Working paper

2014-20

Fairness, socialization and the cultural demand for redistribution

Gilles Le Garrec
OFCE-Sciences Po

December 2014

ofce

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Abstract

When studying redistributive attitudes, surveys show that individuals do care about fairness. They also show that the cultural environment in which individuals grow up affects their preferences about redistribution. In this article we include these two components of the demand for redistribution in order to develop a mechanism for the cultural transmission of the concern for fairness. The preferences of the young are partially shaped through the observation and imitation of others' choices in a way that is consistent with the socialization process. More specifically, observing during childhood how adults have collectively failed to implement fair redistributive policies lowers the concern for fairness or the moral cost of not supporting fair taxation. Based on this mechanism, the model exhibits a multiplicity of history-dependent steady states that may account for the huge and persistent differences in redistribution observed between Europe and the United States. It also explains why immigrants from countries with a preference for greater redistribution continue to support higher redistribution in their destination country.

Keywords: redistribution, fairness, majority rule, socialization, endogenous preferences

JEL: H53, D63, D72, D03

1 Introduction

When studying redistributive attitudes, in a departure from traditional economics surveys show that individuals do care about fairness (Fong, 2001; Corneo and Grüner, 2002; Alesina and La Ferrara, 2005; Corneo and Fong, 2008; Alesina and Giuliano, 2011). More specifically, they underline that people tend to support more redistribution if they believe that poverty is caused by factors beyond an individual's control, such as luck. Besides, surveys stress the strong cultural component in the demand for redistribution (Guiso et al., 2006; Alesina and Fuchs-Schündeln, 2007; Luttmer and Singhal, 2011; Alesina and Giuliano, 2011). In particular, Luttmer and Singhal (2011) and Alesina and Giuliano (2011) show that, after controlling for individual characteristics, immigrants from countries with a preference for greater redistribution continue to support very significantly higher redistribution in their destination country. Taken together, these findings are also consistent with those of Corneo (2001), which support the view that individuals in high-redistributive countries such as West Germany exhibit a greater concern for fairness than individuals in low-redistributive countries such as the United States[1]. Accordingly, the intensity of the concern for others appears to some degree to be culturally shaped at young ages and to stop changing after reaching adulthood[2]. Understanding the development of an agent's preferences when young and the role of the cultural context are then of great importance in explaining individual demands for redistribution, and hence

[1]Note nevertheless that while in Corneo (2001) the preferences of Americans seem to be driven exclusively by egoistic goals, their willingness to pay for distributive justice amounts to about 20% of their disposable income in Corneo and Fong (2008).

[2]Supporting this view, psychologists McCrae and Costa (1994) have shown that personality traits stop changing after age 30. See Roberts and DelVecchio (2000) for a discussion.

the diversity in redistributive policies in democratic countries.

Following robust empirical evidence that fairness and culture are two important components of redistributive attitudes, in this article we propose a mechanism for the cultural transmission of the strength of the moral norm or concern for distributive justice. Through socialization, taste is shaped by the observation, imitation[3] and internalization of cultural practices. More specifically, we argue that the observation during childhood of redistributive policies that are far from what would be perceived as fair results in a weakened concern for distributive justice. From this perspective, our approach is close to that in the literature on crime, which shows that the incentive to behave in a certain manner depends on the degree to which we see others acting in this way. As argued by Funk (2005), the strength of the social crime norm is measured by the moral costs that arise from committing a crime. Therefore, as is well established in this literature, if it is observed that many others are commiting crimes, the remorse or guilt felt from breaking the social norm is weakened. Our approach is also close to the work of Lindbeck et al. (1999, 2003), whose model shows that the individual guilt and social stigma linked to living on benefits decreases with the number of beneficiaries. In contrast with Funk (2005) and Lindbeck et al. (1999, 2003), in our setting the choice is not binary. Therefore, to identify the deviation from the moral norm we replace the fraction of deviators by the distance of the collective choice from the norm. This way, we can apprehend the intensity of the deviation from the norm more properly. Our approach is also closely related to Cervelatti et al. (2010). However, in our model, to characterize the socialization process

[3] In the evolutionary literature, learning from others by imitation is a cheap and efficient way to acquire locally relevant information for adaptation. Accordingly, the propensities to learn and to imitate are part of an evolved psychology shaped by natural selection (Boyd and Richerson, 1985; Boyd et al., 2011).

and the persistence of preferences over generations, deviating from the norm affects preferences with a delay of one generation. The moral cost of not supporting fair taxation is reduced when observing how the previous generation has collectively failed to implement a fair institution.

