Women's Liberation as a Financial Innovation*

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Abstract

Over the course of the second half of the 19th century, states in the US, which were entirely dominated by men, gave married women property rights. Before this "women's liberation", married women were subject to the laws of coverture. Coverture had detailed laws as to which spouse had ownership and control over various aspects of property both before and after marriage. This paper develops a general equilibrium model with endogenous determination of women's rights in which these laws affect portfolio choices, leading to inefficient allocations. We show how technological advancement eventually leads to men granting rights, and in turn how these rights affect development. We show how key implications of the model are consistent with cross-state empirical evidence in the US. Specifically, the dynamics of non-agricultural employment after rights are granted fit exactly with the model's prediction.

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1 Introduction

Over the course of the second half of the 19th century, states in the US, which were entirely dominated by men, gave married women property rights, while England granted similar rights in 1870. Before this "women's liberation", married women were subject to the laws of coverture.[1] Coverture had two aspects. First, in the eyes of the law, husband and wife were the same person. Second, there were detailed laws as to which spouse had ownership and control over various aspects of property both before and after marriage. This paper focuses on the second aspect of coverture, property laws, in developing a theory as to why men gave women rights.

Property was divided into multiple types. Personal property, including money, stocks, furniture and livestock, became the husbands' property entirely. He could sell or give the property away, and even bequeath it to others. There was a limitation on this freedom to paraphernalia, which was personal property such as clothing and jewelry, which the husband could sell or give away, but not bequeath. Real assets, such as land and structures, became under the husbands partial control while remaining in the wife's name. He could manage the assets as he saw fit, including the income generated by the assets, but he could not sell or bequeath the property without his wife's consent.[2]

We argue that these laws influenced the investment portfolio choices women made, and also had the effect of distorting capital markets, and thus allocations. Women investing predominantly in real assets, such as land, rather than moveable assets, such as capital, led to a misallocation between the associated sectors of the economy. As the productivity of capital-intensive industries grew the effects of this factor misallocation became worse. Eventually, these distortions were

[1] Coverture was an inherent aspect of British common law, and as such applied both in England and her colonies, including those that formed the United States and Canada.

[2] See Combs (2005) for a description of these rights. For an excellent description of the general responsibilities husbands and wives had to one another under coverture, see Basch (1982) Tables 1 and 2.

significant enough for men to want to give women rights. We develop a model in order to study men's incentive to give women property rights in the context of financial market efficiency.[3]

In the model, men have utility defined over their own consumption and the bequest they leave to their children. These in turn are determined by overall household income and the man's bargaining power in the household. Bargaining power depends on the relative income of the spouses both from the labor market and from assets. Before marrying, individuals make their portfolio choice, taking into account how their choices affect both total household income and their individual bargaining weight. Women potentially underinvest in capital when they do not have rights, as these assets will become their husbands upon marriage, and thus *decrease* the women's bargaining power.[4,5] Thus, when deciding whether to grant women rights, men face a tradeoff. On one hand, granting rights may increase overall output, and thus household income, while on the other hand, granting rights reduces men's bargaining power within the household, reducing their *share* of household income.[6]

We model two different sectors; agriculture, which uses labor and land, and manufacturing, which uses labor, capital, and structures.[7] As technology in man-

[3]The notions that coverture affected portfolio choices, that capital markets were of increasing importance during this time period, and that men were aware of the tradeoff we emphasize in this paper, are supported by historical evidence we provide in Section 2.

[4]An alternative interpretation of our model could be that parents make investment choices for their children, taking into account the prevailing legal system.

[5]This is equivalent to men and women bargaining before marriage and portfolio choices, subject to the constraint of no commitment on the men's side to implement any promises.

[6]Although couples bargain in a cooperative way, the model leads to Pareto inefficient decision on the women's part, and a corresponding undersupply of capital. This noncooperative ingredient is reminiscent of Basu (2006), who finds that when the threat points depend in part on endogenous decisions, multiple equilibria may exist. The nature of our model, however, is different from that of Basu (2006). In that paper, all decisions are made in the same period. In contrast, our models assumes two periods, and the inefficiency is dynamic in the sense that it is due to the initial underinvestment in capital in the first period caused by expectations of behavior in the second period, rather than any inefficiency in the second period. In this respect, our model is close to Konrad and Lommerud (1995) who assume a two-period model where individuals invest first in education, then marry.

[7]In accordance with the legal classification of assets under coverture, land and structures are considered 'real' assets in the model, while capital is composed of the 'moveable' assets.

ufacturing increases, the demand for capital grows, and the effect of coverture on factor misallocation becomes worse. Specifically, there is an under-investment in capital due to disincentive to invest in moveable assets on the part of women. This reduces labor productivity in manufacturing, and implies that too much labor is allocated to agriculture relative to the first-best. The model is a general equilibrium model with endogenous determination of women's rights by men.

After solving the model, we present a numerical example in order to illustrate how the model works. This exercise clearly shows the tradeoff men face when considering granting rights. On one hand, if they grant rights, total household income goes up.[8] On the other hand, granting women rights reduces men's bargaining power within the household. Furthermore, we are able to study how coverture affects the dynamics of the economy, with a focus on the interaction between capital accumulation, the rate of return of capital, and the level of financial distortion in the economy. We discuss how men's incentive to give women property rights evolves over the course of economic development, and how these rights in turn affect development. Thus, this paper is connected to a growing literature on both how development affects women's empowerment *and* how women's empowerment affects development.[9] Additionally, the mechanism through which the model works is through the financial market, and thus is related to the literature on how financial innovations lead to development.[10]

Next, we empirically validate the predictions of the model. Accordingly, we perform three exercises, all exploiting cross-state variation in the timing of women's economic rights in the U.S., taking the dates from Geddes and Lueck (2002). The first exercise confirms the prediction that men gave rights when

[8]Our mechanism depends on women investing more of their assets in capital when they have rights, which reduces spreads in the returns of assets, and thus increases efficiency. Acemoglu and Zilibotti (1997) argue that financial market development allowed for greater diversification of risk and higher productivity. Granting women property would allow for the same mechanism: greater capital investment allows for more diversification and higher productivity. Incorporating their model into our own would allow for yet another mechanism through which women's property rights affects growth.

[9]For more on this topic, see Duflo (2012) and Doepke and Tertilt (2014).

[10]See, for instances, Levine (1997) and Rajan and Zingales (1998).

distortions grew large. Specifically, using state-level total factor productivity (TFP) data in both agriculture and non-agriculture by state and year, from Turner, Tamura, Mulholland and Baier (2007) and Turner, Tamura and Mulholland (2013), we show that non-agricultural TFP predicts the granting of economic rights. Second, we use IPUMS data to verify that, after rights were granted, there was a dynamic effect on the fraction of workers in the non-agricultural sector, as predicted by the model. Finally, we use the Census of Manufactures, provided by Atack and Bateman (1999), in order to study the dynamic effects of the granting of rights on value added of workers and capital at the firm level. We interpret the empirical evidence as being very consistent with the predictions of the model. Nevertheless, we cannot make causal inferences.[11]

There is a growing literature on why men gave women rights in the 19th century. Doepke and Tertilt (2009) argue that men faced a tradeoff between wanting their own wives to have no power, and other men's wives to have power, and thus increase investment in human capital.[12] Fernández (2014) argues that men faced a tradeoff between not wanting their own wives to have any rights and wanting to be able to leave a bequest for their daughters. This paper adds to this literature in three ways. First, we propose a novel complementary mechanism through which men choose to give women rights, which does not depend on the desire to help their daughters. While men are altruistic towards their children,

[11]Our study contributes to a number of facts documented in the literature. Geddes and Lueck (2002) show that states with a greater fraction of the population in cities, higher wealth, and more educated women were more likely to enact married women's property rights laws. States that were more urbanized, and thus likely to be more industrialized, with more wealth likely experienced greater distortions due to misallocation of assets under coverture, which also goes along with our hypothesis. Khan (1996) shows that granting women property rights led to increased involvement of women in commercial activity, as measured by patent records. While we argue that property rights increased efficiency in the financial markets, the idea that rights also increased research and development is clearly complementary to the story we present in this paper.

[12]Doepke and Tertilt (2009) use the growing importance of human capital as their trigger through which men eventually give women rights. Galor and Moav (2006) study the interaction between physical and human capital complementaries and development. Our paper shows how women's rights affect physical capital accumulation, which in turn affect the returns to human capital, as in Galor and Moav (2006), and thus feedback into the story presented in Doepke and Tertilt (2009).

they are selfish in the sense that they permit women's rights in order to maximize their own consumption. Second, the story we propose is based on the details of the property rights given and how the legal regime that existed prior to these rights distorted capital markets. Finally, our story is consistent with several facts in the data, including the dramatic change in portfolio choices and the dynamics of industrialization as discussed above.

We proceed as follows. Section 2 describes the historical context of granting rights. Section 3 develops the model. In Section 4 we solve the model, define equilibrium, and outline the intuition for various stages of development. Section 5 outlines the solution methodology for numerically solving the model and discusses the results of the numerical exercise. Section 6 presents the cross-state empirical evidence. We conclude in Section 7.

2 Historical Context

In this section, we provide historical evidence to support the case that men granted women rights in order to undo financial distortions despite the effects these rights had on bargaining power at home. Specifically, we make three points. First, coverture affected portfolio allocations. Second, coverture was undone during a time of increasing importance and democratization of capital markets. Finally, people were aware of the tradeoff associated with granting women rights.

We begin by showing that women's property laws affected portfolio choices. Combs (2005) finds that coverture induced women to hold their wealth strategically, and that portfolios changed after rights were granted. Combs exploits the fact that when rights were granted in 1870 to married women, they were not granted retroactively. In her sample of British shopkeepers wives, those who were subject to coverture and not subject to coverture had nearly the same total amount of assets, but their portfolio composition was dramatically different. Women with rights had half as much money in real assets having nearly twice

the amount in personal property. Clearly, the effects of coverture on portfolio allocations were dramatic.

Additionally, Baskerville (2008) studies the effects of women's property rights in Canada, and argues that there was a 'silent revolution' of women becoming active in capital markets. In particular, he concludes from his study that, after rights were granted, "If one were to take away the very rich and obviously powerful, then women's activities and profiles in those areas [wealth holdings/portfolio choices] were often undistinguishable from those of most of their male counterparts." (p. 237).

Next, we argue that it was no coincidence that property rights were given in England in the middle of a period of massive capital market development. For instance, Maltby, Rutterford, Green, Ainscough and van Mourik (2011) argues that there was "an enormous expansion in the volume and variety of securities available to the investing public, especially from the 1860s onwards. Between 1870 and 1913, new issues on the London capital market, for example, totaled 5.7 billion pounds and among them were an increasing number of shares from the likes of British industrial and commercial companies and foreign mines and plantations." (p. 161).

