WHEN THE STATE MIRRORS THE FAMILY: THE DESIGN OF PENSION SYSTEMS

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Abstract
We study how family culture has affected the adoption and generosity of public pension systems. Our theoretical framework suggests that inheritance rules shape filial obligations to parents, and thus the within-family intergenerational transmission of resources. In countries with egalitarian inheritance rules, inheriting children represent a large share of the population, and support generous pension systems; in countries with nonegalitarian inheritance rules, a majority of noninheriting individuals prefer basic pension systems. An empirical cross-country analyses using historical data on inheritance rules support these predictions. These results are robust to controlling for alternative legal, religious, demographic, economic, and political explanations. Evidence from individual (General Social Survey) data confirms our findings: US citizens whose ancestors came from countries featuring egalitarian inheritance rules rely more on the government as a provider of old age security income. (JEL: Z10, Z13, N30, H10, H55)

1. Introduction

"Ergo age, care pater, cervici inponere nostrae:
Ipse subibo umeris nec me labor iste gravabit.
Quo res cumque cadent,
unum et commune periclum"

The editor in charge of this paper was Dirk Krueger.

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"Haste, my dear father, ('t is no time to wait,)
And load my shoulders with a willing freight.
Whate'er befalls, your life shall be my care;
One death, or one deliv'rance, we will share".
(Aeneas to his father Anchises, in Virgil's Aeneid, second book)

Culture and institutions affect economic outcomes (see Alesina and Giuliano 2015 for a review).[1] This paper focuses on the role of family culture in determining the adoption and the design of important economic institutions, such as public pension systems. We consider how different inheritance rules helped to shape the historical patterns of within-family organization. This includes relations between parents and children, among siblings, and between the family as a unit and society at large. These primal aspects of the organization of the family became part of a "family culture" that established which individual behaviors were regarded as morally and socially acceptable. This family culture is persistent: it has been transmitted over time to successive generations (with some adaptations incited by new challenges and environmental changes) (see Bisin and Verdier 2001; Guiso, Sapienza, and Zingales 2008; Tabellini 2008). In the last century, a traditional economic role of the family—providing old age security—was taken up by a formal institution—the public pension system. In this paper, we show that this institution endogenously adopted the economic organization that historically prevailed within the family unit. To study this transmission mechanism from family culture to economic institutions, we thus concentrate on the impact of the family structure on the design of the most widely spread welfare state program in the world: the public pension system.

Before the introduction of public pension systems, which took place between the end of the 19th century and the aftermath of WWII, families were typically the sole providers of old-age security for their elderly members. Even in these predominantly rural economies, however, the within-family organization system (or family types) largely differed across regions. In countries featuring inheritance rules that guaranteed equality among siblings, adult children had an incentive to live close to (or even to cohabit with) their old parents, from whom they expected to inherit a fair portion of the family land. In this family organization, parents could rely on their offsprings for complete old age support, to the extent that their and their children's economic conditions allowed for it.[2] In countries characterized instead by nonegalitarian inheritance rules, such as primogeniture, where parents passed the family land onto one single heir, this inheriting child was expected to look after his elderly parents. Retirement contracts were sometimes signed between the parents and the inheriting child, in which the level of support expected from the future heir (for instance, in terms of the amount of food, shelter, clothing, and products from the

1. Defining culture has been a difficult challenge in the economic literature (see Fernández 2008). Guiso, Sapienza, and Zingales (2006) provided a widely used definition. Well-known definitions of formal institutions are provided by North (1990) and Acemoglu, Johnson, and Robinson (2006).

2. A common family arrangement in Spain ("ir por meses") featured the circulation of the elderly parents among their children (see Reher 1998).

farm), in exchange for the bequest of the whole family land, was stipulated in detail.[3] Noninheriting adult children were instead largely exempted from filial obligations toward their elderly parents. Our goal is to understand to what extent these different family organizations imposed by the inheritance rule[4] influenced the original design of the public pension systems.[5]

We introduce a two-period overlapping generation model (OLG) model that captures these historical links between inheritance rules and family structure. We consider two inheritance rules: egalitarian and nonegalitarian, which give rise to two distinct family structures featuring different forms of intergenerational transmission of family land in exchange for old age resources. In egalitarian societies, every child of a landowner parent inherits some land and has a strong obligation to support his parents. In nonegalitarian societies, only the inheriting child fully supports his parents. In both societies, noninheriting children need only to provide a basic transfer to the parents. In rural areas, landowners determine the labor demand for production in their plot of land, and all individuals work the land. However, individuals may decide to migrate from the rural area to the city, in order to obtain a urban wage. In the urban environment, land inheritance plays no role, but family obligations remain. Young individuals may be relieved of these family obligations if there exists a public pension system that replaces the private upward vertical intergenerational transfer scheme. This pension system may arise as an equilibrium outcome of a voting game, in which both its existence and generosity are determined.

Our model suggests that pensions emerge under both family structures to replace the private family transfer. Three features of our model are crucial for the results. First, individual preferences over pension transfers differ depending on inheritance status, since inheriting children are required to be more generous with their parents than noninheriting children. Second, the pension system is redistributive, as benefits are flat, whereas contributions are proportional to individual income. Hence, redistribution takes place from landowners to peasants. Third, tax collection to finance the system is less efficient in rural as opposed to urban areas. Additionally, the distribution of individual types—and hence their preferences—in the population, and their geographical location between rural and urban areas differ endogenously across inheritance rules.

3. These retirement contracts were common in several continental European countries, such as Germany ("leibzucht", see Berkner 1976), Austria ("ausnahm", see Sieder and Mitterauer 1983), Denmark and Sweden ("undantagskontrakt", see Gaunt 1983).

4. In our analysis, we consider the inheritance rule to be exogenous. Yet, old individuals may have preferences over these rules, since they lead to different filial obligations, and thus to different transfers of resources within the family. The existing literature has suggested different reasons for the prevalence of (or lack thereof) primogeniture—such as the need to preserve the stability of family wealth among the aristocracy or the existence of increasing returns to scale in the agriculture technology. We discuss this issue in Section 3.1.

5. Studies of the impact of the inheritance rules on individuals' geographical mobility and fertility decisions date back to Habakkuk (1955). Laslett (1983) analyzed the effect of inheritance rules on the household fission, that is, children leaving the parents' house. Bertocchi (2006) suggests that, along the transition from a rural to an urban society, the inheritance system evolves from primogeniture to partition.

Our model predicts that, in societies featuring a nonegalitarian inheritance rule, the majority of the voting population is made of noninheriting children with basic filial obligations toward their parents. Hence, only a basic pension system emerges, with its adoption occurring during the urbanization process or even earlier—already in the rural area, if the tax collection cost is not too large. In societies featuring an egalitarian inheritance rule, instead, the majority is made up of landowners, who have strong filial obligations toward their parents. Thus, a generous pension scheme, which substitutes the previous adults-to-old-parents family transfers, emerges. Yet, only at a later stage—in the city, once the urbanization process is complete.

To test the predictions of our model, we rely on Todd's (1983) historical classification of family types. Countries have either an egalitarian inheritance rule—thus requiring equality among siblings—or a nonegalitarian inheritance rule, in which case parents are either unconstrained in their inheritance decisions or have to obey to a norm of having a single heir, such as primogeniture. The generosity of the pension system is measured by the replacement rate, which is the ratio between the pension benefit and the labor income prior to retirement. High average replacement rates indicate generous systems.[6]

Our cross-country empirical findings support these theoretical predictions. In countries where nonegalitarian inheritance rules shaped the family culture, pension schemes emerge earlier, and feature basic old-age transfers, which act mainly as a safety net. More generous systems are instead in place in countries characterized by the egalitarian inheritance principle.[7] This link between inheritance rules and pension design is robust to controlling for several factors, which have been proposed in the literature as alternative explanations for the design of public pension systems. These control variables include legal origins, dominant religion, urbanization, and democratization of the country at the beginning in the 20th century, historical and current economic and demographic variables (GDP, share of elderly in the population, and Gini coefficient), electoral rules, and forms of government in 1900.

The empirical analysis on individual data confirms the cross-country results on the relevance of family culture for individual preferences over public pensions. Following a growing literature (see Fernández and Fogli 2006, 2009; Alesina and Giuliano 2010, among others), we use individual responses to questions on the role of the government

6. A distinctive feature of pensions systems allows us to introduce another measure of generosity, based on the ratio in the replacement rates across individuals of different income groups. In fact, generous systems provide high replacement rates, which are also approximately constant across individuals of different incomes, so that the ratio of the replacement rates across income groups is close to one. Instead, basic pension systems provide decent replacement rates to low earners, but only low replacements to high earners, thereby inducing ratios of the replacement rates across income groups that differ from one (see Conde-ruiz and Profeta 2007).

7. As a simple cross-country comparison, consider the four Scandinavian countries—Denmark, Finland, Norway, and Sweden. They are characterized by the same legal origin, but different inheritance rules: egalitarian in Finland and nonegalitarian elsewhere. The pension system generosity differs accordingly. The average replacement rate is 79% in Finland, but only 51% in Denmark, 65% in Norway and 68% in Sweden. Also the ratio of the replacement rates between low and high earners varies accordingly—being 1 in Finland, 1.09 in Sweden, 1.25 in Norway, and 1.6 in Denmark.

in providing support to the elderly, which were available in the 1983–2014 waves of the General Social Survey (GSS). To avoid reverse causality issues, we associate to each person the family culture—namely, the inheritance rule—which was prevailing in his family's country of origin, and we control for a large set of individual and country of origin characteristics. We find that individuals whose ancestors came from countries featuring an egalitarian inheritance rule prefer more generous state-provided pension systems than those from nonegalitarian countries. A placebo test run using a GSS question on general welfare confirms that our results are not driven by an overall preference for redistribution.

Our paper contributes to the recent literature that studies the role of the family in affecting economic outcomes (for a survey, see Alesina and Giuliano 2014). To the best of our knowledge, this is the first paper in this literature to analyze the impact of family culture on the program that more closely resembles the within-family intergenerational transfer scheme: the pension system. The proposed link between family types and individual economic behavior dates back to Banfield (1958), who first used the term "amoral family" to describe the social and cultural environment that was shaping individual decisions in a small village in the South of Italy. Greif (2006) suggests that nuclear families in medieval times were crucial to establish corporations, and Greif and Tabellini (2012) use differences in family structures to explain the different urbanization patterns in Europe and China. Reher (1998) points out that family ties help to explain the living arrangements and geographical mobility of young generations. Algan and Cahuc (2007, 2009) show that family culture is responsible for cross-country heterogeneity in employment rates. Alesina et al. (2015) argue that, in countries with strong family ties, individuals are less mobile and prefer a more regulated labor market, whereas "weak ties families" are associated with more flexible labor markets, which then require higher geographic mobility of workers to be efficient. Duranton, Rodrìguez-Pose, and Sandall (2009) uses Todd's (1983) classification of family structures to explain regional differences in economic outcomes. The link between family relations and welfare systems has received much attention among sociologists. Esping-Andersen (1999) suggests that where family ties are stronger, social risks are typically internalized within the family by pooling resources across generations. Pfau-Effinger (2005) argues that welfare state policies differ according to the underlying cultural model of the family, and to the relevance attributed to the family for the production of welfare. All these papers tend to consider family culture as persistent over time.[8]

Besides the role of family culture, several alternative theories have been put forward to explain the origin and the generosity of the welfare state. Particularly close to our setting is the paper by Caucutt, Cooley, and Guner (2013), in which the emergence of social security is explained in terms of migration from rural to urban areas. In the city,

8. Anthropologists and family historians argue that differences between family systems are very persistent over time, as family forms fail to converge, despite the process of economic modernization (see Hajnal 1965; Laslett 1983; Viazzo 2010). Goody (1996) suggests that different family systems may lead to different patterns of development.

the bequest of land loses its role in intergenerational transfers, and a higher demand for welfare transfer emerges. Flora (1983, 1987) points to the process of secularization and to the influence of Protestantism in shaping demand for welfare.[9] According to an early modernization theory (Lipset 1959), the welfare state was a response to the growing needs for social policy and social and economic equality and security that has been created by industrialization. Democratization represented an alternative mechanism, whereby to increase the amount of welfare, since in democracies poor individuals can influence policy-making in favor of redistributive policies. In other instances, the welfare state may instead be used as an instrument to limit social unrest and to postpone democratization. Yet, when the cost of an authoritarian strategy becomes too large, democracy will emerge and more redistribution will come with it (Boix 2003; Acemoglu and Robinson 2006). Finally, legal origins may also represent a possible determinant, as they induce financial development (see La Porta et al. 1997), and more financial development reduces the need for unfunded pension systems (see Pinotti 2009; Perotti and Schwienbacher 2009).

The paper is organized as follows: Section 2 explains the model, Section 3 presents the historical classification in family types based on Todd (1983), and discusses the origins of pension systems and their design; Section 4 describes our econometric analyses and results. Section 5 concludes. All proofs are in Appendix A.

2. The Model

To study the link between family culture and pension design, we introduce a two-period OLG model with young and old individuals and two locations: rural and urban. Initially, only the rural location is populated. Rural areas may feature two different family structures, characterized by the inheritance rule. If the bequest is equally partitioned among siblings, a society is egalitarian; whereas if the inheritance rule dictates inequality among siblings (such as primogeniture), the society is nonegalitarian. In both societies, children follow the family culture and have an obligation to transfer resources to their elderly parents. Young individuals may choose whether to stay in the rural society or to migrate to the city. In the urban environment, land inheritance does not play any role, but family culture persists.

2.1. Demography and Individual Types

Young individuals work either in the rural or in the urban sector and consume. Elderly consume only. In the rural economy, individuals can be landowners, if they inherited the land from their parents, or simple peasants, if they did not inherit.

9. By encouraging the mobilization of lower income levels into mass politics and by reducing the power of the church into the public sphere, Protestantism favored the development of the welfare state, in opposition to Catholicism, which continued to be dominated by the conflict between state and church (see however a different view in Cantoni 2015).

The rural economy may feature two different inheritance rules: egalitarian and nonegalitarian. In a society with an egalitarian inheritance rule, all children receive the same amount of land from their landowner parents; whereas in a society with a nonegalitarian inheritance rule, all the land is transferred to one child only—as in the case of primogeniture. The superscript $r = \{E, N\}$ indicates whether the variable refers, respectively, to the egalitarian or to the nonegalitarian rule society. Whenever possible we drop the superscripts to save on notation.

In rural areas, each landowner has J kids, whereas each nonlandowner—henceforth peasant—has K kids. To make our comparison of inheritance rules meaningful, we take $J > 2$. Additionally, we assume $J > K$, that is, landowners have more children than nonlandowners. This fertility differential may be driven by a pure income effect. In fact, it is empirically well established that in agrarian societies a positive relation existed between occupational status and fertility (see Lee 1987; Weir 1995; Clark and Hamilton 2006).

In the urban economy, the land does not play any productive role. All individuals are assumed to have the same fertility, which is lower than in rural areas, and for simplicity is normalized to K. The population dynamics of the rural and urban sectors are closely related, as young individuals may choose to migrate from rural areas to the city.

It is convenient at this point to define the different types of young individuals. We index young individuals with $I = (i, j, g)$, where i refers to their inheritance status at birth, j to where they were born and g to where they choose to live. In nonegalitarian societies, landowners leave their land to one heir only; the other children receive no land, and become peasants. We indicate the former (heirs) as H and the latter (peasants) as P. The children of landless parents receive no land and are also peasants,[10] P. In egalitarian societies, landowners partition their land among their children, $i = H$, whereas landless parents have no land to bequeath, $i = P$. Regarding the location, we have $j \in \{R, U\}$ and $g \in \{R, U\}$, where R and U indicate, respectively, the rural and the urban areas. Notice that i and j refer to individual types, whereas g indicates an individual decision. In particular, $I = (i, j = R, g = R)$ and $I = (i, j = R, g = U)$ denote an individual i born in the rural area who, respectively, remains in the rural area or migrates to the city; whereas $I = (i, j = U, g = U)$ indicates an individual i born in the city. No migration takes place from U to R. A graphical description of fertility, inheritance, and migration in egalitarian and nonegalitarian societies is in Figure 1, respectively, in panels (a) and (b).

The demographic dynamics play an important role in our model. We indicate, respectively, with h_t and p_t the number of landowners and of peasants living in the rural areas at time t; with m_t^H and m_t^P the number of landowners and of peasants, who migrated to the city at time t; and with u_t^H and u_t^P the number of landowners and of nonlandowners born in the city at time t, where $u_t^H + u_t^P = u_t$. Hence, after the

10. We discuss the distinction between peasants born from landowner parents ($i = P_H$) and those born from peasant parents ($i = P_P$) in Section 2.3.2.