As a first result of our intergenerational and cultural transmission mechanism, assuming that the level of redistribution perceived as fair is higher than the level selfishly preferred, we explain that immigrants from countries with a preference for greater redistribution continue to support higher redistribution in their destination country because they have a stronger concern for distributive justice. This result is also consistent with the findings of Corneo (2001). As a second result, the persistent differences in redistribution between the United States and Europe are explained through multiple steady states. Indeed, we show that if people are socialized in an environment whose practices and institutions are close to (but lower than) what is perceived as fair, the redistributive institution and the concern for fairness co-evolve and are self-reinforcing such that the cultural transmission process ends with the implementation of the high redistribution level. By contrast, if people are socialized in an environment that is too far from what is perceived as fair, then internalization of the observed norm "you should behave according to your own interests" reduces individual responsibility regarding moral duty. In that case, the cultural transmission process ends with the implementation of the low redistribution level.

At steady state, our model satisfyingly reproduces the fact that redistribution is higher in (continental) Europe than in the United States while market income inequality appears lower in the former. From this perspective, our paper also builds on the literature and extends the canonical model of Meltzer and Richard[4] (1981) to improve its main prediction that greater income inequality results in greater redistribution – a prediction which has only weak support in the data[5]. The mechanism we propose is most closely related to the theoretical literature analysing through which channels the concern for others' well-being may explain the differences in redistributive policies observed among democracies. The latter has focused mostly either on beliefs or on group membership. If people care about the population's welfare when considering redistribution, Piketty (1995) shows that international differences in the level of redistribution (when countries share identical economic fundamentals) can be explained by different beliefs about the return to effort sustained by an imperfect learning process[6]. With income depending on both effort and luck, Alesina and Angeletos (2005) show that cultural variability in the level of redistribution arises as a multiplicity of equilibria resulting from different self-fulfilled beliefs. Because they expect low redistribution, Americans invest in their human capital and generate conditions for low redistribution by reducing the importance of luck in the determination of income. Conversely, by expecting a high redistribution, Europeans invest less in their human capital and support more redistribution later. In the

[4] Its three dimensions have been extended: economic (Bénabou, 2000; Desdoigts and Moizeau, 2005; de Freitas, 2012; Bredemeier, 2014), political (Roemer 1998; Rodriguez, 2004; Iversen and Soskice, 2006; Campante, 2011) and behavioral (Bénabou and Ok, 2001; Bénabou and Tirole, 2006). See Alesina and Glaeser (2004), Campante (2011) and Acemoglu et al. (2013) for overviews.

[5] See Perotti (1996), Gouveia M. and Masia (1998), Moene and Wallerstein (2001), de Mello and Tiongson (2006), and Iversen and Soskice (2006).

[6] In this approach, false beliefs about social mobility occur accidentally. In a different vein, Bénabou and Tirole (2006) argue that children are actively endoctrinated with these false beliefs by their parents, not for altruistic purposes but to transmit to them the value that the world is just.

second strand of the literature, people are supposedly (more or exclusively) altruistic toward the members of their own group, or the group they identify with. In this context, Lind (2007) and Lindqvist and Östling (2013) show that ethnic fractionalization reduces redistribution. In the spirit of Gilens (1999), they then propose that differences in redistribution between Europe and the United States are sustained by a difference in ethnic fractionalization. Somewhat differently, in Shayo (2009), this difference is sustained because Americans (especially the poor) tend to think of themselves more as members of the nation as a whole rather than as members of a social class, and in any case more so than Europeans. The mechanism we propose provides then a new explanation for the huge and persistent difference of redistribution observed between Europe and the United States based on the intergenerational and cultural transmission of the strength of the concern for fairnesss.

