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WORKING PAPER SERIES

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Working Paper n. 392

This Version: April 2011

IGIER – Università Bocconi, Via Guglielmo Röntgen 1, 20136 Milano –Italy
http://www.igier.unibocconi.it

When the State Mirrors the Family: The Design of Pension Systems*

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April 2011

Abstract

The family is a primal institution, whose internal organization can be transferred to collective institutions, which come to substitute the family in one of its economic roles. We study how the family structure affected the initial design of pension systems. Our theoretical framework predicts that, when pensions systems are introduced in society with weak family ties, they act as a safety net, while in societies with strong ties pensions they replicate the tight link between generations and tend to provide generous benefits. Using Todd (1983) historical classification of family ties, we show that in societies dominated by absolute nuclear families, i.e. weak family ties (f.i. Anglo-Saxon countries), pension systems emerged as a safety net; and viceversa in societies dominated by strong families. Yet, historical family types are not correlated with the size of the pension systems, which have largely changed over time. These results are robust to controlling for alternative explanations, such as legal origin, religion, urbanization and democratization, electoral rules and forms of government. Moreover, evidence on individual data confirm the cross-country results: individuals

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whose ancestors came to the US from countries featuring communitarian or egalitarian nuclear families prefer to rely on the government as a provider of old age security through generous retirement benefits.

Keywords: culture; institutions; family ties, pension design.

JEL Classifications: Z10; Z13; N30; H10; H55.

"Ergo age, care pater, cervici inponere nostrae:
Ipse subibo umeris nec me labor iste gravabit.
Quo res cumque cadent, unum et commune periclum"
(Aeneis[1], liber secundus)

1 Introduction

Institutions matter. A growing literature has emphasized the impact of pre-existing legal, political and economic institutions on economic development, income inequality, living arrangements and even fertility decisions (see, among the others, Putnam, 1993, Tabellini, 2008 and 2009, Acemoglu et al., 2001, North, 1990, La Porta et al., 1997, Fernandez and Fogli, 2009, Guiso et al., 2006). Whether these historical institutions affect social-economic outcomes through their impact on current institutions or through a less tangible, cultural transmission process is instead less understood (Tabellini, 2009).

In this paper, we focus on the role of what is arguably the primal institution: the family. We emphasize the economic relevance of the historical patterns of the within family organization. The organization of the family structure includes the relation between parents and kids, from their childhood till their parents' old age; the relation among siblings, for instance vis-a-vis the inheritance from their parents; and the relation between the family as a unit and the society at large. These primal aspects of the family organization can be transmitted over time, codified in the law, or even embedded into newly born economic institutions. Our point of departure is that when the family is substituted in one of its economic roles by a new institution, the economic organization that was prevailing within the family is likely to be adopted by the new-born institution. To study this transmission mechanism from family culture (or organization) to economic institutions, we 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 largely occurred between the beginning of the XX century and the aftermath of world war II, families were typically the unique providers of old-age security for their elderly members. Yet, the organization of

[1]

"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)

the within-family insurance system largely differed across regions and family types. While in some countries, such as England, kids had no legal obligation to support their parents, in France they were morally, and also legally reliable for their elderly parents' health and economic situations (see Twigg and Grand, 1998). In the latter case, parents could rely on their offsprings for complete old age support, to an extent that of course depended on their own and on their kids' economic conditions. In the former case, instead, upward vertical support (from the kids to their parents) was less common, and mostly consisted of a safety net, whenever parents fell into poverty. Our goal is thus to understand to what extent the principles governing the within family organization have influenced the original design of pension systems in those fundamental characteristics that are still present in the current systems, and that largely differ across countries. Did the initial design of pension systems mirror the within family organization? Did countries characterized by families providing strong vertical support in old age favor the introduction of earning-related insurance schemes, which replace a large share of the workers' previous wage? And did countries characterized by weak family responsibility for the well being of the elderly endorse flat-rate pension schemes providing only an old age safety net?

To answer these fundamental questions, we introduce a two-periods OLG model that characterizes the link between family structure and pensions design. We consider two family structures featuring weak or strong ties, and hence different within family organizations. We also study two economic and demographic scenarios. In an "old regime", family members lived close to one another and the cost of providing resources to the elderly was small. In a "new regime", arising for instance from industrialization, urbanization and similar processes, which induce nuclearization of the family, family members tend to be more spread out geographically, and the cost of transferring resources to the elderly increases. Our model shows that, in the "old regime", individuals in societies characterized by weak family ties are more likely to save and to introduce a pension system than individuals in countries with strong family ties. In the "new regime", pensions emerge under both family types, but they are more comprehensive and generous in societies with strong family ties, where they come to substitute the kids-to-old-parents family transfers. Also in societies with weak family ties, pensions reflect the pre-existing family organization and thus provide only a safety net.

To test the predictions of our model on how the different within family organizations shape the initial pension design, we recur to a historical classification of medieval family types (Todd, 1983). Family organizations are divided in four types - absolute nuclear, egalitarian nuclear, authoritarian, communitarian - which deliver a complete picture of

the family relationships in the world since the medieval era. For instance, absolute nuclear families (the dominating type in Anglo-Saxon countries, Holland and Denmark) feature a high degree of within family independence – both for parents in their inheritance decisions, and for their children – and thus present weak family ties, as opposed to the other types of families, where the degree of interdependence is stronger.

The design of the pension system is classified according to the replacement rates, which measure the ratio between pension benefits and labor income prior to retirement, for different income levels. If a pension system replaces a constant proportion of the workers' income, these replacement rates will be roughly constant across income levels. On the other hand, they will widely differ - being higher for low-income workers, if the pension system acts as a safety net. [2]

Our empirical findings suggest that in countries where absolute nuclear families prevail, pension schemes act mainly as a flat safety net. This link between the family type and the design of pension systems is robust to controlling for alternative explanations of the introduction of the pension systems, such as legal origin, religion, urbanization and democratization of the country at the time of the introduction, current GDP, share of elderly in the population, electoral rules and forms of government. Interestingly, historical family types affect the design of the pension systems, which constitutes a persistent feature, but not their level, which has instead largely changed over time.

A simple comparison may help to appreciate the relevance of the family organization in shaping the design of pension systems. Consider four, geographically close countries characterized by the same (Scandinavian) legal origin, such as Denmark, Finland, Norway and Sweden. According to Todd (1983) classification, Norway and Sweden featured authoritarian families, Finland was characterized by a communitarian family structure, while Denmark was based on absolute nuclear families. Also the design of their pension system differs. With a ratio of the pension replacement rates across income levels (respectively at 75% and at 150% of the average wage) equal to 1.6, and an average replacement rate of 54%, the weak-family-ties Denmark stands out for its safety net like, highly redistributive pension system. Norway and Sweden also have somewhat redistributive (their ratio of replacement rates across income being respectively 1.25 and 1.09), but more generous systems, with an average replacement rate equal to 65.1% and to 68.2%. On the other hand,

[2] As we will discuss in details in section 3.2, pension schemes with an earnings-related formula are typically referred to as "Bismarckian" systems, while flat-rate ones as "Beveridgean" systems. See Disney and Johnson (2001), Conde-Ruiz and Profeta (2007), OECD(2005) for a classification of current pension systems according to their redistributive design and Conde-Ruiz and Profeta (2007), Koethenburger et al. (2008) for political-economy explanations of their different nature.

Finland, which is characterized by a communitarian family structure, features a perfectly Bismarckian pension system (the ratio of replacement rates across income is equal to 1), with an average replacement rate of 78.8%.

The empirical analysis on individual data confirms these cross-country results. Following a growing literature (see Fernández and Fogli, 2006, 2009, and Alesina and Giuliano, 2007, among many others), we use individual responses to questions on the role of the government in providing support to the elderly, which were available in the 1972-2008 waves of the General Social Survey (GSS), and we associate to each person the family type which was prevailing in his family's country of origin. Individuals whose ancestors came from countries featuring communitarian or egalitarian nuclear families continue to have preferences for generous retirement benefits being provided by the state.

A recent literature has analyzed the role of the family as a primal institution affecting economic outcomes, and its role of intergenerational transmission of culture. For instance, Alesina and Giuliano (2007) claim that the strength of family ties represents a fundamental cultural trait shaping economic behavior and attitudes. They elaborate a measure of culture based on family relationships and quantify its role in explaining important economic variables, such as the amount of home production versus market activities and the role of women. A previous argument by Reher (1998) also pointed out that family ties help explaining living arrangements and geographical mobility of young generations. Indeed, the 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. More recently, Duranton et al. (2009) used Todd's (1983) medieval age family structures to explain regional differences in economic outcomes. Algan and Cahuc (2007) shows that family culture is responsible for cross-country heterogeneity in employment rates. Alesina et al. (2010) argue that in cultures with strong family ties individuals are less mobile and prefer more regulated labor market while weak family ties are associated with more flexible labor markets, which then require higher geographic mobility of workers to be efficient.[3] All these papers consider the family culture to be persistent over time. Bisin and Verdier (2001) and Tabellini (2008) endogenize this cultural transformation mechanism by showing how rational, altruistic parents may optimally choose to transmit their family values to their children.

[3]The impact of cultural factors on individual economic decisions is also addressed by Guiso, Sapienza and Zingales (2006), who analyze as a specific example the impact of religion or ethnic origins on trust and on preferences for redistribution. See also Fernández (2007) for a survey of some of the recent empirical studies on the effects of culture on economic outcomes.

The link between family relations and welfare systems has also received a recent attention, mainly by sociologists. Focusing on Europe, Esping-Andersen (1999) argues that where family ties are stronger, social risks are typically internalized within the family by pooling resources across generations. Other authors have stressed the impact of gender culture on the welfare state (Lewis, 1992) and the role of Christian religion in European welfare state (Daly, 1997). Coleman (1988) argues that family ties can strengthen the support received by young generations from the old while, at the same time, representing an obstacle for innovation and new ideas. Finally, Pfau-Effinger (2005) emphasizes the link between culture and welfare state policies, as she argues that welfare state policies differ according to the underlying cultural model of the family, and to how much importance is attributed to the family for the production of welfare.

This paper is also related to a recent literature on the origin of welfare. According to several authors (for a discussion, see Caucutt, Cooley and Guner, 2007, and Cutler and Johnson,2004), Pay-As-You-Go pension systems that feature intergenerational transfers from workers to retirees were introduced in the western world around the period of urbanization. The rationale for the creation of a public transfer system was the rapid change from the existence of an extended family living in the same house to smaller families dislocated in many different places, due to the urbanization. In this new setup, kids became increasingly unable to look after their parents and to take care of their old age needs, and new forms of insurance had to be introduced. Yet, this general theory has hard time matching the timing of the urbanization process with the introduction of social security systems (see e.g., Lindert, 1994, and Perotti and Schwienbacker, 2007). Our relation between family types and the initial design of the social security system instead does not rest on a specific date for the introduction of social security.

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

2 The Model

We introduce a simple two-periods OLG model to analyze the link between family structure and pension design. We consider two stylized family structures: strong and weak family ties. These two structures differ in the rules, which define within-family property rights, sharing of resources and degree of insurance. We also introduce two different sce-

narios. In an initial "old regime", family members and relatives tend to live close to one another. Hence, while families may feature weak or strong ties, the cost of looking after a family member – namely the elderly – is relatively low. We then consider a "new regime" driven for instance by industrialization, urbanization and similar processes, in which a nuclearization of the family has occurred, and looking after the old has become more costly for both weak and strong ties families.

The next section introduces a description of these two family structures. The main economic decisions taken within the family for these two family types in the "old regime", and the collective decision over pension systems, are examined in section 2.2. An analysis of these decisions under the "new regime" follows.

2.1 Strong and weak family ties

In every period, two generations of equal size are alive: adult and old. We consider a logarithmic utility function in youth and old age consumption. An individual born at time t has the following utility function

$$U\left(c_t^A, c_{t+1}^o\right) = \ln c_t^A + \beta \ln c_{t+1}^o \tag{1}$$

where the superscripts indicate the generation (adult, old), subscripts refer to the time period and β is the subjective discount factor.

Adults earn a constant income y and may save, s, to increase the (family or individual) resources in old age. Returns from savings, denoted by R, are uncertain. With a probability ρ, individuals enjoy high returns, $R = \overline{R}$, while with probability $(1-\rho)$ the returns are low, $R = \underline{R}$, with $\overline{R} > \underline{R}$. It is convenient, but not crucial, to assume that $\underline{R} = 0$. Thus, the average returns from savings are $\rho\overline{R}$. Old individuals do not work. They obtain the returns from their savings, and may receive a pension.

If a pension system is in place, adults pay a proportional tax τ_t on their income, y, and these revenues are used to provide pension benefits to the elderly. Pensions are distortionary, as captured by a parameter $\varepsilon > 0$. The PAYG pension system is budget-balanced:

$$P_t = (1-\varepsilon)\tau_t y \tag{2}$$

In line with the existing literature on social security, we assume the average return from private savings to be larger than the (safe) return from pensions; hence, $\rho\overline{R} > 1-\varepsilon$.

Economic decisions are taken within the family. We consider two different family types. In families with strong ties, all the resources obtained by the two generations of individuals

are pooled within the family, under the direct control of the adults. Total resources of the two generations at time t are used to finance the family consumption and the savings:

$$y(1-\tau_t) + P_t + s_{t-1}(1+R) = c_t^A + c_t^o + s_t \tag{3}$$

Old individuals have no property rights on these resources, and thus also on the income that they may contribute to provide, through savings and pensions. Adults have a moral (or perhaps even legal) obligation to provide an adequate level of consumption to the old, irrespective of their contribution to the family resources. We capture this obligation by imposing a constraint on the old consumption, as a function of the adults income:

$$c_t^o \geq \gamma y \tag{4}$$

Hence, regardless of the state of the economy (that is, whether the returns on savings are high or low), adults have to ensure a (large) percentage γ of their income to the old family members. This is to capture the idea that in a family with strong ties, adults have to guarantee to their parents a high standard of living, which is similar to their own.