Bogart (2014) discusses British financing of canals in the late 18^{th} and early 19^{th} centuries as being massive projects that "...appears to have stretched the local capital markets to the limit ..." (p. 375). He further argues that "The landed interest played a role [in financing the canals], but it was the mercantile and industrial sector in the area that provided the majority of funds." Indeed, capital markets were becoming increasingly important, and more reliant on sectors of society that were not historically wealthy.

Maltby et al. (2011) note two interesting facts about railroads in England, which was clearly a capital-intensive industry. First, between 1853 and 1914, railroad stocks rose dramatically to represent roughly 40% of dividend and interest paying assets traded in London, representing the national portfolio (pp.

161-162). Furthermore, there was a great democratization of the stock market over this time period, as "In the years between the 1840s and 1914, there was a transformation of the composition of both investments and the investing public. No longer were investors confined to a wealthy elite largely located in London, for they were increasingly found throughout the country and among the middle classes." (p. 156). In particular, it is estimated that between 150,000 and 300,000 people held stock in British railways by 1886 (p. 163). It is hard to imagine that the railroad industry would have been as successful without the overall deepening of financial markets over this time period.

One possible criticism of the idea that women's property rights were important for aggregate outcomes is the notion that perhaps women didn't have much in the way of assets. Married women's labor force participation was low, even after rights were granted, so where would they have the money to invest? We note that bequests were a major source of wealth in this period, as in DeLong (2003). As such, all we need to assume is that parents bequeathed assets appropriate to their children in order for the distortions to exist. Specifically, as long as parents internalize that their bequest to their daughter will be taken from her unless it's in the form of land, the claims of this paper stand. Indeed, this is argued in Baskerville (2008) "The granting of more control over wealth to married women allowed fathers and mothers to bequeath wealth to single daughters with more frequency since they had less to fear from acquisitive behaviour of prospective husbands. The increased investment profile of single women might be a reflection of that bequeathing behaviour. Certainly, the timing of their increased presence in the bank share sector is consistent with that hypothesis." (p. 87)

Finally, we turn to evidence that people were aware of the tradeoffs associated with granting women rights, specifically that rights would improve financial markets but cause men to lose power at home. That people were aware of this tradeoff is perhaps best shown in the *The Morning Post* which reported that

British Member of Parliament Alexander Hope " was of the opinion that the passage of the measure now before the house would completely revolutionise the whole system of credit in the retail trade of this country." The same article reports that Mr. Hope was opposed to the passage of the bill, as "He thought it wantonly interfered with the relations of married life." (*The Morning Post*, 1869). Clearly, Mr. Hope understood that married women's property rights would affect both financial markets and household relations. He was not alone. Thomas Herrtell, of the New York Legislature, argued that women's property rights "would open appropriate segments of the economy to women, reduce pauperism, and thereby save the public considerable expense." Basch (1982) (p. 115). John Robinson, a politician in British Columbia opposed to the granting of married women property rights, argued that these laws were "calculated to revolutionize the whole household system" (Baskerville 2008) (p. 6).

In additional to the politicians of the time period being aware of the impact of women's property rights, the academic literature has taken note as well. Chused (1985) argues that "It is now generally agreed that the first wave of married women's acts were adopted in part because of the dislocations caused by the Panic of 1837.", implying that the financial market implications of women's rights were indeed a cause of reform.[13] Combs (2006) argues that, after property rights were given, women had higher fraction of household wealth, invested more in 'moveable property' despite returns decreasing in that area, and perhaps received transfer from husband due to bargaining power.

The literature has also discussed a related mechanism through which women's economic rights affected financial markets. Combs (2013) argues that trusts established for women during coverture allowed for women to protect their husbands assets during bankruptcy, effectively committing sophisticated fraud, and shows that people were mindful of these realities during the debate over granting property rights. Chused (1985) argues the same occurred in Oregon, showing that

[13]This notion is further reflected in Basch (1982) "It is worth noting that the two major statutes of 1848 and 1860 followed the depressions of 1839-43 and 1857" (p. 122).

the same phenomenon was present in the United States, and Baskerville (2008) discusses this phenomenon in Canada. Notice that this story of property rights reducing fraud is a complementary mechanism to our own as to how granting married women property rights would be a financial innovation that improves capital markets.

The evidence clearly show that coverture affected portfolio choices during a time of growing importance and democratization of financial markets, and that people were aware of both the financial and intrahousehold implications of married women's rights.

3 Model

The economy consists of overlapping generations of men and women who live for two periods. In every period the economy produces a single homogeneous final good that can be used for consumption and investment. There are three different assets: Land, T, capital, K, and structures, S.[14] The final good is produced by two intermediate goods: agriculture, A, and manufactured goods, M. While agriculture uses labor and land, manufacturing utilizes labor, capital, and structures as factors of production. We assume the structures and capital fully depreciate within a period.[15]

3.1 Production

Production takes place in three different sectors: the final good sector, the agricultural sector, and the manufacturing sector.

[14] Land and structures correspond to the 'real' assets over which married women always had partial rights to, while capital represents the 'moveable' assets that immediately and forever became the husband's property upon marriage.

[15] The assumption of full depreciation is not necessary for our analytic results. Rather, it simplifies the solution by allowing us to abstract from relative changes of asset prices over time and the corresponding implication for portfolio choice of households.

3.1.1 The Final Good

The output of the final good in the economy in period t, Y_t, is given by aggregating the agricultural intermediate good, Y_t^A, and the manufacturing intermediate good, Y_t^M, according to the following neoclassical constant elasticity of substitution (CES) production technology:

$$Y_t = \left[(Y_t^A)^\rho + (Y_t^M)^\rho\right]^{(1/\rho)}, \tag{1}$$

where $\rho \in (0, 1]$.[16]

3.1.2 The Agricultural Intermediate Good

Production of the agricultural intermediate good occurs within a period according to a neoclassical, CRS, Cobb-Douglas production technology, using labor and land. The output produced at time t, Y_t^A, is

$$Y_t^A = A_t^A (T)^\alpha (L_t^A)^{(1-\alpha)}, \tag{2}$$

where A_t^A is the level of technology in the agricultural sector, T and L_t^A are the land and the number of workers, respectively, employed by the agricultural sector in period t, and $\alpha \in (0, 1)$ is the weight on land. Notice that the amount of land in the economy is fixed.

3.1.3 The Manufacturing Intermediate Good

Production of the manufacturing intermediate good occurs within a period according to a neoclassical CRS production technology using labor, structures, and capital. The output produced at time t, Y_t^M, is

$$Y_t^M = \left[A_t^M (K_t)^\sigma + (S_t)^\sigma\right]^{\frac{\alpha}{\sigma}} (L_t^M)^{(1-\alpha)}, \tag{3}$$

[16] Zeira and Zoabi (2015) find that for the equilibrium to be well-behaved, it is required that the two intermediate sectors should be substitutes and not complements.

where A_t^M is the level of technology in the manufacturing sector, and K_t, S_t, and L_t^M are the capital stock, structures, and the number of workers, respectively, employed by the manufacturing sector in period t.[17] We are thinking of the structures as representing small shops, such as on a main street of a town, which women could own as part of their 'real' assets portfolio. In contrast, the capital represents factories. Accordingly, technology, A^M, augments capital, rather than structures. This is similar to Greenwood, Hercowitz and Krusell (1997), which break structures and capital apart in their production function.

3.2 Individuals

In every period a generation, consisting of a unit measure of men and of women, is born. Individuals live for two periods, childhood and adulthood. Children make no decisions. Each adult receives half of their parents' land, and a bequest, b_{t-1}, and then the men decide whether to grant women property rights.[18] Single men and women then invest their bequest in structures and capital. After the investment decision, they form households and decide on consumption for each spouse, along with a bequest for the next generation. We assume that the man supplies his one unit of time inelastically while the woman does not work.[19] Since there is no heterogeneity within genders, we analyze the representative agent problem of married households along with the investment decisions of single men and women.

Preferences of individual $i \in \{m, f\}$, for male and female, who is born in period t are defined over second-period consumption, c_{t+1}^i, and a transfer to both

[17] Notice that we use the same elasticity of production with respect to labor in the manufacturing and agriculture sector, which simplifies our analysis, but is not crucial for our results.

[18] Galor, Moav and Dietrich (2009) also assume that children inherit land directly from their parents. We follow them for simplicity. We believe this assumption to be innocuous, which we will explain later.

[19] None of our results hangs on this assumption as labor is assumed to be exogenous.

offsprings, $2b_{t+1}$. They are represented by a log-linear utility function

$$U(c_t^i, b_t) = \log(c_t^i) + \gamma \log(2b_t), \tag{4}$$

where γ is the weight put on children.

Denote K_t^i and S_t^i as the capital and structures, respectively, that member $i \in \{m, f\}$ has, the single's budget constraint is given by

$$K_t^i + S_t^i = b_{t-1}. \tag{5}$$

Each household has a son and daughter. Using income from their assets and the man's wage, each husband and wife cooperatively allocate their resources between the husband's consumption, c_t^m, the wife's consumption, c_t^f, and equal bequest to each of their progeny, b_t.

The budget constraint that a couple faces in the second period of life is thus

$$c_t^m + c_t^f + 2b_t = I_t, \tag{6}$$

where I_t is household's income, which is given then by

$$I_t = r_t^K K_t + r_t^T T + r_t^S S_t + w_t, \tag{7}$$

where r_t^K, r_t^S, and r_t^T are the returns of capital, structures, and land, respectively, and w_t is the wage earned by the husband. The household budget constraint includes both the man and woman's assets. That is, $K_t = K_t^m + K_t^f$, $S_t = S_t^m + S_t^f$, and $T = T^m + T^f$.

A husband and wife decide cooperatively how to allocate their resources between the three goods: husband's consumption, wife's consumption, and bequest.[20] Thus, economic choices are therefore determined by maximizing the

[20]For an excellent analysis of the importance of cooperative household decision making, see Browning, Chiappori and Weiss (2014).

following weighted average utility:

$$\{c_t^f, c_t^m, b_t\} = \text{argmax}\{\theta_t \log(c_t^f) + (1-\theta_t)\log(c_t^m) + \gamma \log(2b_t)\}, \tag{8}$$

where θ_t is the wife's weight in household's decision and $(1-\theta_t)$ is the husband's. This maximization is subject to the constraint (6).

θ in turn depends both on the relative income of the spouses as well as the political regime chosen by the men, as discussed below. Thus people take the political regime into account when deciding upon their investments when single and allocations when married.

3.3 The No Rights Regime (NR)

In the NR regime the husband owns and controls all the capital the household has and manages all its real assets, even though the wife's land and structures remain in her name. To capture this reality in a parsimonious manner, we assume that the husband extracts $\lambda \in (0,1)$ of the returns on land and structures that the wife brings to the household.[21] Therefore, wife's weight in the household's decision is given by the share $1-\lambda$ of the returns on wife's land and structures out of the total household's resources.