The rest of the paper is organized as follows. We present in section 2 an endogenous mechanism of the formation of preferences based on socialization. In section 3, based on this mechanism and assuming that the perception of the fair level of taxation is exogenous and unanimously shared in the population, we show that our model exhibits multiple steady states consistent with the negative correlation between income inequality and redistribution encountered in the data. We also explain why immigrants from countries with a preference for greater redistribution continue to support higher redistribution in their destination country. In section 4, we extend and verify the robustness of our results by considering endogenous and heterogenous views of what is fair. We conclude briefly in the last section.

2 The social determinants of preferences

To characterize the socialization process, we consider an overlapping generations model in which each individual lives for two periods: childhood and adulthood. People are educated and socialized during childhood, and through this process they internalize the cultural practices that will influence their behavior when they become adults. As adults, they work and consume in order to maximize their utility. Adult individuals also vote on income redistribution.

2.1 Inequity aversion

As underlined in the introduction, an abundant literature shows that people's demand for redistribution reflects that they do indeed care about the equity of market income distribution, where factors beyond one's control such as luck characterize the level of unfairness. Accordingly, following Piketty (1995), Alesina and Angeletos (2005) and Bénabou and Tirole (2006), we assume that income of an adult at date t is determined conjointly by luck and by effort such that:

$$y_{it} = A_i e_{it} + \eta_i \tag{1}$$

where e_{it} denotes his effort and η_i his luck (or bad luck), unknown before the income distribution and such that $E_0 [\eta_i] = 0$ (see Fig. 1). $A_i \geq 0$ characterizes individual talent or ability. (A_i, e_{it}, η_i) is assumed to be private information to agent i, A_i and η_i being independent and identically distributed (i.i.d) across agents. We then associate any market income distribution with a distribution perceived as fair by the population and with an optimal linear redistributive tax rate $\tau^f \in [0, 1]$ that would allow to implement the

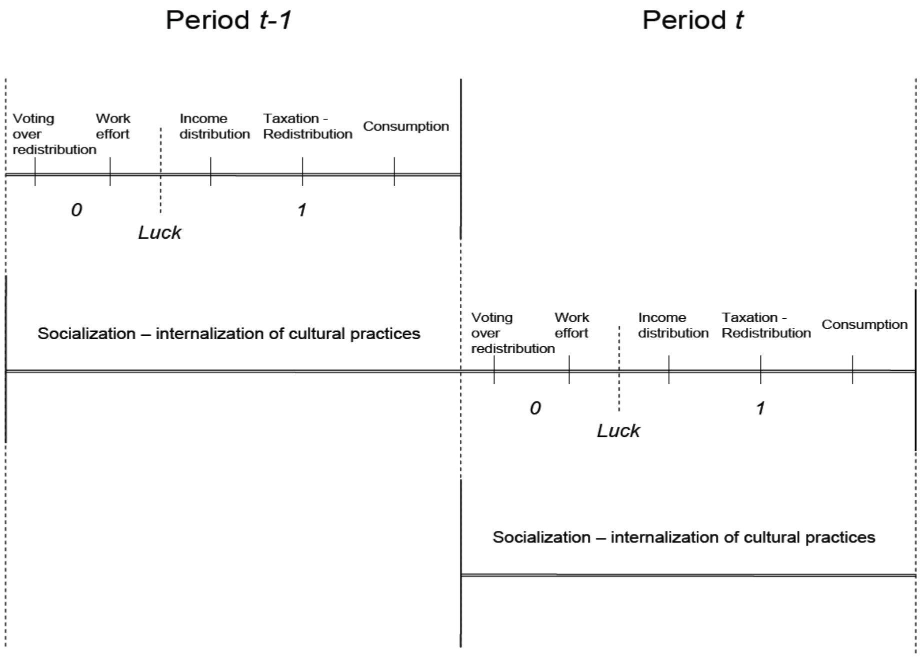

Figure 1: Timing of actions

fair income distribution. In Alesina and Angeletos (2005), this level of redistribution is obtained endogenously and is at the basis of the multiplicity of equilibria. In contrast, for the clarity of our purposes, we will consider first that the level of redistribution perceived as fair is exogenous and unanimously shared in the population. We will investigate the limits of these assumptions in section 4. We then consider an extended version of the Bolton-Ockenfels model (2000) of distributive preferences in specifying the utility function as follows:

$$U_{it} = u_{it} - \varphi_{t-1} \left(\tau^f - \tau_t\right)^2 \tag{2}$$

where u_{it} denotes the private utility from personal consumption and work effort, and $\varphi_{t-1} > 0$ the strength of the concern for fairness or inequity aversion that we assume was shaped during childhood.