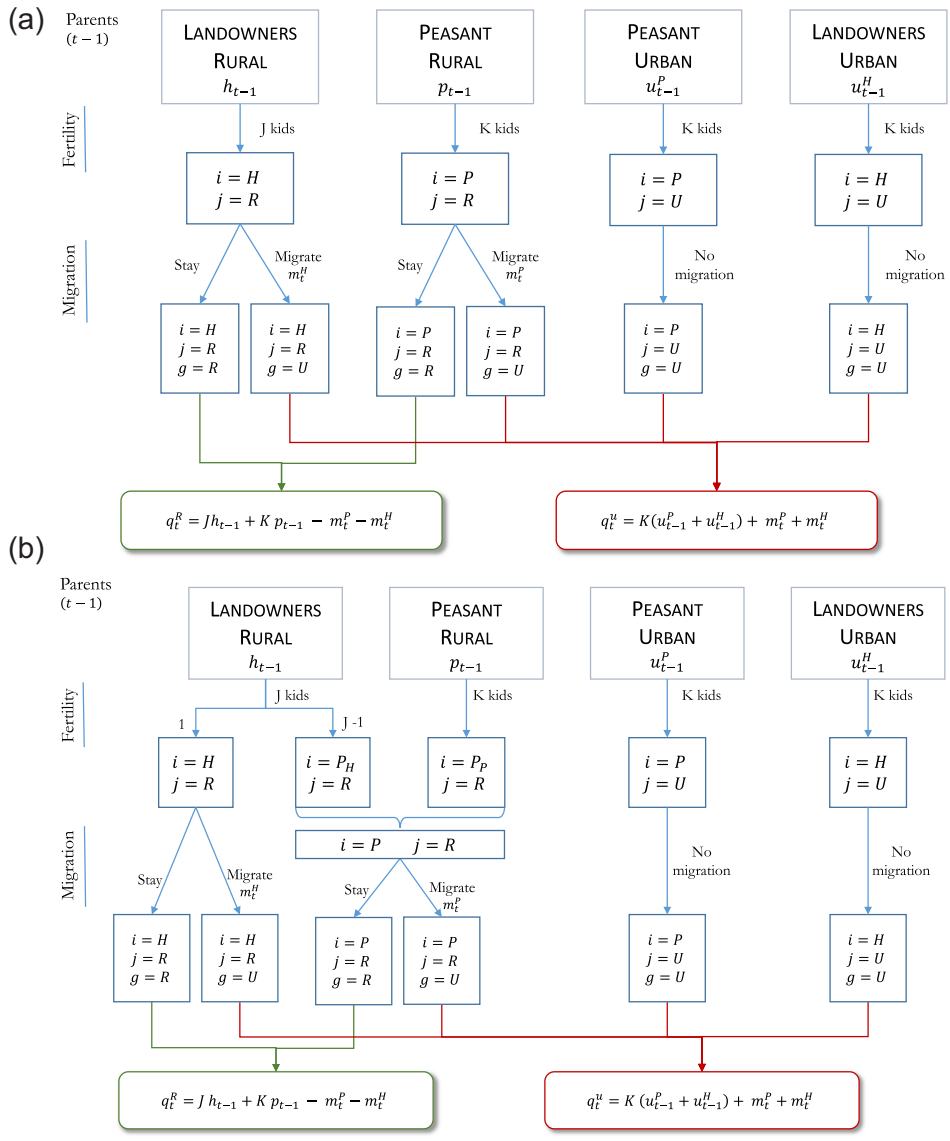


FIGURE 1. Panel (a): egalitarian inheritance rule. Panel (b): nonegalitarian inheritance rule.

migration decisions, the rural young population at time t is

$$q_t^R = h_t + p_t = Jh_{t-1} + Kp_{t-1} - \left(m_t^H + m_t^P\right);$$

whereas the urban young population is

$$q_t^U = u_t + \left(m_t^H + m_t^P\right) = Ku_{t-1} + \left(m_t^H + m_t^P\right).$$

It is also convenient to define the fertility of an individual I as $F_I = \{J$ if $i = H$ and $j = R$; and K otherwise$\}$.

2.2. Economic Environment

2.2.1. Technology. We consider a rural and a urban sector. In the rural sector, R, the following Cobb–Douglass production function operates thus

$$f^R\left(L_t, l_t^R\right) = A(L_t)^{\alpha}\left(l_t^R\right)^{1-\alpha} \tag{1}$$

where A and α are a constant productivity parameter and the relevance of the land in the production function, L_t represents the size of the plot of land used at time t by each landowner, and l_t^R is the amount of labor employed at time t on his plot by each landowner. We assume that, at time $t = 0$, there is the same number of landowners in egalitarian and nonegalitarian societies, $h_0^E = h_0^N = h_0$, and that each landowner has the same sized plot of land, L_0. Moreover, the total amount of available land is fixed,

$$\sum_{I|i=H} L_t = \bar{L} = L_0 h_0 \forall t.$$

Hence, in nonegalitarian societies, $L_{t+1}^N = L_t^N = L_0 = \bar{L}/h_0$, since each plot of land is transmitted to the single heir. In egalitarian societies, $L_{t+1}^E = L_t^E/J = L_0/(J)^t = \bar{L}/h_0(J)^t$, since each single plot is partitioned among the J inheriting children. In rural societies, all young individuals supply their labor inelastically, and receive a wage w_t^R. There is perfect labor mobility across fields for the peasants. Landowners instead work in their own fields and determine the labor demand, l_t^R, for production in their plot of land. Hence, landowners receive both a wage w_t^R for their labor supply and profits $\pi_t(L_t)$ on their land. Landowners exploit their land for production as long as they live and work on the plot of land. Once they leave the rural area, and migrate to the city, their land is left unproductive.[11] Hence, in egalitarian societies, the total land used for production at time t is

$$\tilde{L}_t^E = \bar{L}\frac{h_t^E}{h_0(J)^t} \tag{2}$$

that is equal to the total available land, $\bar{L}$, if no landowner has ever migrated, and thus $h_t^E = h_0(J)^t$. In nonegalitarian societies, the total amount used for production

11. Alternatively, landowners migrating to the city could sell their land. We choose not to consider a market for land for several reasons. First, land has historically been an illiquid asset, particularly during periods of large migrations from rural areas to the city—and thus of excess supply of land (see Caucutt et al. 2013). Second, we choose to keep the model simple. With a market for land, keeping track of the inheritance, and thus of the filial obligations, would have required a great deal of additional notation, and probably it would not have been analytically tractable. However, since urban wages are assumed to grow at an exogenous rate, even with a market for land, all landowners should eventually abandon the rural areas and move to the city (see Proposition 3). This suggests that our results could still hold, unless the rate at which the land is sold more than compensate for the fertility differential between landowners and peasants—and thus, also in an egalitarian society, the majority of the young population is made of noninheriting children (see Proposition 5).

at time t is

$$\widetilde{L}_t^N = \bar{L}\frac{h_t^N}{h_0} \tag{3}$$

that again coincides with the total available land, $\bar{L}$, if no migration of landowners were ever to take place, and thus $h_t^N = h_0$.

In the urban sector, U, we consider a simple linear technology, $f^U\left(l_t^U\right) = B_t l_t^U$, where B_t is a productivity parameter, which features exogenous growth $\delta > 0$, such that $B_t = B_{t-1}(1+\delta)$. Hence, the wage in the urban sector is simply $w_t^U = w_0^U(1+\delta)^t$. In the urban sector, demand labor by firms is perfectly elastic at the current wage, w_t^U, whereas labor supply is perfectly inelastic, and the entire young urban population at time t, q_t^U, is employed. Young individuals are free to migrate from the rural to the urban sector, at no moving cost; but not vice versa. We analyze the young individuals' decision to migrate in Section 2.3.

To summarize, individual income can be indicated as follows:

$$y_{I,t} = \begin{cases} \pi_t(L_t) + w_t^R & \text{if } i = H, \text{and } j = g = R, \\ w_t^g & \text{otherwise, with } g = R, U, \end{cases} \tag{4}$$

where the top line of equation (4) refers to landowners in rural areas, and the bottom line to peasants and urban workers.

2.2.2. Preferences and Obligations. All individuals care about consumption in youth and old age according to a linear utility function

$$V_{I,t} = c_{I,t} + z_{I,t+1}, \tag{5}$$

where $c_{I,t}$ is the consumption of a type-I young individual at time t, and $z_{I,t+1}$ is his consumption when old at time $t+1$. There are no savings in our setting and old age consumption is ensured by the individuals' filial obligation to transfer resources to their old parents either directly or through a pension transfer.

In both egalitarian and nonegalitarian rural societies, landowners, who have inherited a plot of land L_t, have an obligation to transfer a share $\gamma > 0$ of their total income, which is equal to $\left[\pi_t\left(L_t\right) + w_t^R\right]$, to their parents. For the noninheriting children—of both landowners and peasants—the obligation is instead to transfer a share $\sigma > 0$ of their wage w_t^R. We set $\gamma > \sigma$, in order to impose higher obligations (relative to their income) on inheriting as opposed to noninheriting children, as inheriting children have to reciprocate the bequest received from their parents. When young individuals choose to migrate to the city, their obligations toward their parents, who are left behind, remain. For the individuals born in the city, any bequest of lands from their parents is not economically relevant, since the parents left the land unproductive. Nevertheless, the family culture persists, so that urban individuals, respectively, inheriting and not inheriting the land have an obligation to transfer γw_t^U or σw_t^U.

The filial obligations, $\Phi_{I,t}$, of a young type-I at time t can be summarized as

$$\Phi_{I,t} = \begin{cases} \gamma \left[\pi_t(L_t) + w_t^R\right] & \text{if } i = H \text{ and } j = R, \\ \gamma w_t^U & \text{if } i = H \text{ and } j = U, \\ \sigma w_t^R & \text{if } i = P \text{ and } j = R, \\ \sigma w_t^U & \text{if } i = P \text{ and } j = U. \end{cases} \tag{6}$$

These filial obligations can be satisfied with direct private transfers from the children and with pension benefits to the parents.

We can now introduce the budget constraint in youth for an individual I

$$c_{I,t} = y_{I,t}(1 - \tau_t) - \rho_{I,t}\Phi_{I,t}, \tag{7}$$

where τ_t is the pension tax rate levied to finance pensions and $\rho_{I,t}$ is a function that describes whether—and to what extent—a young individual I is relieved of his filial obligation by the pension transfers (see Section 2.3).

The budget constraint in old age for an individual I is simply

$$z_{I,t+1} = S_{t+1} + \Lambda_{I,t+1}, \tag{8}$$

where S_{t+1} is the pension transfer paid out in old age (if a pension system exists), and $\Lambda_{I,t+1}$ is the total family transfer received from the children, defined in Sections 2.3.1 and 2.3.2.

2.2.3. Pension System. A Pay-As-You-Go (PAYG) pension system may be in place in the rural and/or urban economy. We consider a balanced budget PAYG system, which taxes individuals according to their income (see equation (4)), and provides a flat pension benefit, S_t, to the elderly. In the rural sector, tax collection is more difficult, due for instance to limited state capacity, so we introduce a deadweight cost, ε, on the contributions paid on landowners' rents, and on agricultural wages.[12] The pension system budget constraint at time t is thus

$$S_t q_{t-1} = \tau_t \left[(1 - \varepsilon) \left[\sum_{I|i=H} \pi_t(L_t) + q_t^R w_t^R \right] + q_t^U w_t^U \right], \tag{9}$$

where $q_{t-1} = q_{t-1}^R + q_{t-1}^U$ is the total elderly population at time t, that is, the individuals born at time $t - 1$.

12. Agriculture is commonly considered one of the hardest sectors to tax, because of small scale and spatially spread activities (see World Bank 1991). In the absence of large state capacity, this causes inefficient tax collection in rural areas.

2.3. Household Decisions

In the rural sector, landowners decide how many individuals (including themselves), l_t^R, to employ on their land, in order to maximize their profits $\pi_t(L_t) = f^R\left(L_t, l_t^R\right) - w_t^R l_t^R$, subject to the rural production function. If born in rural areas, $j = R$, young individuals also decide whether to migrate to the city or not. In the urban economy, all individuals—regardless of whether landowners or not—work and receive a wage w_t^U. Finally, all young individuals compute how much they need to transfer to their parents, $\rho_{I,t}\Phi_{I,t}$, in order to comply with their filial obligations, given the size of the pension transfer (if any). To better understand the migration decision and the calculation of how many resources to transfer to the parents, it is convenient to consider societies with egalitarian and nonegalitarian inheritance rules separately.

2.3.1. Egalitarian Inheritance Rule Society. Young individuals' obligations toward their parents are described at equation (6). However, these obligations may be lifted, if parents receive a large enough pension benefit. We assume co-responsibility among similar siblings toward their parents. Hence, each individual calculates his own filial obligation by comparing the pension benefit received by the parents with the total transfer to the parents made by similar siblings. The next expression summarizes the (minimum) transfer to their parents, $\overline{S}_{I,t}^E$, that frees them of their parental obligations,

$$\overline{S}_{I,t}^E = \begin{cases} J\Phi_{I,t}^E & \text{if } i = H \text{ and } j = R, \\ K\Phi_{I,t}^E & \text{otherwise.} \end{cases} \tag{10}$$

The top line represents the total filial obligations toward landowners parents living in rural areas, whereas the bottom line shows the total filial obligations toward all other parents. For a large enough pension benefit, $S_t^E > \overline{S}_{I,t}^E$, (type-*I*) young individuals are thus not required to make any transfer; whereas full transfer is due in the absence of a pension system. For intermediate cases, $0 < S_t^E < \overline{S}_{I,t}^E$, co-responsibility among similar siblings requires each (type-*I*) young individual to transfer a share, $\rho_{I,t}^E$, of his filial obligation, $\Phi_{I,t}^E$, so that the sum of the pension benefit and of each sibling private transfer amounts to the total filial obligation among similar siblings, $\overline{S}_{I,t}^E$. A young individual's calculation of the private transfer to comply with his filial obligation $\Phi_{I,t}^E$ can thus be summarized by the function:

$$\rho_{I,t}^E = \text{Max}\left\{0, 1 - \left(S_t^E \big/ \overline{S}_{I,t}^E\right)\right\}. \tag{11}$$

The actual transfer made to the parents is then $\rho_{I,t}^E \Phi_{I,t}^E$, which appeared in the budget constraint at equation (7).

We can now also define the total family transfer $\Lambda_{I,t+1}^E$ (see the old age budget constraint at equation (8)) that an old individual receives from his children. For a type-*I*

parent, we consider type-I' children where $I' = (i', j', g')$. Then we have

$$\Lambda^E_{I,t+1} = F_I \rho^E_{I',t+1} \Phi^E_{I',t+1}, \tag{12}$$

where the link between a type-I parent and his type-I' children is as follows:

$$\begin{aligned} I = (i, j = g = R) &\rightarrow I' = (i' = i, j' = R, g'), \\ I = (i, j, g = U) &\rightarrow I' = (i' = i, j' = g' = U). \end{aligned} \tag{13}$$

In words, parents living in rural areas have children, who either remain in rural areas or migrate to the city (top line of equation (13)); but their children's filial obligations remain the same. If instead the parents live in the city, so will their children (bottom line). Hence, depending on the size of the pension benefit, $S^E_{I,t}$, parents may (or may not) receive private transfers, $\Lambda^E_{I,t+1}$, from their (J or K) children.

Young individuals born in rural areas also have to decide whether to migrate to the city or to stay in the rural sector. There are no moving costs, and individuals retain their obligation toward their parents, regardless of their chosen location. Furthermore, they take as given the public policy, represented by the current and future pension tax rate and transfers $\left(\tau^E_t, S^E_t, S^E_{t+1}\right)$. Individuals thus compare their utility, $V_{i,j,g}$, from migrating to the city ($g = U$), and from staying in the rural area, ($g = R$), given their type, (i, j), and given the public policy. From the utility function at equation (5) and the budget constraints at equations (7) and (8), a type-I young individual migrates if

$$V^E_{i,j,U} - V^E_{i,j,R} = (y_{(i,R,U),t} - y_{(i,R,R),t})(1 - \tau_t) + \Lambda^E_{(i,R,U),t+1} - \Lambda^E_{(i,R,R),t+1} \geq 0 \tag{14}$$

2.3.2. Non-Egalitarian Inheritance Rule Society. In nonegalitarian inheritance rule societies, peasants may be children of landowners (H) or of peasants (P). To be able to specify their co-responsibility toward their parents, it is convenient to refer to the former group—peasants from landowner parents—as $i = P_H$, and to the latter group—peasants from peasant parents—as $i = P_P$. As in egalitarian societies, we assume co-responsibility among similar siblings toward their parents. The minimum transfer to parents, $\overline{S}^N_{I,t}$, that frees each type of young individuals of their parental obligations, $\Phi_{I,t}$, is

$$\overline{S}^N_{I,t} = \begin{cases} \Phi^N_{I,t} & \text{if } i = H, \\ (F_I - 1)\Phi^N_{I,t} & \text{if } i = P_H, \\ K\Phi^N_{I,t} & \text{otherwise.} \end{cases} \tag{15}$$

The first line suggests that, in the absence of similar siblings, the only inheriting child will be solely responsible for his parents. The $(F_I - 1)$ noninheriting children of landowner parents share responsibilities, and thus, to be relieved of their transfer duty,

the pension has to be large enough (second line in equation (15)). And analogously for the (K) children of peasant parents (third line).

A young individual's calculation of the private transfer needed to comply with his filial obligation $\Phi_{I,t}$ is described by

$$\rho^N_{I,t} = \text{Max}\left\{0, 1 - \left(S^N_t / \bar{S}^N_{I,t}\right)\right\} \tag{16}$$

The total family transfer, $\Lambda_{I,t+1}$, that a type-I old individual receives from his type-I' children can thus be summarized as

$$\Lambda^N_{I,t+1} = \begin{cases} \rho^N_{I'|i'=H,t+1}\Phi^N_{I'|i'=H,t+1} + (F_I - 1)\rho^N_{I'|i'=P_H,t+1}\Phi^N_{I'|i'=P_H,t+1} & \\ \qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad \text{if } i = H, & (17) \\ K\rho^N_{I'|i'\neq H,t+1}\Phi^N_{I'|i'\neq H,t+1} \qquad\qquad \text{if } i \neq H, & \end{cases}$$

where the first line refers to landowners' parents, whose children have different obligations, and the second to peasants' parents. The link between a type-I parent and his type-I' children is as follows:

$$\begin{aligned} I = (i = H, j = g = R) &\rightarrow \begin{cases} I' = (i' = H, j' = R, g') \\ I' = (i' = P_H, j' = R, g') \end{cases} \\ I = (i = H, j, g = U) &\rightarrow \begin{cases} I' = (i' = H, j' = g' = U) \\ I' = (i' = P_H, j' = g' = U) \end{cases} \\ I = (i \neq H, j = g = R) &\rightarrow I' = (i' \neq H, j' = R, g') \\ I = (i \neq H, j, g = U) &\rightarrow I' = (i' \neq H, j' = g' = U) \end{aligned} \tag{18}$$

In words, landowner parents living in rural areas have inheriting and noninheriting children, who either remain in rural areas or migrate to the city (first line). Peasant parents living in rural areas have children, who either remain in rural areas or migrate to the city (third line). These filial obligations are not affected by the migration decisions. If instead the parents live in the city, so will the children. This is true both for landowner parents, who have inheriting and noninheriting children (second line), and for peasant parents (forth line). This structure can be recognized at Figure 1, panel (b).