That is, the wife's share of household's choice would be given by

$$\theta_t = \frac{(1-\lambda) r_t^T T^f + r_t^S S_t^f}{I_t}. \tag{9}$$

3.4 The Rights Regime (R)

In the R regime each member owns, manages and controls her (his) assets. Thus, the wife controls all the returns of all the assets she brings to the household. In

[21] The legal reality was that the men controlled the income from the wife's real assets, but could not sell or bequeath them without the wife's permission, and these assets would return to her upon dissolution of the marriage. We thus think of λ as capturing the rental flow of the real assets over the course of the marriage.

this case, the wife's welfare weight would be given by

$$\theta_t = \frac{r_t^T T^f + r_t^K K_t^f + r_t^S S_t^f}{I_t}, \tag{10}$$

3.5 Determination of the Political Regime

The political regime is determined by a vote among the male population before marriages take place. Individuals' portfolio depends upon the outcome of the men's decision, as described above. Under the assumption that men will vote for NR when both regimes yield the same utility, granting rights will occur if and only if:

$$(U_t^m)^R > (U_t^m)^{NR}. \tag{11}$$

Two economic forces dictate whether inequality (11) holds. The first is that, under the NR regime, husbands have control over the women's capital and a fraction λ of their land, leading to greater power within the household and thus a male preference for the NR regime. However, the NR regime distorts the women's perception of the different assets, which may lead to inefficiency in resource allocation within the economy. In what follows, we examine these trade-offs in more detail, and derive conditions under which men prefer to share power with their wives.

4 Model Solution

We begin by solving for the production side of the economy, taking as given the investment choices made by households. Then we solve for individual choices of individuals in the model by backwards induction. Given a rights regime and the corresponding portfolio of each spouse, we calculate the consumption allocation and bequest for the children. Foreseeing the solution to the household problem, singles make their portfolio choice. Notice that in order to solve for the portfolio

choice of men and women, we need to know the returns to both structures and capital, as solved for in the production side of the economy. As noted, production in turn depends on the portfolio allocations, yielding a general equilibrium problem.

As a last step, men take into account how their choice of granting women's rights affects both investment choices of singles before marriage along with household allocations of couples after marriage.

4.1 Production and Factor Prices

The final good producers take as given prices of intermediate goods and maximize their profits:

$$\{Y_t^A, Y_t^M\} = \text{argmax}\left\{\left[(Y_t^A)^\rho + (Y_t^M)^\rho\right]^{\frac{1}{\rho}} - P_t^M Y_t^M - P_t^A Y_t^A\right\} \tag{12}$$

In turn, profit maximization by the final good producer, using the first order conditions of (12), give the following inverse demand functions for the intermediate goods:

$$\begin{aligned} P_t^M &= (Y_t^M)^{\rho-1}(Y_t)^{1-\rho} \\ P_t^A &= (Y_t^A)^{\rho-1}(Y_t)^{1-\rho}. \end{aligned} \tag{13}$$

The intermediate agricultural good producers maximize the following profit

$$\{T_t, L_t^A\} = \text{argmax}\left\{P_t^A A_t^A (T_t)^\alpha (L_t^A)^{1-\alpha} - r_t^T T_t - w_t L_t^A\right\}, \tag{14}$$

and for the intermediate manufacturing good producers it is given by

$$\{K_t, S_t, L_t^M\} = \text{argmax}\left\{P_t^M \left[A_t^M (K_t)^\sigma + (S_t)^\sigma\right]^{\frac{\alpha}{\sigma}} (L_t^M)^{(1-\alpha)} - r_t^K K_t - r_t^S S_t - w_t L_t^M\right\}. \tag{15}$$

These maximization problems give the following first order conditions

$$r_t^T = \alpha P_t^A A_t^A \left(\frac{L_t^A}{T}\right)^{1-\alpha} \tag{16}$$

$$r_t^K = \alpha P_t^M \left[A_t^M (K_t)^\sigma + (S_t)^\sigma\right]^{\frac{\alpha}{\sigma}-1} (L_t^M)^{(1-\alpha)} A^M (K_t)^{(\sigma-1)} \tag{17}$$

$$r_t^S = \alpha P_t^M \left[A_t^M (K_t)^\sigma + (S_t)^\sigma\right]^{\frac{\alpha}{\sigma}-1} (L_t^M)^{(1-\alpha)} (S_t)^{(\sigma-1)} \tag{18}$$

$$\begin{aligned} w_t &= (1-\alpha) P_t^A A_t^A \left(\frac{T}{L_t^A}\right)^{\alpha} \\ w_t &= (1-\alpha) P_t^M \left(\frac{\left[A_t^M (K_t)^\sigma + (S_t)^\sigma\right]^{\frac{1}{\sigma}}}{L_t^M}\right)^{\alpha} \end{aligned} \tag{19}$$

Notice that wages are equalized between workers in agriculture and manufacturing as labor can move freely between them. However, the rates of return on structures and capital are not necessarily equalized. If women are disincentivized from investing in capital due to coverture, there might be an under accumulation of capital leading to excessive returns. This point is crucial as it is the source of economic inefficiency under the NR regime.

4.2 Household Optimal Choice

We begin by analyzing the household choice given a portfolio and political regime. Maximizing (8) subject to (6) gives the following optimal choices

$$c_f = \frac{\theta I}{1+\gamma}, \tag{20}$$

$$c_m = \frac{(1-\theta) I}{1+\gamma}, \tag{21}$$

and

$$b = \frac{\gamma I}{(1+\gamma)}. \tag{22}$$

Notice that this formulation is general. That is, the political regime will affect both I and θ, but once they have been determined, these equations dictate the solution to the household problem.

4.3 Individual Portfolio Optimal Choice

Individuals' portfolio choices depend on the political regime as the latter impacts the assets over which men and women have control.

4.3.1 The No Right Regime (NR)

Substituting household's optimal choices: (20), (21) and (22); individual's budget constraint (5) and individual's share in household decision under the NR regime, (9) into individual's utility function, (4) gives an optimal behavior that can be derived from maximizing the following problem for women:

$$\begin{aligned} S_t^f = \text{argmax} \Big\{ &\log[S_t^f r_t^S + r_t^T T/2] + \gamma \log[S_t^f (r_t^S - r_t^K) + S_t^m r_t^S \\ &+ (K_t^m + B_{t-1}) r_t^K + r_t^T T + w] \Big\}, \end{aligned} \tag{23}$$

and the corresponding problem for men:

$$\begin{aligned} S_t^m = \text{argmax} \Big\{ &\log[S_t^m (r_t^S - r_t^K) + \lambda S_t^f r_t^S + (1+\lambda) r_t^T T/2 + (K_t^f + B_{t-1}) r_t^K + w] \\ &+ \gamma \log[S_t^m (r_t^S - r_t^K) + S_t^f r_t^S + (K_t^f + B_{t-1}) r_t^K + r_t^T T + w] \Big\} \end{aligned} \tag{24}$$

The solution to women's maximization problem, (25) and men's maximization problem, (26) depend on returns on land, r_t^T, the returns on capital, r_t^K and the budget constraint, (5). This optimal choice is summarized in the following Lemma

Lemma 1 *In the No-Right regime:*

Women's optimal investment is given by

$$S_t^f = \begin{cases} B_{t-1} & \text{if } r_t^S \geq r_t^K \\ \min\left\{B_{t-1}, \frac{r_t^S S^m + (B_{t-1}+K^m) r_t^K + r_t^T T\left[1-\frac{\gamma}{2}\left(\frac{r_t^K - r_t^S}{r_t^S}\right)\right] + w}{(1+\gamma)(r_t^K - r_t^S)}\right\} & \text{if } r_t^S < r_t^K \end{cases}$$

And men's optimal investment is given by

$$S_t^m \begin{cases} = B_{t-1} & \text{if } r_t^S > r_t^K \\ = 0 & \text{if } r_t^S < r_t^K \\ \in (0, B_{t-1}) & \text{if } r_t^S = r_t^K \end{cases}$$

Proof: Follows directly from the first order conditions and the constraint (5).

□

4.3.2 The Right Regime (R)

Substituting household's optimal choices: (20), (21) and (22); individual's budget constraint (5) and individual's share in household decision under the R regime, (10) into individual's utility function, (4) gives an optimal behaviour that can be derived from maximizing the following problem for women:

$$\begin{aligned} S_t^f = \text{argmax} \Big\{ &\log[S_t^f (r_t^S - r_t^K) + B_{t-1} r_t^K + r_t^T T/2] \\ &+ \gamma \log[S_t^f (r_t^S - r_t^K) + S_t^m r_t^S + (K_t^m + B_{t-1}) r_t^K + r_t^T T + w] \Big\}, \end{aligned} \tag{25}$$

and the corresponding problem for men:

$$\begin{aligned} S_t^m = \text{argmax} \Big\{ &\log[S_t^m (r_t^S - r_t^K) + B_{t-1} r_t^K + r_t^T T/2 + w] \\ &+ \gamma \log[S_t^m (r_t^S - r_t^K) + S_t^f r_t^S + (K_t^f + B_{t-1}) r_t^K + r_t^T T + w] \Big\}. \end{aligned} \tag{26}$$

The solution to women's maximization problem, (25) and men's maximization problem, (26) depend on returns on land, r_t^T, the return capital, r_t^K, and

the budget constraint, (5). This optimal choice is summarized in the following lemma:

Lemma 2 *In the Right regime:*
Individual i's $\in \{f, m\}$ optimal investment is given by

$$S_t^i \begin{cases} = B_{t-1} & \text{if } r_t^S > r_t^K \\ = 0 & \text{if } r_t^S < r_t^K \\ \in (0, B_{t-1}) & \text{if } r_t^S = r_t^K \end{cases}$$

Proof: Follows directly from the first order conditions and the constraint given in (5). □

4.4 Market Clearing

We need to verify that the goods markets clear, that the capital, structure, and land supplied by the household are equal to those demanded by the firms, and that the labor market clears.

Specifically, the goods market clearing involves production to be equal to consumption, as shown by

$$Y_t = c_t^m + c_t^f + 2b \tag{27}$$

The capital market clears, as shown by

$$K_t = K_t^m + K_t^f, \tag{28}$$

where K_t is the capital used by the manufacturing sector, as in Equation (15), and K_t^m and K_t^f are the capital choices by men and women, respectively.

The structure market clears, as shown by

$$S_t = S_t^m + S_t^f, \tag{29}$$

where S_t is the structures used by the manufacturing sector, as in Equation (15), and S_t^m and S_t^f are the structure choices by men and women, respectively.

The land market clears, as shown by

$$T_t = T^m + T^f, \tag{30}$$

where T_t is the land used by the agricultural sector, as in Equation (14), and T^m and T^f are the land endowments of men and women, respectively.