Families with weak ties feature a different structure. No pooling of resources takes place among family members, but the old have property rights on their savings and pensions. Nevertheless, the adults still have a moral (or legal) obligation to keep each old family member above a subsistence consumption level, δy, with $\delta < 1$, if the old do not have enough resources. This limited degree of within family insurance is represented by the following constraint on the individuals' consumption:

$$c_t^o \geq \delta y \tag{5}$$

Clearly, to capture the idea that in families with weak ties the adults only provide a safety net, whereas in strong families they share consumption more evenly among the family members, we assume that $\delta < \gamma$.

To characterize the emergence of a pension system, we consider that the introduction of the system is decided upon by the current adult generation, and that the system has to be supported by all future generations of adults.

In the following sections, we analyze the economic decisions taken in families with strong and weak ties in the old and in the new regime. We also examine the collective decisions over the pension system.

2.2 The "Old Regime"

2.2.1 Strong family ties

In the "old regime", adult individuals living in families with strong ties have control of the common pool of family resources. They decide how much to save, and how to share consumption across family members, and there is no transaction cost in transferring resources to the elderly. Saving amounts to reduce the resources in the period when the adults have control over the consumption decision, in order to increase the family pool of resources in the next period, when they are old and have no property rights. It is easy to see (see Proposition 1 below) that, regardless of the return on the savings, adults have no incentive to save, and hence $s_t = 0$. As all the current family resources are used to finance current consumption, the adults will maximize their own consumption subject to the constraint at eq.(4) that characterizes a strong family.

Proposition 1 *In the "old regime", countries with strong family ties feature no savings,* $s_t = 0$*, and no pension system,* $P_t = \tau_t = 0$*.*

In strong families, the existence of a common family pool of resources managed by the adults limits their incentive to save for the future. In this environment, a pension system is not supported. In fact, its introduction would imply to tax the adults by an amount $\tau_t y$ and to provide back resources to the old equal to $P_t = (1 - \varepsilon)\tau_t y$. For any positive level of distortion, $\varepsilon > 0$, pensions are thus opposed.

2.2.2 Weak family ties

When family ties are weak, there is no pooling of resources and every generation has property rights on its own income. Adults have a moral obligation to keep elderly family members at least at a subsistence level of consumption equal to δy.

In this environment, adults have more incentives to save for old consumption, since (i) they have property rights on their savings, and (ii) if they reach old age with no resources, they will only be guaranteed a minimum subsistence level from their offsprings. Different cases may emerge depending on the returns from savings, $\overline{R}$, and on the subsistence level, δ. For high returns from savings, if the subsistence level is sufficiently high, agents will choose not to save and to rely on the subsistence family transfers in old age. For lower levels of δ, private savings will be used to ensure enough old age consumption, at least in the good state, whereas agents will rely on the subsistence family transfers in bad times. Finally, if the subsistence level is extremely low, adults will want to save, but also

to use the (inefficient) pension system in order to secure some consumption in the bad state. Instead, when the returns from savings are low, pensions become a better device to transfer resources into the future, and will be used to substitute the family transfer also for medium and high levels of the subsistence level δ.

It is useful at this stage to introduce some definitions: $\delta_I = \gamma_I = \frac{\beta\rho\overline{R}(1-\varepsilon)}{1-\varepsilon+\beta\rho\overline{R}}$; $\delta_{II} = \gamma_{II} = \frac{\beta(1-\rho)\overline{R}(1-\varepsilon)}{(1+\beta)\left[\overline{R}-(1-\varepsilon)\right]}$; and $\delta_B = \frac{\beta\rho\overline{R}}{\beta\rho\overline{R}+(1+\beta\rho)^{\frac{1+\beta\rho}{\beta\rho}}}$. It is easy to see that $\delta_{II} < \delta_I$ and $\delta_{II} < \delta_B$.

The following proposition characterizes the equilibrium of the economy.

Proposition 2 *In the "old regime", countries with weak family ties feature the following characteristics:*

- *For* $R > \frac{1-\varepsilon}{\varepsilon}$. *If* $\delta < \delta_A$, $\tau = \tau^*$ *and* $s > 0$; *if* $\delta_A < \delta < \delta_B$, $\tau = 0$ *and* $s > 0$; *if* $\delta > \delta_B$, $\tau = 0$ *and* $s = 0$;
- *For* $R < \frac{1-\varepsilon}{\varepsilon}$. *If* $\delta < \delta_C$, $\tau = \tau^*$ *and* $s > 0$; *if* $\delta_C < \delta < \delta_D$, $\tau = \frac{\delta}{1-\varepsilon}$ *and* $s > 0$; *if* $\delta > \delta_D$, $\tau = \frac{\delta}{1-\varepsilon}$ *and* $s = 0$.

  where $\tau^* = \frac{\beta(1-\rho)\overline{R}}{(1+\beta)\left[\overline{R}-(1-\varepsilon)\right]}$, $\delta_A < \delta_{II}$, $\delta_C < \delta_{II}$, *and* $\delta_{II} < \delta_D < \delta_I$.

Hence, in countries with weak family ties, a pension system may be supported, as it represents the only device to move resources to the bad state in old age, when the level of subsistence is particularly low. Alternatively, a pension system that resembles the within family transfer, that is, $P_t = \delta y$, is introduced when the returns on savings are low, and thus the adults who are called to support their parents in the bad state prefer to set up an inefficient pension system (through which they will however receive a pension in old age), rather than to use the more efficient family transfer that would allow to free more resources that could then be saved for future consumption.

2.3 The "New Regime"

In the initial "old regime", families were assumed to be geographically concentrated, with family members living close to one another – if not together. Hence, the cost of looking after the old was relatively low, although in different families (weak or strong) adults were subject to different obligations.

In this section, we consider the economic decisions within these two family types in a "new regime", introduced by a process such as industrialization, urbanization or similar, which imposed an exogenous nuclearization of the family. We characterize this "new regime" with two crucial elements: (i) an exogenous increase in the cost of providing

resources to the elderly, due for instance to the increased geographical distance between the adults and their parents, so that every unit of consumption provided to the elderly costs $1+\phi$ to their offsprings; and (ii) the acquisition of property rights over their savings by the elderly in the strong families, due again to a possible geographical separation among family members. The moral obligation by the adults to secure old age consumption to their parents, according to the constraints at Eq.(4) and (5), remains however unmodified.

Furthermore, we assume that the cost of providing resources to the elderly, ϕ, is sufficiently large, when compared to the inefficiency level of the pension system, that is, $(1+\phi)(1-\varepsilon) > 1$.

2.3.1 Strong family ties

This "new regime" may cause large adjustments in the internal organization of strong families. Strong families may choose to continue with their organization, and hence pay the higher cost of providing resources to the elderly; or the adults may exploit the newly established property rights over their savings, and choose to save for old age consumption. Even more importantly, changes may occur to the adults' preferences over the introduction of a pension system, which may become a good substitute for private transfers to the elderly. The proposition below summarizes the economic decisions taken in a strong family during the "new regime", and the collective decision over the pension system.

Proposition 3 *In the "new regime", countries with strong family ties feature the following characteristics: If* $\gamma < \gamma_{II}$, $\tau = \tau^*$ *and* $s > 0$; *if* $\gamma_{II} < \gamma < \gamma_I$, $\tau = \frac{\gamma}{1-\varepsilon}$ *and* $s > 0$; *if* $\gamma > \gamma_I$, $\tau = \frac{\gamma}{1-\varepsilon}$ *and* $s = 0$.

In this new regime, the large cost of transferring resources to the parents – recall that we assumed $(1+\phi)(1-\varepsilon) > 1$ – induces the adults to support a pension system that completely replaces the family transfers: $P_t = \tau_t y (1-\varepsilon) = \gamma y$. Additionally, the newly acquired property rights may also convince the adults to save for future consumption, particularly if γ is low, that is, if the family support is not very large. Indeed, for very low levels of family support ($\gamma < \gamma_{II}$), the adults will use savings, but also the pension system to increase old age consumption above the (low) level secured by the family transfer.

2.3.2 Weak family ties

In the "new regime", the cost of providing consumption to the elderly, when their savings are not sufficient to reach the subsistence level, increases. Nevertheless, weak families may continue with their organization. Adults may save for old age consumption (or not), and

pay the higher cost when they need to provide resources to the elderly (see Proposition 2 for $\overline{R} > (1-\varepsilon)/\varepsilon$). Alternatively, they may rely on the pension system (see Proposition 2 for $\overline{R} < (1-\varepsilon)/\varepsilon$). Clearly, the increase in the cost of the family transfer makes the option of introducing a pension system more attractive. As shown in proposition 4, in fact, the adults will always at least choose to use the pension system to substitute for the family transfer, with $P_t = \tau_t y(1-\varepsilon) = \delta y$. Moreover, for low levels of family support, δ, they will prefer to have a more generous pension system, and to save.

The next proposition summarizes the economic decisions taken in a weak family during the "new regime", and the collective decision over the pension system.

Proposition 4 *In the "new regime", countries with weak family ties feature the following characteristics: If* $\delta < \delta_{II}$, $\tau = \tau^*$ *and* $s > 0$; *if* $\delta_{II} < \delta < \delta_I$, $\tau = \frac{\delta}{1-\varepsilon}$ *and* $s > 0$; *if* $\delta > \delta_I$, $\tau = \frac{\delta}{1-\varepsilon}$ *and* $s = 0$.

The analysis of the family organization in the "old" and "new" regime for the strong and weak families provides interesting insights. Not surprisingly, in the old regime, adults living in weak families are more likely to save, due mainly to the better property rights that they enjoy on their savings in old age. Moreover, pension systems may emerge under the "old" regime, in societies with weak families, either when family transfers are insufficient or when the returns from savings are particularly low. Pension schemes will instead be introduced under the "new" regime, under both family structure, due to the increased cost of looking after the elderly. Figure 1 summarizes the results for the new regime. For sufficiently large family obligations, $\gamma > \delta > \delta_{II}$, the pension system will mirror the within family vertical transfers (from the adults to the old), and will thus be more generous in societies with strong family ties. Only when family obligations are insufficient, $\delta < \delta_{II}$, the pension system becomes a crucial asset to ensure old age consumption in bad states, and pensions thus become more generous.

3 Historical perspectives on family ties and pension system design

3.1 Family types

Characterizing the internal organization of the family, the relations between parents and children, among children, and between the family and the society at large, represents a difficult task. A recent literature (see Alesina and Giuliano, 2007) 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, while current relations within and across families are certainly shaped by cultural factors, they are also largely influenced by the incentives provided by economic and legal institutions, such as labor market regulations, tax code and the welfare state. To evaluate the primal effect of the family organization on the initial design of the welfare state, we thus need to use measurements of the family organization dating back to periods prior to the introduction of welfare state policies. A historical classification of family ties is in Todd (1983), who used historical monographs sometimes dating back more than 500 years, to compile a geographical mapping of family ties. We consider four family types (see figure 2):

- *Absolute nuclear families* are characterized by (i) non-cohabitation between parents and adult children (children typically leave their family after their adolescence, form their own family and become independent); (ii) lack of stringent inheritance rules; and (iii) exogamous marriage relationships. These families nurture individualism. Every person is independent, and has to rely mainly on his/her own effort. This clearly implies total independency of children from their parents, and viceversa. The choice of taking care of old-age parents becomes a subjective decision, rather than a generalized, codified value. As parents have no obligation to support their adult children, kids may in turn also choose whether to take care of old parents or not, and to what extent. Anglo-Saxon countries, Holland and Denmark belong to this group;

- *Egalitarian nuclear families* feature (i) no cohabitation of parents and adult children, (ii) exogamy, but (iii) the independence among generations is weaker than in the previous case. In fact, more precise inheritance rules are typically in place, based on the principle of equality among siblings. This family welfare context favors the emergence of ideologies of "universalism", which recognize the value of equality, often in contrast to individualism. Egalitarian families encourage the persistence of stronger relations between parents and children. Moreover, to the extent that parents have a (moral or legal) obligation not to favour a kid over the others in their inheritance decisions, all children become equally responsible for their old-age. Mediterranean countries (France, Italy, Spain, Greece), Portugal, Romania, Poland, Latin America (apart from Cuba) and Ethiopia are in this group;

- *Stem or authoritarian families* are based on cohabitation of parents and adult children (sons typically remain in their parents' home and are subject to a vertical hierarchical structure). Rules and social norms are strongly transmitted from one generation to the other. This strengthens family ties. However, the principle of equality is typically not

recognized in inheritance rules. Germany, Austria, Sweden, Norway, Czech Republic, Belgium, Luxembourg, Scotland, Ireland, Japan, Korea, Israel and Gitans populations are characterized by this family structure;

- *Communitarian families* are also based on cohabitation, but they affirm equality among siblings in inheritance rules, which reduces individualism and reinforces family ties. This system was in place in Russia, Yugoslavia, Slovak, Bulgaria, Finland, Hungary, Albania, Baltic republics, Centre of Italy, China, Vietnam, Cuba, Indonesia and India.