Hence, depending on the size of the pension benefit, $S^N_{I,t}$, landowner parents may receive private transfers from their inheriting child and from their ($J-1$ or $K-1$) noninheriting children (see the first line of the expression at equation (17)); and peasant parents from their (K) children (see the second line).

Young individuals from rural areas also have to decide whether to migrate or to stay. Recall that there are no moving costs, the migration choice does not affect the children's filial obligations, and individuals take the public policy, $\left(\tau_t, S^N_t, S^N_{t+1}\right)$, as given. The comparison of their utility from migrating, $V^N_{i,j,U}$, and from staying, $V^E_{i,j,U}$,

suggests that a type-I young individual migrates if

$$V^N_{i,j,U} - V^N_{i,j,R} = (y_{(i,R,U),t} - y_{(i,R,R),t})(1-\tau_t) + \Lambda^N_{(i,R,U),t+1} - \Lambda^N_{(i,R,R),t+1} \geq 0. \tag{19}$$

2.4. Characterization of Equilibrium

In this section, we characterize the equilibrium dynamics of our two-sector economy. We start by providing a formal definition of a competitive economic equilibrium.

DEFINITION 1. For a given sequence of urban wages, pension tax rates and pension benefits, $\left\{w^{r,U}_t, \tau^r_t, S^r_t\right\}^{\infty}_{t=0}$ with $r = \{E, N\}$ and given initial land plots and individual types, $\left\{L_0, h_0, p^r_0\right\}$, a competitive economic equilibrium is a sequence of individual and aggregate allocations and prices

$$\left\{c^r_{I,t}, z^r_{I,t+1}, l^{r,R}_t, l^{r,U}_t, w^{r,R}_t, \pi^r_t, h^r_t, p^r_t, m^{r,H}_t, m^{r,P}_t, u^{r,H}_t, u^{r,P}_t\right\}^{\infty}_{t=0} \quad \forall \quad I,$$

such that, in every period,

- in the rural sector, each landowner chooses the labor demand, $l^{r,R}_t$, which maximizes the profits from his land, $\pi^r_t\left(L^r_t\right)$, subject to the rural production function at equation (1);
- in the rural sector, the amount of land used for production is $\widetilde{L}^E_t = \bar{L}\left(h^E_t/h_0(J)^t\right)$ in egalitarian societies and $\widetilde{L}^N_t = \bar{L}\left(h^N_t/h_0\right) = L_0 h^N_t$ in nonegalitarian societies, as shown at equations (2) and (3);
- every young individual born in rural areas takes his migration decision, $g|I = (i, j = R, g)$, by comparing his expected utility from staying and from migrating, according to equations (14) and (19);
- every type-I young individual determines the amount of transfer to his parents, $\rho^r_{I,t}\Phi^r_{I,t}$, according to equations (11) and (16);
- labor markets clear, that is, $\sum_I l^{r,R}_t = q^{r,R}_t$ in the rural sector, and $l^{r,U}_t = q^{r,U}_t$ in the urban sector;
- the goods market clears:

$$\sum_I c^r_{I,t} + \sum_I z^r_{I,t} = A\sum_{I|i=B}\left(L^r_t\right)^{\alpha}\left(l^{r,R}_t\right)^{1-\alpha} + B_t l^{r,U}_t;$$

- rural and urban young populations evolve, respectively, according to

$$q^{r,R}_t = h^r_t + p^r_t = Jh^r_{t-1} + Kp^r_{t-1} - \left(m^{r,H}_t + m^{r,P}_t\right) \quad \text{and}$$
$$q^{r,U}_t = u^{r,H}_t + u^{r,P}_t + m^{r,H}_t + m^{r,P}_t = Ku^r_{t-1} + m^{r,H}_t + m^{r,P}_t;$$

- the pension system budget constraint at equation (9) holds.

Our theoretical model begins with the whole population living and working in the rural sector. This is because the initial (endogenous) rural wage,

$$w_0^{r,R} = A(1-\alpha)\sum_I (L_0^r/q_0^r)^\alpha ,$$

is assumed to be larger than the initial (exogenous) urban wage. Moreover, in both egalitarian and nonegalitarian societies, we assume an initial, large enough and equal, number of landowners and peasants.

ASSUMPTION 1. For $r = \{E, N\}$, $w_0^{r,R} > w_0^{r,U}$ and $h_0^r = p_0^r > \alpha/2$.

Due to the existence of a fixed factor of production (the land[13]) and to population growth, which increases the aggregate labor supply, rural wages initially decrease, whereas the value of land increases. Hence, the value for peasants of remaining in the rural sector drops over time, whereas the value of migrating to the city, which is driven by urban wages, increases. Eventually, peasants start to migrate to the city. This outflow of labor from the rural to the urban sector decreases the labor supply in the rural sector and has the effect of keeping rural wages equal to urban wages. The continuous migration of peasants from the rural to the urban sector in fact compensates two contemporaneous and opposing forces: the growth of urban wages and the increase of the rural young population, which increases the aggregate labor supply. However, this balancing mechanism eventually comes to an end when all peasants have moved to the city.[14] Due to the exogenous growth of urban wages and to the existence of landowners who work their own land, and thus prevent the labor supply from becoming too small and the marginal product of labor from becoming too large, urban wages thus become higher than rural wages. Only landowners may still find it convenient to remain in the rural sector to work on their own land, as their total rural income (composed of rent and wage) is higher than urban wages. Yet, this total rural income depends on the size of the plot of land, which decreases over time in egalitarian societies and remains constant in nonegalitarian societies (see Section 2.2.1). Hence, for a large enough urban wage, eventually even the landowners will leave their land unproductive and migrate to the city. The next proposition provides a formal characterization of the migration dynamics.

PROPOSITION 1. *In both egalitarian and nonegalitarian societies* ($r = E, N$)*, there exist three calendar times* (T_1^r, T_2^r, T_3^r)*, such that,*

- *for* $t \leq T_1^r$*, there is no migration:* $m_t^{r,H} = m_t^{r,P} = 0$*;*
- *for* $T_1^r < t \leq T_2^r$*, peasants migrate:* $m_t^{r,H} = 0$*,* $m_t^{r,P} \geq 0$*;*

13. The total amount of land is assumed to be fixed ($\bar{L}$) and is used for production as long as the landowners remain in the rural area (see Section 2.2.1).

14. In nonegalitarian societies, noninheriting children of the landowners, $i = P_H$, will be born in rural areas and will continue to move to the city.

- *for* $T_2^r < t < T_3^r$, *only peasants in nonegalitarian societies migrate:* $m_t^{r,H} = 0$, $m_t^{E,P} = 0$, $m_t^{N,P} = (J-1)h_{t-1}^N$;
- *for* $t = T_3^r$, *landowners in both societies and the peasants in nonegalitarian societies migrate:* $m_t^{E,H} = J h_{t-1}^E$, $m_t^{N,H} = h_{t-1}^N$, $m_t^{N,P} = (J-1)h_{t-1}^N$, $m_t^{E,P} = 0$;
- *for* $t > T_3^r$, *the entire population is in the city, and no migration can occur:* $q_t^{r,R} = 0$, *and* $u_t^r = K u_{t-1}^r$.

2.5. Political Equilibrium

In this section, we analyze the introduction of a PAYG pension system as an outcome of a majority voting game played by young individuals only.[15] They vote over[16] the pension tax rate, τ_t, which finances the pension transfers to the elderly individuals, S_t, according to the pension budget constraint at equation (9).

DEFINITION 2. A political equilibrium is a competitive economic equilibrium in which the sequence of pension tax rates $\{\tau_t^r\}_{t=0}^{\infty}$ with $r = \{E, N\}$ is determined at majority voting by all young individuals I at each time t.

Individual preferences over the pension tax rate are shaped by a simple consideration. Young individuals have to comply with their filial obligations toward their parents, but can be relieved by a sufficiently generous pension system (see equations (10) and (15)). Hence, they are willing to support such a pension system, if its cost to them, as measured by their total pension tax bill, is lower than the cost of the filial private transfer.

Two main aspects characterize the political game. First, the pension system is redistributive. Since it is financed through a proportional tax, but provides flat pension benefits, the system redistributes from landowners to peasants. Second, the pension system is more efficient in the city. In fact, the existence of a tax collection cost, ε, in rural areas makes it less efficient to have a pension system (vis-a-vis private filial transfers), the larger the rural population is. Hence, a pension system is more likely to be supported if the share of peasants is large and if most people live in the urban area. These two channels play different roles, according to the type of inheritance rule, since

15. We choose to consider the vote of young individuals only to keep the analysis simple. Young individuals are of great interest, since their preferences over the pension system depend on their type I, whereas old individuals are all in favor of the largest possible pension transfer. However, our analysis (at Propositions 5 and 6) is robust to including the elderly among the voting population, as discussed in footnotes 18 and 20.

16. Unlike many political economy models (see Galasso and Profeta 2002 for a review), this setting does not require voters to consider the impact of their voting decisions on future voters for a political equilibrium with pension to arise. Differently from most other models (with the exception of Tabellini 2000), in fact, young voters may benefit from the existence of a pension system that relieves them from making a private transfer to their parents. On the contrary, the existence of a pension system does not necessarily increase their old age utility, as filial obligations already guarantee them private transfers from their children. Hence, the intergenerational interaction that is typical of these repeated pension games does not arise in this model.

the relative share of peasants and landowners differs in egalitarian and nonegalitarian societies, and so does the timing of migration to the city (see Proposition 3).

The next proposition characterizes the political equilibrium in an egalitarian society.

PROPOSITION 2. *In egalitarian societies, a pension system is introduced at* $t = T_3^E$ (*in the city*) *with* τ_t^E *such that* $S_t^E = \gamma K w_t^{E,U}$.

In egalitarian societies, the number of landowners increases over time more than the number of peasants,[17] due to the fertility differential ($J > K$). Thus, the inheritance rule favors the prevalence of the landowners, whose preferences toward the pension system determine its design.[18] In the rural society, landowners oppose a pension system, both because of the cost of collecting taxes and of the redistributive nature of the system, which penalizes them. The beginning of the urbanization process partially mitigates the former concern, but the latter remains. Only when a complete transition to the city has occurred, at $t = T_3^E$, and all individuals obtain the same (urban) wage, $w_t^{E,U}$, do these two concerns disappear, and landowners support a pension system with $S_t^E = \gamma K w_t^{E,U}$.

The next proposition characterizes the political equilibrium in a nonegalitarian society.[19]

PROPOSITION 3. *In nonegalitarian societies, for* $J > K + 1$, *there exist two thresholds of the tax collection costs,*

$$\varepsilon_K = 1 - \frac{(1-\alpha)K(J+K)}{J-K+K(J+K)} \quad \textit{and} \quad \varepsilon_J = 1 - \frac{2(1-\alpha)(J-1)}{J+K},$$

with $\varepsilon_K > \varepsilon_J$, *such that*

- *for* $\varepsilon \leq \varepsilon_J$, *a pension system is introduced at* $t = 1$ (*in rural areas*) *with* τ_t^N *such that* $S_t^N = \sigma(J-1)w_t^{N,R}$;
- *for* $\varepsilon_J < \varepsilon \leq \varepsilon_K$, *a pension system is introduced at* $t = 2$ (*in rural areas*) *with* τ_t^N *such that* $S_t^N = \sigma K w_t^{N,R}$;
- *for* $\varepsilon > \varepsilon_K$, *a pension system is introduced at some* $t \in \left[T_1^N, T_2^N\right]$ (*during the urbanization process*) *with* τ_t^N *such that* $S_t^N = \sigma K w_t^{N,U}$.

17. If peasants were assumed to be initially more numerous than landowners (unlike we do in Assumption 2), and the cost of collecting taxes was not too high, a pension system with $S_t^E = \sigma K w_t^{E,R}$ would emerge in the rural area, already at $t = 1$. However, as long as the fertility differential, $J > K$, remains, landowners would eventually become a majority and vote down this system.

18. If the elderly were allowed to vote, they would vote for the largest possible pension transfer. It is easy to see that, if $J \geq K + 2$, landowners would remain the majority, and the results at Proposition 5 would still hold. If instead $J < K + 2$, peasants would be the median voter at $t = 1$. Applying the same reasoning as in Proposition 5, we can see that a pension system with $S_t^E = \sigma K w_t^{E,R}$ emerges at $t = 1$, if $\varepsilon < 1 - (1 - \alpha/\alpha(J + K)$.

19. In Proposition 6, we consider $J > K + 1$. The only other possible case ($J = K + 1$, since we assumed $J > K$) is qualitatively similar and is presented in Appendix A

In nonegalitarian societies, the number of landowners remains constant over time, since the land is transmitted from the parents to one child only and the other (noninheriting) children of landowners become peasants. This inheritance rule thus favors the development of a large group of peasants,[20] who, at some point, T_1^N, begin to migrate to the city. At $t = 1$, there are h_0^N landowners, $(J-1)h_0^N$ peasants from landowner parents, and $Kp_0^N = Kh_0^N$ peasants from nonlandowner parents. However, for any $t > 1$, peasants from nonlandowner parents ($i = P_P$) in the rural sector or who migrated to the city or descendants of peasants in the urban sector—constitute an absolute majority of the voting population. Their preferences toward the pension system thus determine its design. In the rural society, peasants enjoy the redistributiveness of the pension system, but suffer from the tax collecting cost, ε. If this cost is not too high, pensions are introduced already in the rural sector (at $t = 1$ or $t = 2$) to relieve the peasants of their filial obligations. For higher costs, a pension system is introduced only when the urbanization process begins. In fact, peasants' preferences do not change,[21] but the overall burden of tax collection drops, since there is no deadweight cost on the pension contributions paid by urban workers.

To summarize, our simple model can thus be used to compare the economic dynamics in these two societies—egalitarian and nonegalitarian. Two testable predictions emerge. First, in egalitarian societies pension systems are only introduced in the city, when the urbanization process has been completed; whereas in nonegalitarian societies, they are introduced earlier, in the rural areas or during the urbanization process. Second, pension transfers are more generous in egalitarian than in nonegalitarian societies.

3. Historical Perspectives and Data

3.1. Inheritance Rules and Family Structure

Characterizing the internal organization of the family prior to the introduction of the welfare state is a difficult task.[22] Todd (1983) provided a mapping of historical family characteristics, according to three principles: (i) egalitarian (or not) principle in the

20. Also in this case, if the elderly were allowed to vote, they would vote for the largest possible pension transfer. If $J \geq K + 2$, the results at Proposition 6 still hold. If instead $J < K + 2$, peasants would be the median voter also at $t = 1$ (see the proof of Proposition 6 in the Appendix), and thus a pension system with $S_t^N = \sigma K w_t^{N,R}$ would immediately emerge, if $\varepsilon < \varepsilon_K$.

21. Peasants who migrated to the city and individuals born in the city to peasant parents share the same preferences as the peasants in the rural sector. In fact, for $t \in [T_1^N, T_2^N]$, peasants and migrants prefer $S_t = \sigma^N K w_t^{N,R}$; individuals born in the city to peasant parents prefer $S_t = \sigma^N K w_t^U$ and $w_t^{N,R} = w_t^{N,U}$.

22. A recent literature (see Alesina and Giuliano 2014 for a review) has used survey data on individual responses to questions on the relevance of the family, on the time spent with relatives, and on living arrangements to provide a quantitative measure of these family ties. Yet, although current relations within and across families are certainly shaped by cultural factors, they are also largely influenced by the incentives provided by current economic institutions, such as labor market regulations and the welfare state.

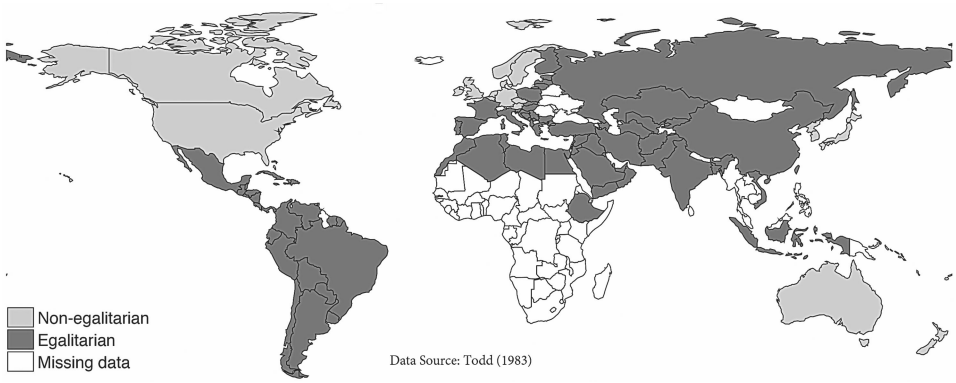


FIGURE 2. Diffusion of inheritance rules.

inheritance rule; (ii) cohabitation (or not) between parents and adult children; (iii) exogamous or endogamous marriage relationships.[23] Figure 2 shows the inheritance principle in 85 countries.

Our empirical analysis focuses on the first principle, which—according to the model presented at Section 2—may generate different family cultures, different incentives for inheriting and noninheriting children, and ultimately a different design of the welfare state. The second principle outlined by Todd (1983)—cohabitation—does not modify, but rather complements these arrangements. For instance, in countries with nonegalitarian inheritance rules, parents may live with their heir, or establish a different living arrangement. And similarly for egalitarian inheritance rule countries. The third principle—exogamous marriage—is instead less relevant for within family intergenerational arrangements.