The last equilibrium condition is labor market clearing:

$$L_t^M + L_t^A = 1. \tag{31}$$

4.5 General Equilibrium

We now define the general equilibrium of the economy.

Definition 1 *General equilibrium in the economy is a set of prices* $\{P_t^A, P_t^M, w_t, r_t^K, r_t^S, r_t^T\}$, *allocations in the production side* $\{Y_t, Y_t^M, Y_t^A, T, K_t, S_t, L_t^A, L_t^M\}$, *portfolio choices of the household* $\{S_t^f, S_t^m, K_t^f, K_t^m\}$, *household allocation* $\{c_t^f, c_t^m, b_t\}$, *and a series of political regimes for each date* t, *such that:*

1. *Given prices and a rights regime,* $\{Y_t, Y_t^M, Y_t^A, T, K_t, S_t, L_t^A, L_t^M\}$ *solve the production side and* $\{c_t^f, c_t^m, b_t\}$ *solve the household problem.*

2. *Markets clear.*

3. *The political regime at each time* t *is determined by* $(U_t^m)^R$ *compared to* $(U_t^m)^{NR}$.

We next describe intuitively the various phases of development of the economy, before showing a numerical example in the following section.

In our exercise, we will study development by increasing the relative productivity of the manufacturing sector. The economy experiences three phases along its development path.

1. For A_M sufficiently low, the manufacturing sector is small enough that returns between land and capital can be equalized under the NR regime. Accordingly, men do not give rights to women as there is no distortion in the economy.

2. When A_M is large but not too large, there begins to be a wedge between the returns to capital and the returns to land. The economy operates below potential, but not so much so that men are willing to grant women rights.

3. Finally, after A_M grows high enough, the distortion in the economy becomes great enough that men grant women rights.

5 A Numerical Example

In this section, we solve a numerical example of the model in order to illustrate how it works. As mentioned above, there are three phases of development. First, as A_M is low, there is no distortion caused by coverture. After a certain point, there is insufficient capital provided to the manufacturing sector, causing an increasing degree of inefficiency. When the inefficiency grows, men eventually give women rights. First we describe the solution method for the numerical example, along with parameters chosen, and then we show various results from the model along with the economics of these results.

5.1 Numerical Solution and Parameters

For the example, we create an evenly spaced grid of A_M from 0.5 to 5, while holding A_T constant at 1.[22] This allows for the example to illustrate what happens in the model as manufacturing grows in relation to agriculture, as happened histor-

[22]We solve the model using the following parameter values: $\gamma = 1, \lambda = 0.5, \rho = 0.9, \sigma = 0.5, \alpha = 0.5, T = 1$.

ically.[23] For each grid point, we first solve the model for the case where women are not given property rights as follows. First, assume that $r_k = r_s$ and solve for the general equilibrium. If indeed there is a solution with $r_k = r_s$, then the economy is operating without any distortions. Otherwise, we solve the model under the assumption that returns are not equalized. To do so, we perform an iterative process as follows:

1. Guess w, r_k, r_s, r_t, and infer portfolio allocations for men and women using Lemma 2, and thus K and S.

2. Using equations (19) and (31), solve for L_M and L_A.

3. Using K, T, S, L_M, and L_A, infer w, r_k, r_s, and r_t using equations (19), (17),(18), and (16).

4. Update guess and iterate until convergence.

We solve the model at each grid point three different ways. First, we assume that women never have rights. Then we resolve under the assumption that they always have rights. Finally, we do the exercise where men optimally choose when to give women rights.

5.2 Dynamics of Development and Rights

We now show graphically the results of the numerical exercise and discuss the economic intuition behind the model. For all graphs, unless otherwise specified, the line 'No Rights' shows the evolution of these variables if women are never given rights, the line 'Rights' shows these variables if women always have

[23] There is a literature about whether the shift of labor from agriculture was due to the 'pull' of higher TFP in manufacturing increasing demand for industrial workers, or the 'push' of higher TFP in agriculture decreasing demand for farm workers. Clark (2007) provides historical TFP data for this time period arguing that TFP grew faster in manufacturing than in agriculture, providing the basis for our analysis here.

rights, and the line 'With Change' shows the evolution of these variables if men optimally choose to switch political regimes.

In Figure 1 we show the evolution of women's bargaining power, θ, as well as log income. We see here clearly the tradeoff men face. Women with rights always have higher bargaining power than women without rights, so clearly the moment that men grant rights, women's bargaining power increases. On the other hand, the case of women having rights implies no distortion in the asset markets, and thus higher income. Accordingly, when rights are granted, income rises. Notice also that, at the beginning, the income levels are the same, as there is no distortion. It is only as A^M grows large enough that the distortion develops, and eventually men give rights, as explained in Section 4.5. Additionally, notice that, while women's bargaining power jumps immediately to the new level, income takes time to adjust. This is due to the fact that people are poorer under patriarchy than they would be otherwise, and convergence to the new steady-state growth path takes time. The mechanism for convergence, made clear below, works through the growth of the bequests.

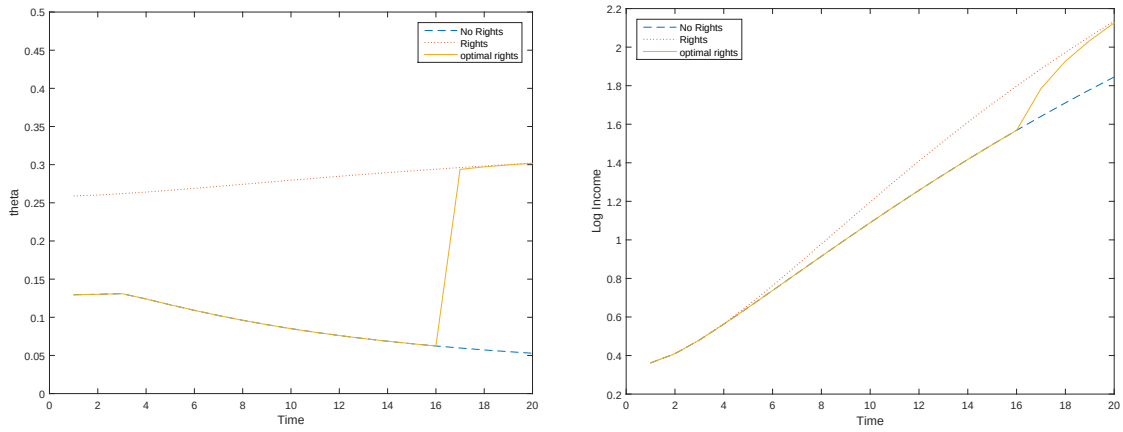

Fig. 1: *Women's Bargaining Power (Left) and Log Income (Right)*

In Figure 2, we show men's utility over the course of development, and leads to the first testable prediction of the model: as development progresses, men

eventually endogenously choose to grant women rights. The curve labeled "no rights" is men's utility when women do not have rights. We then compute men's utility "E.P.N.", for "End Patriarchy Now". This is men's utility if they decide to grant rights in any given period for the first time. The difference between this curve and a hypothetical curve (not shown) where women always have rights is that this curve has men take into account that, due to underaccumulation of capital under patriarchy as described above, the level of income will be smaller at first.

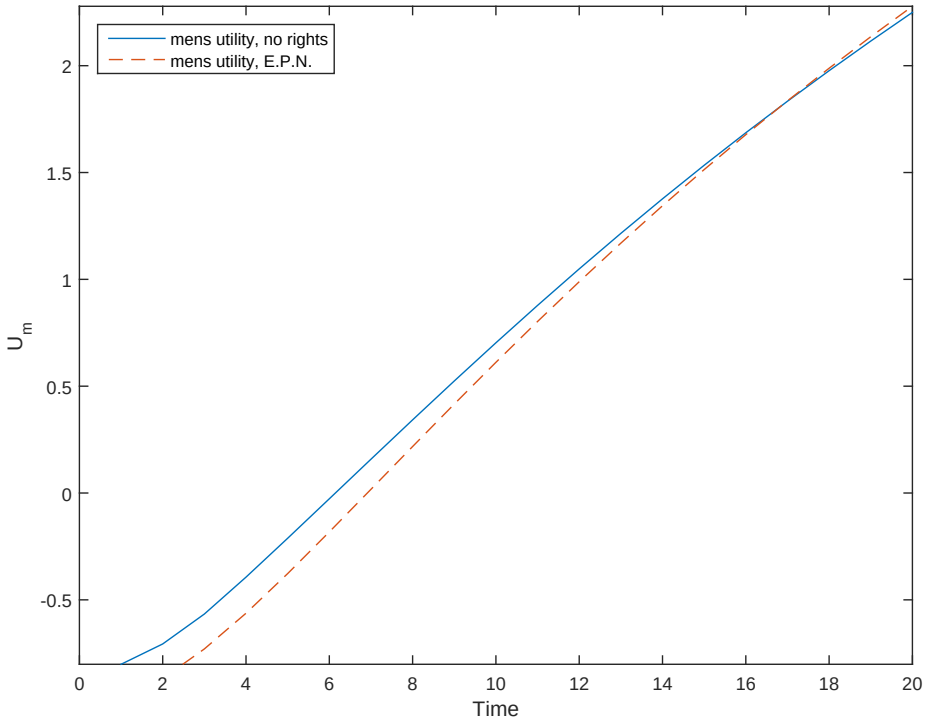

Fig. 2: *Men's Utility*

Figure 3 shows the dynamics of labor in the non-agricultural sector. Under coverture, there is an inefficiently low amount of capital, and thus less labor in non-agriculture as would be otherwise. Upon granting rights, the fraction of workers employed in non-agriculture grows immediately and dynamically, con-

verging to a higher level on the growth path. This is the second testable prediction of the model.