Todd historical classification of family types is simple, but, at the same time, it captures those aspects of the intergenerational family organization that are crucial to understand the different incentives for the early design of the pension systems. In communitarian and, to a lesser extent, in egalitarian nuclear families, children have a strong moral (or even legal) obligation to support their parents in old age, while this feature is somewhat less present in authoritarian families and almost absent in absolute nuclear families. To relate this historical classification to the current literature on family culture, we compare it to the analysis of family ties in Alesina and Giuliano (2007). They use three individual questions from the World Value Survey: (i) How family is important in life? the answer ranging from 1, "very important", to 4, "not at all important"; (ii) Choose between A (corresponding to the score of 0): "Regardless of what the qualities and faults of one's parents are, one must always love and respect them" and B (score equals 1): "One does not have the duty to respect and love parents who have not earned it by their behavior and attitudes"; (iii) Choose between A (score equals 0) "Parents' duty is to do their best for their children even at the expense of their own well-being" and B (score equals 1) "Parents have a life of their own and should not be asked to sacrifice their own well-being for the sake of their children". To compare their current measures of family ties based on these questions with Todd historical classification we estimate the following simple model:

$$y_i = \alpha + \beta_1 X_i + \beta_2 COMMUNITY + \beta_3 AUTHORITARIAN + \beta_4 EGALNUCLEAR + \varepsilon_i$$

where y_i is the score attributed to the answer that individual i gives to each of the three questions (respectively in column 1, 2 and 3), X_i is a set of individual controls (age, age squared, income, education, political views) and a dummy variable controls for the dominant level of family organization in the country of the respondent with absolute nuclear families being the excluded category. Table 1 shows the correlation between Todd (1983) and Alesina and Giuliano (2007) classifications. Todd classification plays no role in explaining current responses on the importance of the family (column 1). However, stronger (current) kid-to-parents links (see column 2) are associated with egalitarian nuclear and communitarian families as compared to absolute nuclear families. Finally, col-

umn 3 describes the downward vertical ties from parents to kids, where authoritarian and communitarian families are characterized by the prominent role of the parents.

3.2 The design of pension systems

In the western world, public pension systems were initially introduced between the end of the XIX century and the end of World War II. Besides their financing method - PAYG, FF or mixed- ever since their introduction, pension systems have largely differed in their design, generosity and coverage. The two polar cases are represented by the so-called Bismarckian and the Beveridgean systems[4]. A Bismarckian scheme covers all the workers, who have contributed to the system throughout their working life, and provides them with a pension benefit that is strictly related to these contributions, and typically replaces a large share of the workers' previous wage. The replacement rates, i.e., the ratio of post-retirement pension benefits to pre-retirement earnings, are thus approximately constant across individuals of different incomes, and the system entails no intragenerational redistribution. In Beveridgean systems contributions are proportional to earnings but benefits are instead almost flat; thus, intragenerational redistribution is large. Beveridgean systems have more universal coverage; they still base their financing on social security contributions, but typically the pension benefit does not replace a large share of the worker's previous wage. As such, they mainly constitute a safety net that ensures enough retirement income to low-income workers to cover their pensions wage, while providing a low replacement of their previous wage to middle and high income workers;

To measure the design of the pension system, we thus consider the difference in the replacement rates across individuals of different income groups. Large differences in the replacement rates – with high values for low-income individuals and viceversa – identify pension systems that only act as a safety net, and should thus be associated with weak family ties; and viceversa for constant replacement rates. As discussed in the next section, we only have current measures of the replacement rates – namely around the year 2000. Hence, for some countries, such as Germany, more than hundred years have passed since the initial design of the pension systems. Fortunately, this design has been rather persistent over time. In fact, while the size of pensions changes rapidly over years, depending on the economic and political circumstances (see Galasso, 2006), the redistributive design has

[4] The names "Bismarckian" and "Beveridgean" date back respectively to the origin of the social security system in Germany and to the system proposed few decades later by the Beveridge report in the United Kingdom. In the first social security system, created in Germany by Bismarck in 1881, benefits were earning-related. The Beveridge report, published in 1942 in the UK, introduced the alternative idea of a *minimum* system, i.e., a system with flat-rate benefits for qualified retirees.

proven to be much more stable. For instance, the United Kingdom is still an example of a flat-rate pension system, while Germany, Italy and France have remained earnings-related. For a sample of 20 OECD countries, Krieger and Traub (2008) find no significant evidence of a change in the intragenerational redistribution in PAYG systems. Some examples suggest that each scheme has even accentuated its original design: Bismarckian systems have become more Bismarckian and analogously for Beveridgean schemes. Italy, for instance, has implemented reforms which have accentuated the earning-related design, by shifting from a defined benefit formula for calculating pensions to a notional defined contribution, which implies a full link of contributions and benefits, thus entailing almost no intragenerational redistribution. On the opposite, in the last few years the UK program has become even more redistributive: rich individuals may 'contract out' of the public system and enjoy a reduction of the contribution rate, while the State Second Pension (S2P) scheme introduced in 2002 reinforced the safety net nature of the system.

3.3 Alternative determinants of pension design

Our model at section 2 highlights the existence of a transmission mechanism from pre-existing family organizations to the original design of pension systems. Pension systems were introduced to provide old-age support, which was previously supplied within the family, and they were designed to mirror the same organization that was prevailing within the family. Hence, where families characterized by weak ties among generations and strong independence within the family, such as Todd's absolute nuclear families, prevail, pension systems feature only a basic safety net, and are not compelled to ensure a complete provision of the elderly retirement income.

Besides family organizations, there may be alternative determinants of the main features of the welfare state, and alternative mechanisms of transmission from pre-existing conditions to the welfare state. The literature has so far focused on the role of religion, democratization, urbanization and legal origins. Flora (1983, 1987) argues that the welfare state emerged under the process of secularization, i.e. the decline of religion on human conduct, and the influence of Protestantism. When religious institutions lost their dominance over society and in non-religious roles, and people reduced their religious practices and beliefs, the state replaced the church in the "public" spheres. Protestantism favored the development of the welfare state, in opposition to Catholicism, since the former encouraged the mobilization of lower income levels into mass politics and reduced the power of the church into the public sphere, while the latter continued to be dominated by the

conflict between state and church.[5] This contrast between Protestant and Catholic countries helps also to explain the differences in characteristics of the welfare states (such as the level of centralization and the degree of state intervention).[6] Since the diffusion of religion has proved very persistent, this original effect may continue to shape current welfare state systems.

Democratization may represent an alternative mechanism. According to the modernization theory (Lipset, 1959), the introduction of the welfare state was due to the growing needs for social policy, social and economic equality and security, created by the industrialization. In urban, richer societies, the demand for welfare state increases. Moreover, the process of economic modernization promotes also the foundation and the consolidation of democracies.[7] In democracies, poor individuals take part in politics and, as a consequence, policies favouring these individuals and promoting equality, such as redistributive policies and welfare state may emerge (Acemoglu and Robinson, 2006; Boix, 2003). Thus, democratic countries tend to have larger welfare states.

Legal origins may also shape the pre-existing context in which pension systems were introduced. According to La Porta et al. (1997) legal origins are a good proxy for financial development. As argued by Pinotti (2009) more financial development implies less PAYG social security and viceversa, thus establishing a causal relationship from pre-existing legal origins and the size and features of the pension system (see also Perotti and Schwienbacher, 2007).

Finally, according to Persson and Tabellini (2004), old age spending may also depend on electoral rules (majoritarian/proportional) and forms of government (presidential/parliamentary). In particular, presidential regimes tend to induce smaller public sectors, while proportional elections lead to higher, but less targeted government spending, and to larger budget deficits.

[5] The relation between religion and in general socio-economic transformations was first identified by Weber (1905), who linked the Protestant Reform to the modern capitalism. Guiso et al (2003) find that religious beliefs, especially Christian religions, are associated with growth enhancing economic reforms. See also McCleary and Barro (2006).

[6] Recently, van Kersbergen and Manow (2009) reconsidered the role of Protestantism, and showed that Reformed Protestantism substantially delayed and restricted modern social policy, while the Lutheran state churches positively contributed to the introduction of social protection programs. They also argue that the interaction between religion and electoral rules produced different political class coalitions sustaining different welfare regimes.

[7] Clearly, the interaction between modernization and democratization is a two-way relation and it is difficult to know the correct direction of causality: economic development favors democracy, but also stable democracies would entail economic growth.

In the next section, we will test the validity of the transmission mechanism running from family types to pension's design compared to these alternative channels.

4 The Empirical Analysis

4.1 Data and empirical specification

We aim to test the effect of the pre-existing family organization, in particular its vertical kids-to-parents transfer structure, on the initial design of pension systems around the world. To characterize the different family organizations, we consider Todd classification described at section 3.1 for a set of 85 countries, as shown at figure 2. We use different measures to identify the initial design of the pension system. Since Bismarckian systems provided high replacement rates that are constant across income groups, while in Beveridgean systems the replacement rates vary widely across income, we identify the design of the pension scheme with the ratio between replacement rates (the ratio of post-retirement pension benefits to pre-retirement earnings) at different levels of income. Higher ratios imply different provision of pension to different retirees, relative to their previous wage income, and are consistent with a safety net being provided to low-income, and little replacement being given to the others. We also use a direct measure of the current replacement rate for an individual with the average wage in the economy. Higher replacements of his income are associated with more generous pension for the retiree, and thus indicate that the system provides more than just a safety net. Pension coverage, defined as the share of population between 15 and 64 years old that is covered by the pension system, captures the diffusion of the system among the population. System providing only a safety net typically feature high coverage, and yet are associated with lower spending. Pension expenditure as a percentage of GDP is also considered as a dependent variable. For these pension variables, we consider the available data around the year 2000. While the redistributive design of the pension systems has been rather stable since their introduction, and thus these recent values may be a good proxy for the initial design, current coverage and pension spending will largely be determined by current demographic, economic and political processes.

We perform two types of analysis: we first estimate a cross-country model and then turn to individual data.

First, we estimate a simple cross country model:

$$\begin{aligned} y_i &= \alpha + \beta_1 COMMUNITY + \beta_2 AUTHORITARIAN + \beta_3 EGALNUCLEAR + \\ &\quad \beta_4 OECD + \beta_5 LAAM + \beta_6 AFRICA + \beta_7 X_i + \varepsilon_i \end{aligned}$$

where y_i is our dependent variable measuring the redistributive design of the pension scheme (or the size of pension) in country i; $COMMUNITY$ is a dummy variable equal to 1 if country i features a communitarian family and 0 otherwise; $AUTHORITARIAN$ is a dummy variable equal to 1 if country i has an autoritharian family and 0 otherwise; $EGALNUCLEAR$ is a dummy variable equal to 1 if country i there has an egalitarian nuclear family and 0 otherwise; $OECD, LAAM$ and $AFRICA$ are geographical dummy variables equal to 1 if country i belongs respectively to OECD, Latin America and Africa and 0 otherwise; X_i is a set of control variables, which include alternative legal, cultural, political, economic and demographic determinants that could have affected the design and the size of the system, and ε_i is the error term. The absolute nuclear family type is thus the omitted one and our reference family type.

For our dependent variables y_i we use different measures of design and size of the pensions: (i) the ratio between the replacement rates of a worker earning one-half of the average income and the one of a worker earning exactly the average income (repl50_1); (ii) the ratio between the replacement rate of a worker earning the 75% of the average income and the one of a worker earning 150% of the average income (repl75_150); (iii) the replacement rate of a worker earning the average income (replacem1); (iv) the pension coverage, i.e. the share of population between 15 and 64 years old that is covered by the pension system, and (v) the pension expenditure as a percentage of GDP.

Figures 3 and 4 show the distribution of our main measures of pensions design, (repl50_1) and (repl75_150) around the world, suggesting that they vary widely across (and within) geographic areas.

Due to the small number of observations, we run different sets of regressions including one of the following control variables, X, at a time: legal origins, religion, level of urbanization, level of democracy, GDP and the share of elderly.

Our unit of analysis is the country, since pension design varies at country level but is homogeneous within country. Furthermore, since this design displays a strong time persistence and we have historical data family types, we abstract from the time component and concentrate on a cross-country analysis. Data availability limits the number of observations to 55 when we use the replacement rates (repl50_1) and to 78 when we measure the size of pension. Data sources are described in the appendix. Summary statistics are at table 2.

We then turn to individual data to test whether the individuals' preferences on the current design of pension system are affected by their family types. We consider individual responses to four questions on the role of the government in providing support to the

elderly, contained in different waves of the General Social Survey (GSS) from 1972 to 2008. Following an established literature (see Fernández and Fogli, 2006, 2009, and Alesina and Giuliano, 2007, among many others), we associate to each person the family type of his/her family's country of origin. This information is available since each individual in the GSS is asked to provide his/her birthplace and the country of origin of his/her forbearers – namely to answer to the following question: "From what countries or part of the world did your ancestors come?". We restrict our analysis to the available countries[8] for which Todd's classification in family types is available.

We concentrate on four questions, which unable us to identify the individual preferences for government responsibility in social issue, and in particular in old age security. 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?" (see natsoc in column 1, table 11, where 1 identifies "too little" and 3 is for "too much"). This question was available in several waves (1983-87, 1987, 1988-91, 1993-96, 1998, 2000, 2002, 2004, 2006, 2008). 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?" (see aidold in column 2, table 11, where 1 is for "it definitely should be" and 4 is for "it definitely should not be"). This question was available for the following waves: 1983-87, 1988-91, 1993-96, 2002, 2006. Third, "Listed below are various areas of government spending. Please indicate whether you would like to see more or less government spending in retirement benefits. Remember that if you say "much more," it might require a tax increase to pay for it" (see spretire in column 3, table 11, where 1 means "you want to spend much more" and 5 is that "you want to spend much less") This question was available for the following waves: 1983-87, 1988-91, 1993-96, 1998, 2006. Forth, "On these cards are some opinions about the government and the economy. I'd like you to tell me whether you strongly agree, somewhat agree, somewhat disagree or strongly disagree with the following: It is the responsibility of government to meet everyone's needs, even in case of sickness, poverty, unemployment, and old age." (see equal4 in column 4, table 11, where 1 means "strongly agree" and 4 "strongly disagree").

[8] The available answers 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.

This question was only available in the 1983-87 wave.

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

$$y_{ic} = \alpha + \beta_1 COMMUNITY_c + \beta_2 AUTHORITARIAN_c + \beta_3 EGALNUCLEAR_c + \beta_4 X_i + \varepsilon_{ic}$$

where y_{ic} is our dependent variable measuring the response to the above questions by an individual i whose ancestors were coming from country c; the dummy refers to the family type in the country of origin of the respondent, and X_i is a set of individual controls, such as age, income, level of education and political views, and ε_{ic} is the error term. As before, the absolute nuclear family type is the omitted one and our reference family type.