In our empirical analysis, we take the inheritance rule as given. However, the type of dominant inheritance rules may depend on geographical or economic features. For instance, several authors suggest that primogeniture was mostly preferred among landowners and aristocracy in order to ensure the stability of family wealth (see Goody, Thirsk, and Thompson 1976; Chu 1991). Inheritance rules may also be related to legal origins. For instance, after Napoleon, the French civil law imposed the (egalitarian) principle of equal bequest among children. In the empirical analysis, we control for the effects of legal origins, as well as for other economic, political and cultural factors, which may be related to the type of inheritance rule. Finally, inheritance rules may also depend on the land characteristics, which might have required extensive or intensive cultivation—thereby dictating the most efficient rule. Baker and Miceli (2005) provide supporting evidence for scale economies in land use to affect inheritance rules. Interestingly, Alston and Schapiro (1984) suggest that some US states, which

23. Combinations of these principles give rise to different family types: absolute nuclear families, egalitarian nuclear families, authoritarian (or stem) families, and communitarian families.

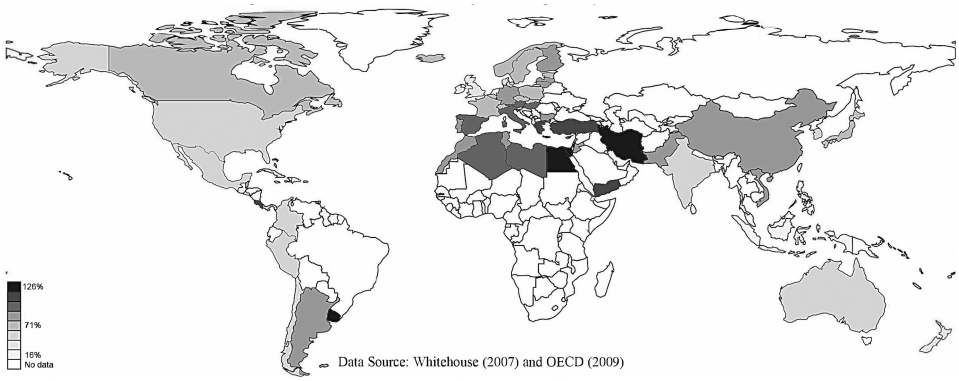


FIGURE 3. Pension generosity: average replacement rate.

were characterized by decreasing returns in agriculture, did not passively accept the British inheritance system of primogeniture, but rather adopted multigeniture.

3.2. The Pension Systems: Introduction and Generosity

In the western world, public pension systems were initially introduced between the end of the 19th century and the aftermath of World War II. The first country to introduce a pension system was Germany in 1889, the last one in our sample[24] was Bangladesh in 1998. Ever since their introduction, these systems have largely differed in their design and generosity. Generous schemes typically provide to those workers who have paid contributions during their working life, a pension benefit that is strictly related to their previous wage. Basic pension systems, instead, provide only a safety net, by combining contributions that are proportional to earnings with (almost) flat pension benefits.

Our main indicator of generosity of the pension scheme is the average replacement rate, which measures the ratio between the pension benefit and the wage for a worker with the average wage. Higher average replacement rates indicate more generous pension systems. Figure 3 shows the distribution of average replacement rates around the world.

To assess the difference between generous and basic pension systems, we construct a further measure: the ratio in the replacement rates across individuals of different income groups. This ratio captures an interesting difference between generous and basic pension schemes. In generous systems, the replacement rates are high and approximately constant across individuals of different incomes. Hence, the ratio of

24. Embryonic pension systems developed in different countries prior to the introduction of a general scheme, which was able to ensure wide coverage across the population. We rely mainly on the information provided by Social Security Programs Throughout the World (edited by the US Social Security Administration) for the official year of the introduction of a general, public pension scheme (see Online Appendix C).

the replacement rates across income groups is close to one. Basic pension schemes instead ensure enough retirement income to low-income workers, but provide only a low replacement of their previous wage to middle and high income workers.[25] The ratio in the replacement rates across income groups will thus differ from one. Our second set of measures of pension generosity relates to this feature by considering the ratio between the replacement rates of workers earning different labor incomes. We present three cases: (i) Low: the ratio between the replacement rates of workers earning, respectively, 100% and 75% of the average income; (ii) Medium: the ratio between the replacement rates of workers earning, respectively, 150% and 100% of the average income; and (iii) High: the ratio between the replacement rates of workers earning, respectively, 150% and 75% of the average income.[26]

Due to data availability, we use measures of the replacement rates around the year 2000 and rely on the strong persistence of the initial design of the pension systems. In fact, although pension spending has changed over the years, driven by demographic, economic, and political factors (see Galasso 2006), its design—basic or generous—has proven to be more stable.[27] In the United States, the 1935 Social Security Act introduced a basic pension system, which featured a nonlinear formula to calculate the old age benefits from the pre-retirement wage (see Online Appendix B). The first individuals to retire in 1942, with (only) five years of contributions, obtained a replacement rate equal to 13.8% if they earned the annual average wage ($1,700 in 1937), to 16.7% if earning 75% of the average wage, and to 10.9% if earning 150% of the average wage. In 2011, the replacement rate for individuals (with a complete working history of 35 years) earning 75% and 150% of the average wage ($41,211) was, respectively, 49% and 38%. Over the years, the US pension system has thus maintained its original design.[28]

25. In these systems, high earners tend in fact to rely largely on private pensions (Conde-Ruiz and Profeta 2007).

26. The correlation among these three measures is strong, ranging between 0.78 and 0.96. The correlation between our first indicator (the replacement rate for an average worker) and the other measures ranges between 0.34 and 0.52.

27. For instance, the United Kingdom is still an example of a basic, flat-rate pension system, whereas Germany, Italy, and France have remained generous and earnings-related. Recent reforms aimed at limiting pension spending have not modified the systems' original design. In Italy, reforms have increased the retirement age and strengthened the earning-related design, by shifting from a defined benefit to a notional defined contribution scheme. Yet, pensions have remained generous and replacement rates are high. In the United Kingdom, reforms have not changed the basic nature of the system: the safety net component has been reinforced, whereas a "contract out" option has been introduced.

28. It is interesting to notice that, according to the 1935 Act formula, had an individual retired with 35 years of contributions (as required today to obtain the regular pension), the replacement rate would have been equal to 39.5% if they earned the annual average wage ($1,700 in 1937), to 48% if earning 75% of the average wage, and 32.2% if earning 150% of the average wage. These figures are in line with current replacement rates.

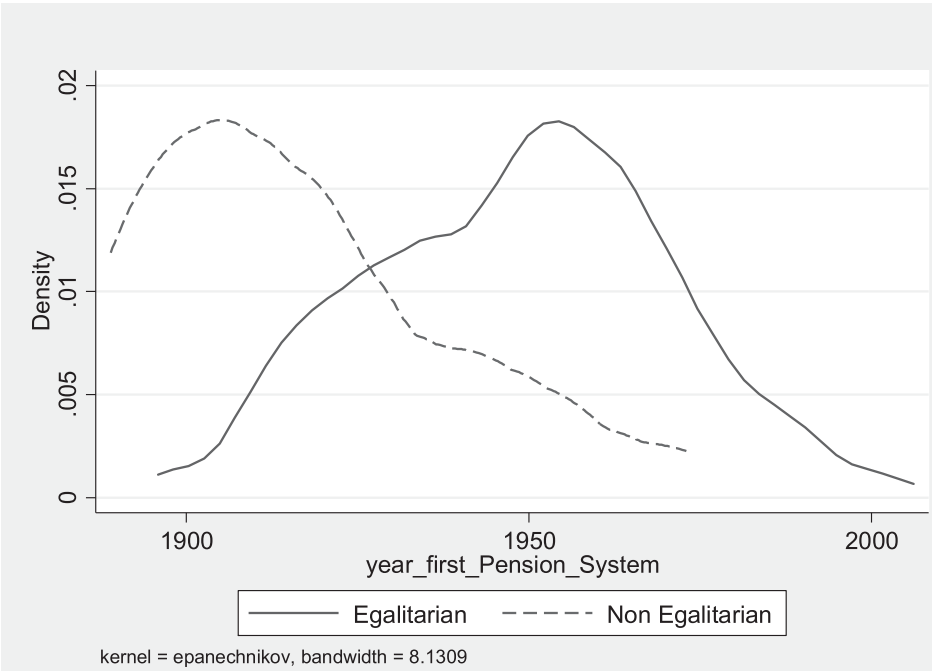


FIGURE 4. Year of introduction of pension systems.

4. The Empirical Analysis

4.1. Cross Country Specification

Our theoretical model delivers two predictions. The first one concerns the timing of the introduction of pension systems. In nonegalitarian societies, pension systems are introduced already in the rural areas or during the urbanization process, whereas in egalitarian societies they are adopted only in the city. Using historical data on the time of the initial introduction of pension systems, we can test whether they appeared earlier in nonegalitarian than in egalitarian societies. The second prediction is that pension systems are more generous in egalitarian than in nonegalitarian societies. To test this, we use our two measures of the generosity of the pension system discussed in the previous section.

As an initial piece of descriptive evidence, Figure 4 shows the empirical kernel distributions of the year of introduction of the pension system for countries with egalitarian and nonegalitarian inheritance systems. The two distributions differ quite substantially and the Kolmogorov–Smirnov test rejects equality of distribution functions. In nonegalitarian countries, pension systems were mostly introduced in the early 20th century (the average year is 1916), whereas in egalitarian countries they typically appeared much later, after World War II (the average year is 1948).

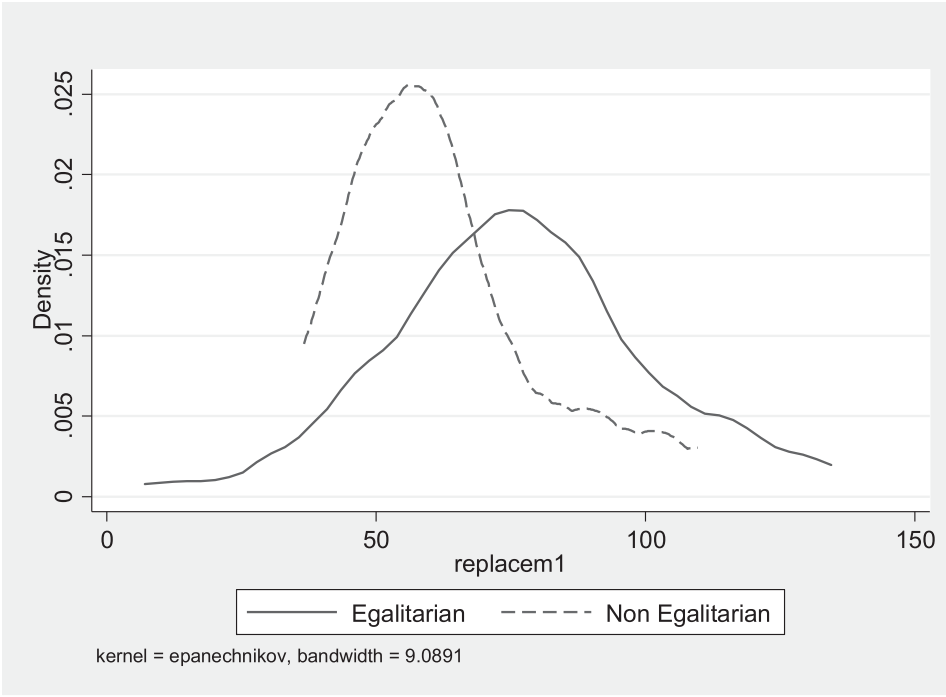


FIGURE 5. Pension generosity: average replacement rate.

Figures 5 and A.1 provide descriptive evidence on the differences in pension generosity across countries, according to their inheritance rules. Figure 5 displays the empirical kernel distributions of the replacement rates for an average earner in countries with egalitarian and nonegalitarian inheritance systems. The two distributions are substantially different. The average replacement rate is 62% in nonegalitarian countries and 76% in egalitarian countries and the Kolmogorov–Smirnov test rejects equality of distribution functions. Analogous differences across inheritance systems emerge for the other measures of generosity.[29]

After this supporting descriptive evidence, we turn to the regression analysis in order to control for several variables, which measure possible differences between these two groups. To test our theoretical predictions, we estimate a cross country

29. Figure A.1 shows the empirical kernel distributions of our three measures of the replacement rate ratios. In all three cases (panel a: medium to low replacement rates; panel b: high to medium replacement rates; and panel c: high to low replacement rates) the distributions for countries with egalitarian and nonegalitarian inheritance systems are very different and the Kolmogorov–Smirnov test always rejects equality of distribution functions. The average of the replacement rate ratios in the egalitarian countries is close to one (respectively, 0.97 for the medium to low replacement rates; 0.98 for high to medium replacement rates; and 0.95 for high to low replacement rates), whereas it is smaller than one in the nonegalitarian countries (respectively, 0.89 for the medium to low replacement rates; 0.87 for high to medium replacement rates; and 0.78 for high to low replacement rates).

regression model:

$$y_i = \alpha + \beta_1 EGALIT_i + \beta_2 COHABITATION_i + \beta_3 EXOGAMY_i + \beta_4 X_i + \varepsilon_i, \tag{20}$$

where y_i is our dependent variable measuring, in country i, either the year of introduction of the pension system or one of our measures of generosity of the pension scheme (described at Section 3.2); $EGALIT_i$ is the dummy variable of interest, which is equal to 1 if country i features an egalitarian inheritance rule and 0 otherwise; $COHABITATION_i$ is a dummy variable equal to 1 if in country i cohabitation was the rule and 0 otherwise; $EXOGAMY_i$ is a dummy variable equal to 1 if country i featured exogamous marriages and 0 otherwise; X_i is a set of control variables, which include continent dummies, and alternative legal, religious, political, economic, and demographic determinants that could have affected the adoption and the size of the system; and ε_i is the error term. A complete description of these variables and of the data sources is in Online Appendix C.

Due to the small number of observations, we run different sets of regressions, which always include the continent dummies (Europe, America, Asia, Africa, and Oceania) and the (log) current per capita GDP for the (current) measures of pension generosity, but only one by one the other control variables in X_i: legal origin (Anglo-Saxon, Socialist, Germany, French, and Scandinavian), dominant religions in 1900 (shares of Catholics, Muslims, Orthodox, and Protestants), religious homogeneity of the country in 1900, level of urbanization in 1900, level of democracy in 1900 (Polity 2 index), form of government and electoral rules in 1900, the share of elderly in the population (historical or current values), income inequality (historical or current values of the Gini coefficient).

Our unit of analysis is the country, since pension design varies at country level. Furthermore, since this design displays a strong time persistence and we have historical data on inheritance rules, we concentrate on a cross-country analysis. Summary statistics are at Table 1.

In Table 2, we show the empirical results of the regression of the years of introduction of the pension system on the dummy for the egalitarian inheritance principle. We control for the other two principles (cohabitation and exogamy) and for the set of variables described previously. The regression results confirm the descriptive evidence at Figure 4: countries featuring a nonegalitarian inheritance rule introduced their pension systems earlier than egalitarian countries. In column (1), which reports the results of the main regression with the three dummies for the family characteristics and continent controls, the effect is statistically significant (at 1% level) and sizeable: almost 20 years of difference between the average years of introduction in the two groups. In the other columns,[30] we control one by one, respectively, for legal origin (column (2)), dominant religions (column (3)) and religious homogeneity in 1900 (by

30. The coefficients for the control variables are reported at Table D.1 in Online Appendix D.

TABLE 1. Summary statistics, cross-country analysis.