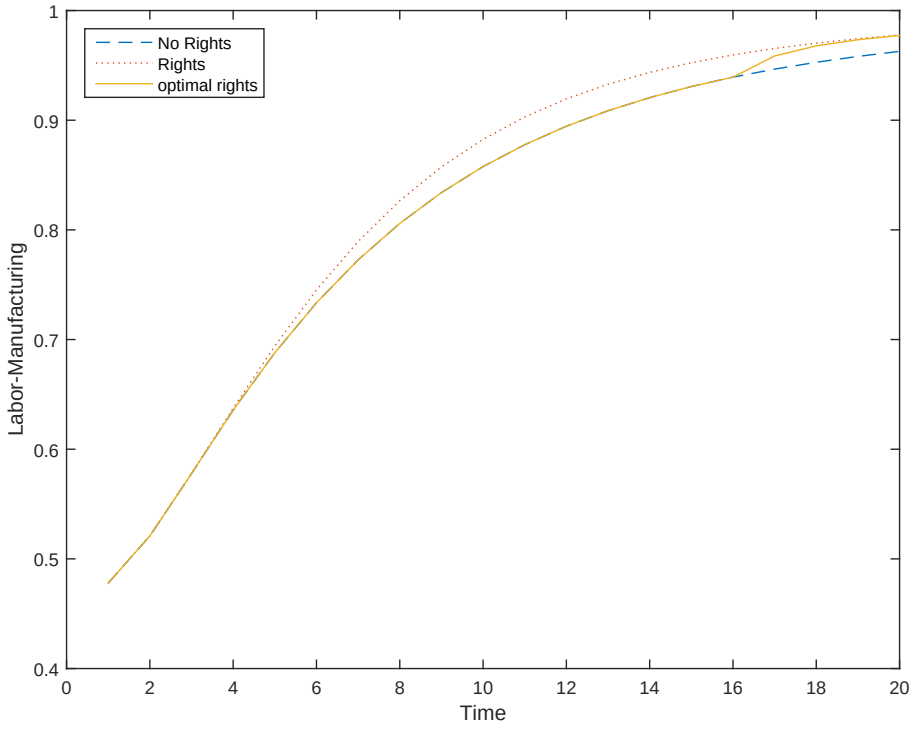

Fig. 3: *Labor in Non-Agriculture*

Figure 4 shows the evolution of value added per worker and per unit of capital. Empirically, we cannot distinguish between capital and structures, so for the purposes of this example, we combine them into one aggregate. Upon granting rights, there is a more efficient allocation of capital leading to higher value added per worker. As capital accumulates, this value added increases dynamically. Additionally, since the capital exhibits a better allocation in it of itself (between structures and actual capital), value added per capital rises. The dynamic effect is a slight reduction in the value added per capital, as capital accumulation decreases the marginal product. These dynamics are the third and final testable prediction of the model.

Figure 5 shows the dynamics of the log of the bequest in the model. Notice

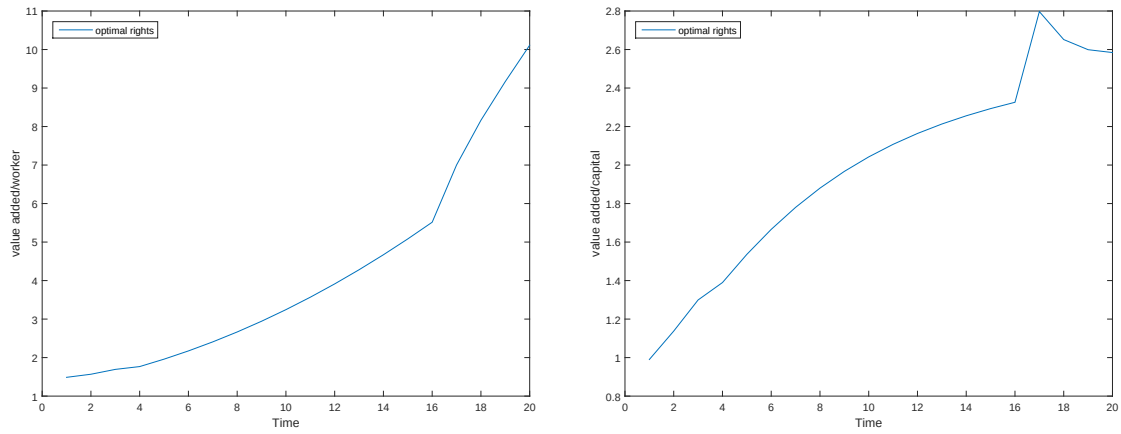

Fig. 4: *Value Added per Worker (Left) & per unit of Capital (Right)*

that bequest levels are higher when women have rights, due to the lack of distortion. Note that it is not due to women's bargaining power leading to a greater allocation towards children, as women and men value their children the same amount. After rights are granted, the bequest grows and converges to the case of women always having rights. The reason for this is that the bequest a generation receives is proportional to the income level of their parents. Once women have rights, this bequest is allocated more efficiently, leading to higher income, and thus a higher level of bequest to the next generation. There is a steady state growth path that the model converges towards.

Figure 6 shows the dynamics of log capital and log structure stock in the model. When rights are granted, there is a greater allocation of resources towards capital, and the stock converges dynamically towards the steady state growth path. On the other hand, there is less investment in structures, and so the stock of structures drops immediately. It then grows as there is overall economic growth towards the steady state path of structures. Notice that the assumption of full depreciation in capital and structures is important towards both the speed of the transition of capital, and the fact that the stock of structures drops below the long run trend when rights are given.

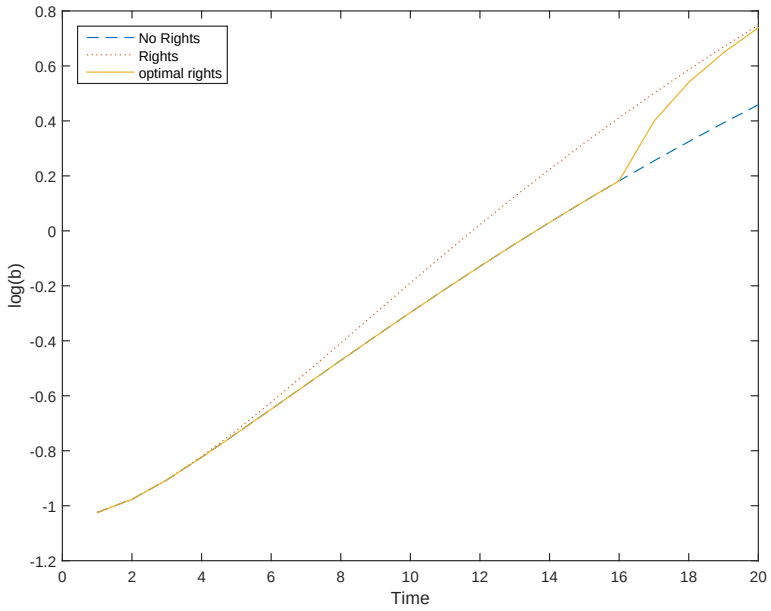

Fig. 5: *Log Bequest Level*

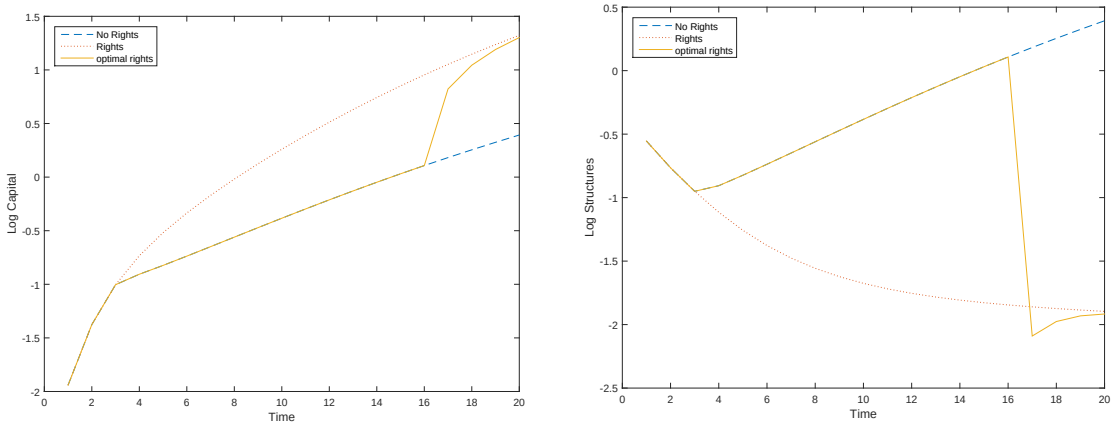

Fig. 6: *Log Capital (Left) and Structures (Right)*

Figure 7 shows the dynamics of the returns to capital and structures.[24] At low

[24]Our model predicts that the returns to moveable assets decline after rights are granted. Rights were granted in England in 1870, and many US states granted rights around 1870 as well. Siegel (1992) has long run historical data on returns to various assets, such as stocks and bonds, which are clearly moveable assets. These assets appear to begin to exhibit lower returns around 1870, which is consistent with the theory presented here.

levels of A^M there is no economic distortion, and thus the returns are equalized. When there is a distortion, at higher levels of A^M, the returns to capital exceed the returns to structures due to underinvestment in capital. As soon as rights are granted, the returns are equalized. As the economy accumulates more wealth after rights are granted, these returns fall even more.

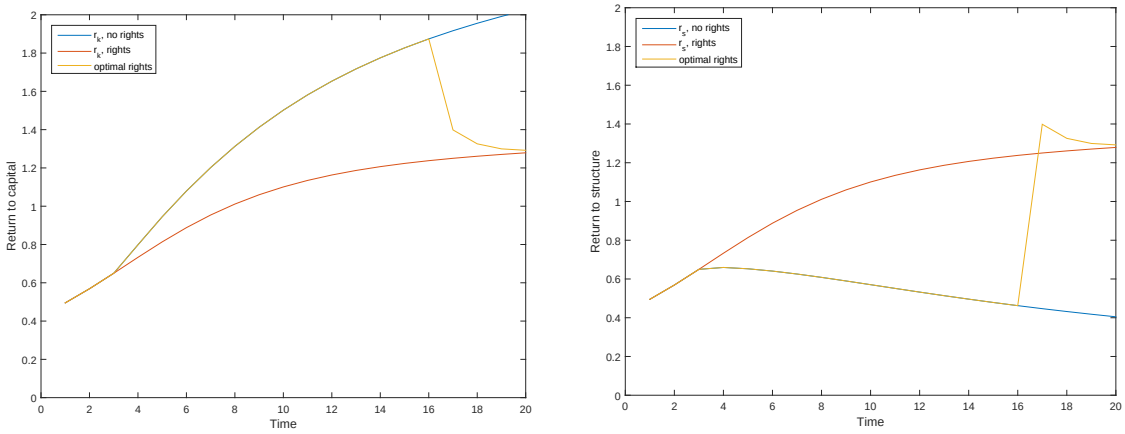

Fig. 7: *Returns to Capital (Left) and Structures (Right)*

Figure 8 shows the returns to land over time. There is a long-term reduction in returns to land as there is a general shift of labor away from agriculture. When women do not have rights, there is a higher amount of labor in agriculture, and thus the returns to land are relatively high. After rights are granted, there is a dynamic increase in the flow of labor away from agriculture, and thus a sharper drop in the returns to land. Clark (2007) has long-run data rates of return on land. They are clearly declining over the period studied. Furthermore, Piketty (2014) has data depicting the declining importance of land in national wealth portfolios for both the U.S. (Figure 4.6) and England (Figure 3.1).