4.2 Results

Table 3 presents our baseline specification: we regress our measures of the design and size of pensions on the three types of pre-existing family structures and on the geographical dummies. Communitarian and egalitarian nuclear families are less redistributive than absolute nuclear ones for our two measures of the replacement ratio. Using our second measure, also authoritarian families are less redistributive than absolute nuclear. This result is in line with the idea that absolute nuclear families capture weak and independent relations between parents and children in the family, which lead to the design of a pension system that resembles a safety net. In families that prize independence, and do not tie the parents' hands to equal inheritance rules, children do not perceive an obligation to provide old-age support to their parents, unless perhaps they are in strong need of help. This family organization translates into pensions: individuals only expect to receive a safety net from the state. Where instead children took good care of their elderly parents, the state has to provide a sufficient pension to replace the individual previous wage income. This idea is supported by the level of the replacement rate being positively related to the strength of the family ties: all other family types enjoy a higher replacement than countries with absolute nuclear families, indicating that they provide more than a safety net.

When we turn to the size of pension, as expected, absolute nuclear families are associated with a higher coverage, while current pension spending is instead unrelated to the types of families.

We now enrich our baseline scenario by introducing additional variables to test for alternative channels that may explain the original design of pension systems, or which may influence both the design of pensions and the family values. We first introduce legal origins, which, following La Porta et al. (1997) are classified as Anglo-Saxon, Socialist, Germany and French. Figure 5 shows the distribution of these indicators around the

world. By comparing figures 2 and 5 we do not see a clear association between the family types and the origin of the legal system, suggesting that family ties are capturing some inherent values different from what is expressed by the origin of the legal system. This is confirmed in table 4, where we include the four dummy variables referring to legal origins in our baseline specification. When compared to communitarian and egalitarian nuclear families, absolute nuclear families remain associated with less earnings-related schemes and larger coverage. Communitarian families have also a higher replacement rate. The Anglo-Saxon legal origin is associated with less coverage and less pension spending, but it does not seem to affect the design.[9]

We then turn to religion, which has also been considered a crucial and persistent determinant of economic and social outcomes (see section 2.3). We hence need to control whether religion, rather than the principles underlying family types, is the real driver of the different pension design across countries. Figure 6 suggests that the diffusion of the main religions, Catholic, Orthodox, Protestant, Islamic, around the world in 1900 is not directly associated with the design of pensions. Redistributive pensions are present in many Protestant countries, but also in the catholic Argentina and Ireland. In table 5, we control for the relative share of the four religions in the different countries in 1900 (i.e., in the period around or before the introduction of the pension systems). We find that absolute nuclear family are again associated with more redistributive pension schemes than the other types of families, while religion seems to have no effect on pensions design,[10] but to be associated with small pension expenditure and coverage, in countries with a large share of Muslims. Similarly, in table 6, an Herfindal index of religious homogeneity is not significantly associated with the design, while the types of family (absolute nuclear family as opposed to the others) remain crucial.

In table 7, we include a measure of the level of urbanization of the country at the beginning of the XX century. While this variable turns out to be associated with the size of the pensions system in the obvious direction (more urbanization implies more pensions), it is not significant to explain their design. The types of family instead remain significant.

In table 8, we introduce an indicator of the political environment in the different countries in 1900. Do the design of system or their size depend on whether countries were more democratic at the time of the introduction of the system? A higher level of

[9] This result is in line with the idea that private pensions may substitute for public pensions when financial markets are well developed, which is in turn associated with English legal origin.

[10] Unfortunately, the CIA factbook reports observations only for 49 countries, among those for which we have pension data. The coefficient of the family types are less precisely estimated, but point estimates are in line with the estimates in the previous tables.

democratization, as captured by the Polity2 indicator[11] has no impact on the design of pensions; as usual, having an absolute nuclear family organization implies a significantly different design than any other family type, namely a higher redistributive component.

In table 9, we control for current economic and demographic variables, that is, the level of GDP and the share of elderly in the population. Richer countries have higher coverage, while more elderly are associated with both higher coverage and more pension spending.[12] Current income and aging however are not correlated with pension design, and the type of family remains significant in all specifications in the usual way.

Finally, in table 10, we control for electoral rules and forms of government. As expected, countries with majoritarian systems have lower coverage and level of pension and lower replacement rates than countries with proportional systems. However, having a majoritarian or a proportional electoral rule has no effect on the redistributive design of pensions, while family types continue to show the same relationships found so far. Also the form of government, presidential versus parliamentary, turns out to play no role.

We then turn to the results using individual data with responses to four questions on the role of the government in providing support to the elderly from 1972-2008 General Social Survey (GSS). Table 11 presents the results of the regression of these individual responses on family type in the respondent's country of origin, and on individual characteristics. Individuals with family's country of origin characterized by communitarian or egalitarian nuclear families are more favorable to increase spending in social security (see column 1) and in retirement benefits (see column 3). Moreover, they also see it more as a government responsibility to secure a decent standard of living for the old, and to provide to everyone's needs in case of sickness, poverty, unemployment, and old age.

To sum up the empirical analysis, the family organization played a crucial role as a primal determinant of the design of pension systems since their introduction. Instead, legal origin and religion, which have been extensively suggested to determine other socioeconomic outcomes, play no role in this case. Similarly, other determinants of the context in which pensions were introduced, such as the level of urbanization or democratization of the country at that time, or current variables such as current GDP and the share of elderly in the population, have also little to say about the design of pensions. Interestingly, some of these variables turn out to be related to current features, such as the size or the coverage of the pensions, but not to persistent characteristics, such as its design. A family

[11] This indicator is widely used in both the economic and political science literature on democracy. For details, see the appendix.

[12] There is a large literature on the link between aging and the size of social security (see Galasso and Profeta, 2004, Disney, 2007).

organization based on absolute nuclear families represents the better correspondence to the design of redistributive pension systems. Data on the individual responses to questions on the role of the government in providing support to the elderly provide a similar picture. Individuals whose ancestors came to the US from countries featuring communitarian or egalitarian nuclear families would prefer to rely on the government as a provider of old age security through generous retirement benefits.

5 Conclusions

We have tried to identified the types of family relationships as the ultimate cause of the design of pension systems. Why family? Following Todd (1983), families do not depend on climate conditions, geological features, economic environment. It is impossible to associate it with geographic territories. The system of latent values embedded in the family has no link with religion or language. There is nothing pre-determined to the family relationships. In a world, behind the family there is only the "hazard".

We have found that absolute nuclear families, where the relations between parents and children are weak, leads to the emergence of a pension system with flat benefit formulas and more redistribution across income levels, as compared with the other types of families, in particular communitarian and egalitarian nuclear. The link between the type of families and the design of pension systems is robust to the introduction of other historical pre-existing conditions, such as legal origin, religion, urbanization, democratization. Family culture or organization is persistent. Our analysis on recent GSS data shows that individuals whose ancestors went to the US from countries featuring communitarian or egalitarian nuclear families continue to have preferences for generous retirement benefits being provided by the state.

Hence, besides having a strong historical component, our analysis may shed some light on the feasibility of today's pension reforms, by explaining how individuals' behavior as shaped by cultural/institutional elements influences the policy-makers' decision on which institution (e.g., pension system) to choose, how to design it (namely, earnings-related versus flat-rate) and how to implement the policy. This is a promising direction for future research.

Technical Appendix

.1 Proof of Proposition 1

Adults have no incentives to save, since in old age they will have no property rights on the returns from these savings. Hence, $s_t = 0$. Analogously, adults will not support pensions. In fact, pensions constitute a current cost (the tax contribution) with no future benefit, since their old age pension benefits will be managed by the adults, and they will always only receive the same family transfer, γy.

.2 Proof of proposition 2

It is useful to separate the adults saving decisions (s_t) and their voting decisions over the pension contribution rate (τ) in two steps.

Step one: Consider that $\tau \leq \frac{\delta}{1-\varepsilon}$, and hence $P_t = \tau(1-\varepsilon)y \leq \delta y$.

The adults maximize the following utility function:

$$\ln\left(y(1-\tau) - s_t - x_t I_t\right) + \beta\left\{\rho \ln\left(y(1-\varepsilon)\tau + s_t\overline{R}\right) + (1-\rho)\ln(\delta y)\right\} \tag{6}$$

$$\text{for } y(1-\varepsilon)\tau + s_t\overline{R} > \delta y$$

where

$$I_t = \begin{cases} 0 & \text{if } y(1-\varepsilon)\tau + s_{t-1}\overline{R} \geq \delta y \\ 1 & \text{if } y(1-\varepsilon)\tau + s_{t-1}\overline{R} < \delta y \end{cases} \tag{7}$$

$$x_t = \delta y - y(1-\varepsilon)\tau - s_{t-1}\overline{R} \tag{8}$$

First, agents maximize w.r.t. s_t for a given τ. Then, once $s_t(\tau)$ has been obtained, they maximize the indirect utility function w.r.t. τ.

The first order condition w.r.t. s_t is:

$$FOC(s_t) = -\frac{1}{y(1-\tau) - s_t - x_t I_t} + \frac{\beta\rho\overline{R}}{y(1-\varepsilon)\tau + s_t\overline{R}}$$

which yields

$$s(\tau) = \frac{\beta\rho\overline{R}\left[y(1-\tau) - I_t x_t\right] - \tau y(1-\varepsilon)}{\overline{R}(1+\beta\rho)}$$

The first order condition w.r.t. τ is:

$$FOC(\tau) = -\frac{y\left[1-(1-\varepsilon)I_t\right]}{y(1-\tau) - s_t - x_t I_t} + \frac{(1-\varepsilon)\beta\rho y}{y(1-\varepsilon)\tau + s_t\overline{R}}$$

Given the constraints $y(1-\varepsilon)\tau + s_t\overline{R} > \delta y$ and $\tau \leq \frac{\delta}{1-\varepsilon}$, we have $s_t > 0$, and thus can use $FOC(s_t) = 0$ to obtain the following FOC(τ)

$$FOC(\tau) = \frac{-y\beta\rho\overline{R}\left[1-(1-\varepsilon)I_t\right] + (1-\varepsilon)\beta\rho y}{y(1-\varepsilon)\tau + s_t\overline{R}}$$

For $I_t = 0$, that is, when the current adults need not to transfer resources to their parents, $FOC(\tau) \simeq -\overline{R} + 1 - \varepsilon < 0$, and hence $\tau = 0$. However, we are also interested in understanding whether pensions would be introduced for $I_t = 1$, for instance in the bad state of nature, i.e. when $R = 0$. For $I_t = 1$, $FOC(\tau) \simeq -\overline{R}\varepsilon + 1 - \varepsilon$. Hence, for $\overline{R} > \frac{1-\varepsilon}{\varepsilon}$, $FOC(\tau) < 0$ and $\tau = 0$; whereas for $\overline{R} < \frac{1-\varepsilon}{\varepsilon}$, $FOC(\tau) > 0$ and $\tau = \frac{\delta}{1-\varepsilon}$.

- Let us consider the case $\overline{R} > \frac{1-\varepsilon}{\varepsilon}$.

Adults prefer $\tau = 0$ for $\tau \in \left[0, \frac{\delta}{1-\varepsilon}\right]$, but we need to check that the constraint $y(1-\varepsilon)\tau + s_t\overline{R} > \delta y$ is satisfied. It is easy to see that this occurs for $\delta < \frac{\beta\rho\overline{R}}{1+\beta\rho+\beta\rho\overline{R}}$.

When the above constraint is reversed, i.e., for $y(1-\varepsilon)\tau + s_t\overline{R} \leq \delta y$, the utility at eq. 6 to be maximized becomes:

$$\ln\left(y(1-\tau) - s_t - x_t I_t\right) + \beta\ln\left(\delta y\right) \tag{9}$$

Clearly, $s_t = 0$; and $FOC(\tau) = -\frac{y[1-(1-\varepsilon)I_t]}{y(1-\tau)-s_t-x_tI_t} < 0$, so that $\tau = 0$.

Hence, for $\overline{R} > \frac{1-\varepsilon}{\varepsilon}$, and $\tau \in \left[0, \frac{\delta}{1-\varepsilon}\right]$, we have that when $\delta > \frac{\beta\rho\overline{R}}{1+\beta\rho+\beta\rho\overline{R}}$, the only solution features $s_t = 0$ and $\tau = 0$; whereas for $\delta < \frac{\beta\rho\overline{R}}{1+\beta\rho+\beta\rho\overline{R}}$, the maximization under the two different constraints provide different results. We thus need to compare the indirect utility associated with $\tau = 0$ and $s_t(\tau = 0) > 0$ [call it $V(s_t(\tau), \tau = 0)$] with the indirect utility from $\tau = 0$ and $s_t = 0$ [call it $V(s_t = 0, \tau = 0)$]. They are respectively equal to

$$\begin{aligned} V(s_t(\tau), \tau = 0) &= \ln\frac{y(1-\delta)}{1+\beta\rho} + \beta\rho\ln\frac{\beta\rho\overline{R}y(1-\delta)}{1+\beta\rho} + \beta(1-\rho)\ln y\delta \\ V(s_t = 0, \tau = 0) &= \ln y(1-\delta) + \beta\ln y\delta \end{aligned}$$

where the former utility is evaluated at $I_t = 1$. Simple algebra shows that $V(s_t = 0, \tau = 0) < V(s_t(\tau), \tau = 0)$ for $\delta < \frac{\beta\rho\overline{R}}{\beta\rho\overline{R}+(1+\beta\rho)^{\frac{1+\beta\rho}{\beta\rho}}} = \delta_B \left(< \frac{\beta\rho\overline{R}}{1+\beta\rho+\beta\rho\overline{R}}\right)$.

To summarize, for $\overline{R} > \frac{1-\varepsilon}{\varepsilon}$, and $\tau \in \left[0, \frac{\delta}{1-\varepsilon}\right]$, we have $s_t = 0$ and $\tau = 0$ for $\delta > \delta_B$, and $s_t(\tau = 0) > 0$ and $\tau = 0$ for $\delta < \delta_B$.