	Obs.	Mean	StDev	Min	Max
Year of introduction of pension system	87	1.942	24.886	1889	1998
Replacement rate of a worker earning the average income	54	71.713	23.370	16.2	125.4
Ratio of the replacement rate of a worker earning 75% of the average income and the replacement rate of a worker earning the average income	50	1.067	0.105	0.928	1.334
Ratio between the replacement rate of a worker earning the average income and the replacement rate of a worker earning 150% of the average income	50	1.081	0.145	0.907	1.499
Ratio between the replacement rate of a worker earning 75% of the average income and the replacement rate of a worker earning 150% of the average income	50	1.166	0.271	0.841	2
Principle of equality	87	0.793	0.407	0	1
Principle of cohabitation	87	0.575	0.497	0	1
Principle of exogamous marriage	87	0.391	0.491	0	1
Continent dummy: America	87	0.299	0.460	0	1
Continent dummy: Asia	87	0.287	0.455	0	1
Continent dummy: Africa	87	0.069	0.255	0	1
Continent dummy: Oceania	87	0.023	0.151	0	1
Legal origin: Anglo-Saxon	87	0.172	0.380	0	1
Legal origin: Socialist	87	0.230	0.423	0	1
Legal origin: Germany	87	0.057	0.234	0	1
Legal origin: French	87	0.494	0.503	0	1
Dominant religion: Catholic (1900)	49	0.466	0.424	0	1
Dominant religion: Protestant (1900)	49	0.206	0.335	0	0.992
Dominant religion: Orthodox (1900)	49	0.068	0.143	0	0.839
Dominant religion: Muslim (1900)	49	0.189	0.372	0	0.997
Herfindahl index of religious homogeneity (1900)	49	0.778	0.195	0.339	1
Urbanization level (1900)	77	0.631	0.194	0.154	0.97
Polity 2 index (1900)	47	−0.319	6.112	−10	10
Share of elderly (2000)	83	8.851	5.101	2.112	18.236
GDP per capita (ln, 2000)	83	8.147	1.379	4.707	10.478
Gini index (2000)	82	40.214	11.832	20.074	68.9
Electoral rule: Majoritarian (1900)	55	0.218	0.417	0	1
Form of Government: Presidential (1900)	55	0.364	0.485	0	1

using a Herfindal index of religious homogeneity in column (4)), level of urbanization and level of democratization (as captured by the Polity 2 indicator) of the country in 1900 (columns (5) and (6)), political institutions (electoral rules and forms of government, at column (7)) current economic and demographic variables (GDP and the share of elderly in the population in 2000, at column (8)), and current income inequality (measured by the Gini coefficient in 2000, at column (9)). In all these cases,

TABLE 2. Year of introduction of pension system.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Egalitarian principle	19.855***	25.761***	23.549***	20.664**	15.216***	21.072***	24.066***	16.195**	18.317***
	(4.756)	(5.158)	(8.352)	(7.70)	(5.311)	(7.570)	(7.134)	(6.699)	(4.852)
Principle of cohabitation	−1.750	−0.124	−7.454	−7.265	−6.638	−2.033	−6.431	−0.689	−2.044
	(5.852)	(8.217)	(5.991)	(9.842)	(5.964)	(7.308)	(7.590)	(6.308)	(6.221)
Principle of exogamous marriage	6,618	7,344	17.05	10,298	9,728	5,856	15,039	3,248	5,072
	(4.842)	(7.167)	(11.279)	(12.81)	(5.974)	(7.451)	(9.099)	(6.006)	(5.01)
Continent dummy	YES	YES	YES	YES	YES	YES	YES	YES	YES
Legal origin dummies	NO	YES	NO	NO	NO	NO	NO	NO	NO
Dominant religions (1900)	NO	NO	YES	NO	NO	NO	NO	NO	NO
Religious homogeneity (1900)	NO	NO	NO	YES	NO	NO	NO	NO	NO
Urbanization level (1900)	NO	NO	NO	NO	YES	NO	NO	NO	NO
Democracy (1900)	NO	NO	NO	NO	NO	YES	NO	NO	NO
Political dummies (1900)	NO	NO	NO	NO	NO	NO	YES	NO	NO
Share of elderly (2000)	NO	NO	NO	NO	NO	NO	NO	YES	NO
Income inequality (2000)	NO	NO	NO	NO	NO	NO	NO	NO	YES
Constant	1905.598***	1907.731***	1989.431***	1918.248***	1925.953***	1905.036***	1902.317***	1917.552***	1911.461***
	(4.956)	(9.161)	(38.122)	(13.075)	(11.198)	(5.10)	(6.551)	(14.949)	(7.359)
Observations	87	87	48	49	77	47	55	83	82
R-squared	0.659	0.683	0.815	0.717	0.685	0.632	0.629	0.663	0.639

Notes: The table shows the results of a cross-country estimation. The dependent variable is the year of introduction of the pension system. The explanatory variables include the three principle of historical organization of the family (egalitarian, cohabitation, exogamous marriage). Continent dummies (Europe, America, Asia, Africa, and Oceania) are added as control variables in all specifications. Columns (2)–(9) include one additional control variable each: in column (2) we add the legal origin dummies (Anglo-Saxon, Socialist, Germany, French, and Scandinavian); in column (3) the dominant religions in 1900 (Catholic, Muslim, Orthodox, Protestant); in column (4) the Herfindahl index of religious homogeneity; in column (5) the urbanization level in 1900; in column (6) the level of democracy in 1900 (Polity 2 indicator); in column (7) political dummies (the form of government and electoral rules); in column (8) the share of elderly in 2000 and in column (9) the level of income inequality in 2000 (measured by the Gini index). Robust standard errors are in parentheses. **Significant at 5%; ***significant at 1%.

the effect of the inheritance rule on the timing of the introduction is sizable—ranging from 15 to 25 years, depending on the set of controls, and statistically significant.[31]

Table 3 presents the empirical results for our main measure of pension generosity—the average replacement rate. As shown at equation (20), we regress the replacement rate for an average earner on the dummies for the egalitarian inheritance principle and for the other two principles (cohabitation and exogamy), controlling for a set of additional variables. In line with the descriptive evidence at Figure 5, we find that countries featuring the egalitarian inheritance rule have a significantly higher average replacement rate than nonegalitarian countries. In the basic regression reported at column (1), the effect is statistically significant (at 1% level) and economically sizeable: 29 points on an average replacement rate of 72%. In the other columns,[32] we enrich our baseline scenario by introducing additional variables to control for alternative channels that may explain the average generosity of pension systems: legal origin (column (2)), dominant religions (column (3)) and religious homogeneity in 1900 (column (4)), level of urbanization and level of democratization in 1900 (columns (5) and (6)), electoral rules and forms of government (column (7)), the share of elderly in the population (column (8)), and income inequality in 2000 (column (9)). In all these cases, the effect of the inheritance rule on pension spending remains sizable—ranging from 19 to 42 points and statistically significant.

These findings are confirmed when we use our additional measures of pension generosity—the ratios between the replacement rates of workers with different incomes, as shown at Tables A.1–A.3. The nonegalitarian inheritance principle is associated with basic pensions, for which the ratios between the replacement rates of workers with high and low incomes is lower than in generous systems.[33] In fact, the coefficient corresponding to the egalitarian principle in Tables A.1–A.3 is always positive and strongly significant.[34]

31. The size of the effect becomes smaller, but remains statistically significant at 1% level, when we control for urbanization level in 1900 (column (5)). According to our theoretical model, pension systems are more likely to emerge in more urbanized societies—and this correlation emerges in our empirical results. However, even controlling for the degree of urbanization, the impact of the egalitarian inheritance principle on the year of introduction remains strongly significant. Among the controls, a larger share of Catholics or Protestants significantly (at 1% level) anticipates the year of the adoption by about 8 years earlier for a 1% increase in each share.

32. The coefficients for the control variables are reported at Table D.2 in Online Appendix D.

33. Tables 2 and 3, and A.1–A.3 report the results for current values of GDP per capita, share of elderly, and Gini index. Results are robust to use historical values.

34. Tables A.1–A.3 present the results of the cross-country analysis with different ratios of replacement rates regressed on the three family principles, on the continent dummy variables, (log) current GDP per capita, and on the additional controls (columns (2)–(9)). We use, respectively, the following ratios: medium (the average labor income) to low (75% of the average labor income) replacement rates, at Table A.1; high (150% of the average labor income) to medium (the average labor income) replacement rates, at Table A.2; and high (150% of the average labor income) to low (75% of the average labor income) replacement rates, at Table A.3. Our theoretical predictions are strongly supported by the data. For all the three ratios and with all the controls, countries featuring egalitarian inheritance rules have a significantly (at 1% and 5% level) higher (i.e., closer to one) replacement rates ratio—and thus a more generous pension system—than the other countries.

TABLE 3. The replacement rate of a worker earning the average income.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Principle of equality	29.149***	18.831**	21.328*	42.760***	28.963***	37.104**	33.726***	30.571***	31.076***
	(8.665)	(8.598)	(11.525)	(12.693)	(8.699)	(15.980)	(10.860)	(9.293)	(10.262)
Principle of cohabitation	−2,514	6,459	−0.799	−16.920*	−2,571	6,731	−3,937	−5,479	−3,642
	(8.479)	(8.560)	(9.389)	(8.881)	(8.462)	(15.844)	(7.982)	(9.080)	(8.553)
Principle of exogamous marriage	13,379	4,149	11,332	38.735***	13,183	15,340	17,344	19,430	14,124
	(11.164)	(8.818)	(12.102)	(14.067)	(12.077)	(14.629)	(11.625)	(13.474)	(11.775)
Continent dummies and current GDP	YES	YES	YES	YES	YES	YES	YES	YES	YES
Legal origin dummies	NO	YES	NO	NO	NO	NO	NO	NO	NO
Dominant religions (1900)	NO	NO	YES	NO	NO	NO	NO	NO	NO
Religious homogeneity (1900)	NO	NO	NO	YES	NO	NO	NO	NO	NO
Urbanization level (1900)	NO	NO	NO	NO	YES	NO	NO	NO	NO
Democracy (1900)	NO	NO	NO	NO	NO	YES	NO	NO	NO
Political dummies (1900)	NO	NO	NO	NO	NO	NO	YES	NO	NO
Share of elderly (2000)	NO	NO	NO	NO	NO	NO	NO	YES	NO
Income inequality (2000)	NO	NO	NO	NO	NO	NO	NO	NO	YES
Constant	−1,707	−25,057	61,384	17,040	−0.368	−16.093	−20.598	0.411	−6.129
	(37.574)	(46.147)	(75.778)	(48.720)	(34.014)	(100.261)	(43.043)	(38.150)	(43.061)
Observations	54	54	48	48	54	34	41	54	53
R-squared	0.240	0.290	0.417	0.381	0.240	0.356	0.338	0.261	0.245

Notes: The table shows the results of a cross-country estimation. The dependent variable is the replacement rate of a worker earning the average income. The explanatory variables include the three principle of historical organization of the family (egalitarian, cohabitation, exogamous marriage). Continent dummies (Europe, America, Asia, Africa, and Oceania) and current GDP are added as control variables in all specifications. Columns (2)–(9) include one additional control variable each: in column (2) we add the legal origin dummies (Anglo-Saxon, Socialist, Germany, French, and Scandinavian); in column (3) the dominant religions in 1900 (Catholic, Muslim, Orthodox, Protestant); in column (4) the Herfindahl index of religious homogeneity; in column (5) the urbanization level in 1900; in column (6) the level of democracy in 1900 (Polity 2 indicator); in column (7) political dummies (the form of government and electoral rules); in column (8) the share of elderly in 2000 and in column (9) the level of income inequality in 2000 (measured by the Gini index). Robust standard errors are in parentheses.*Significant at 10%; **significant at 5%; ***significant at 1%.

4.2. Individual Data Specification

We now turn to individual data to test whether individuals' preferences on the current generosity of the pension system are affected by their family culture. According to our theoretical model, the prevailing inheritance rule in a country shapes individuals' filial obligations toward their parents and thus their preferences over pension design. We perform an empirical analysis at individual level for the United States, in which we consider individual responses to two questions on the role of the government in providing support to the elderly, contained in several waves of the General Social Survey (GSS). This methodology allows us to keep constant the institutional framework (most importantly, the pension system) across individuals, but to exploit potentially different family cultures. In particular, following an established literature (see Fernández and Fogli 2006, 2009; Alesina and Giuliano 2010 among many others), we associate to each person the family culture of the country of origin of their ancestors.[35] However, since, besides inheritance rules, countries may differ along several other dimensions, such as legal, economic, and political characteristics, we control for these variables in the individual regressions, as we did in the cross-country regressions at Section 4.1. We restrict our analysis to those countries for which the Todd (1983) classification is available.[36]

We concentrate on two questions, which enable us to identify the individual preferences for government responsibility in old age security.[37] First, individuals are asked the following: "We are faced with many problems in this country, none of which can be solved easily or inexpensively. I'm going to name some of these problems, and for each one I'd like you to tell me whether you think we're spending too much money on it, too little money, or about the right amount. Are we spending too much, too little, or about the right amount on *social security*?" (where 1 identifies "too much" and 3 is for "too little"). This question was available in several waves (1983–1987, 1987, 1988–1991, 1993–1996, 1998, 2000, 2002, 2004, 2006, 2008, 2010, 2012, 2014). Second, "On the whole, do you think it should or should not be the government's responsibility to provide a decent standard of living for the old?" (where 1 is for "it definitely should

35. This information is available since each individual in the GSS is asked to provide his birthplace and the country of origin of his forbearers—namely to answer to the following question: "From what countries or part of the world did your ancestors come?" Notice that the data thus include descendants of different generations of migrants.

36. The available answers in the GSS are Africa, Austria, Canada, China, Czechoslovakia, Denmark, England and Wales, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Mexico, Netherlands, Norway, Philippines, Poland, Puerto Rico, Russia (USSR), Scotland, Spain, Sweden, Switzerland, West Indies, other to be specified, American Indian, India, Portugal, Lithuania, Yugoslavia, Romania, Belgium, Arabic, other Spanish, other Asian, other European, America. We drop the observations with answers nonreferring to specific countries, such as Africa, other Spanish, other Asian, other European, for which we are unable to match a family type.

37. We recoded the answers to these GSS questions so that a positive coefficient in the regression equation (21) indicates more support for social security, for government responsibility for the elderly, and for the welfare state.

not be" and 4 is for "it definitely should be"). This question was available for the following waves: 1983–1987, 1988–1991, 1993–1996, 2002, 2006.

For these two questions, we run the following OLS regression:

$$y_{ict} = \alpha + \beta_1 EGALIT_c + \beta_2 COHABITATION_c + \beta_3 EXOGAMY_c + \beta_4 X_{it} + \beta_5 Z_c + \beta_6 W_t + \varepsilon_{ict}, \quad (21)$$

where y_{ict} is our dependent variable measuring the response to the previous questions by an individual i, whose ancestors were coming from country c, at time (or GSS wave) t; the dummies refer to the three principles in the country of origin of the respondent; X_{it} is a set of individual controls; Z_c is the same set of controls for the country of origin used in the cross-country analysis[38] at Section 4.1; W_t are time (or GSS wave) dummies, and ε_{ict} is the error term. For individual controls, X_{it}, we use age, age squared, gender, marital status (married or single), education (less than high school, some college, graduate), employment status (unemployed, retired, employed, and other employment status), an income dummy (low, medium, and high income), a religious dummy (Catholic, Protestant, Orthodox, Muslim, or other), race (White, Black, other), political orientation (liberal, moderate, and conservative), and geographical fixed effects, corresponding to the (seven) US macroregion of residence.[39] Standard errors are clustered at country (of origin) level.[40] Summary statistics on the GSS dataset are provided in Table 4.

Table 5 presents the results for the individual perceptions on the amount of social security spending. We regress the individual responses on the family culture in the respondent's country of origin, and on individual characteristics and country-level controls. US respondents with an egalitarian family background (i.e., with ancestors coming from countries featuring egalitarian inheritance rules) find current US spending in social security to be too low. The impact of the egalitarian family background is strongly significant and robust to the inclusion of all country level controls[41] (see

38. We always include continent dummies and current (log) per capita GDP, and one by one the other variables related to the country of origin: legal origin (Anglo-Saxon, Socialist, Germany, French, and Scandinavian), dominant religions in 1900 (shares of Catholics, Muslims, Orthodox, and Protestants), religious homogeneity of the country in 1900, level of urbanization in 1900, level of democracy in 1900 (Polity 2 index), form of government and electoral rules in 1900, share of elderly in 2000, and current values of income inequality (Gini coefficient in 2000).

39. Income is reported in twelve income brackets. We define as low, medium and high income individuals, respectively, in the income brackets 1–4, 5–8, and 9–12. Political views are recorded on a scale from 1 (very liberal) to 6 (very conservative). We define as liberal, moderate and conservative, individuals who responded, respectively, 1–2, 3–4, and 5–6. For the dummy variables, the excluded groups are single, some college education, employed, low income, other religious status, White, and moderate.

40. In our regression, we consider the following 23 countries of origin: Austria, Belgium, China, Czech Republic, Denmark, England, Finland, France, Germany, Greece, Hungary, India, Ireland, Italy, Japan, Lithuania, Mexico, Netherlands, Norway, Poland, Portugal, Spain, Sweden.

41. Among the control variables, legal systems, dominant religion, political and inequality dummies play a role. Individuals, whom ancestors came from countries with Anglo-saxon, German, or Socialist legal systems, with a lower share of Protestants, with Parliamentary political systems and with a more equal

TABLE 4. Summary statistics, individual answers to GSS questions.

	Obs.	Mean	StDev	Min	Max
Individual Variables					
Preference for spending on social security	20,616	2.471	0.623	1	3
Preference for government involvement in providing a decent standard of living for the elderly	2,888	3.238	0.768	1	4
Preference for redistribution (welfare state)	11,123	1.706	0.759	1	3
Age	22,607	46.281	17.114	18	89
Male	22.633	0.460	0.498	0	1
Married	22.456	0.567	0.495	0	1
Income: middle	22.633	0.070	0.254	0	1
Income: high	22.633	0.887	0.317	0	1
Race: Black	22.633	0.029	0.168	0	1
Race: other	22.633	0.060	0.237	0	1
Individual religion: Catholic	22.633	0.349	0.477	0	1
Individual religion: Protestant	22.633	0.529	0.499	0	1
Individual religion: Muslim	22.633	0.001	0.035	0	1
Individual religion: Orthodox	22.633	0.008	0.090	0	1
Individual religion: no religion	22.633	0.051	0.221	0	1
Education: less than high school	22.633	0.158	0.365	0	1
Education: graduate	22.633	0.287	0.452	0	1
Political view: liberal	20,400	0.140	0.347	0	1
Political view: conservative	20,400	0.189	0.392	0	1
Employment status: unemployed	22.633	0.029	0.169	0	1
Employment status: retired	22.633	0.146	0.353	0	1
Employment status: other	22.633	0.163	0.370	0	1
Country of Origin Variables					
Geographic dummy: America	22.633	0.111	0.314	0	1
Geographic dummy: Africa	22.633	0	0	0	0
Geographic dummy: Oceania	22.633	0	0	0	0
Geographic dummy: Asia	22.633	0.025	0.157	0	1
Egalitarian principle	22.633	0.273	0.445	0	1
Principle of cohabitation	22.633	0.512	0.450	0	1
Principle of exogamous marriage	22.633	0.480	0.500	0	1
Legal origin: Anglo-Saxon	22.633	0.403	0.491	0	1
Legal origin: Socialist	22.633	0.071	0.258	0	1
Legal origin: Germany	22.633	0.240	0.427	0	1
Legal origin: French	22.633	0.224	0.417	0	1
Dominant religion: Catholic (1900)	22,170	0.516	0.372	0	1
Dominant religion: Protestant (1900)	22,170	0.422	0.364	0	0.992
Dominant religion: Orthodox (1900)	22,170	0.040	0.090	0	0.839
Dominant religion: Muslim (1900)	22,170	0.001	0.010	0	0.128
Herfindahl index of religious homogeneity (1900)	22,170	0.730	0.186	0.366	1
Urbanization level (1900)	22.555	0.756	0.133	0.268	0.97
Polity 2 index (1900)	17.107	2.100	5.396	−9	10
Share of elderly (2000)	22.633	14.052	3.606	2.594	18.236
GDP per capita (ln, 2000)	22.633	9.629	0.715	5.923	10.478
Gini index (2000)	22.555	44.631	9.844	23.121	57.50
Electoral rule: majoritarian (1900)	22.295	0.261	0.439	0	1
Form of government: presidential (1900)	22.295	0.104	0.305	0	1

