cities with more than 100,000 habitants; MALE is the percentage of white adults that are male; SUFFRAGE is a dummy variable indicating whether women have the right to vote (see the text for further details); FERTNEW is the number of children between 10-19 divided by the number of women between 30-49; FSCHOOL is percentage of girls 5-19 years old that attend school (excluding slaves); MSCHOOL is percentage of boys 5-19 years old that attend school (excluding slaves); see Tables 2 and 3 for additional notes.

Alternative Fertility Variables

Although the theory calls for using surviving-fertility rather than average fertility as the explanatory variable, we can nonetheless construct measures of average fertility by using responses to the question of "children ever born" included in the Census as of 1900.[65] For each cohort and state one can create a measure of fertility by calculating the average number of children born to women belonging to a given age bracket in that state. I chose to do this, whenever possible, for women between the ages of 38-42. Thus, for example, the fertility of women born in between 1908 and 1912, labelled the 1910 cohort, is calculated using the responses of women 38-42 years old in the 1950 census. A cohort's fertility is attached to a

[65] Women were asked to report all live births.

date two decades later, e.g., the variables for 1880 include the fertility of the cohort born in 1860.

Unfortunately, the above strategy for calculating fertility is sometimes infeasible for a number of reasons. First, this question wasn't asked prior to 1900. This implies that, for cohorts born prior to 1860, one needs to use the cohort's fertility numbers given by older women in the 1900 census (e.g. the number for the 1850 cohort is calculated using women 48-52 in the 1900 census). Although the cohort's fertility would be the same whether measured in the (non-existent) earlier census or in the 1900 census, the drawback to using 1900 is that the sample will tend to be more affected by inter-state migration and by survival selection (especially for the oldest cohorts). An additional complication is that both the 1920 and 1930 censuses omitted this question, affecting the feasibility of this strategy for the 1880 and 1890 cohorts. I obtain their average fertility by using older women from their cohorts (58-62 and 48-52 years old, respectively) in the 1940 Census. Throughout I restrict the sample to white married women born in the US and only include a state at a point in time if there are at least 10 individual observations with which to construct the fertility measure.[66] This variable is denoted CHILDBORN. Its correlation with FERTILITY10 is 0.58. In order not to rely on observations of women above the age of 70 in the fertility measure (which would also be from the earliest decade and thus even more tainted by survival bias), I start the analysis in 1860 (i.e., with the fertility of the cohort born in 1840).

The results from using this alternative fertility measure are reported in column 5 of Table 8. As can be seen, the significance of this variable is lower than FERTILITY10 – the appropriate variable according to the theory. A one-standard deviation decrease in CHILDBORN is associated with a 9.1 percent increase in the probability of reform.

One can also use a survival-fertility measure with alternative age ranges. Column 6 shows the result of constructing an alternative measure of survival-fertility, denoted FERTNEW, in which the age range of women runs from 30 to 49 (rather than 20-39). The results obtained are similar. A one standard deviation decrease in FERTNEW (net of variation from fixed effects) is now associated with an **7%** increase in the probability of reform although the presence of community property law is no longer significant at conventional levels.

5 Conclusion

This paper developed a dynamic model to analyze how capital accumulation, fertility, and different legal traditions affect male preferences towards married women obtaining property rights. The main intuition delivered by the model is that wealth accumulation or falling fertility alters the relative benefits of a patriarchal system relative to one in which women have fuller property rights. Under the patriarchal regime, both factors increase the welfare of sons more than the welfare of daughters. At some critical level of fertility or capital, the disparity in the welfare levels of daughters versus sons leads a father to prefer to sacrifice the consumption benefits he obtains under patriarchy in order to ensure that his sons-in-law do the same with his daughters (thus decreasing the welfare gap between men and women). This

[66] The omitted category is Black and thus the sample contains women from other races but these constitute around a half percent of the sample. Throughout I use person weights.

critical level comes sooner in regimes that are initially less beneficial to women (e.g., those that follow English common law relative to community property law). Although these regimes allow men to reap greater consumption benefits and thus cause them to favor patriarchy even more at low levels of wealth, they also imply that their daughters fare worse vis a vis their sons. Thus, reform happens at a lower level of wealth (and a higher level of fertility), and hence sooner.