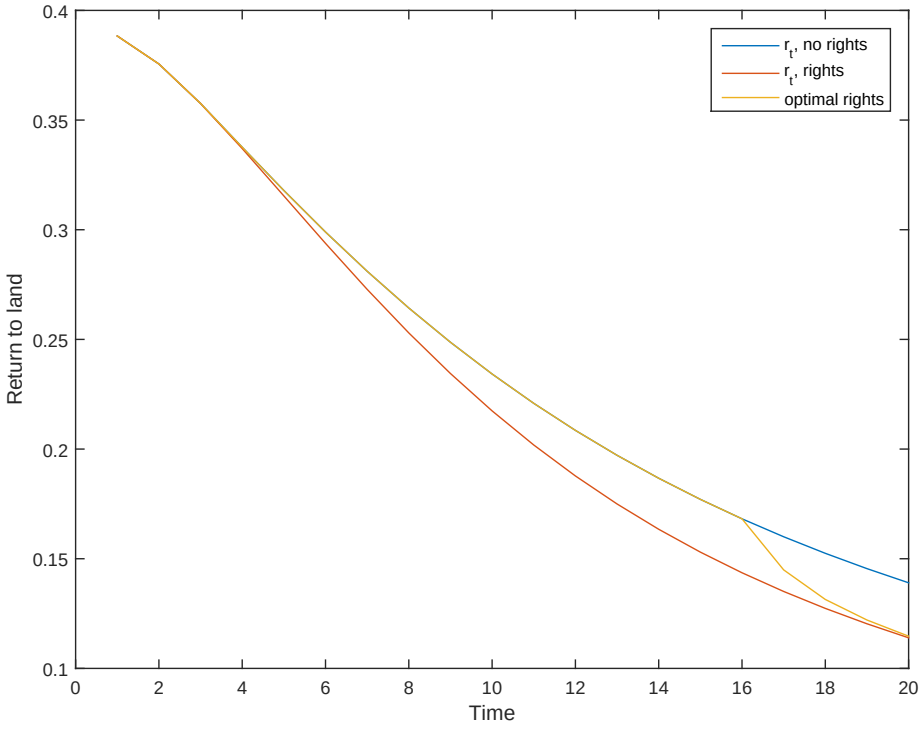

Fig. 8: *Returns to Land*

6 Empirical Evidence

In this Section, we exploit cross-state variation in the timing of women's rights in the U.S. in order to provide empirical evidence to validate the model predictions studied in Section 5. Specifically, the model exhibits a bidirectional relationship between development and women's rights. First, as we emphasized above, development leads to women's rights. Accordingly, we begin by showing that greater levels of TFP in the non-agricultural sectors predict the granting of women's rights. Then, we show that women's rights lead to development. Thus, our second exercise shows that, as predicted in Figure 3, that granting rights predicts an immediate and dynamic increase in the fraction of a state's labor force allocated towards the non-agricultural sectors. Our third and final exercise shows

that, as predicted in Figure 4, granting of rights predicts an immediate and dynamic increase in value added per worker and per capital.

Our empirical analysis is based on the implicit assumption that states are closed economies with respect to financial markets. This assumption is based on the realities of the time. It is well known that banking was highly regulated at the state level during the 19^{th} century.[25] Empirically, the results of this were large variations in interest rates. For instance, Breckenridge (1898) documents regional dispersion of high quality corporate paper in the 1890s. He finds that interest rates varied from about 4% in Boston to more than 9% in Denver. The distribution of interest rates appear to have been relatively continuous as well. There is a large literature on the source of these regional variations in interest rates and why capital did not flow to correct imbalances.[26] Considering these realities, we continue with our analysis under the assumption that states are closed economies.

6.1 Data Sources and Sample Selection

Data on women's liberation comes from Geddes and Lueck (2002).[27] They coded the year in which states granted women rights. Following the standard they began in the literature we consider women's rights to have been granted in states when both property rights and control over income had been granted to married women. The variable is called $rights$. Figure 9 shows the date that each state granted women rights, between 1840 and 1930. This leaves out four states, specifically, Florida (1943), Arizona (1973), New Mexico (1973), and Louisiana (1980).

[25] For an excellent history of US banking, see Calomiris (2000).

[26] For an excellent summary and contribution to this literature, see Landon-Lane and Rockoff (2007).

[27] We thank the authors for making their data available to us.

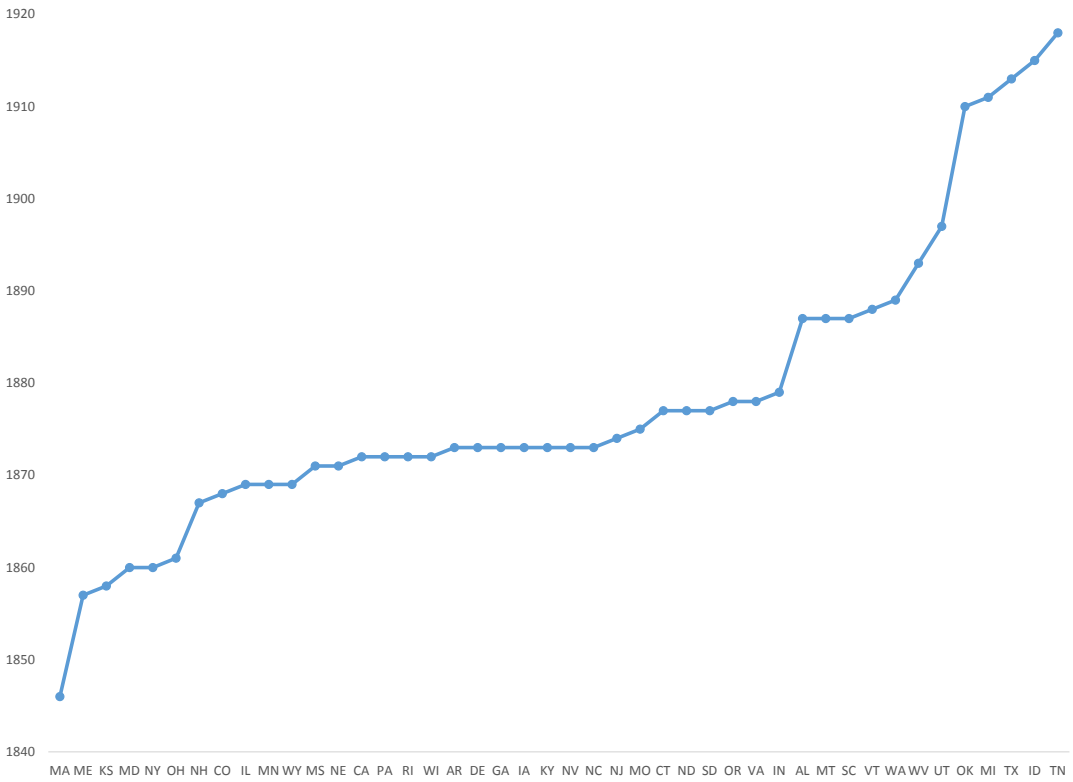

Fig. 9: *Timing of Women's Rights by State*

Except for the dates of rights being granted, all of our data comes from various censuses, conducted once a decade. Thus, we have issues of rounding. For example, California gave rights in 1872. When is the first year we assume California granted women rights? In all of our exercises, we will round to the nearest decade, and then do a robustness exercise where we round up. Accordingly, in our baseline exercises, California will be coded as having granted rights in 1870, and we will subsequently do an exercise with California being coded as having given rights in 1880. We will refer to these specific robustness exercises as 'rounding up'.

Turner et al. (2007) and Turner et al. (2013) develop state-level time series data on both TFP in the agricultural sector, manufacturing sector, and non-agriculture-non-manufacturing sectors. We use this data to compute a single TFP level for

the non-agricultural sector. We use this as our source of TFP by state/year/sector in our analysis below.

Our other state-level data is taken from the US Census via Ruggles, Alexander, Genadek, Goeken, Schroeder and Sobek (2010) from 1850-1920. We have 356 state-year observations from 1850 to 1920. Following the literature, such as Fernández (2014), we impute values for the missing 1890 census, and do a robustness exercise in order to show that our results do not depend on these imputations. In particular, our dependent variable in the second exercise is the fraction of men in the labor force, age 20-60, who are in the non-agriculture sector, as defined by the IND1950 variable.

We use the Census of Manufactures data from 1850-1880, as compiled by Atack and Bateman (1999), in order to calculate value added per worker or per dollar of capital, at the firm level. For firm regressions, we only include firms where we can compute value-added per worker or capital (i.e. no missing entries for the number of workers, amount of capital, value of output, or value of input), and if we can identify which industry the firm was associated with.[28] By state-year, we drop the top and bottom 1% of firms as measured by value added per capital or per worker. Additionally, we do not use data from Washington D.C. In order to put all numbers in 1860 dollars, we use Hoover (1960). We are left with a sample of 16,647 firms in 122 industries, and 36 states.

6.2 TFP Predicts Rights

In order to show that TFP predicts women's rights, we run the following regression:

$$Rights_{st} = \beta_1 A_{st}^M + \beta_2 A_{st}^A + d_t + \lambda_s + \lambda_s \times t + controls_{st} + \epsilon_{st}, \tag{32}$$

[28] Specifically, we drop firms with industry 999, which meant firms operating in more than one industry. Additionally, we corrected industry = 2080 and 2081 to be 208.

where A_{st}^M is non-agriculture TFP in state s, year t, while A_{st}^A is the equivalent for agriculture. d_t are year fixed effects, λ_s are state fixed effects, and $\lambda_s \times t$ is state specific linear time trend.[29] Furthermore, we control for a state being in the South interacted with the years 1870 and 1880, fraction of the state's population that is female, fraction of women in school, fraction of the population that is non-whites, a dummy variable that a state was a territory in a given year, the fraction of the population under age 35, and 'Fertility 10'.

We control for the south interacted with 1870 and 1880 in order to account for the differential impact of the civil war. We control for the fraction of the states population that is female and the fraction of women in school as these variables are related to mechanisms in the literature for granting rights to women, (Geddes and Lueck 2002, Doepke and Tertilt 2009). Fertility 10 is the ratio of white children age 10-19 over white women age 20-39, (Fernández 2014).[30] The remaining controls are included as they may be correlated with both TFP and the propensity to grant rights.

We show our results in Table 1, which reports the point estimates for the effects of TFP on rights, as well as standard errors clustered at the state level. The first column shows an OLS regression of $Rights$ on our controls. The second column shows the same regression using a Probit model, and reports the marginal effect of the variables evaluated at the mean. Column 3 returns to OLS to add state fixed effects and Fertility 10. Column 4 adds state linear time trends. Column 5 does the robustness exercise where we round up on the timing of granting rights. All the columns show a positive and highly significant effect of TFP in the non-agricultural sector on the propensity to grant rights. We find that a one-

[29] Fernández (2014) creates state fixed effects based on US political boundries in 1850. For instance, at that time Washington, Idaho, and Oregon were part of the same territory. Therefore, they are considered to have the same fixed effect. See her paper for details. In these regressions, we follow her approach given that she is also running regressions explaining the timing of rights by state.

[30] In that paper, the author argues that this ratio predicts rights due to a mechanism revolving around bequest motives. We control for this variable just in order to show that our results are robust to including her mechanism.

standard deviation higher level of A^M increases the propensity to grant rights by 7-8%.