TABLE 5. Preferences for spending on social security.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Egalitarian principle	0.092***	0.157***	0.059*	0.107***	0.080***	0.115***	0.112***	0.084***	0.076***
	(0.019)	(0.020)	(0.033)	(0.019)	(0.020)	(0.031)	(0.025)	(0.021)	(0.021)
Principle of cohabitation	−0.030	0.003	−0.004	−0.041	−0.041	0.147**	−0.046	−0.040	−0.035
	(0.046)	(0.031)	(0.060)	(0.040)	(0.050)	(0.051)	(0.060)	(0.042)	(0.042)
Principle of exogamous marriage	0.065	0.056*	0.019	0.071	0.064	−0.120**	0.100	0.080*	0.047
	(0.047)	(0.032)	(0.068)	(0.044)	(0.051)	(0.046)	(0.065)	(0.040)	(0.046)
Individual controls	YES	YES	YES	YES	YES	YES	YES	YES	YES
Continent dummies and current GDP	YES	YES	YES	YES	YES	YES	YES	YES	YES
Time dummies	YES	YES	YES	YES	YES	YES	YES	YES	YES
Legal origin dummies	NO	YES	NO	NO	NO	NO	NO	NO	NO
Dominant religions (1900)	NO	NO	YES	NO	NO	NO	NO	NO	NO
Religious homogeneity (1900)	NO	NO	NO	YES	NO	NO	NO	NO	NO
Urbanization level (1900)	NO	NO	NO	NO	YES	NO	NO	NO	NO
Democracy (1900)	NO	NO	NO	NO	NO	YES	NO	NO	NO
Political dummies (1900)	NO	NO	NO	NO	NO	NO	YES	NO	NO
Share of elderly (2000)	NO	NO	NO	NO	NO	NO	NO	YES	NO
Income inequality (2000)	NO	NO	NO	NO	NO	NO	NO	NO	YES
Constant	2.35***	1.693***	2.070***	2.247***	2.365***	1.571***	2.218***	2.426***	2.327***
	(0.169)	(0.194)	(0.620)	(0.167)	(0.168)	(0.261)	(0.177)	(0.159)	(0.169)
Observations	15,576	15,576	15,320	15,320	15,526	11,781	15,374	15,576	15,526
R-squared	0.076	0.078	0.078	0.077	0.077	0.081	0.077	0.076	0.077

Notes: The table shows the results of an OLS estimation at the individual level. The dependent variable is the answer to the GSS question: "Are we spending too much, too little or about the right amount on social security?" A higher score is associated with more support to social spending. The explanatory variables include the three principle of organization of the family (egalitarian, cohabitation, exogamous marriage) of individual country of origin. Individual controls are: age, gender, marital status (married or single), education (less than high school, some college, graduate), employment status (unemployed, retired, employed, and other employment status), an income dummy (low, medium, and high income), a religious dummy (Catholic, Protestant, Orthodox, Muslim, or other), race (White, Black, other), political orientation (liberal, moderate, and conservative), and geographical fixed effects. Continent dummies (Europe, America, Asia, Africa, and Oceania), current GDP and time dummies are added as control variables in all specifications. Columns (2)–(9) include one additional control variable each: in column (2) we add the legal origin dummies (Anglo-Saxon, Socialist, Germany, French, and Scandinavian); in column (3) the dominant religions in 1900 (Catholic, Muslim, Orthodox, Protestant); in column (4) the Herfindahl index of religious homogeneity; in column (5) the urbanization level in 1900; in column (6) the level of democracy in 1900 (Polity 2 indicator); in column (7) political dummies (the form of government and electoral rules); in column (8) the share of elderly in 2000 and in column (9) the level of income inequality in 2000 (measured by the Gini index). Standard errors are clustered at country of origin level. *Significant at 10%; **significant at 5%; ***significant at 1%.

columns (2)–(9)). Table 6 provides additional evidence of this effect by considering individual responses regarding the level of government involvement in providing a decent standard of living to the elderly. US respondents with ancestors coming from countries featuring egalitarian inheritance rules favor more government involvement in old age security to the elderly. Results are robust the inclusion of the usual set of controls[42] (see columns (2)–(9)).[43]

Finally, we provide a placebo test to rule out the possibility that our results are driven by a general preference for equality in individuals, whose ancestors came from egalitarian society. The same GSS question used for *social security* at Table 5 can be obtained for *welfare*: "We are faced with many problems in this country, none of which can be solved easily or inexpensively. I'm going to name some of these problems, and for each one I'd like you to tell me whether you think we're spending too much money on it, too little money, or about the right amount. Are we spending too much, too little, or about the right amount on *welfare*?". For this question, we run the OLS regression at equation (21), and include the usual controls. The results, reported at Table 7, suggest that family culture—and more specifically the egalitarian inheritance rule—plays no role in explaining the individuals' general preference for the welfare state.[44] In our nine specifications (see columns (1)–(9) in Table 7), the coefficient of the egalitarian principle is mostly not significant (five times), or even negative (three times), to indicate that individuals with ancestors coming from countries with egalitarian inheritance rules are just as likely, or even more likely, to answer that there is too much spending on welfare.[45]

Overall, this evidence thus shows that, among US individuals, who face a common institutional environment, even after controlling for individual characteristics, family culture shapes individual preferences over social security, but not over welfare in general.

income distribution find pension spending to be too low. The coefficients on all control variables are shown in Table D.3 in Online Appendix D.

42. Also in this case, among the control variables, legal systems and inequality dummies play a role. Individuals, whose ancestors came from countries with French legal system, a lower level of urbanization in 1900, and with a more equal income distribution favor more government involvement in old age security. The coefficients on all control variables are shown in Table D.4 in Online Appendix D.

43. In Tables 5 and 6, the coefficient of interest (on the egalitarian principle) becomes smaller, although still statistically significant at a 10% level, when we add the country of origin's dominant religion variables as controls in the regression, which already features the individual religious dummies**.**

44. Despite being asked in the same waves as the question on social security, the question on welfare has fewer overall valid answers. On a total of 62,466 observations, 42,527 observations are valid (i.e., there are different from "not applicable", "don't know", and "no answer") for social security and only 34,367 for welfare. After merging with our data on the cultural variables, we are left with 15,576 observations for social security (results at Table 5) and 8,139 observations for welfare (results at Table 7).

45. Tables 5–7 report the results for the current values of GDP per capita, share of elderly, and Gini index. Results are robust to use historical values.

TABLE 6. Preferences for government involvement in providing a decent standard of living for the elderly.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Egalitarian principle	0.154***	0.115***	0.084*	0.150***	0.112**	0.210***	0.145***	0.174***	0.117***
	(0.035)	(0.034)	(0.048)	(0.038)	(0.040)	(0.042)	(0.036)	(0.035)	(0.029)
Principle of cohabitation	−0.025	0.055	0.002	−0.061	−0.042	0.230	0.031	−0.004	−0.032
	(0.083)	(0.083)	(0.109)	(0.097)	(0.084)	(0.137)	(0.082)	(0.089)	(0.095)
Principle of exogamous marriage	0.081	0.066	0.012	0.128	0.059	−0.182	0.007	0.048	0.039
	(0.090)	(0.079)	(0.114)	(0.104)	(0.087)	(0.149)	(0.095)	(0.092)	(0.096)
Individual controls	YES	YES	YES	YES	YES	YES	YES	YES	YES
Continent dummies and current GDP	YES	YES	YES	YES	YES	YES	YES	YES	YES
Time dummies	YES	YES	YES	YES	YES	YES	YES	YES	YES
Legal origin dummies	NO	YES	NO	NO	NO	NO	NO	NO	NO
Dominant religions (1900)	NO	NO	YES	NO	NO	NO	NO	NO	NO
Religious homogeneity (1900)	NO	NO	NO	YES	NO	NO	NO	NO	NO
Urbanization level (1900)	NO	NO	NO	NO	YES	NO	NO	NO	NO
Democracy (1900)	NO	NO	NO	NO	NO	YES	NO	NO	NO
Political dummies (1900)	NO	NO	NO	NO	NO	NO	YES	NO	NO
Share of elderly (2000)	NO	NO	NO	NO	NO	NO	NO	YES	NO
Income inequality (2000)	NO	NO	NO	NO	NO	NO	NO	NO	YES
Constant	3.349***	2.979***	3.114***	3.179***	3.449***	3.026***	3.338***	3.157***	3.329***
	(0.264)	(0.389)	(1.046)	(0.234)	(0.233)	(0.582)	(0.269)	(0.250)	(0.293)
Observations	2,807	2,807	2,772	2,772	2,798	2,138	2,772	2,807	2,798
R-squared	0.153	0.155	0.157	0.155	0.155	0.169	0.156	0.153	0.155

Notes: The table shows the results of an OLS estimation at the individual level. The dependent variable is the answer to the GSS question: "On the whole, do you think it should or should not be government's responsibility to provide a decent standard of living for the old?" A higher score is associated with more support to government's responsibility. The explanatory variables include the three principle of organization of the family (egalitarian, cohabitation, exogamous marriage) of the individual country of origin. Individual Controls are: age, gender, marital status (married or single), education (less than high school, some college, graduate), employment status (unemployed, retired, employed, and other employment status), an income dummy (low, medium, and high income), a religious dummy (Catholic, Protestant, Orthodox, Muslim, or other), race (White, Black, other), political orientation (liberal, moderate, and conservative), and geographical fixed effects. Continent dummies (Europe, America, Asia, Africa, and Oceania), current GDP and time dummies are added as control variables in all specifications. Columns (2)–(9) include one additional control variable each: in column (2) we add the legal origin dummies (Anglo-Saxon, Socialist, Germany, French, and Scandinavian); in column (3) the dominant religions in 1900 (Catholic, Muslim, Orthodox, Protestant); in column (4) the Herfindahl index of religious homogeneity; in column (5) the urbanization level in 1900; in column (6) the level of democracy in 1900 (Polity 2 indicator); in column (7) political dummies (the form of government and electoral rules); in column (8) the share of elderly in 2000 and in column (9) the level of income inequality in 2000 (measured by the Gini index). Standard errors are clustered at country of origin level. *Significant at 10%; **significant at 5%; ***significant at 1%.

TABLE 7. Preferences for redistribution (welfare state).

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Egalitarian principle	−0.022	0.053**	−0.030	−0.065***	−0.053**	−0.015	−0.021	−0.006	−0.053**
	(0.023)	(0.022)	(0.042)	(0.015)	(0.020)	(0.020)	(0.024)	(0.022)	(0.024)
Principle of cohabitation	0.013	−0.018	0.045	0.085**	0.040	0.098	0.050	0.030	0.046**
	(0.046)	(0.037)	(0.032)	(0.033)	(0.033)	(0.074)	(0.034)	(0.042)	(0.021)
Principle of exogamous marriage	−0.014	0.044	−0.050	−0.086***	−0.062*	−0.097	−0.035	−0.041	−0.074**
	(0.047)	(0.037)	(0.058)	(0.030)	(0.034)	(0.079)	(0.041)	(0.045)	(0.027)
Individual controls	YES	YES	YES	YES	YES	YES	YES	YES	YES
Continent dummies and current GDP	YES	YES	YES	YES	YES	YES	YES	YES	YES
Time dummies	YES	YES	YES	YES	YES	YES	YES	YES	YES
Legal origin dummies	NO	YES	NO	NO	NO	NO	NO	NO	NO
Dominant religions (1900)	NO	NO	YES	NO	NO	NO	NO	NO	NO
Religious homogeneity (1900)	NO	NO	NO	YES	NO	NO	NO	NO	NO
Urbanization level (1900)	NO	NO	NO	NO	YES	NO	NO	NO	NO
Democracy (1900)	NO	NO	NO	NO	NO	YES	NO	NO	NO
Political dummies (1900)	NO	NO	NO	NO	NO	NO	YES	NO	NO
Share of elderly (2000)	NO	NO	NO	NO	NO	NO	NO	YES	NO
Income inequality (2000)	NO	NO	NO	NO	NO	NO	NO	NO	YES
Constant	1.884***	1.594***	1.656***	2.079***	2.074***	1.833***	2.048***	1.738***	2.032***
	(0.154)	(0.162)	(0.396)	(0.195)	(0.132)	(0.345)	(0.142)	(0.150)	(0.119)
Observations	8,139	8,139	8,005	8,005	8,114	6,135	8,025	8,139	8,114
R-squared	0.087	0.089	0.087	0.087	0.087	0.091	0.087	0.088	0.087

Notes: The table shows the results of an OLS estimation at the individual level. The dependent variable is the answer to the GSS question: "Are we spending too much, too little or about the right amount on welfare." A higher score is associated with more support to welfare expenditure. The explanatory variables include the three principle of organization of the family (egalitarian, cohabitation, exogamous marriage) of the individual country of origin. Individual Controls are: age, gender, marital status (married or single), education (less than high school, some college, graduate), employment status (unemployed, retired, employed and other employment status), an income dummy (low, medium, and high income), a religious dummy (catholic, protestant, orthodox, muslim, or other), race (White, Black, other) and political orientation (liberal, moderate and conservative). Continent dummies (Europe, America, Asia, Africa, and Oceania), current GDP and time dummies are added as control variables in all specifications. Columns (2)–(9) include one additional control variable (at the country level) each: in column (2) we add the Legal Origin Dummies (Anglo-Saxon, Socialist, Germany, French, and Scandinavian); in column (3) the Dominant Religions in 1900 (Catholic, Muslim, Orthodox, Protestant); in column (4) the Herfindahl index of religious homogeneity; in column (5) the urbanization level in 1900; in column (6) the level of democracy in 1900 (Polity2 indicator); in column (7) political dummies (the form of government and electoral rules); in column (8) the share of elderly in 2000 and in column (9) the level of income inequality in 2000 (measured by the Gini index). Standard errors are clustered at country of origin level. *Significant at 10%; **significant at 5%; ***significant at 1%.

5. Conclusions

Family culture affects the design of new economic institutions, such as pension systems. Inheritance rules determine the within-family intergenerational transmission of resources, and shape the relation between parents and children and among siblings. This aspect is particularly relevant in rural societies, where land ownership (or land contracts) is transmitted within the family in exchange for old age support. We show that different inheritance rules—equal or unequal inheritance among children—produce different filial obligations and hence family cultures. An egalitarian rule induces the inheriting children to support their parents' old age consumption and perhaps to live close to them. This arrangement creates a large share of individuals with strong family values, which persists in a urban environment and leads to the introduction of a generous pension system. Nonegalitarian inheritance rules, on the other hand, single out the heir, who will inherit the whole family land, from the other (noninheriting) siblings and nurture independent family values. These weaker family ties persist, and may facilitate the transition to the urban environment. A pension system is adopted early, but guarantees only a basic transfer.

Our empirical analysis shows that family culture, as induced by the inheritance rule, was a primal determinant of the pension systems' adoption and initial design. Legal origin, and religion, which have extensively been suggested to determine other socioeconomic outcomes, played instead no role. Similarly, other features of the political, demographic, and economic context in which pensions were introduced, such as the level of urbanization or democratization, GDP and the share of elderly in the population at the time of the introduction of the system, also have little power in explaining the pension design. Data on individual responses to questions on the role of the government in giving support to the elderly provide a similar picture. Using GSS data, we find that individuals whose ancestors came to the United States from countries featuring egalitarian inheritance rules prefer to rely on the government as a provider of generous retirement benefits.

Our analysis may shed some light on the feasibility of today's pension reforms. Individuals' behavior, as shaped by cultural or institutional elements, influences the policy-makers' decision regarding which institution (e.g., pension systems) to choose, how to design it (basic or generous) and how to implement the policy. This is a promising direction for future research, which could also be extended to the design of more recent institutions, featuring intergenerational components, such as long-term care.

Appendix A: Proofs

A.1. Proof of Proposition 3

Non-Egalitarian Society ($r = N$). At $t = 0$, we have $w_0^{N,R} > w_0^{N,U}$ (by Assumption 2). Hence, according to equation (14), no peasant (and much less a landowner) has any

TABLE A.1. Low ratio. Ratio between the replacement rate of a worker earning the average income and the replacement rate of a worker earning 75% of the average income.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Principle of equality	0.138***	0.118***	0.110***	0.180***	0.138***	0.147***	0.141***	0.135***	0.140***
	(0.031)	(0.039)	(0.039)	(0.033)	(0.032)	(0.051)	(0.047)	(0.030)	(0.032)
Principle of cohabitation	0.042	0.059	0.058*	0.011	0.042	0.091	0.063*	0.025	0.029
	(0.025)	(0.041)	(0.031)	(0.023)	(0.025)	(0.056)	(0.034)	(0.021)	(0.023)
Principle of exogamous marriage	0.036	0.006	0.008	0.093*	0.036	0.022	0.010	0.055	0.043
	(0.043)	(0.052)	(0.057)	(0.048)	(0.044)	(0.061)	(0.056)	(0.042)	(0.043)
Continent dummies and current GDP	YES	YES	YES	YES	YES	YES	YES	YES	YES
Legal origin dummies	NO	YES	NO	NO	NO	NO	NO	NO	NO
Dominant religions (1900)	NO	NO	YES	NO	NO	NO	NO	NO	NO
Religious homogeneity (1900)	NO	NO	NO	YES	NO	NO	NO	NO	NO
Urbanization level (1900)	NO	NO	NO	NO	YES	NO	NO	NO	NO
Democracy (1900)	NO	NO	NO	NO	NO	YES	NO	NO	NO
Political dummies (1900)	NO	NO	NO	NO	NO	NO	YES	NO	NO
Share of elderly (2000)	NO	NO	NO	NO	NO	NO	NO	YES	NO
Income inequality (2000)	NO	NO	NO	NO	NO	NO	NO	NO	YES
Constant	0.629***	0.523**	0.632**	0.603***	0.629***	0.462	0.512**	0.675***	0.649***
	(0.150)	(0.242)	(0.242)	(0.153)	(0.152)	(0.332)	(0.220)	(0.135)	(0.159)
Observations	49	49	48	48	49	33	39	49	48
R-squared	0.395	0.469	0.424	0.437	0.395	0.367	0.352	0.424	0.402

Notes: The table shows the results of a cross-country estimation. The dependent variable is the Ratio between the replacement rate of a worker earning the average income and the replacement rate of a worker earning 75% of the average income. The explanatory variables include the three principle of historical organization of the family (egalitarian, cohabitation, exogamous marriage). Continent dummies (Europe, America, Asia, Africa, and Oceania) are added as control variables in all specifications. Columns (2)–(9) include one additional control variable each: in column (2) we add the Legal Origin Dummies (Anglo-Saxon, Socialist, Germany, French, and Scandinavian); in column (3) the Dominant Religions in 1900 (Catholic, Muslim, Orthodox, Protestant); in column (4) the Herfindahl index of religious homogeneity; in column (5) the urbanization level in 1900; in column (6) the level of democracy in 1900 (Polity2 indicator); in column (7) political dummies (the form of government and electoral rules); in column (8) the share of elderly in 2000 and in column (9) the level of income inequality in 2000 (measured by the Gini index.) Robust standard errors are in parentheses. *Significant at 10%; **significant at 5%; ***significant at 1%.