Assuming as in Boldrin and Montes (2005) and Docquier et al. (2007) that children's consumption is part of their parents' consumption, we then specify the private utility as follows:

$$u_{it} = c_{it} - \frac{e_{it}^2}{2} \tag{3}$$

where c_{it} denotes household consumption (one adult - one child) at date t. Utility grows with consumption and decreases with effort. The quadratic disutility of effort is for analytical simplicity. At each period t, the government redistribute the income according to a simple fiscal scheme characterized by a flat-rate tax τ_t and a lump-sum benefit g_t provided to all adults. Assuming a balanced budget, this yields $g_t = \tau_t \bar{y}_t$, where $\bar{y}_t$ denotes the mean income at date t. As a consequence, each adult faces the following budget constraint:

$$c_{it} = y_{it}(1 - \tau_t) + \tau_t \bar{y}_t \tag{4}$$

2.2 Socialization

To incorporate social forces into individual behavior, one privileged way is by considering the formation of agents' preferences[7]. Preferences are to some degree socially determined so that agents internalize preferences that reflect the cultural practices of the society they inhabit. Through the process of socialization, young individuals internalize, by imitation and learning, preferences that will influence their behavior when they become adults and will explain the persistence of the cultural practices.

[7]See Postlewait (2011) for an overview of the different approaches in the economic literature linking individual behaviors and social environment.

Assume then that the distributive preferences of an individual youth at date $t-1$ are influenced by the observation of the social environment and its degree of fairness. Denoting by τ^*_{t-1} the effective level of taxation at date $t-1$ while τ^f is the level perceived as fair, we can characterize the social environment by the social distance to distributive justice

$$\mathcal{S}_{t-1} = \int_i \left[\tau^f - \tau^*_{t-1}\right]^2 di \tag{5}$$

The higher $\mathcal{S}_{t-1}$, the more unfair the redistributive system perceived by the population. As the effective level of taxation τ^*_{t-1} results from a collective choice of the adults at date $t-1$ through voting, a significant $\mathcal{S}_{t-1}$ reveals a low weight attached to the moral norm adherence and a failure in implementing fair taxation. This low weight is therefore transmitted to the young generation through observation and imitation. Denoting $\varphi_{t-1} = \Phi\left(\mathcal{S}_{t-1}\right)$, we will then assume in the following that $\Phi' \leq 0$. Our mechanism is closely related to that of Lindbeck et al. (1999, 2003) and Funk (2005), where the disutility of deviating from the norm is non-increasing in the fraction of deviators. However, in our setting the choice is not a binary choice between working full-time or living off benefits, as in Lindbeck et al. (1999, 2003), or following the law or committing a crime, as in Funk (2005). Therefore, to determine the deviation from the moral norm we replace the fraction of deviators by the distance between the collective choice and the norm. In addition, in our model, to characterize the socialization process, the impact on preferences of deviating from the norm applies with a delay of one generation. The moral cost of not supporting a fair taxation is reduced when observing how the previous generation has collectively failed to implement a fair institution. Note that, contrary to Bisin and Verdier (2001) and Bénabou and Tirole (2006), the intergenerational cultural transmision mechanism we underline occurs through passive observation and imitation of society at large, not through active behaviors of the parents to transmit values. As highlighted by the empirical findings of Dohmen et al. (2012), those two aspects of the cultural transmission process are relevant in influencing child attitudes.

In light of these preferences, in the following section we study the resulting individual demands for redistribution and the policy that will be implemented in a democracy.