The implications of the model were studied empirically using variation across US states in the timing of reforms to their property rights. A robust negative correlation was demonstrated between survival-fertility and reform. The presence of community property law was also shown to lead to later reform than English common law. The non-monotonic relationship between per-capita wealth and reform, however, was not present, leading to the conclusion that heterogeneity and a better understanding of the exact political-economy mechanism for aggregating preferences may be critical.

In general, it would be of interest to study more deeply the coevolution of economic and political rights and economic development.[67] The relationship between the organization of families (e.g., who gives consent in marriage, the existence of polygyny, the ease of divorce, etc.), women's rights, and economic outcomes also deserves to be explored, particularly if one wants to answer the question of why women's rights were extended in the West.[68] It would also be of interest to see whether the results of this analysis can be replicated for other countries, particularly in the context of contemporary developing countries. It may be possible to find natural variation in survival-fertility (e.g. in the ease of access to/cost of contraception) and variation in local laws that allow more in depth examination of some of the main predictions of the model. Exploring variation in the timing of political rights within countries (e.g., across Swiss cantons), with an appropriately modified model, may also shed light on the evolution of women's political rights.[69]

The model also hints at why women's welfare may not have increased in line with economic growth. In particular, some historians have speculated that women may have been better off when the economy was poorer than in the mid 19th century (both for the US and for England).[70] As shown in the theoretical analysis of male regime preferences and growth, when the economy has very low wealth, men do not have much to gain from patriarchy. It is only as capital accumulation takes off that male preferences strongly favor patriarchy. This preference is later reversed once the economy reaches a critical level of wealth.

The model suggests furthermore that there should be attempts at piecemeal reform before granting women full property rights. This would happen once the economy's wealth exceeded $\widehat{k}$ (but was below k^*). As of that point, men would be in favor of decreasing somewhat their own consumption in favor of their wives' consumption, if that allowed them to also improve

[67] See Lagerlof (2009) for an interesting recent attempt to study the endogenous evolution of property rights in land and people (slavery).

[68] See Edlund and Lagerlof (2006), Iyigun and Walsh (2007b) and Tertilt (2006) for interesting work in this area. See Coontz (2005) for a history of marriage.

[69] In this case, endogenously different political preferences of men and women may come into play (see, e.g., Edlund and Pande (2002)).

[70] See Shammas et al (1987). In England, dower rights for women shrank over time before the reform of married women's property rights.

their daughter's position (though they would not yet favor granting women full property rights).

What are the lessons of this paper for countries in which women have yet to obtain full property rights? The model and empirical work suggest that policies that reduce fertility may also help improve women's economic position. It should be noted, however, that whether this conclusion continues to hold in the presence of technologies that not only allow fertility reduction but also sex selection is unknown and thus any policy implications should be drawn cautiously.

6 Appendix

6.1 Proofs of Lemmas 1 and 2

To prove lemmas 1 and 2, I guess the following functional forms for the value functions:

$$V_h^{NR}(k_h, \widetilde{k}_h) = a_h + b_h \log\left(k_h + \widetilde{k}_h - \frac{\underline{c}}{d}\right) \tag{31}$$

$$V_w^{NR}(k_w, \widetilde{k}_w) = a_w + b_w \log\left(k_w + \widetilde{k}_w - \frac{\underline{c}}{d}\right) \tag{32}$$

$$V_h^{ER}(k_h, \widetilde{k}_h) = \phi + \theta \log\left(k_h + \widetilde{k}_h\right) \tag{33}$$

$$V_w^{ER}(k_w, \widetilde{k}_w) = \phi + \theta \log\left(k_w + \widetilde{k}_w\right) \tag{34}$$

where $\{a_h, b_h, a_w, b_w, d, \phi, \theta\}$ is the set of parameters that will be solved for using the method of undetermined coefficients. Recall that $k = k_w + \widetilde{k}_w$ and that to solve for the efficient equilibrium we impose $\widetilde{k}'_h \equiv k'_w$ and $\widetilde{k}'_w \equiv k'_h$ before optimizing. Substituting (31) and (32) in the RHS of (3) and (4), and substituting (33) and (34) in the RHS of (16), one obtains