TABLE A.2. Medium ratio. Ratio between the replacement rate of a worker earning 150% of the average income and the replacement rate of a worker earning the average income.

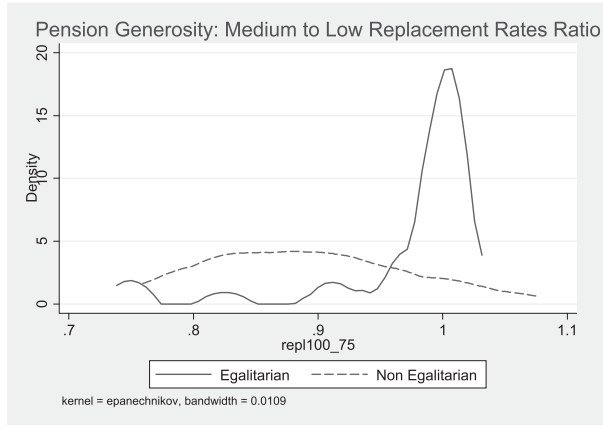
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Egalitarian principle	0.179***	0.155**	0.204***	0.200***	0.175***	0.153**	0.162**	0.179***	0.191***
	(0.046)	(0.072)	(0.069)	(0.052)	(0.046)	(0.071)	(0.064)	(0.046)	(0.056)
Principle of cohabitation	0.027	0.046	0.016	0.013	0.028	0.049	0.051	0.027	0.055
	(0.035)	(0.060)	(0.049)	(0.036)	(0.035)	(0.087)	(0.044)	(0.034)	(0.042)
Principle of exogamous marriage	0.056	0.000	0.082	0.083	0.053	0.072	−0.000	0.056	0.045
	(0.063)	(0.086)	(0.090)	(0.071)	(0.064)	(0.091)	(0.079)	(0.067)	(0.063)
Continent dummies and current GDP	YES	YES	YES	YES	YES	YES	YES	YES	YES
Legal origin dummies	NO	YES	NO	NO	NO	NO	NO	NO	NO
Dominant religions (1900)	NO	NO	YES	NO	NO	NO	NO	NO	NO
Religious homogeneity (1900)	NO	NO	NO	YES	NO	NO	NO	NO	NO
Urbanization level (1900)	NO	NO	NO	NO	YES	NO	NO	NO	NO
Democracy (1900)	NO	NO	NO	NO	NO	YES	NO	NO	NO
Political dummies (1900)	NO	NO	NO	NO	NO	NO	YES	NO	NO
Share of elderly (2000)	NO	NO	NO	NO	NO	NO	NO	YES	NO
Income inequality (2000)	NO	NO	NO	NO	NO	NO	NO	NO	YES
Constant	0.627***	0.781**	0.751**	0.624***	0.632***	0.695	0.507	0.627***	0.496*
	(0.215)	(0.307)	(0.276)	(0.225)	(0.212)	(0.451)	(0.306)	(0.207)	(0.256)
Observations	49	49	48	48	49	33	39	49	48
R-squared	0.348	0.433	0.361	0.353	0.355	0.368	0.366	0.348	0.369

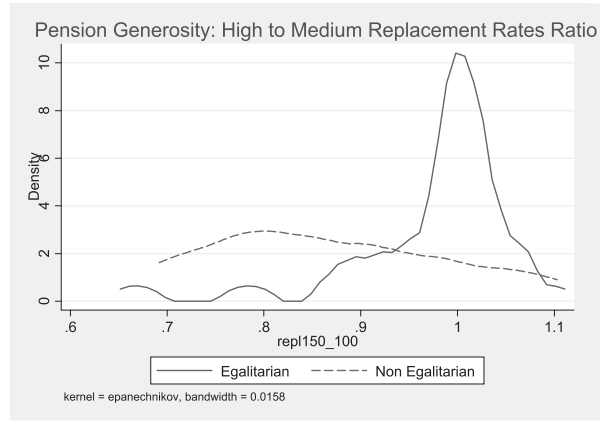
Notes: The table shows the results of a cross-country estimation. The dependent variable is the ratio between the replacement rate of a worker earning 150% of the average income and the replacement rate of a worker earning the average income. The explanatory variables include the three principle of historical organization of the family (egalitarian, cohabitation, exogamous marriage). Continent dummies (Europe, America, Asia, Africa, and Oceania) are added as control variables in all specifications. Columns (2)–(9) include one additional control variable each: in column (2) we add the Legal Origin Dummies (Anglo-Saxon, Socialist, Germany, French, and Scandinavian); in column (3) the Dominant Religions in 1900 (Catholic, Muslim, Orthodox, Protestant); in column (4) the Herfindahl index of religious homogeneity; in column (5) the urbanization level in 1900; in column (6) the level of democracy in 1900 (Polity2 indicator); in column (7) political dummies (the form of government and electoral rules); in column (8) the share of elderly in 2000 and in column (9) the level of income inequality in 2000 (measured by the Gini index). Robust standard errors are in parentheses. *Significant at 10%; **significant at 5%; ***significant at 1%.

TABLE A.3. High ratio. Ratio between the replacement rate of a worker earning 150% of the average income and the replacement rate of a worker earning 75% of the average income.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Egalitarian principle	0.284***	0.251**	0.281***	0.340***	0.280***	0.262**	0.269**	0.281***	0.297***
	(0.066)	(0.097)	(0.093)	(0.074)	(0.066)	(0.105)	(0.098)	(0.065)	(0.076)
Principle of cohabitation	0.058	0.091	0.063	0.018	0.059	0.120	0.100	0.046	0.075
	(0.050)	(0.082)	(0.067)	(0.051)	(0.051)	(0.107)	(0.065)	(0.047)	(0.057)
Principle of exogamous marriage	0.085	0.009	0.082	0.160	0.081	0.085	0.008	0.099	0.079
	(0.089)	(0.120)	(0.127)	(0.108)	(0.090)	(0.114)	(0.117)	(0.093)	(0.090)
Continent dummies and current GDP	YES	YES	YES	YES	YES	YES	YES	YES	YES
Legal origin dummies	NO	YES	NO	NO	NO	NO	NO	NO	NO
Dominant religions (1900)	NO	NO	YES	NO	NO	NO	NO	NO	NO
Religious homogeneity (1900)	NO	NO	NO	YES	NO	NO	NO	NO	NO
Urbanization level (1900)	NO	NO	NO	NO	YES	NO	NO	NO	NO
Democracy (1900)	NO	NO	NO	NO	NO	YES	NO	NO	NO
Political dummies (1900)	NO	NO	NO	NO	NO	NO	YES	NO	NO
Share of elderly (2000)	NO	NO	NO	NO	NO	NO	NO	YES	NO
Income inequality (2000)	NO	NO	NO	NO	NO	NO	NO	NO	YES
Constant	0.358	0.428	0.456	0.334	0.363	0.311	0.156	0.393	0.253
	(0.306)	(0.458)	(0.401)	(0.318)	(0.303)	(0.647)	(0.441)	(0.289)	(0.358)
Observations	49	49	48	48	49	33	39	49	48
R-squared	0.40	0.477	0.405	0.418	0.403	0.398	0.387	0.405	0.401

Notes: The table shows the results of a cross-country estimation. The dependent variable is the ratio between the replacement rate of a worker earning 150% of the average income and the replacement rate of a worker earning 75% of the average income. The explanatory variables include the three principle of historical organization of the family (egalitarian, cohabitation, exogamous marriage). Continent dummies (Europe, America, Asia, Africa, and Oceania) are added as control variables in all specifications. Columns (2)–(9) include one additional control variable each: in column (2) we add the Legal Origin Dummies (Anglo-Saxon, Socialist, Germany, French, and Scandinavian); in column (3) the Dominant Religions in 1900 (Catholic, Muslim, Orthodox, Protestant); in column (4) the Herfindahl index of religious homogeneity; in column (5) the urbanization level in 1900; in column (6) the level of democracy in 1900 (Polity2 indicator); in column (7) political dummies (the form of government and electoral rules); in column (8) the share of elderly in 2000 and in column (9) the level of income inequality in 2000 (measured by the Gini index). Robust standard errors are in parentheses. *Significant at 10%; **significant at 5%; ***significant at 1%.





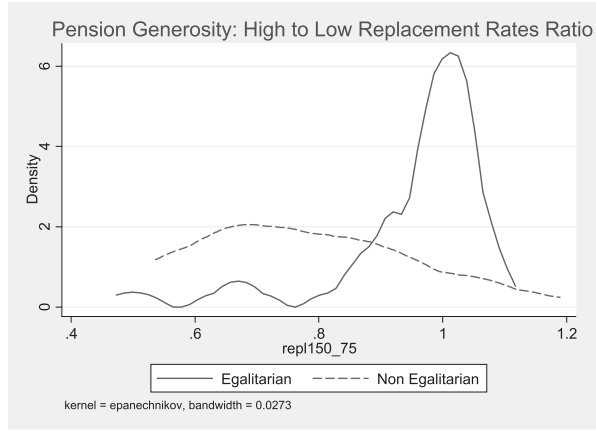


FIGURE A.1. Distribution of replacement rates ratios across inheritance rules.

incentive to migrate. To see this, recall that pension benefits at $t+1$, S^r_{t+1}, are given and unaffected by the individual migration decision, and that

$$\Lambda^N_{(i,R,U),t+1} - \Lambda^N_{(i,R,R),t+1} = \sigma K \left(w^{N,U}_{t+1} - w^{N,R}_{t+1} \right) \text{ for } i \in \{P_H, P_P\}.$$

Over time, the increase in the rural population, $q^{N,R}_t$, increases the aggregate labor supply and reduces the equilibrium wage in the rural sector, since

$$w^{N,R}_t = A(1-\alpha) \left[\bar{L}^N / q^{N,R}_t \right]^\alpha$$

whereas the urban wage, $w^{N,U}_t = w^{N,U}_{t-1}(1+\delta)$, increases due to the exogenous productivity growth, δ. At some $t = T^N_1$, we have $w^{N,R}_t = w^{N,U}_t$, and, according to equation (14) and equation (19), peasants will begin to migrate to the city, $m^{N,P}_t > 0$. The magnitude of the outflow is regulated by the arbitrage condition on the labor market $w^{N,R}_t = w^{N,U}_t$. In fact, the migration of peasants increases the rural wages and contributes to keep the two wages equal. The increase in the rural wages that is driven by the migration of peasants is, however, limited by the existence of landowners, who also work the land. Hence, even after all peasants leave the rural areas, there will still be h^N_t landowners working the land. In other words, the labor supply does not drop below h^N_t, and thus the rural wage reaches

$$w^{N,R}_t = A(1-\alpha) \left[\bar{L}^N / h^N_t \right]^\alpha = A(1-\alpha) \left(L^N_t \right)^\alpha.$$

This will occur at some $t = T^N_2 > T^N_1$, as all peasants have migrated to the city, $p^N_t = 0$. At this point, the noninheriting children born from landowners, $i = P_H$, continue to migrate to the city, $m^{M,P}_t = (J-1)h^N_{t-1}$. Only the landowners remain in the rural area (see equation (14)), since their rural income (the sum of rent and wage) at

$$t = T^N_2 \text{ is } w^{N,R}_t + \pi^N_t \left(L^N_t \right) = A \left(L^N_t \right)^\alpha > w^{N,U}_t$$

and

$$\Lambda^N_{(B,R,U),t+1} - \Lambda^N_{(B,R,R),t+1} = \gamma \left(w^{N,U}_{t+1} - w^{N,R}_{t+1} - \pi^N_{t+1} \left(L^N_{t+1} \right) \right) \leq 0.$$

The landowner total rural income, $A \left(L^N_t \right)^\alpha$, remains constant over time, as the size of each plot of land is constant, $L^N_t = L_0$, but the urban wage continues to increase. Eventually, at some $t = T^N_3 > T^N_2$, the landowners will also migrate to the city, since $V^N_{B,R,U} > V^N_{B,R,R}$ (see equation (14)). Hence, for $t > T^N_3$, we have $q^{N,R}_t = 0$, and $u^N_t = K u^N_{t-1}$.

Egalitarian Society ($r = E$). It follows the same logic as in the previous case. By Assumption 2, at $t = 0$, $w^{E,R}_t > w^{E,U}_t$, and thus no migration takes place. At some $t = T^E_1$, because of the decrease in the rural wages (due to rural population growth)

and to the exogenous increase in the urban wage, we have $w_t^{E,R} = w_t^{E,U}$, and the peasants will begin to migrate to the city, $m_t^{E,P} > 0$. Again, the magnitude of the outflow is regulated by the arbitrage condition on the labor market $w_t^{E,R} = w_t^{E,U}$. In this case too, the increase in rural wages is capped. In fact, the migration of peasants reduces the labor supply, but there are always h_t^E landowners who work their own land. Thus, the labor supply does not drop below h_t^E, and at most rural wages become $w_t^{E,R} = A(1-\alpha)\left(L_t^E\right)^{\alpha}$. At some $t = T_2^E > T_1^E$, all peasants will have migrated to the city, $p_t^E = 0$, and only landowners remain in the rural area as their total rural income is still larger than the urban wages,

$$w_t^{E,R} + \pi_t^E\left(L_t^E\right) = A\left(L_t^E\right)^{\alpha} > w_t^{E,U} = w_t^{E,R} = A(1-\alpha)\left(L_t^E\right)^{\alpha}$$

and

$$\Lambda^E_{(B,R,U),t+1} - \Lambda^E_{(B,R,R),t+1} = \gamma J\left(w_{t+1}^{E,U} - w_{t+1}^{E,R} - \pi_{t+1}^E\left(L_{t+1}^E\right)\right) \leq 0.$$

But landowners' total rural income decreases over time, as the plot of land L_t^E shrinks—due to equal partition among children whereas the urban wage continues to increase. Hence, at some $t = T_3^E > T_2^E$, the landowners will also migrate to the city, since $V^E_{B,R,U} > V^E_{B,R,R}$ (see equation (14)). Hence, for $t > T_3^E$, we have $q_t^{E,R} = 0$, and $u_t^E = Ku_{t-1}^E$.

A.2. Proof of Proposition 5

To prove this proposition, first notice that landowners ($i = H$) represent an absolute majority of the young (voting) population for any $t \geq 1$. In fact, by Assumption 1, at $t = 0$, we have $h_0^E = p_0^E$, and the fertility rate is J for $i = H$ and K for $i = P$. Moreover, by Proposition 3, landowners remain in the rural area for $t < T_3^E$ and migrate at $t = T_3^E$.

Consider $t < T_3^E$. Landowners have filial obligations according to equation (6). They support a pension system, which provides their parents with a transfer as at equation (10), if the cost of pension system is lower than the cost of the private transfer:

$$\tau_t^E\left[w_t^{E,R} + \pi_t^E\left(L_t^E\right)\right] \leq \Phi^E_{\left(H,R,R\right),t} = \gamma\left[w_t^{E,R} + \pi_t^E\left(L_t^E\right)\right], \tag{A.1}$$

where τ_t^E is such that the social security budget constraint at equation (9) holds for $S_t^E = \gamma J\left[w_t^{E,R} + \pi_t^E\left(L_t^E\right)\right]$. The previous condition can be written as

$$\frac{\gamma J\left[\pi_t^E\left(L_t^E\right) + w_t^{E,R}\right]q_{t-1}^E}{(1-\varepsilon)\left[\sum_{I|i=H}\pi_t^E\left(L_t^E\right) + q_t^{E,R}w_t^{E,R}\right] + q_t^{E,U}w_t^{E,U}} \leq \gamma. \tag{A.2}$$

Time: $t < T_1^E$. For $t < T_1^E$ we have $q_t^{E,U} = 0$, $h_t^N = J^t h_0^N$, and $p_t^N = K^t p_0^N$.

Moreover,

$$w_t^{E,R} = A(1-\alpha)\left[\bar{L}^E / q_t^{E,R}\right]^\alpha \quad \text{and} \quad \sum_{I\,|\,i=H} \pi_t^E\left(L_t^E\right) = A\alpha\left(\bar{L}^E\right)^\alpha \left(q_t^{E,R}\right)^{1-\alpha}.$$

Thus, after simple algebra, the inequality at equation (A.2) can be written as

$$\varepsilon \leq 1 - \left[\frac{1+(K/J)^{t-1}}{1+(K/J)^t}\right](1+\alpha(K/J)^t),$$

which is clearly not possible, since the right hand side (hereafter, r.h.s.) of the inequality is negative. Hence, landowners, who constitute a majority of the voting population, do not support a pension system for $t < T_1^E$.