- Let us consider the case $\overline{R} < \frac{1-\varepsilon}{\varepsilon}$.

  Adults prefer $\tau = \frac{\delta}{1-\varepsilon}$ for $\tau \in \left[0, \frac{\delta}{1-\varepsilon}\right]$, and the constraint $y(1-\varepsilon)\tau + s_t\overline{R} > \delta y$ is satisfied for $s_t(\tau = \frac{\delta}{1-\varepsilon}) > 0$, that is, for $\delta < \frac{\beta\rho\overline{R}(1-\varepsilon)}{1-\varepsilon+\beta\rho\overline{R}} = \delta_I$.

When the constraint is reversed, that is, $y(1-\varepsilon)\tau + s_t\overline{R} \leq \delta y$, we know from the above calculation that $s_t = 0$ and $\tau = 0$. Hence, for $\delta > \delta_I$, we have $s_t = 0$ and $\tau = 0$; while for $\delta < \delta_I$, we have to compare $V(s_t = 0, \tau = 0)$ and $V\left(s_t(\tau), \tau = \frac{\delta}{1-\varepsilon}\right)$, where

$$V\left(s_t(\tau), \tau = \frac{\delta}{1-\varepsilon}\right) = \ln \frac{y\left[\overline{R}\left(1 - \frac{\delta}{1-\varepsilon}\right) + \delta\right]}{\overline{R}(1+\beta\rho)} + \beta\rho \ln \frac{\beta\rho y\left[\overline{R}\left(1 - \frac{\delta}{1-\varepsilon}\right) + \delta\right]}{1+\beta\rho} + \beta(1-\rho)\ln y\delta.$$

It is easy to show that $V(s_t = 0, \tau = 0)$ is increasing in δ (for δ in the feasible range, i.e., $\delta < \beta/(1+\beta)$); while $V\left(s_t(\tau), \tau = \frac{\delta}{1-\varepsilon}\right)$ is decreasing in δ for $\delta > \frac{\beta(1-\rho)\overline{R}(1-\varepsilon)}{(1+\beta)\left[\overline{R}-(1-\varepsilon)\right]} = \delta_{II}$. Simple algebra shows that $V(s_t = 0, \tau = 0) > V\left(s_t(\tau), \tau = \frac{\delta}{1-\varepsilon}\right)$ for $\delta = \delta_I$; whereas tedious algebra (available upon request) is needed to show that $V(s_t = 0, \tau = 0) < V\left(s_t(\tau), \tau = \frac{\delta}{1-\varepsilon}\right)$ for $\delta = \delta_{II}$. Hence, there exists a $\delta_D \in (\delta_{II}, \delta_I)$ such that when $\overline{R} < \frac{1-\varepsilon}{\varepsilon}$ and $\tau \in \left[0, \frac{\delta}{1-\varepsilon}\right]$, the agents choose $s_t = 0$ and $\tau = 0$ for $\delta > \delta_D$; and $s_t(\tau) > 0$ and $\tau = \frac{\delta}{1-\varepsilon}$ for $\delta \in (\delta_{II}, \delta_D)$. We can abstract from comparing $V(s_t = 0, \tau = 0)$ and $V\left(s_t(\tau), \tau = \frac{\delta}{1-\varepsilon}\right)$ for $\delta < \delta_{II}$.

Step two: Consider that $\tau \geq \frac{\delta}{1-\varepsilon}$, and hence $P_t = \tau(1-\varepsilon)y \geq \delta y$.

The adults maximize the following utility function:

$$\ln\left(y(1-\tau) - s_t\right) + \beta\left\{\rho \ln\left(y(1-\varepsilon)\tau + s_t\overline{R}\right) + (1-\rho)\ln\left(y(1-\varepsilon)\tau\right)\right\} \tag{10}$$

First, the agents maximize their utility w.r.t. s_t for a given τ. This yields a saving function

$$s(\tau) = \frac{\beta\rho\overline{R}y(1-\tau) - \tau y(1-\varepsilon)}{\overline{R}(1+\beta\rho)} \tag{11}$$

Second, they maximize the indirect utility function w.r.t. τ. to obtain the following first order condition:

$$FOC(\tau) = -\frac{y}{y(1-\tau) - s_t} + \frac{(1-\varepsilon)\beta\rho y}{y(1-\varepsilon)\tau + s_t\overline{R}} + \frac{\beta(1-\rho)}{\tau}$$

which yields

$$\tau^* = \frac{\beta(1-\rho)\overline{R}}{(1+\beta)\left[\overline{R} - (1-\varepsilon)\right]}$$

It is easy to see that $\tau^* > \frac{\delta}{1-\varepsilon}$ for $\delta < \frac{\beta(1-\rho)\overline{R}(1-\varepsilon)}{(1+\beta)\left[\overline{R}-(1-\varepsilon)\right]} = \delta_{II}$. Hence, when $\tau \geq \frac{\delta}{1-\varepsilon}$ and $\delta < \delta_{II}$, adults will choose $\tau = \tau^*$ and $s_t(\tau^*)$ (see eq. 11), regardless of $\overline{R}$ (which is in any case greater than $(1-\varepsilon)/\rho$).

Final step: To find the adults optimal decisions, we need to bring together the constrained maximizations done at step one and two.

- Consider that $\overline{R} > \frac{1-\varepsilon}{\varepsilon}$.

When $\tau \leq \frac{\delta}{1-\varepsilon}$, we have $s_t = 0$ and $\tau = 0$ for $\delta > \delta_B$, and $s_t(\tau = 0) > 0$ and $\tau = 0$ for $\delta < \delta_B$. When $\tau \geq \frac{\delta}{1-\varepsilon}$, we have $\tau = \tau^*$ and $s_t(\tau^*)$ for $\delta < \delta_{II}$. Since $\delta_{II} < \delta_B$, we need to compare

$V(s_t(\tau = 0), \tau = 0)$ and $V(s_t(\tau^*), \tau^*)$ for $\delta < \delta_{II}$, where

$$\begin{aligned} V(s_t(\tau), \tau = 0) &= \ln \frac{y(1-\delta)}{1+\beta\rho} + \beta\rho \ln \frac{\beta\rho\overline{R}y(1-\delta)}{1+\beta\rho} + \beta(1-\rho)\ln y\delta \quad \text{for } I_t = 1 \\ V(s_t(\tau^*), \tau^*) &= \ln \frac{y}{1+\beta} + +\beta\rho \ln \frac{\beta\rho\overline{R}y}{1+\beta} + \beta(1-\rho)\ln \frac{\beta(1-\rho)\overline{R}y(1-\varepsilon)}{(1+\beta)\left[\overline{R}-(1-\varepsilon)\right]} \end{aligned}$$

Define $H(\delta) = V(s_t(\tau^*), \tau^*) - V(s_t(\tau), \tau = 0) = (1+\beta\rho)\ln\frac{1+\beta\rho}{(1+\beta)(1-\delta)} + \beta(1-\rho)\ln\frac{\beta(1-\rho)\overline{R}(1-\varepsilon)}{\delta(1+\beta)\left[\overline{R}-(1-\varepsilon)\right]}$. Notice that $H(\delta = 0) > 0$; moreover, $H(\delta)$ is decreasing in δ and is minimized for $\delta = \frac{\beta(1-\rho)}{1+\beta} > \delta_{II}$. If we evaluate $H(\delta)$ at δ_{II}, we have $H(\delta = \delta_{II}) = (1+\beta\rho)\ln\frac{(1+\beta\rho)\left[\overline{R}-(1-\varepsilon)\right]}{(1+\beta)\left[\overline{R}-(1-\varepsilon)\right]-\beta(1-\rho)\overline{R}(1-\varepsilon)}$. Simple algebra shows that $H(\delta = \delta_{II}) < 0$ for $\overline{R} > \frac{1-\varepsilon}{\varepsilon}$; and viceversa. Thus, there exists a $\delta_A \in (0, \delta_{II})$ such that $H(\delta) > 0$ for $\delta < \delta_A$; and $H(\delta) < 0$ for $\delta > \delta_A$.

To summarize, for $\overline{R} > \frac{1-\varepsilon}{\varepsilon}$, we have for $\delta < \delta_A$, $\tau = \tau^*$ and $s(\tau = \tau^*) > 0$; for $\delta_A < \delta < \delta_B$, $\tau = 0$ and $s(\tau = 0) > 0$; and for $\delta > \delta_B$, $\tau = 0$ and $s = 0$. QED.

- Consider that $\overline{R} < \frac{1-\varepsilon}{\varepsilon}$.

When $\tau \leq \frac{\delta}{1-\varepsilon}$, we have $s_t = 0$ and $\tau = 0$ for $\delta > \delta_C$, and $s_t(\tau = 0) > 0$ and $\tau = \frac{\delta}{1-\varepsilon}$ for $\delta \in [\delta_{II}, \delta_c]$. When $\tau \geq \frac{\delta}{1-\varepsilon}$, we have $\tau = \tau^*$ and $s_t(\tau^*)$ for $\delta < \delta_{II}$. We thus need to compare $V(s_t = 0, \tau = 0)$,

$V\left(s_t\left(\tau = \frac{\delta}{1-\varepsilon}\right), \tau = \frac{\delta}{1-\varepsilon}\right)$ and $V(s_t(\tau^*), \tau^*)$ for $\delta < \delta_{II}$. Clearly, $V(s_t(\tau^*), \tau^*) > V\left(s_t\left(\tau = \frac{\delta}{1-\varepsilon}\right), \tau = \frac{\delta}{1-\varepsilon}\right)$ since τ^* maximizes $V(s_t(\tau), \tau)$ for $\tau \geq \frac{\delta}{1-\varepsilon}$. To compare $V(s_t = 0, \tau = 0)$ and $V(s_t(\tau^*), \tau^*)$, define $K(\delta) = V(s_t(\tau^*), \tau^*) - V(s_t = 0, \tau = 0) = (1+\beta)\ln\frac{1}{1+\beta} + \beta\rho\ln\beta\rho\overline{R} + \beta(1-\rho)\ln\frac{\beta(1-\rho)\overline{R}(1-\varepsilon)}{\overline{R}-(1-\varepsilon)} + \ln\frac{1}{1-\delta} - \beta\ln\delta$. Notice that $K(\delta)$ is decreasing in δ and is minimized for $\delta = \frac{\beta}{1+\beta} > \delta_{II}$. Moreover, $K(\delta = 0) > 0$, whereas $K(\delta = \delta_{II}) \lessgtr 0$. Thus, if $K(\delta = \delta_{II}) < 0$, there exists $\delta_C < \delta_{II}$ such that $K(\delta) > 0$ for $\delta < \delta_C$; and $K(\delta) < 0$ for $\delta > \delta_C$; whereas if $K(\delta = \delta_{II}) > 0$, then $K(\delta) > 0$ for $\delta < \delta_{II}$.

To summarize, for $\overline{R} < \frac{1-\varepsilon}{\varepsilon}$, we have for $\delta < \delta_C$, $\tau = \tau^*$ and $s(\tau = \tau^*) > 0$; for $\delta_C < \delta < \delta_D$, $\tau = \frac{\delta}{1-\varepsilon}$ and $s\left(\tau = \frac{\delta}{1-\varepsilon}\right) > 0$; and for $\delta > \delta_D$, $\tau = 0$ and $s = 0$. QED.

.3 Proof of proposition 3

As for proposition 2, it is useful to separate the adults saving decisions (s_t) and their voting decisions over the pension contribution rate (τ) in two steps.

Step one: Consider that $\tau \leq \frac{\gamma}{1-\varepsilon}$, and hence $P_t = \tau(1-\varepsilon)y \leq \gamma y$.

The adults maximize the following utility function:

$$\ln(y(1-\tau) - s_t - z_t I_t) + \beta\left\{\rho \ln\left(y(1-\varepsilon)\tau + s_t\overline{R}\right) + (1-\rho)\ln(\gamma y)\right\} \tag{12}$$

$$\text{for } y(1-\varepsilon)\tau + s_t\overline{R} > \gamma y$$

where

$$I_t = \begin{cases} 0 & \text{if } y(1-\varepsilon)\tau + s_{t-1}\overline{R} \geq \gamma y \\ 1 & \text{if } y(1-\varepsilon)\tau + s_{t-1}\overline{R} < \gamma y \end{cases} \tag{13}$$

$$z_t = \left[\gamma y - y(1-\varepsilon)\tau - s_{t-1}\overline{R}\right](1+\phi) \tag{14}$$

First, agents maximize the utility at Eq. 12 w.r.t. s_t for a given τ, which yields

$$s(\tau) = \frac{\beta\rho\overline{R}\left[y(1-\tau) - I_t z_t\right] - \tau y(1-\varepsilon)}{\overline{R}(1+\beta\rho)}$$

Then, adults maximize the indirect utility function w.r.t. τ, which gives the following first order condition:

$$FOC(\tau) = -\frac{y\left[1-(1-\varepsilon)(1+\phi)I_t\right]}{y(1-\tau) - s_t - x_t I_t} + \frac{(1-\varepsilon)\beta\rho y}{y(1-\varepsilon)\tau + s_t\overline{R}}$$

Giiven the constraints $y(1-\varepsilon)\tau + s_t\overline{R} > \delta y$ and $\tau \leq \frac{\delta}{1-\varepsilon}$, we have $s_t > 0$, and thus we can use $FOC(s_t) = 0$ to obtain the following FOC(τ):

$$FOC(\tau) \simeq -\overline{R}\left[1-(1-\varepsilon)(1+\phi)I_t\right] + 1 - \varepsilon$$

For $I_t = 0$, that is, when the current adults need not to transfer resources to their parents, $FOC(\tau) \simeq -\overline{R} + 1 - \varepsilon < 0$, and hence $\tau = 0$. However, we are interested in understanding whether pensions would be introduced for $I_t = 1$, for instance in the bad state of nature, i.e. when $R = 0$. For $I_t = 1$, $FOC(\tau) \simeq -\overline{R}\left[1-(1-\varepsilon)(1+\phi)\right] + 1 - \varepsilon > 0$ and thus $\tau = \frac{\gamma}{1-\varepsilon}$.