6.3 Rights Predicts Labor Shifts Towards Non-Agriculture

We now show the effects of granting rights on the dynamics of labor allocation by state. We begin with summary statistics.

Figure 10 shows the time series fraction of employment in the non-agricultural sector. The line denoted 'National Average' is the average for the entire country. The line denoted '90th Percentile' is the 90th percentile of states, as ranked separately each year, where the ranking is done by the fraction of workers in non-agriculture in each state. The line denoted '10th Percentile' is the same thing, for the 10th percentile of states. This graph shows the overall trend towards greater labor in non-agriculture as the country developed, as well as the amount of cross-state variation. In every year, the 90th percentile was roughly 20 percentage points above the mean, while the 10th percentile was 20 percentage points below the mean. Note that the bottom 10 percentile of states decreased their non-agricultural employment dramatically after the civil war, recovering only around 1900 to their antebellum level.

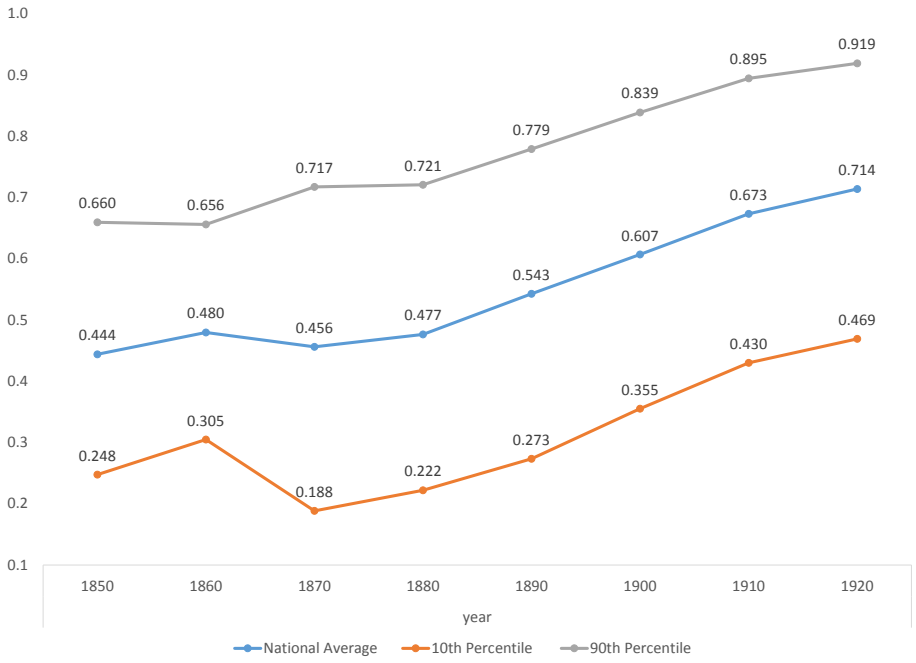

Fig. 10: *Cross State Comparison of Non-Agriculture Employment, Percentile*

Figure 11 shows the fraction of workers in non-agricultural sectors by census year for states that have already granted rights and states that have not. The figure shows that for all census years, states that granted rights to women had a higher share of their workforce in non-agricultural sectors. This is consistent with the view that granting rights was related to the growth of industrialization. Furthermore, the fact that states with rights had higher levels of employment outside of agriculture shows that granting of rights was not associated with a convergence towards a national mean.

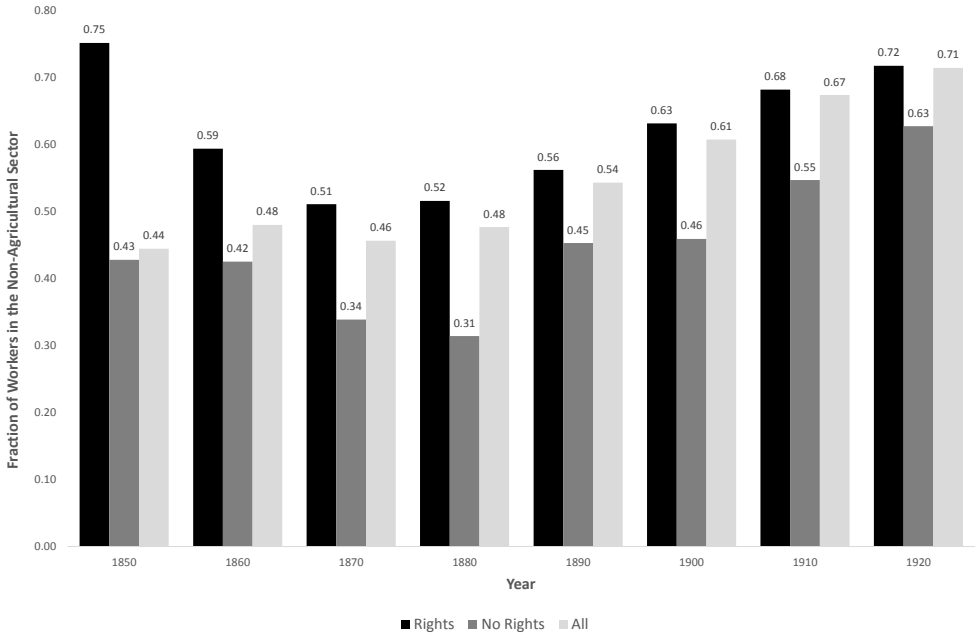

Fig. 11: *Cross State Comparison of Non-Agriculture Employment, by Rights*

Our model predicts a specific dynamic of changing employment rates with respect to the date of granting married women property rights, as seen in Figure 3.

We follow Stevenson and Wolfers (2006)' approach in estimating the effects of granting women's rights over time.[31] Accordingly, we estimate a regression that takes into account the amount of time a given state-year observation is before or after rights were granted in that state.

Our specification is of the form:

$$L_{st}^{M} = \sum_{k} \alpha_k \cdot rights_{st}^{k} + \lambda_s + d_t + \lambda_s \times t + controls_{st} + \epsilon_{st}, \tag{33}$$

where L_{st}^{M} is the fraction of workers in non-agricultural sectors in state s in year t,

[31] Stevenson and Wolfers (2006) studies the effects of unilateral divorce laws on suicide over time, exploiting cross-state timing of divorce law changes.

$t \in \{1850, 1860, \ldots, 1920\}$ and $rights_{st}^{k}$ is a series of dummy variables set equal to one if a state had granted rights k years ago, where $k \in \{\geq -30, -20, -10, 0, 10, 20, \geq 30\}$.[32] λ_s and d_t are state and year dummies. $\lambda_s \times t$ are state linear time trends. The remainder of our controls are a dummy variable that the observation is a territory, interactions between the south and 1870 and 1880, the fraction of the population that is female, the fraction of women in school, the fraction of the population that isn't white, and the fraction of the adult population under age 35.

Table 2 shows the results for these regressions. All estimates are relative to a decade before rights are granted. Column 1 includes year and state dummies, as well as a dummy for being a territory. Column 2 adds South interacted with 1870 and 1880, as well as the fraction of the population that is female. Column 3 adds the fraction of women in school. Column 4 adds the fraction of the population that is not white, while column 5 adds the fraction of adults under age 5. Column 6 includes state linear time trends. All estimates include standard errors clustered at the state level.

The estimates for 3 or more decades before rights were given and 2 decades before rights were given are close to 0 and not statistically significantly different than 0. Once rights are given, there is a statistically significant increase in the fraction of the labor force working in the non-agricultural sector. The effect is dynamic, increasing with respect to the amount of time since rights were granted, with an estimated total impact of 6-8 percentage points by 20 years after rights were given. Figure 12 shows graphically these dynamic effects, as captured in column 6.

[32] We use increments of 10 as our data is dependant on the decennial census. For states that granted rights not in a census year, we round to the nearest decade. For example, California granted rights in 1872. For our purposes, we round to 1870. Thus, the dummy variable $rights_{st}^{0}$ takes the value of 1 for California in 1870, while the dummy variable $rights_{st}^{1}0$ takes the value 1 for California in 1880. Our results are robust to always rounding up. Using California again as an example, we code 1880 as the first year rights exist, rather than 1870, as to avoid the case of assigning rights to California before rights were actually granted.

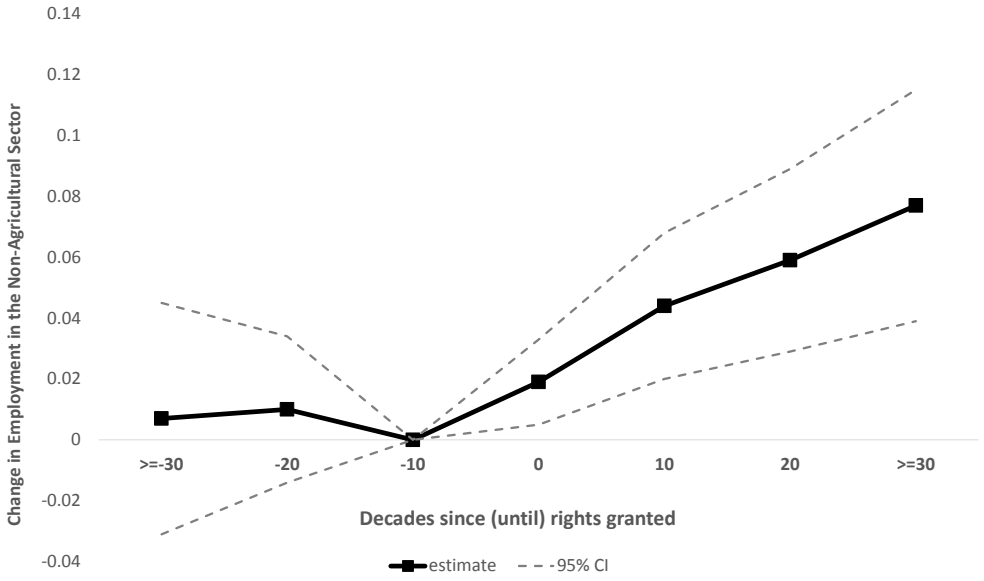

Fig. 12: *Dynamics of Non-Agricultural Employment with respect to Rights*

We now perform two sets of robustness exercises. First, as shown in Table 3, we redo Table 2 while 'rounding up' on rights, as described above. The results are very similar quantitatively. Then, in Table 4, we perform 4 more robustness exercises. For the first two, recall that women were allowed to own structures. We consider these as either homes or shops in town. Accordingly, we attempt to reclassify retail into 'agriculture', in the sense that it is part of the sector that labor is leaving. In order to do so, we attempt exercises, detailed in the appendix, using either the occupational or industry classification of a worker. If workers are in retail, we consider them part of agriculture, and repeat the exercise. Column 3 drops all observations from 1890, as that year was imputed. Finally, column 4 uses state fixed effects as in Fernández (2014), as described above. The results of our analysis are robust to all of these sensitivity checks.