Time: $t \in \left[T_1^E, T_2^E\right]$. For $t \in \left[T_1^E, T_2^E\right]$ we have $m_t^{E,P} > 0$, and $w_t^{E,U} = w_t^{E,R} = A(1-\alpha)\left[\bar{L}^E / q_t^{E,R}\right]^\alpha$. After simple algebra, the inequality at equation (A.2) can be written as

$$J\left[\frac{\alpha}{1-\alpha} q_t^{E,R} \frac{L_t^E}{\bar{L}^E} w_t^{E,R} + w_t^{E,R}\right] q_{t-1}^E \leq (1-\varepsilon)\,\frac{q_t^{E,R}}{1-\alpha} w_t^{E,R} + q_t^{E,U} w_t^{E,U} \tag{A.3}$$

or

$$\varepsilon \leq 1 + \frac{(1-\alpha) q_t^{E,U}}{q_t^E} - \frac{J q_{t-1}^E}{q_t^E}\left[\alpha \frac{q_t^E}{h_t^E} + 1 - \alpha\right], \tag{A.4}$$

recall that

$$q_t^{E,R} = (J-K) h_{t-1}^E + K q_{t-1}^{E,R} - m_t^{E,P} \quad \text{and} \quad q_t^{E,U} = K q_{t-1}^{E,U} + m_t^{E,P}$$

and thus $q_t^{E,U} = K q_{t-1}^E + (J-K) h_{t-1}^E - q_t^{E,R}$. The previous inequality thus becomes

$$\varepsilon \leq \alpha - \frac{(1-\alpha)(J-K)\left(q_{t-1}^E - h_{t-1}^E\right)}{q_t^E} - \frac{\alpha J h_{t-1}^E}{q_t^E}, \tag{A.5}$$

notice that

$$h_t^E = J^t h_0^E, \;\; q_{t-1}^E = J^{t-1} h_0^E + K^{t-1} p_0^E \quad \text{with} \quad h_0^E = p_0^E$$

by Assumption 1. After simple algebra we have,

$$\varepsilon \leq -\frac{(1-\alpha)(J-K) K^t q_0^E}{q_t^E} - \alpha\left(\frac{K}{J}\right)^{t-1}, \tag{A.6}$$

where the r.h.s. is clearly negative. Hence, landowners, who constitute a majority of the voting population, do not support a pension system for $t \in \left[T_1^E, T_2^E\right]$.

Time: $t \in \left[T_2^E, T_3^E\right)$. For $t \in \left[T_2^E, T_3^E\right]$ we have $m_t^{E,P} = p_t^E = 0$, but also $m_t^{E,H} = 0$, and thus $\pi_t^E \left(L_t^E\right) + w_t^{E,R} = A\left(L_t^E\right)^\alpha > w_t^{E,U}$. After simple algebra, the inequality at equation (A.2) can be written as

$$J\left[A\left(L_t^E\right)^\alpha\right]q_{t-1}^E \leq (1-\varepsilon)A\left(\bar{L}^E\right)^\alpha\left(h_t^E\right)^{1-\alpha} + q_t^{E,U} w_t^{E,U} \tag{A.7}$$

or

$$\varepsilon \leq 1 + \frac{q_t^{E,U} w_t^{E,U}}{A\left(\bar{L}^E\right)^\alpha \left(h_t^E\right)^{1-\alpha}} - \frac{J q_{t-1}^E A\left(L_t^E\right)^\alpha}{A\left(\bar{L}^E\right)^\alpha \left(h_t^E\right)^{1-\alpha}}, \tag{A.8}$$

notice that $L_t^E h_t^E = \bar{L}^E$, $h_t^E = J^t h_0^E$, $q_{t-1}^E = J^{t-1} h_0^E + K^{t-1} p_0^E$, and $q_t^{E,U} = K^t p_0^E$. After simple algebra we have

$$\varepsilon \leq \left(\frac{K}{J}\right)^{t-1}\left[\frac{w_t^U}{A\left(L_t^E\right)^\alpha}\frac{K}{J} - 1\right],$$

where the r.h.s. is clearly negative. Hence, landowners, who constitute a majority of the voting population, do not support a pension system for $t \in \left[T_2^E, T_3^E\right]$.

Time: $t \geq T_3^E$. Consider now $t \geq T_3^E$. Landowners have moved to the city but keep their filial obligations according to equation (6). Hence, they support a pension system, which provides their parents with a transfer as at equation (10), if the cost of the pension system is lower than the cost of the private transfer: $\tau_t^E w_t^{E,U} \leq \Phi_{(H,U,U),t}^E = \gamma w_t^{E,U}$ where τ_t^E is such that the social security budget constraint at equation (9) holds for $S_t^E = \gamma K w_t^{E,U}$. The previous condition can be written as

$$\gamma \geq \frac{\gamma K w_t^{E,U} q_{t-1}^E}{q_t^{E,U} w_t^{E,U}} = \frac{\gamma K q_{t-1}^E}{q_t^{E,U}},$$

which holds with equality since $q_t^{E,U} = q_t^E = K q_{t-1}^E$. Therefore, for $t \geq T_3^N$, a pension system will be introduced with τ_t^N such that $S_t^E = \gamma K w_t^{E,U}$.

A.3. Proof of Proposition 6

To prove this proposition, it is useful to establish first that nonlandowner individuals from nonlandowner parents ($i = P_P$) represent an absolute majority of the young (voting) population for any $t > 1$.

Recall that, by Assumption 1, at $t = 0$ we have $h_0^N = p_0^N$. For all $t \geq 1$, the number of landowners is $h_t^N = h_0^N$, and the number of nonlandowner individuals from landowner parents ($i = P_H$) is $h_0^N (J-1)$; whereas the number of nonlandowner individuals from nonlandowner parents ($i = P_P$) increases over time. At $t = 1$, the number of individuals of type $i = P_P$ is $Kp_0^N = Kh_0^N$; moreover, there are h_0^N landowners ($i = H$), and $(J-1)p_0^N$ peasants from landowner parents ($i = P_P$). Since $J > K$, individuals of type $i = P_H$ constitute a relative majority. For $t \geq 2$, however, individuals of type $i = P_P$ will constitute an absolute majority. In particular, at $t = 2$, they are $K(K+J-1)p_0^N > Jp_0^N$. For $T_1^N < t < T_2^N$, individuals of type $i = P_P$ will begin to migrate to the city. However, regardless of where they live, for $T_1^N < t < T_2^N$, their preferences toward the pension system do not change, since

$$w_t^{N,R} = w_t^{N,U} \quad \text{and} \quad \bar{S}^N_{(P_P,R,R),t} = \bar{S}^N_{(P_P,R,U),t} = \bar{S}^N_{(P_P,U,U),t} = \sigma K w_t^{N,R}$$

by equation (19). For $t > T_2^N$, all nonlandowner individuals from nonlandowner parents ($i = P_P$) will have moved to the city.

Time: $t \in \left(1, T_1^N\right]$. Consider the preferences over the pension system for the young of type $i = P_P$, when $t \in \left[1, T_1^N\right]$. Notice that for $t \in \left(1, T_1^N\right]$, the absolute majority of the young is of type $i = P_P$, and hence their preferences determine the political equilibrium outcome of the majority voting. But not for $t = 1$ (see the discussion in what follows). Individuals of type $i = P_P$ have filial obligations according to equation (6). They support a pension system, which provides their parents with a transfer as at equation (15), if the cost of pension system is lower than the cost of the private transfer:

$$\tau_t^N w_t^{N,R} \leq \Phi^N_{(P_P,R,R),t} = \sigma w_t^{N,R}, \tag{A.9}$$

where τ_t^N is such that the social security budget constraint at equation (9) holds for $S_t^N = \sigma K w_t^{N,R}$. The condition at equation (A.9) can be written as

$$\frac{\sigma K w_t^{N,R} q_{t-1}^N w_t^{N,R}}{(1-\varepsilon)\left[\sum_{I|i=H} \pi_t^N\left(L_t^N\right) + q_t^{N,R} w_t^{N,R}\right] + q_t^{N,U} w_t^{N,U}} \leq \sigma w_t^{N,R}. \tag{A.10}$$

For $t \in \left[1, T_1^N\right]$, we have $q_t^{N,U} = 0$, moreover

$$w_t^{N,R} = A(1-\alpha)\left[\bar{L}^N / q_t^{N,R}\right]^\alpha \quad \text{and} \quad \sum_{I|i=H} \pi_t^N\left(L_t^N\right) = A\alpha\left(\bar{L}^N\right)^\alpha \left(q_t^{N,R}\right)^{1-\alpha}.$$

Thus, after simple algebra, the condition at equation (A.10) can be written as $K(1-\alpha)q_{t-1}^N \leq (1-\varepsilon)\, q_t^{N,R}$. Finally, notice that

$$q_t^{N,R} = Jh_0^N + Kp_{t-1}^N = (J-K)h_0^N + Kq_{t-1}^{N,R}.$$

Hence, the condition for individuals of type $i = P_P$ to support a pension system becomes

$$\varepsilon \leq 1 - \frac{K(1-\alpha)q_{t-1}^N}{(J-K)h_0^N + Kq_{t-1}^{N,R}}, \tag{A.11}$$

where $q_{t-1}^N = q_{t-1}^{N,R}$, since $q_{t-1}^{N,U} = 0$. By dividing numerator and denominator of the previous expression by q_{t-1}^N, it is straightforward to see that the r.h.s. of the expression decreases over time. Thus, for $t \in \left(1, T_1^N\right]$, the highest value is reached at $t = 2$, when $q_{t-1}^N = (J+K)h_0^N$, and

$$\varepsilon_K = 1 - \frac{K(1-\alpha)(J+K)}{J-K+K(J+K)}, \tag{A.12}$$

whereas the lowest value is reached for $t = T_1^N$. Therefore, for $\varepsilon < \varepsilon_K$, at $t = 2$ a majority of the voting population, made up of the individuals of type $i = P_P$, supports the introduction of a pension system characterized by a transfer $S_t^N = \sigma K w_t^{N,R}$, and by a tax rate τ_t^N, such that the social security budget constraint at equation (9) holds.

Time: t = 1. For $t = 1$, however, we need to consider also the preferences of the peasants from landowner parents, $i = P_H$, and of the landowners, $i = H$. Individuals of type $i = P_H$ have similar preferences of those of type $i = P_P$. They support a pension system, which provides their parents with a transfer as at equation (15), if the cost of pension system is lower than the cost of the private transfer:

$$\tau_t^N w_t^{N,R} < \Phi_{(P_H,R,R),t}^N = \sigma w_t^{N,R}$$

where τ_t^N is such that the social security budget constraint at equation (9) holds for $S_t^N = \sigma(J-1)w_t^{N,R}$. Similar algebra as previous shows that they support a pension system with $S_t^N = \sigma(J-1)w_t^{N,R}$, if $\varepsilon \leq \varepsilon_J$, where

$$\varepsilon_J = 1 - \frac{2(J-1)(1-\alpha)}{J+K}. \tag{A.13}$$

It is straightforward to show that $\varepsilon_K > \varepsilon_J$. Moreover, notice that the pension transfer (and thus the tax rate) chosen by the individuals of type $i = P_H$ is larger than (or equal to) the one chosen by the individuals of type $i = P_P$.

Consider now the landowners. They support a pension system, which provides their parents with a transfer as at equation (15), if the cost of pension system is lower than the cost of the private transfer:

$$\tau_t^N \left[\pi_t^N\left(L_t^N\right) + w_t^{N,R}\right] < \Phi_{\left(P_P,R,R\right),t}^N = \gamma\left[\pi_t^N\left(L_t^N\right) + w_t^{N,R}\right], \tag{A.14}$$

where τ_t^N is such that the social security budget constraint at equation (9) holds for $S_t^N = \gamma\left[\pi_t^N\left(L_t^N\right) + w_t^{N,R}\right]$. The previous condition can be written as

$$\frac{\gamma\left[\pi_t^N\left(L_t^N\right) + w_t^{N,R}\right]p_{t-1}^N}{(1-\varepsilon)\left[\sum_{I|i=H}\pi\left(L_t^N\right) + q_t^{N,R}w_t^{N,R}\right] + q_t^{N,U}w_t^{N,U}} \leq \gamma, \tag{A.15}$$

which, for $t = 1$, becomes

$$\varepsilon \leq 1 - \frac{(1-\alpha) + 2(J+K)\alpha h_0^N}{J+K}.$$

Since, by Assumption 2, we have $h_0^N > \alpha/2$, it is easy to see that the r.h.s of this expression is always negative. Thus, the condition is never satisfied and landowners do not support any pension system at $t = 1$.

Hence, at $t = 1$, the ordering of preferences is as follows. For $\varepsilon \leq \varepsilon_J$, P_H types prefer higher pension transfer (and taxes) than P_P types. Landowners want no taxes. Individuals of type $i = P_H$ constitute the absolute majority for $J - 1 \geq K + 1$ (with a tie in case of equality), which holds true, since $J > K + 1$ and J and K are integers. They support a pension system with $S_t^N = \sigma(J-1)w_t^{N,R}$. For $\varepsilon_J < \varepsilon \leq \varepsilon_K$, only P_P types support positive pensions, but they are not a majority at $t = 1$.

Time: $t \in \left[T_1^N, T_2^N\right]$. Consider $t \in \left[T_1^N, T_2^N\right]$. The absolute majority of the young is made of type $i = P_P$, but now some are still in the rural areas, $I = (P_P, R, R)$, some migrated to the city, $I = (P_P, R, U)$, and others were born in the city, $I = (P_P, U, U)$. As established at the beginning of the proof, they all have the same preferences toward the pension system, since

$$w_t^{N,R} = w_t^{N,U} \quad \text{and} \quad \bar{S}^N_{(P_P,R,R),t} = \bar{S}^N_{(P_P,R,U),t} = \bar{S}^N_{(P_P,U,U),t} = \sigma K w_t^{N,R}$$

by equation (19). We can thus concentrate on those in the rural areas, $I = (P_P, R, R)$. The condition for these individuals to support the pension system was given at equation (A.10). Since $t \in \left[T_1^N, T_2^N\right]$, we have

$$w_t^{U,R} = w_t^{N,R} = A(1-\alpha)\left[\bar{L}^N/q_t^{N,R}\right]^\alpha,$$

so that the migration process, $m_t^{N,P} > 0$, and the population in the rural area, $q_t^{N,R}$, is endogenously determined by this arbitrage condition on the labor market. After simple algebra, the condition at equation (A.10) can be written as

$$Kq_{t-1}^N \leq \frac{(1-\varepsilon)\,q_t^{N,R}}{1-\alpha} + q_t^{U,R} \quad \text{or} \tag{A.16}$$

$$\varepsilon \leq 1 - (1-\alpha)\left[Kq_{t-1}^N - q_t^{U,R}\right]/q_t^{N,R}. \tag{A.17}$$

Since

$$q_t^{N,R} = (J-K)h_0^N + Kq_{t-1}^{N,R} - m_t^{N,P} \quad \text{and} \quad q_t^{N,U} = Kq_{t-1}^{N,U} + m_t^{N,P},$$

the previous inequality can be written as

$$\varepsilon \leq \alpha + \left[(1-\alpha)(J-K)h_0^N\right]/q_t^{N,R}. \tag{A.18}$$

We cannot determine whether the r.h.s. of this expression is initially decreasing or increasing over time. However, we can establish that at $t = T_2^N$, when $q_t^{N,R} = h_0^N$, the r.h.s. of equation (A.18) becomes $\varepsilon_{II} = \alpha + (1-\alpha)(J-K)$, with $\varepsilon_{II} > 1$, since $J - K > 1$. Therefore, a majority of the voting population, made of the individuals of type $i = P_P$, at some point $t \in \left[T_1^N, T_2^N\right]$, supports the introduction of a pension system characterized by a transfer $S_t^N = \sigma K w_t^{N,U}$, where $w_t^{N,R} = w_t^{N,U}$, and by a tax rate τ_t^N, such that the social security budget constraint at equation (9) holds. It follows that for $\varepsilon > \varepsilon_K$, a pension system has not yet been introduced for $t \in \left[1, T_1^N\right]$, and will be introduced at some $t \in \left[T_1^N, T_2^N\right]$ with τ_t^N such that $S_t^N = \sigma K w_t^{N,U}$.

A.4. Extension of Proposition 6

PROPOSITION A.1. *In nonegalitarian societies, for $J = K + 1$, there exists a threshold of the tax collection costs, $\varepsilon_J = 1 - (2(1-\alpha)(J-1)/J + K)$, such that*

- *for $\varepsilon \leq \varepsilon_J$, a pension system is introduced at $t = 1$ (in the rural areas) with τ_t^N such that $S_t^N = \sigma K w_t^{N,R}$;*
- *for $\varepsilon > \varepsilon_J$, a pension system is introduced at some $t \in \left[T_1^N, T_2^N\right]$ (during the urbanization) with τ_t^N such that $S_t^N = \sigma K w_t^{N,U}$.*

The proof of this proposition follows the same steps as the proof of Proposition 5, but with two important differences. First, since $J = K + 1$, simple algebra shows that,

$$\varepsilon_K = 1 - \frac{(1-\alpha)K(J+K)}{J-K+K(J+K)} < \varepsilon_J = 1 - \frac{2(1-\alpha)(J-1)}{J+K}.$$

Second, at $t = 1$, the ordering of preferences is the same as in Proposition 5. However, for $J = K + 1$, individuals of type $i = P_P$ constitute the median voter, and support a pension system with τ_t^N such that $S_t^N = \sigma K w_t^{N,R}$.

Hence, the median voter is always of type $i = P_P$ and supports a pension system with τ_t^N such that $S_t^N = \sigma K w_t^{N,R}$. For $\varepsilon \leq \varepsilon_J$, the pension system is introduced at $t = 1$, and for $\varepsilon > \varepsilon_J$ at some $t \in \left[T_1^N, T_2^N\right]$.

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Supplementary Data

Supplementary data are available at *JEEA* online.