Hence, adults prefer $\tau = \frac{\gamma}{1-\varepsilon}$ for $\tau \in \left[0, \frac{\delta}{1-\varepsilon}\right]$, and thus the constraint $y(1-\varepsilon)\tau + s_t\overline{R} > \gamma y$ is satisfied for $s_t > 0$. It is easy to see that this occurs for $\gamma < \frac{\beta\rho\overline{R}(1-\varepsilon)}{1-\varepsilon+\beta\rho\overline{R}} = \gamma_{II}$.

When the above constraint is reversed, i.e., for $y(1-\varepsilon)\tau + s_t\overline{R} \leq \gamma y$, the utility at eq. 12 to be maximized becomes:

$$\ln(y(1-\tau) - s_t - z_t I_t) + \beta \ln(\gamma y) \tag{15}$$

Clearly, $s_t = 0$; and $FOC(\tau) \simeq -[1-(1-\varepsilon)(1+\phi)I_t]$. Again, for $I_t = 0$, $FOC(\tau) < 0$, and hence $\tau = 0$; while for $I_t = 1$, $FOC(\tau) \simeq -[1-(1-\varepsilon)(1+\phi)] > 0$ and thus $\tau = \frac{\gamma}{1-\varepsilon}$.

To summarize, for $\tau \leq \frac{\gamma}{1-\varepsilon}$, adults choose to have $\tau = \frac{\gamma}{1-\varepsilon}$, and $s_t > 0$ for $\gamma < \gamma_{II}$ and $s_t = 0$ for $\gamma \geq \gamma_{II}$.

Step two: Consider that $\tau \geq \frac{\gamma}{1-\varepsilon}$, and hence $P_t = \tau(1-\varepsilon)y \geq \gamma y$.

The adults maximize the following utility function:

$$\ln(y(1-\tau)-s_t) + \beta\left\{\rho\ln\left(y(1-\varepsilon)\tau + s_t\overline{R}\right) + (1-\rho)\ln(y(1-\varepsilon)\tau)\right\} \tag{16}$$

First, they agents maximize w.r.t. s_t for a given τ. This yields a saving function

$$s(\tau) = \frac{\beta\rho\overline{R}y(1-\tau) - \tau y(1-\varepsilon)}{\overline{R}(1+\beta\rho)} \tag{17}$$

Second, they maximize the indirect utility function w.r.t. τ. to obtain the following first order condition:

$$FOC(\tau) = -\frac{y}{y(1-\tau)-s_t} + \frac{(1-\varepsilon)\beta\rho y}{y(1-\varepsilon)\tau + s_t\overline{R}} + \frac{\beta(1-\rho)}{\tau}$$

which yields

$$\tau^* = \frac{\beta(1-\rho)\overline{R}}{(1+\beta)\left[\overline{R}-(1-\varepsilon)\right]}$$

It is easy to see that $\tau^* > \frac{\gamma}{1-\varepsilon}$ for $\gamma < \frac{\beta(1-\rho)\overline{R}(1-\varepsilon)}{(1+\beta)\left[\overline{R}-(1-\varepsilon)\right]} = \gamma_{II}$. Hence, when $\tau \geq \frac{\gamma}{1-\varepsilon}$ and $\gamma < \gamma_{II}$, adults will choose $\tau = \tau^*$ and $s_t(\tau^*)$ (see eq. 17).

Final step: To find the adults optimal decisions, we need to bring together the constrained maximizations done at step one and two.

For $\gamma < \gamma_{II}$, under $\tau \leq \frac{\gamma}{1-\varepsilon}$ we obtained $\tau = \frac{\gamma}{1-\varepsilon}$, whereas $\tau \geq \frac{\gamma}{1-\varepsilon}$ we obtained $\tau = \tau^* > \frac{\gamma}{1-\varepsilon}$. Clearly, $V(s_t(\tau^*), \tau^*) > V\left(s_t\left(\tau = \frac{\gamma}{1-\varepsilon}\right), \tau = \frac{\gamma}{1-\varepsilon}\right)$ since τ^* maximizes $V(s_t(\tau), \tau)$ for $\tau \geq \frac{\gamma}{1-\varepsilon}$. For $\gamma > \gamma_{II}$, the results under $\tau \leq \frac{\gamma}{1-\varepsilon}$ hold.

To summarize, we thus have for $\gamma < \gamma_{II}$, $\tau = \tau^*$ and $s(\tau = \tau^*) > 0$; for $\gamma_{II} < \gamma < \gamma_I$, $\tau = \frac{\gamma}{1-\varepsilon}$ and $s\left(\tau = \frac{\gamma}{1-\varepsilon}\right) > 0$; and for $\gamma > \gamma_I$, $\tau = \frac{\gamma}{1-\varepsilon}$ and $s = 0$. QED.

.4 Proof of proposition 4

It follows from the same steps as proposition 3 but with δ instead of γ.

A Data appendix

We here describe the variables used in the empirical analysis and their sources.

- Replacement rates of the pension system at 50%, 75%, 100% and 150% of average labor income are built on Whitehouse (2007) "Pension Panorama" The World Bank and OECD (2009) "Pension at a Glance. Special Edition: Asia/Pacific. From these data we calculate repl50_1: the ratio between the replacement rate of a worker earning one-half of the average income and the one of a worker earning exactly the average income; repl75_150: the ratio between the replacement rate of a worker earning the 75% of the average income and the one of a worker earning 150% of the average income and replacem1: the replacement rate of a worker earning the average income. Data on repl75_150 are available for the following countries: Algeria, Argentina, Australia, Austria, Bahrain, Belgium, Bulgaria, Canada, Chile, Colombia, Costa Rica, Croatia, Czech Republic, Denmark, Dominican Republic, Egypt, El Salvador, Estonia, Finland, France, Germany, Greece, Hungary , Iran, Ireland, Italy, Japan, Jordan, Latvia, Libya, Lithuania, Luxembourg, Mexico, Morocco, Netherlands, New Zealand, Norway, Peru, Poland, Portugal, Slovak Republic, South Korea, Spain, Sweden, Tunisia, Turkey, United Kingdom, United States, Uruguay, Yemen. Data on replacemen1 and repl50_1 include also China, India, Indonesia, Pakistan, Vietnam.

- Coverage1564 is the share of population between 15 and 64 years old that is covered by the pension system. It is constructed as the mean of different observations over time. Source: World Bank (2007). HDNSP pension database. With respect to the previous variable, the sample includes some additional countries, Afghanistan, Albania, Bangladesh, Bolivia, Brazil, Dominica, Ecuador, Jamaica, Kazakhstan, Kyrgyzstan, Lebanon, Nicaragua, Paraguay, Syria, Venezuela, Yugoslavia, but excludes Bulgaria, Dominican Republic, New Zealand.

- Pengdp_91_2006: this variable indicates how much pensions count as a share of GDP. The data were collected in different time periods, in particular between 1991 and 2006. However most of them come from a period around the 2000. Source: World Bank (2007), HDNSP pension database. The sample includes the same countries as coverage 1564 with the addition of Azerbaijan, Belize, Cuba, Dominican Republic, Ethiopia, Guatemala, Honduras, Israel, Kuwait, New Zealand, Panama, Russia, Slovenia, Trinidad & Tobago, Turkmenistan, Uzbekistan and the exclusion of Bahrain, Dominica, India, Indonesia, Kazakhstan, South Korea.

- Family types variables:

  - AbsoluteEgal: this variable is equal to one if the family is absolute nuclear and

zero otherwise. Source: Todd (1983).

- Community: this variable is equal to one if the family is communitarian and zero otherwise. Source: Todd (1983).

- Authoritarian: this variable is equal to zero if there are authoritarian families and zero otherwise. Source: Todd (1983).

- Egal Nuclear: this variable is equal to zero if there are egalitarian nuclear families and zero otherwise. Source: Todd (1983).

- Legal origins variables: the origin of the legal system in a country is indicated by a set of dummy variables l_eng l_soc l_ger l_fra. Each dummy is equal to one if the country has the particular legal origin of interest and zero otherwise. In general we do not have overlapping among the dummies. More precisely: l_eng refers to an Anglo-Saxon legal origin; l_soc refers to a socialist legal origin; l_ger to a Germany legal origin; l_fra to a French legal origin. Source: La Porta et al. (1998).

- Religion variables:

  - Cath1900, Orth1900, Prot1900, Mus1900 contain the percentage in 1900 over the entire population of Catholic, Orthodox, Protestant and Muslin people respectively. Source: CIA factbook.

  - Herfrel1900: this variable is a proxy for the level of religious heterogeneity is a country in 1900. It has been constructed computing the Hirschman-Herfindahl index using the religion data. In particular we have data on the following religions: catholic, protestant, orthodox, Muslim, Jewish, Buddhism, East Religions;

- Urban: this variable contains the share of population living in an urban area in the early XX century. Source: World Bank, World Development Indicators (WDI).

- Polity2_1900: This data presents an evaluation of the political situation in the different countries. The ranking goes from -10 (hereditary monarchy) to +10 (consolidated democracy). The score is computed by subtracting the AUTOC score from the DEMOC score, where these indicators are derived from coding of the competitiveness of political participation, the openness and competitiveness of executive recruitment and constraints on the chief executive using different weights. Source: Center of Systemic peace, the Policy IV Project (http://www.systemicpeace.org/polity/polity4.htm). Data refers to the year 1900.

- Lngdppc2000: logarithm of the GDP per capita in the 2000. Source: World Bank, World Development Indicators
- Pop_65_2000: share of people older than 65 years old over the entire population in 2000. Source: World Bank, World Development Indicators
- Geographic dummy variables:

  - Oecd: dummy variable equal to one if the country of interest is an OECD country and zero otherwise;

  - Laam: dummy variable that is equal to one if the country of interest is a Latin America country and zero otherwise;

  - Africa: dummy variable that is equal to one if the country of interest is an African country and zero otherwise;

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Table 1: Family ties and family types

VARIABLES	(1) fam_imp	(2) pare_respect	(3) pare_respon
age	-0.00689***	-0.000724	-0.00412***
	(0.000976)	(0.000891)	(0.00106)
agesq	7.74e-05***	-2.91e-06	2.74e-05***
	(1.24e-05)	(1.06e-05)	(1.00e-05)
income	-0.00885***	0.00602***	0.000759
	(0.00220)	(0.00199)	(0.00266)
educ	0.00388	0.00875***	0.0150***
	(0.00234)	(0.00250)	(0.00318)
polviews	0.00303	0.0146***	0.00801**
	(0.00427)	(0.00269)	(0.00350)
community	**0.0392**	**-0.135****	**0.0857*****
	(0.0397)	**(0.0647)**	**(0.0313)**
aut	**0.0187**	**0.0120**	**0.163*****
	(0.0328)	**(0.0883)**	**(0.0486)**
egalnucl	**0.0177**	**-0.142****	**0.0136**
	(0.0354)	**(0.0647)**	**(0.0253)**
Constant	1.259***	0.219***	0.180***
	(0.0411)	(0.0642)	(0.0393)
Observations	101169	94631	89011
R-squared	0.007	0.037	0.028

Table 2: Summary statistics

Summary Statistics					
Variable	Obs	Mean	Std. Dev.	Min	Max
community	85	0.4470588	0.50014	0	1
aut	85	0.1294118	0.3376472	0	1
egalnucl	85	0.3411765	0.4769182	0	1
absonucl	85	0.0823529	0.2765332	0	1
africa	85	0.0705882	0.2576559	0	1
asia	85	0.0588235	0.2366905	0	1
laam	85	0.2705882	0.4469003	0	1
oecd	85	0.2823529	0.4528157	0	1
l_eng	85	0.1764706	0.3834825	0	1
l_soc	85	0.2470588	0.4338609	0	1
l_fra	85	0.4823529	0.502654	0	1
l_ger	85	0.0470588	0.2130215	0	1
cath1900	49	0.4662041	0.4243819	0	1
prot1900	49	0.2058776	0.3351906	0	0.992
orth1900	49	0.0683224	0.1434626	0	0.839
mus1900	49	0.189102	0.3724387	0	0.997
herfrel1900	49	0.7779092	0.1950197	0.338706	1
urban	79	63383.54	19569.98	15400	97000
polity2_1900	46	-0.2391304	6.147031	-10	10
pop_65_2000	83	8.96701	5.089319	1.373369	18.23579
lngdppc	82	8.115943	1.393526	4.706893	10.47798
maj	55	0.2363636	0.4287638	0	1
pres	55	0.3818182	0.4903101	0	1

Table 3: Baseline specification

VARIABLES	(1) repl50_1	(2) repl75_150	(3) replacem1	(4) coverage1564	(5) pengdp_91_2006
community	**-0.470*** **	**-0.512*** **	**29.54*** **	**-31.96*** **	**0.743**
	(0.150)	**(0.120)**	**(10.45)**	**(8.560)**	**(2.267)**
aut	**-0.218**	**-0.237***	**12.81**	**-1.228**	**1.819**
	(0.149)	**(0.139)**	**(8.514)**	**(3.452)**	**(1.444)**
egalnucl	**-0.359** **	**-0.461*** **	**28.50*** **	**-8.203*** **	**2.379**
	(0.162)	**(0.116)**	**(7.285)**	**(2.602)**	**(1.848)**
oecd	-0.0516	-0.0509	10.17	13.18*	4.176**
	(0.0896)	(0.0561)	(9.138)	(7.785)	(2.045)
laam	0.205	0.173	-8.536	-27.69***	-3.114
	(0.172)	(0.116)	(12.97)	(7.115)	(3.145)
africa	-0.104**	-0.00697	14.89	-1.353	-2.718**
	(0.0445)	(0.0354)	(10.05)	(5.787)	(1.087)
Constant	1.564***	1.529***	44.94***	58.53***	4.453*
	(0.153)	(0.122)	(10.53)	(7.820)	(2.311)
Observations	55	50	55	68	78
R-squared	0.314	0.378	0.185	0.661	0.360