6.4 Rights Predicts Value Added Increases

Finally, we turn to the exercise testing the effects of women's rights on value added at the firm level. We run the following set of regressions:

$$va^d_{jist} = \sum_k \alpha_k \cdot rights^k_{st} + d_t + \lambda_s + I_i + \lambda_s \times t + I \times t + controls_{st} + \epsilon_{jist}, \quad (34)$$

where va^d_{jist} is the value added of firm j, belong to industry i, operates in state s, in year t, and value added is with respect to $d \in \{L, K\}$ (labor or capital). $rights^k_{st}$ is a series of dummy variables set equal to one if a state s had granted rights k years ago at time t, where $k \in \{\leq -20, -10, 0, 10, \geq 20\}$. d_t are year fixed effects, λ_s are state fixed effects, I_i are industry fixed effects, & $\lambda_s \times t$ & $I_i \times t$ are state & industry specific linear time trend. Other controls include south interacted with 1870 and 1880 dummies.

Table 5 shows the results of these regressions. Column 1 shows the response of value added per worker to rights. Notice that, upon impact, there is no statistically significant increase in value added per worker, but dynamically there is a large impact. As made clear in the robustness below, this is due to rounding. Take again the example of California granting rights in 1872. In our baseline regression, we are treating firms in California as experiencing women's rights in 1870, even though they had not in practice. Thus, we should expect a weaker effect of rights, as we are including firms that did not experience rights. However, the effects of rights on value added per unit of capital, as shown in column 2, are positive and significant even upon impact, as well as dynamically.

Table 6 shows the result of these regressions when rounding up. As explained above, the impact is statistically significant and large. We thus conclude that women's rights had a strong impact on manufacturing production.

7 Concluding Remarks

In this paper, we propose and model a novel mechanism through which men choose to give women rights through a desire to correct capital market imperfections related to women's portfolio choices. The story is consistent with historical evidence on how the laws of coverture affected investment decisions by married women. Furthermore, we show that people were aware at the time of the implications of women's property rights on financial markets.

We solve a general equilibrium model with endogenous property rights determination, and study a numerical example which illustrates how technological growth in manufacturing interacts with the laws of coverture in order to induce inefficiencies. When deciding whether to grant women rights, men face a tradeoff. On one hand, granting rights may increase overall output, and thus household income, while on the other hand, granting rights reduces men's bargaining power within the household, reducing their share of household income. At a certain point of development, the benefits of women's property rights dominate and men give rights.

We show empirically, using cross-state variation in the timing of the granting of married women's property rights, that the model is consistent with several features of the US data. First, TFP in non-agriculture predicts the timing of granting women rights. Second, the dynamics of the movement of labor from agriculture to non-agriculture are consistent with the model's predictions. Finally, the model's prediction of the dynamics of value added per worker or unit of capital is supported by the empirical evidence.

Our findings contribute to a growing literature on how development and women's rights are intricately linked. Women are given rights when development reaches a certain level. After granting rights, there is a feedback from women's empowerment into growth. Our empirical evidence support this relationship, by showing that women's liberation was a financial innovation. We thus connect the literature on women's empowerment and development with the

literature of financial development and growth.

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Table 1
Dependent Variable: Rights

	(1) Rights	(2) Rights Probit	(3) Rights	(4) Rights	(5) Rights Round Up
A^M	9.528***	14.833***	8.175***	9.158***	8.459***
	(2.909)	(5.019)	(2.212)	(2.134)	(1.635)
A^A	10.168	19.690	3.853	-5.726	-8.339
	(6.682)	(16.275)	(9.462)	(7.545)	(4.993)
FERT 10	No	No	Yes	Yes	Yes
State dummies	No	No	Yes	Yes	Yes
State Time Trend	No	No	No	Yes	Yes
N	349	349	349	349	349

NOTE. Standard errors, clustered at the state level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. All regressions include year dummies, dummy for being a territory, having community property, equity courts, fraction of female in school, fraction female, South×1870 and South×1880 dummies, fraction nonwhite, and fraction of adults under 35.

Table 2
Dependent Variable: Fraction of Workers in Non-Agriculture

	(1)	(2)	(3)	(4)	(5)	(6)
$\geq$ 3 decades before	-0.013	-0.019	-0.033	-0.039*	-0.030	0.007
	(0.032)	(0.031)	(0.026)	(0.023)	(0.022)	(0.019)
2 decades before	0.021	0.022	0.011	0.008	0.008	0.010
	(0.021)	(0.022)	(0.022)	(0.019)	(0.017)	(0.012)
1 decade before	0	0	0	0	0	0
Rights given	0.035***	0.036***	0.038***	0.036***	0.035***	0.019**
	(0.011)	(0.010)	(0.011)	(0.010)	(0.010)	(0.007)
1 decade after	0.072***	0.074***	0.077***	0.070***	0.069***	0.044***
	(0.018)	(0.016)	(0.016)	(0.016)	(0.016)	(0.012)
2 decades after	0.088***	0.092***	0.101***	0.086***	0.084***	0.059***
	(0.028)	(0.027)	(0.027)	(0.027)	(0.025)	(0.015)
$\geq$ 3 decades after	0.106***	0.115***	0.124***	0.104***	0.100***	0.077***
	(0.039)	(0.037)	(0.035)	(0.036)	(0.033)	(0.019)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
State dummies	Yes	Yes	Yes	Yes	Yes	Yes
Territory	Yes	Yes	Yes	Yes	Yes	Yes
South$\times$1870	No	Yes	Yes	Yes	Yes	Yes
South$\times$1880	No	Yes	Yes	Yes	Yes	Yes
Fraction Female	No	Yes	Yes	Yes	Yes	Yes
Fraction of Female in school	No	No	Yes	Yes	Yes	Yes
Fraction Non-White	No	No	No	Yes	Yes	Yes
Fraction under 35	No	No	No	No	Yes	Yes
State time trend	No	No	No	No	No	Yes
N	356	356	356	356	356	356

NOTE. Estimated using state population weights. Standard errors, clustered at the state level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 3
Dependent Variable: Fraction of Workers in Non-Agriculture – Robustness

	(1)	(2)	(3)	(4)	(5)	(6)
$\geq$ 3 decades before	-0.004	-0.010	-0.030	-0.038	-0.030	-0.029**
	(0.030)	(0.030)	(0.026)	(0.023)	(0.022)	(0.012)
2 decades before	0.009	0.008	0.000	-0.002	-0.003	-0.007
	(0.021)	(0.021)	(0.022)	(0.019)	(0.017)	(0.012)
1 decade before	0	0	0	0	0	0
Rights given	0.032***	0.030***	0.030***	0.027**	0.027**	0.024***
	(0.010)	(0.009)	(0.010)	(0.010)	(0.011)	(0.008)
1 decade after	0.045**	0.042**	0.045**	0.040**	0.037**	0.050***
	(0.018)	(0.018)	(0.018)	(0.019)	(0.018)	(0.015)
2 decades after	0.062**	0.061**	0.068**	0.056**	0.052**	0.071***
	(0.028)	(0.028)	(0.027)	(0.027)	(0.026)	(0.019)
$\geq$3 decades after	0.066*	0.070*	0.077**	0.061*	0.054	0.087***
	(0.036)	(0.036)	(0.036)	(0.035)	(0.033)	(0.024)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
State dummies	Yes	Yes	Yes	Yes	Yes	Yes
Territory	Yes	Yes	Yes	Yes	Yes	Yes
South$\times$1870	No	Yes	Yes	Yes	Yes	Yes
South$\times$1880	No	Yes	Yes	Yes	Yes	Yes
Fraction Female	No	Yes	Yes	Yes	Yes	Yes
Fraction of Female in school	No	No	Yes	Yes	Yes	Yes
Fraction Non-White	No	No	No	Yes	Yes	Yes
Fraction under 35	No	No	No	No	Yes	Yes
State time trend	No	No	No	No	No	Yes
N	356	356	356	356	356	356

NOTE. Estimated using state population weights. Standard errors, clustered at the state level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Rights are "rounded up".

Table 4
Robustness

	(1) Industry	(2) Occupation	(3) Drop 1890	(4) Alternate FE
$\geq$ 3 decades before	-0.001	0.002	-0.001	0.009
	(0.012)	(0.014)	(0.021)	(0.018)
2 decades before	0.009	0.013	0.002	0.003
	(0.011)	(0.012)	(0.007)	(0.007)
1 decade before	0	0	0	0
Rights given	0.015**	0.019***	0.019**	0.015**
	(0.007)	(0.007)	(0.008)	(0.007)
1 decade after	0.039***	0.043***	0.038***	0.031**
	(0.011)	(0.012)	(0.012)	(0.012)
2 decades after	0.053***	0.059***	0.058***	0.047***
	(0.014)	(0.015)	(0.018)	(0.017)
$\geq$ 3 decades after	0.069***	0.081***	0.077***	0.058***
	(0.019)	(0.021)	(0.022)	(0.021)
N	356	356	308	356

NOTE. Estimated using state population weights. Standard errors, clustered at the state level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. All regressions include year dummies, state dummies, territory dummies, south interacted with 1870 and 1880, fraction female, fraction of female in school, fraction non white, fraction under 35, and state linear time trend.

Table 5
Effects of Rights on Firms

	(1) value added per worker	(2) value added per capital
$\geq$ 2 decades before	30.081	-0.051
	(66.786)	(0.271)
1 decade before	0	0
Rights given	67.710	0.620***
	(51.519)	(0.216)
1 decade after	201.938**	1.353***
	(95.290)	(0.330)
$\geq$ 2 decades after	187.207	1.987***
	(131.159)	(0.412)
Year dummies	Yes	Yes
State dummies	Yes	Yes
Industry dummies	Yes	Yes
South$\times$1870	Yes	Yes
South$\times$1880	Yes	Yes
Industry time trend	Yes	Yes
State time trend	Yes	Yes
N	16,647	16,647

NOTE. Standard errors, clustered at the state-year level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 6
Effects of Rights on Firms – Robustness

	(1) value added per worker	(2) value added per capital
$\geq$ 2 decades before	-103.194	-0.459
	(101.103)	(0.441)
1 decade before	0	0
Rights given	193.769**	0.963***
	(90.251)	(0.333)
1 decade after	283.734**	1.459***
	(137.417)	(0.518)
$\geq$ 2 decades after	325.968*	2.286***
	(179.516)	(0.642)
Year dummies	Yes	Yes
State dummies	Yes	Yes
Industry dummies	Yes	Yes
South$\times$1870	Yes	Yes
South$\times$1880	Yes	Yes
Industry time trend	Yes	Yes
State time trend	Yes	Yes
N	16,647	16,647

NOTE. Standard errors, clustered at the state-year level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Rights are "rounded up".