$$\begin{aligned} V_h^{NR}(k) &= \underset{c_h, k'_h, k'_w}{Max} \left\{ \log c_h + \frac{\beta}{2}\left[a_h + a_w + (b_h + b_w)\log\left(k'_h + k'_w - \frac{\underline{c}}{d}\right)\right]\right\} \\ \text{s.t.} \qquad Ak &= c_h + \underline{c} + nk'_h + nk'_w \end{aligned} \tag{35}$$

$$V_w^{NR}(k) = \log \underline{c} + \frac{\beta}{2}\left[a_h + a_w + (b_h + b_w)\log\left(k'_h + k'_w - \frac{\underline{c}}{d}\right)\right] \tag{36}$$

$$\begin{aligned} V_h^{ER}(k) + V_w^{ER}(k) &= \underset{c_h, c_w, k'_h, k'_w}{Max} \left\{\log c_h + \log c_w + 2\beta\left[\phi + \theta \log\left(k'_h + k'_w\right)\right]\right\} \\ \text{s.t.} \qquad Ak &= c_h + c_w + nk'_h + nk'_w \end{aligned} \tag{37}$$

Taking the first-order conditions with respect to c_h, c_w, k'_h and k'_w, yields the following optimal policies.

$$c_h^{NR} = \frac{Ak - \underline{c} - \frac{n\underline{c}}{d}}{1 + \frac{\beta}{2}(b_h + b_w)}$$

$$k'_{NR} = \frac{1}{n}\frac{\frac{\beta}{2}(Ak - \underline{c})(b_h + b_w) + \frac{n\underline{c}}{d}}{1 + \frac{\beta}{2}(b_h + b_w)}$$

$$c_w^{ER} = c_h^{ER} = \frac{1}{2}\frac{Ak}{1 + \beta\theta}$$

$$k'_{ER} = \frac{1}{n}\frac{\beta\theta Ak}{1 + \beta\theta}$$

We are now set to use the method of undetermined coefficients for the NR regime by substituting the optimal policies and the value functions in the RHS of (35) and (36), obtaining:

$$\begin{aligned} a_h + b_h \log\left(k - \frac{\underline{c}}{d}\right) &= \log \frac{Ak - \underline{c} - \frac{n\underline{c}}{d}}{1 + \frac{\beta}{2}(b_h + b_w)} + \\ &+ \frac{\beta}{2}\left[a_h + a_w + (b_h + b_w)\log\left(\frac{1}{n}\frac{\frac{\beta}{2}(Ak - \underline{c})(b_h + b_w) + \frac{n\underline{c}}{d}}{1 + \frac{\beta}{2}(b_h + b_w)} - \frac{\underline{c}}{d}\right)\right] \end{aligned} \tag{38}$$

$$\begin{aligned} a_w + b_w \log\left(k - \frac{\underline{c}}{d}\right) &= \log \underline{c} + \\ &+ \frac{\beta}{2}\left[a_h + a_w + (b_h + b_w)\log\left(\frac{1}{n}\frac{\frac{\beta}{2}(Ak - \underline{c})(b_h + b_w) + \frac{n\underline{c}}{d}}{1 + \frac{\beta}{2}(b_h + b_w)} - \frac{\underline{c}}{d}\right)\right] \end{aligned} \tag{39}$$

Following the same procedure for the ER regime yields:

$$2\left[\phi + \theta \log k\right] = 2 \log \frac{1}{2}\frac{Ak}{1 + \beta\theta} + 2\beta\left[\phi + \theta \log\left(\frac{1}{n}\frac{\beta\theta Ak}{1 + \beta\theta}\right)\right] \tag{40}$$