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4: Legal origin

VARIABLES	(1) repl50_1	(2) repl75_150	(3) replacem1	(4) coverage1564	(5) pengdp_91_2006
community	**-0.348***	**-0.387****	**17.43***	**-36.96*****	**-3.094**
	(0.180)	**(0.166)**	**(10.12)**	**(7.908)**	**(2.136)**
aut	**-0.0100**	**-0.0291**	**3.132**	**-7.160**	**-1.034**
	(0.156)	**(0.156)**	**(9.235)**	**(8.077)**	**(1.526)**
egalnucl	**-0.143**	**-0.282***	**9.865**	**-10.13***	**0.332**
	(0.192)	**(0.161)**	**(11.44)**	**(5.277)**	**(1.758)**
l_eng	0.0831	0.197	-10.69	-16.87**	-5.185***
	(0.161)	(0.165)	(8.109)	(7.913)	(1.384)
l_soc	-0.190	0.0239	-0.893	7.020	1.667
	(0.146)	(0.144)	(9.834)	(10.45)	(1.913)
l_ger	-0.329*	-0.213	4.562	-8.339	0.610
	(0.175)	(0.162)	(10.84)	(6.569)	(1.801)
l_fra	-0.193	-0.0607	14.87	-14.46	-2.507**
	(0.127)	(0.121)	(10.38)	(8.994)	(1.246)
oecd	-0.102	-0.0481	4.883	18.29**	4.378*
	(0.120)	(0.103)	(12.41)	(7.116)	(2.290)
laam	0.169	0.189	-14.98	-19.88**	-2.289
	(0.187)	(0.138)	(15.47)	(7.878)	(2.846)
africa	-0.0512	0.0635	1.342	9.558*	-0.533
	(0.0646)	(0.0702)	(17.74)	(5.222)	(1.430)
Constant	1.582***	1.395***	55.74***	67.09***	8.313**
	(0.239)	(0.217)	(16.10)	(10.54)	(3.169)
Observations	55	50	55	68	78
R-squared	0.410	0.465	0.274	0.759	0.529

Table 5: Religion (1)

VARIABLES	(1) repl50_1	(2) repl75_150	(3) replacem1	(4) coverage1564	(5) pengdp_91_2006
community	**-0.441*** **	**-0.518*** **	**21.36** **	**-7.959***	**1.493**
	(0.154)	**(0.140)**	**(9.763)**	**(4.632)**	**(1.688)**
aut	**-0.230**	**-0.272***	**13.34**	**1.290**	**2.484**
	(0.167)	**(0.158)**	**(8.382)**	**(3.109)**	**(1.543)**
egalnucl	**-0.301**	**-0.515*** **	**25.55** **	**-4.183**	**6.068*** **
	(0.184)	**(0.158)**	**(10.06)**	**(4.161)**	**(1.816)**
oecd	-0.0218	-0.0340	5.801	5.675	0.437
	(0.103)	(0.0709)	(8.630)	(4.024)	(1.522)
laam	0.185	0.182	-9.600	-30.53***	-8.789***
	(0.187)	(0.124)	(13.43)	(5.612)	(1.860)
africa	-0.0804**	0.00311	-6.112	6.929	0.527
	(0.0349)	(0.0369)	(12.83)	(4.947)	(0.999)
cath1900	-0.0822	-0.00204	4.545	-0.0206	-3.221
	(0.178)	(0.141)	(19.39)	(9.672)	(5.294)
prot1900	-0.0303	-0.0872	3.023	7.061	-0.560
	(0.168)	(0.134)	(14.39)	(7.986)	(4.874)
orth1900	-0.347	-0.0142	13.50	5.183	-4.111
	(0.248)	(0.200)	(23.51)	(11.43)	(5.753)
mus1900	-0.0858	-0.0544	31.85	-38.94***	-9.189*
	(0.171)	(0.129)	(20.44)	(10.11)	(5.187)
Constant	1.603***	1.575***	45.09***	60.75***	9.572*
	(0.201)	(0.162)	(16.55)	(8.267)	(5.190)
Observations	49	49	49	47	47
R-squared	0.355	0.379	0.332	0.862	0.637

Table 6: Religion (2) Herfindal index of religious homogeneity

VARIABLES	(1) repl50_1	(2) repl75_150	(3) replacem1	(4) coverage1564	(5) pengdp_91_2006
community	**-0.580*** **	**-0.538*** **	**34.76*** **	**-20.71***	**-0.715**
	(0.141)	**(0.122)**	**(10.75)**	**(11.71)**	**(2.385)**
aut	**-0.310** **	**-0.264***	**13.42**	**2.792**	**3.120**
	(0.146)	**(0.145)**	**(9.662)**	**(6.131)**	**(2.070)**
egalnucl	**-0.472*** **	**-0.494*** **	**29.09*** **	**-3.586**	**5.555*** **
	(0.148)	**(0.112)**	**(9.577)**	**(6.288)**	**(1.983)**
oecd	-0.0835	-0.0648	7.344	9.304	1.044
	(0.0915)	(0.0654)	(9.667)	(9.180)	(1.875)
laam	0.198	0.168	-10.74	-28.73***	-8.126***
	(0.166)	(0.115)	(13.26)	(8.080)	(2.102)
africa	-0.107**	-0.0183	7.653	-12.48*	-2.683**
	(0.0419)	(0.0441)	(11.00)	(7.367)	(1.322)
herfrel1900	0.370*	0.108	-3.673	-17.92	-4.881
	(0.188)	(0.152)	(20.11)	(14.03)	(3.655)
Constant	1.378***	1.480***	49.93***	72.88***	10.46***
	(0.174)	(0.145)	(14.02)	(10.21)	(2.958)
Observations	49	49	49	47	47
R-squared	0.381	0.378	0.252	0.684	0.534

Table 7: Urban

VARIABLES	(1) repl50_1	(2) repl75_150	(3) replacem1	(4) coverage1564	(5) pengdp_91_2006
community	**-0.546*** **	**-0.535*** **	**35.11*** **	**-19.13***	**1.135**
	(0.156)	**(0.129)**	**(10.79)**	**(10.26)**	**(1.799)**
aut	**-0.233**	**-0.243***	**13.95**	**0.871**	**1.949**
	(0.148)	**(0.137)**	**(8.367)**	**(4.002)**	**(1.350)**
egalnucl	**-0.413** **	**-0.483*** **	**32.40*** **	**-0.495**	**5.495*** **
	(0.167)	**(0.125)**	**(8.414)**	**(4.155)**	**(1.514)**
oecd	-0.0288	-0.0474	8.495	8.510	1.602
	(0.0942)	(0.0574)	(9.107)	(7.970)	(1.639)
laam	0.235	0.181	-10.72	-32.89***	-7.427***
	(0.175)	(0.123)	(12.95)	(7.230)	(1.766)
africa	-0.0827*	-0.0112	13.30	-7.366	-3.295***
	(0.0433)	(0.0337)	(10.62)	(5.661)	(1.136)
urban	-3.24e-06	-1.30e-06	0.000238	0.000491***	9.14e-05***
	(2.39e-06)	(2.54e-06)	(0.000236)	(0.000140)	(2.74e-05)
Constant	1.813***	1.634***	26.66	22.22*	-0.626
	(0.240)	(0.239)	(21.14)	(13.23)	(2.448)
Observations	55	50	55	64	73
R-squared	0.338	0.382	0.208	0.753	0.541

Table 8: Democracy

VARIABLES	(1) repl50_1	(2) repl75_150	(3) replacem1	(4) coverage1564	(5) pengdp_91_2006
community	**-0.663****	**-0.543****	**44.77****	**-37.60*****	**-3.729**
	(0.306)	**(0.248)**	**(21.40)**	**(8.632)**	**(2.636)**
aut	**-0.337***	**-0.349****	**17.42**	**0.712**	**2.239***
	(0.186)	**(0.150)**	**(11.17)**	**(4.693)**	**(1.193)**
egalnucl	**-0.330**	**-0.453*****	**28.93*****	**-9.371****	**2.441***
	(0.200)	**(0.139)**	**(9.305)**	**(3.658)**	**(1.370)**
oecd	-0.217*	-0.114	6.885	9.592	0.297
	(0.119)	(0.106)	(15.08)	(5.673)	(2.228)
laam	0.00230	0.115	-11.75	-28.30***	-8.212***
	(0.198)	(0.132)	(18.20)	(7.620)	(2.429)
africa	-0.134	-0.0609	-18.07*	-7.621	-7.392**
	(0.0894)	(0.0560)	(10.46)	(5.094)	(3.025)
polity2_1900	-0.00357	0.00299	0.114	0.444	-0.0918
	(0.0127)	(0.00972)	(0.955)	(0.366)	(0.0900)
Constant	1.755***	1.587***	48.09**	60.68***	9.344***
	(0.237)	(0.194)	(18.91)	(6.762)	(2.574)
Observations	34	33	34	39	45
R-squared	0.265	0.355	0.275	0.863	0.535

Table 9: GDP and Share of elderly

VARIABLES	(1) repl50_1	(2) repl75_150	(3) replacem1	(4) coverage1564	(5) pengdp_91_2006
community	**-0.583*** **	**-0.591*** **	**38.07*** **	**-14.76*** **	**0.915**
	(0.179)	**(0.146)**	**(11.53)**	**(4.596)**	**(1.435)**
aut	**-0.203**	**-0.232***	**12.51**	**-4.331**	**0.467**
	(0.148)	**(0.136)**	**(8.791)**	**(3.898)**	**(1.138)**
egalnucl	**-0.365** **	**-0.487*** **	**31.28*** **	**-13.02*** **	**2.243**
	(0.173)	**(0.127)**	**(8.843)**	**(4.157)**	**(1.359)**
oecd	0.0453	0.0142	3.427	-2.484	0.00698
	(0.118)	(0.0812)	(10.89)	(3.541)	(1.410)
laam	0.118	0.122	-6.369	-5.984	-1.292
	(0.190)	(0.121)	(15.89)	(5.345)	(1.813)
africa	-0.142**	-0.0459	15.26	1.682	0.422
	(0.0552)	(0.0646)	(13.47)	(3.230)	(0.707)
pop_65_2000	-0.00870	-0.00274	0.0504	2.655***	0.670***
	(0.00703)	(0.00570)	(0.978)	(0.424)	(0.106)
lngdppc	-0.0652	-0.0636	5.812*	5.650***	0.418
	(0.0494)	(0.0571)	(3.419)	(1.837)	(0.323)
Constant	2.230***	2.132***	-6.655	-18.35	-4.454*
	(0.481)	(0.545)	(33.20)	(15.49)	(2.509)
Observations	54	49	54	65	75
R-squared	0.350	0.393	0.204	0.885	0.742

Table 10: Electoral rules and forms of government

VARIABLES	(1) repl50_1	(2) repl75_150	(3) replacem1	(4) coverage1564	(5) pengdp_91_2006
community	**-0.399***	**-0.495****	**18.85**	**-36.62*****	**-3.310***
	(0.197)	**(0.192)**	**(11.57)**	**(10.75)**	**(1.669)**
aut	**-0.0943**	**-0.182**	**0.359**	**-12.96***	**-1.372**
	(0.220)	**(0.201)**	**(10.05)**	**(7.552)**	**(1.426)**
egalnucl	**-0.287**	**-0.438****	**19.11****	**-18.71****	**1.906**
	(0.194)	**(0.162)**	**(7.290)**	**(7.114)**	**(1.545)**
maj	0.188	0.0906	-17.50***	-15.60**	-3.830***
	(0.198)	(0.175)	(6.152)	(7.456)	(1.006)
pres	-0.176	-0.149	1.665	-8.651	-1.001
	(0.167)	(0.152)	(9.593)	(6.410)	(0.667)
oecd	-0.0865	-0.0836	9.918	5.619	1.052
	(0.113)	(0.0712)	(10.62)	(7.794)	(1.424)
laam	0.366	0.303	-11.36	-26.83***	-7.564***
	(0.252)	(0.195)	(14.30)	(7.382)	(1.632)
Constant	1.489***	1.519***	57.46***	77.94***	10.46***
	(0.223)	(0.195)	(13.24)	(10.69)	(1.790)
Observations	41	39	41	46	52
R-squared	0.257	0.339	0.255	0.736	0.584

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 11: Individual preferences and strength of ancestors' family ties

VARIABLES	(1) natsoc	(2) aidold	(3) spretire	(4) equal4
age	-0.0125***	-0.0141***	-0.0124**	0.0252***
	(0.00254)	(0.00498)	(0.00480)	(0.00710)
agesq	0.000147***	0.000163***	0.000150***	-0.000210**
	(2.42e-05)	(4.90e-05)	(4.92e-05)	(7.57e-05)
income	0.00520	0.0232***	0.0205**	0.0266**
	(0.00385)	(0.00442)	(0.00773)	(0.0122)
educ	0.0367***	0.0580***	0.0746***	0.0744***
	(0.00563)	(0.00537)	(0.00505)	(0.00976)
polviews	0.0424***	0.105***	0.0601***	0.110***
	(0.00368)	(0.0121)	(0.0112)	(0.0301)
community	**-0.00722**	**-0.185*** **	**-0.247*** **	**-0.282***
	(0.0279)	**(0.0505)**	**(0.0449)**	**(0.152)**
aut	**-0.0290**	**-0.0920***	**-0.0769***	**-0.143**
	(0.0206)	**(0.0531)**	**(0.0384)**	**(0.104)**
egalnucl	**-0.0824*** **	**-0.224*** **	**-0.143*** **	**-0.230***
	(0.0274)	**(0.0294)**	**(0.0486)**	**(0.120)**
Constant	1.070***	0.661***	1.344***	0.254
	(0.113)	(0.163)	(0.133)	(0.192)
Observations	17113	3085	2469	841
R-squared	0.045	0.107	0.077	0.109