After some lengthy algebra, we obtain:

$$\begin{aligned} a_h &= \frac{\left(1 - \frac{\beta}{2}\right)\log \frac{A(1-\beta)}{\left(1-\frac{\beta}{2}\right)} + \frac{\beta}{2}\log \underline{c} + \frac{\beta/2}{(1-\beta)}\log\left(\frac{A}{n}\frac{\beta/2}{\left(1-\frac{\beta}{2}\right)}\right)}{(1-\beta)} \\ b_h &= \frac{1 - \beta/2}{1 - \beta} \\ a_w &= \frac{\frac{\beta}{2}\log \frac{A(1-\beta)}{\left(1-\frac{\beta}{2}\right)} + \left(1 - \frac{\beta}{2}\right)\log \underline{c} + \frac{\beta/2}{(1-\beta)}\log\left(\frac{A}{n}\frac{\beta/2}{\left(1-\frac{\beta}{2}\right)}\right)}{(1-\beta)} \\ b_w &= \frac{\beta/2}{1 - \beta} \\ d &= A - n \\ \phi &= \frac{\log(1-\beta)\frac{A}{2} + \frac{\beta}{(1-\beta)}\log \beta\frac{A}{n}}{(1-\beta)} \\ \theta &= \frac{1}{1-\beta} \end{aligned}$$

6.2 Descriptive Statistics and Correlations

Table A1 - Descriptive Statistics

	OBS	MEAN	ST. DEV	ST. DEV 1	ST. DEV 2	MIN	MAX
BOTH	356	0.58	0.49			0	1
FERTILITY10	356	1.40	0.27	0.12	0.21	0.70	2.86
WEALTHpc	356	1.37	0.96	0.60	0.77	0.12	8.22
TERRITORY	356	0.10	0.29			0	1
COMMUNITY	356	0.16	0.37			0	1
EQUITY	356	0.27	0.44			0	1
CHILD MORT.	356	0.23	0.09	0.07	0.09	0.08	0.57
FSCHOOL	355	56.60	16.20			0.90	93.60
MSCHOOL	355	57.81	16.00			3.20	90.90
CITY	356	8.45	13.49	4.49	1.26	0.00	65.55
MALE	356	54.51	7.49	1.10	5.66	44.59	95.93
CHILDBORN	322	3.60	1.42	1.07	1.26	1.25	9.40
FERTNEW	356	2.01	0.51	0.29	0.43	1.00	5.14
SUFFRAGE	356	0.14	0.35			0	1

See text for variable definitions.
Notes: ST. DEV 1 is standard deviation net of variation due to year fixed effects. ST. DEV 2 is standard deviation net of variation due to year and state fixed effects.

Table A2 - Correlations

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
(1)	BOTH	1													
(2)	FERTILITY10	-0.42	1												
(3)	WEALTHpc	0.45	-0.59	1											
(4)	TERRITORY	-0.29	-0.04	-0.14	1										
(5)	COMMUNITY	-0.27	-0.06	0.17	0.30	1									
(6)	EQUITY	0.10	-0.34	-0.03	-0.20	-0.27	1								
(7)	CHILD MORT.	-0.46	0.14	-0.50	0.13	0.03	0.36	1							
(8)	FSCHOOL	0.44	-0.40	0.45	-0.28	-0.20	0.20	-0.39	1						
(9)	MSCHOOL	0.37	-0.32	0.35	-0.27	-0.25	0.23	-0.28	0.98	1					
(10)	CITY	0.34	-0.44	0.33	-0.20	-0.03	0.25	-0.07	0.18	0.17	1				
(11)	MALE	-0.12	-0.28	0.26	0.46	0.41	-0.34	-0.11	0.00	-0.06	-0.22	1			
(12)	CHILDBORN	-0.53	0.58	-0.61	0.29	0.04	-0.29	0.47	-0.59	-0.49	-0.40	0.08	1		
(13)	FERTNEW	-0.51	0.94	-0.61	0.08	0.00	-0.41	0.25	-0.53	-0.46	-0.47	0.08	0.73	1	
(14)	SUFFRAGE	0.23	-0.25	0.44	0.00	0.04	-0.12	-0.41	0.29	0.23	0.16	0.06	-0.31	-0.29	1

See text for variable definitions.

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