Figure 1: Pension design and family ties

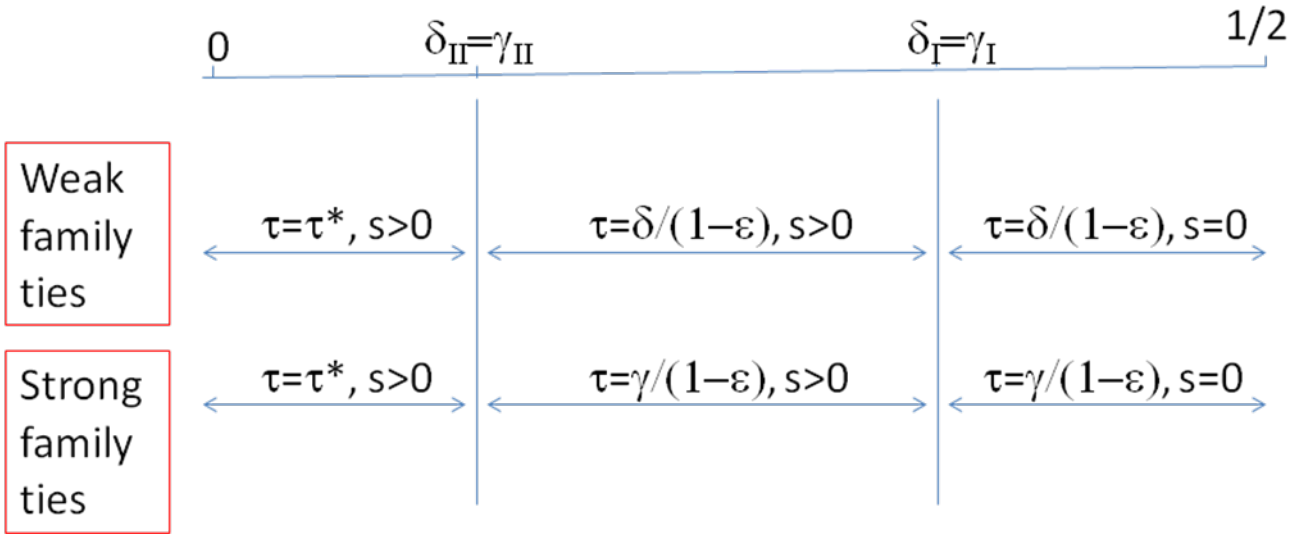

figure 2: The four groups

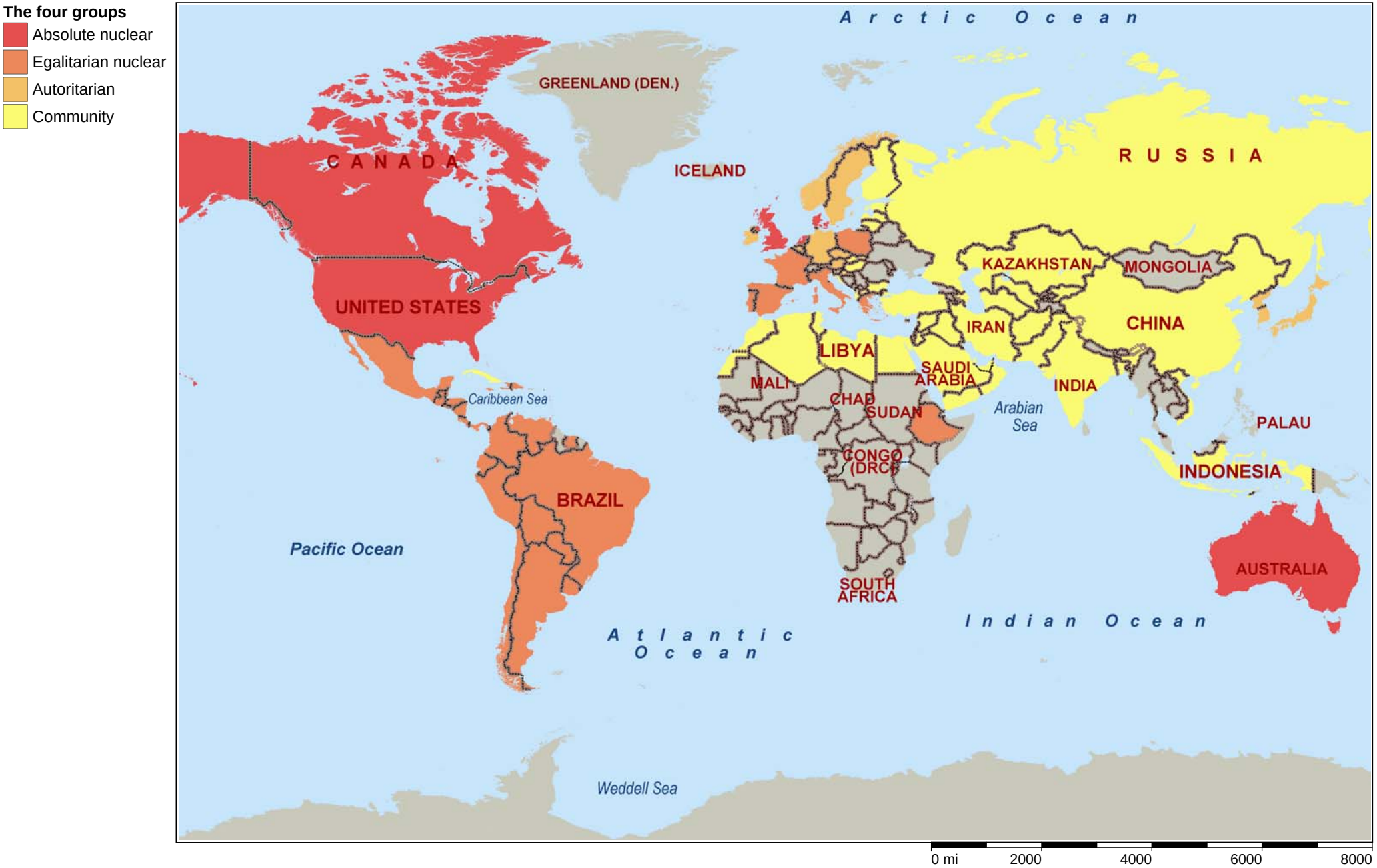

figure 3: The redistributive design of pensions: repl50_1

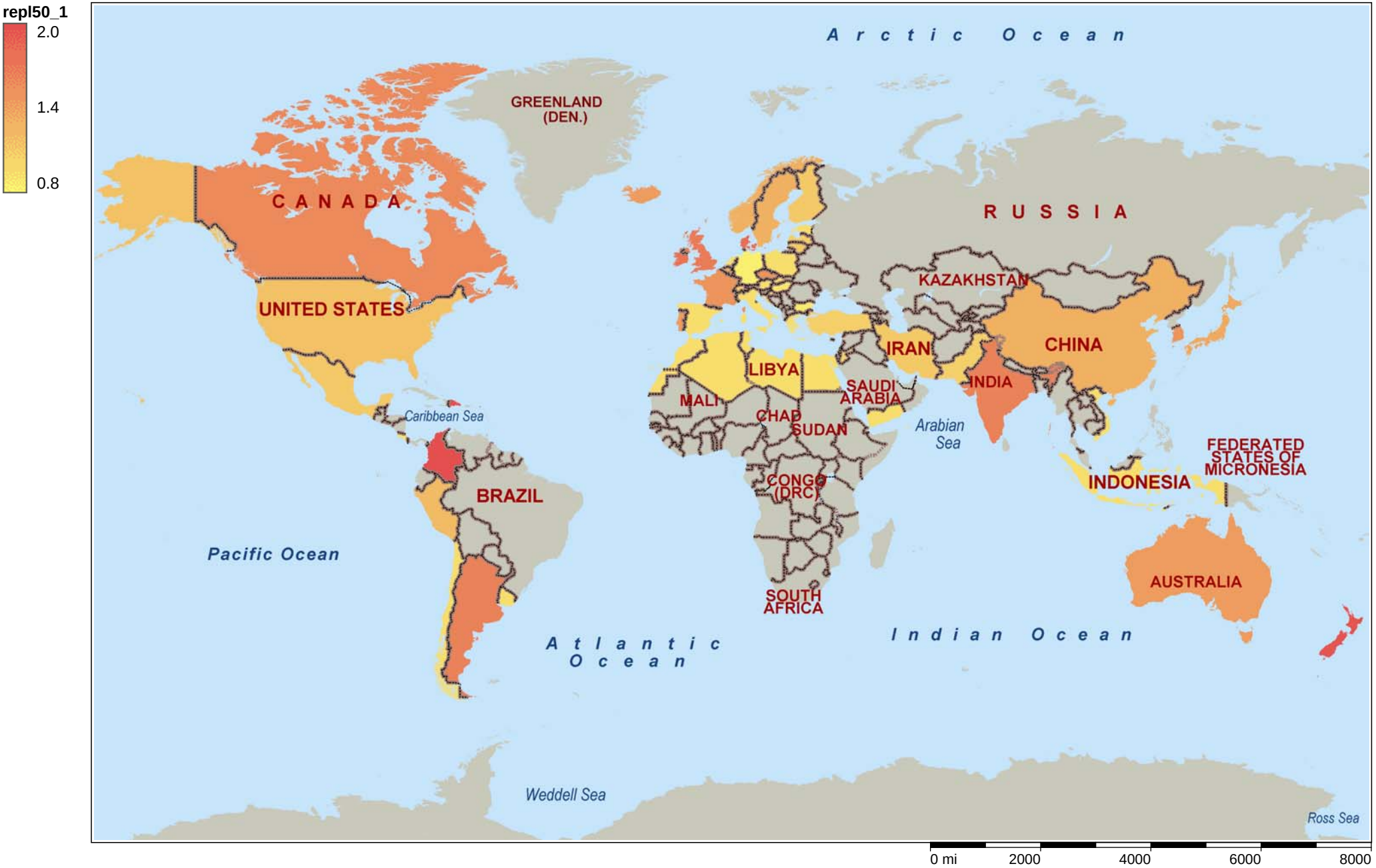

figure 4: The redistributive design of pensions: repl75_150

figure 5: Legal origins

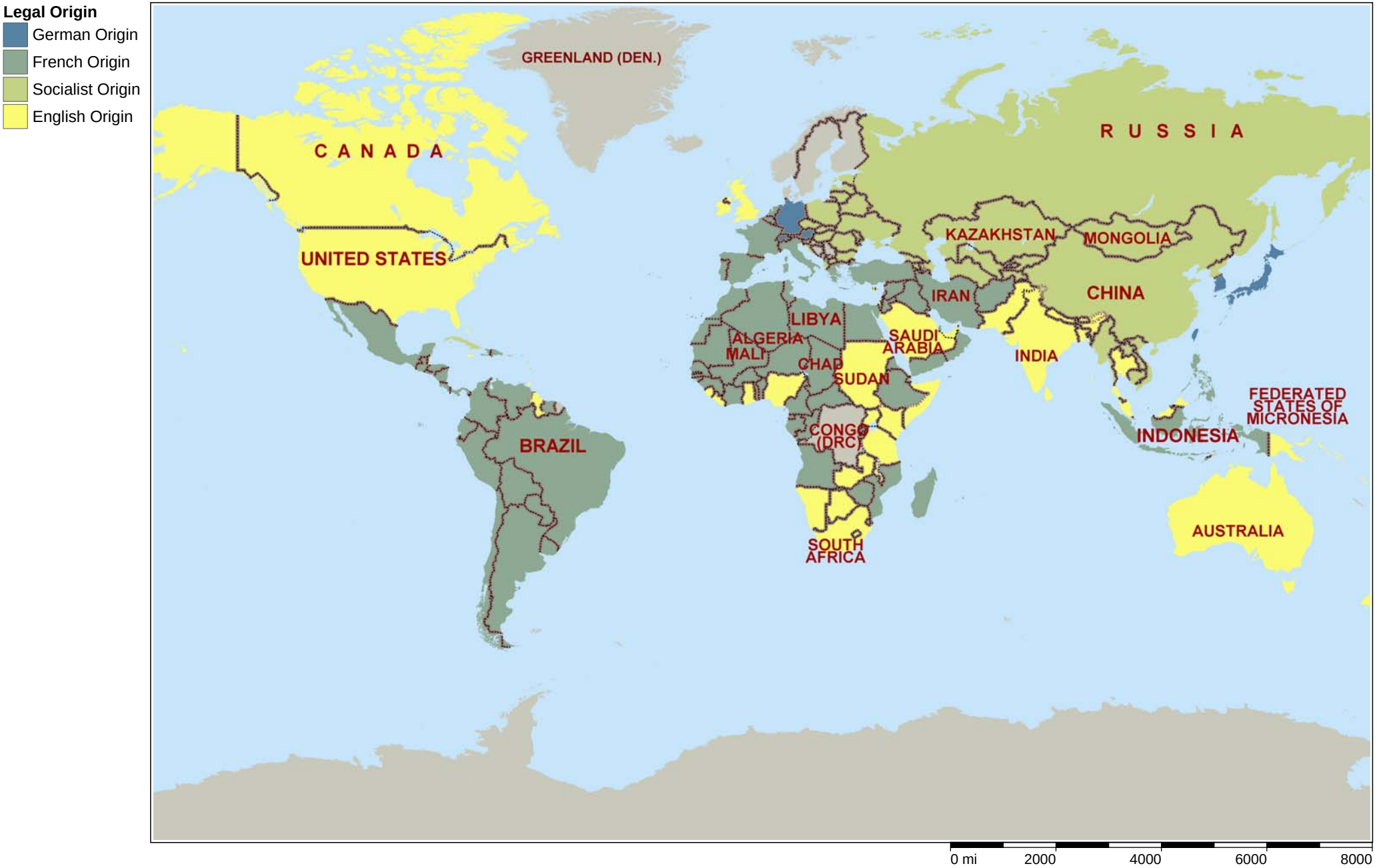

figure 6: Religion