3 Redistributive policies in democracies

The economy is populated by a continuum of mass 1 of individuals at each generation endowed with utilities (2) and characterized by their specific effort e_i, their specific talent A_i and their specific luck η_i. As already mentioned, A_i and η_i are i.i.d across agents. The optimal effort resulting from the maximization of the expected utility $E_{0t}\left[U_{it}\right]$ is as follows:

$$e_{it} = A_i\left(1-\tau_t\right) \tag{6}$$

As redistribution lowers the market return to effort, it reduces the effort. In addition, as the return to effort grows with ability, more talented individuals work harder. Considering eq. (6), the pre-tax income (1) of an adult at date t can be rewritten as:

$$y_{it} = a_i\left(1-\tau_t\right)+\eta_i \tag{7}$$

where $a_i = A_i^2$. As the level of effort is reduced by redistribution, obviously the pre-tax income is also reduced.

3.1 The individual demands for redistribution

Considering eqs. (3)-(4) and (6)-(7), maximizing utility (2) with respect to the redistributive tax rate results in the following individual demands for redistribution at date t:

$$\tau_{it} = \begin{cases} \frac{\bar{a}-a_i+2\Phi(\mathcal{S}_{t-1})\tau^f}{2\bar{a}-a_i+2\Phi(\mathcal{S}_{t-1})} & \text{if } a_i - \bar{a} \leq 2\Phi\left(\mathcal{S}_{t-1}\right)\tau^f \\ 0 & \text{otherwise} \end{cases} \tag{8}$$

where $\bar{a}$ denotes the mean a_i. Assuming $\max_i\{a_i\} \leq 2\bar{a}$ is a sufficient condition so that preferences are single-peaked in τ_t. Individual demands for redistribution as specified in eq. (8) decrease with personal income, $\frac{\partial \tau_{it}}{\partial a_i} \leq 0$, and increase with the level of redistribution perceived as fair, $\frac{\partial \tau_{it}}{\partial \tau^f} \geq 0$. By exhibiting both selfish and fair motives, eq. (8) is consistent with empirical surveys (Fong, 2001; Corneo and Grüner, 2002; Alesina and La Ferrara, 2005; Corneo and Fong, 2008; Alesina and Giuliano, 2011). Eq. (8) also reflects the fact that adults' demands for redistribution at date t are affected by the cultural environment in which they have grown up. More specifically, if the level of redistribution perceived as fair by an individual of type i is higher than the level of redistribution he would have chosen under the selfish motive, then the degree of unfairness in the environment when young will lower his demand for redistribution: $\tau^f \geq \left.\frac{\bar{a}-a_i}{2\bar{a}-a_i}\right|_{\max_i\{a_i\}\leq 2\bar{a}} \Leftrightarrow \frac{\partial \tau_{it}}{\partial \mathcal{S}_{t-1}} \leq 0$. Denoting by $\tau_{a_i t}$ the demand for redistribution of an individual of type a_i, it follows then from eq. (8) that:

Proposition 1 $\tau^f \geq \frac{1}{2}$ *and* $\tau^*_{t-1} \leq \tau^f$ *yields* $\frac{\partial \tau_{a_i t}}{\partial \tau^*_{t-1}} \geq 0 \; \forall a_i \, (\leq 2\bar{a})$.

Following Proposition 1, the specific effect of being an immigrant coming from a high redistribution country is then to support higher redistribution compared to native individuals of the same type a_i. Indeed, consider two representative individuals of type a_i who have grown up at date $t-1$ in two different countries D and F characterized by $\tau_{t-1}^{*D} \geq \tau_{t-1}^{*F}$, everything else being equal. In that case, according to Proposition 1 we will observe $\tau_{a_it}^{F,D} \geq \tau_{a_it}^{D,D}$, where $\tau_{a_it}^{x,z}$ is the demand for redistribution of an adult of type a_i at date t living in country z and having grown up in country x. From this perspective, if assuming $\tau^f \geq \frac{1}{2}$ and $\tau_{t-1}^* \leq \tau^f$, the demands for redistribution as expressed in eq. (8) are consistent with the empirical findings of Guiso et al. (2006), Alesina and Giuliano (2011) and Luttmer and Singhal (2011). This is also consistent with the findings of Corneo (2001). Individuals in high-redistributive countries such as West Germany exhibit a greater concern for fairness than individuals in low-redistributive countries such as the United States.

3.2 The majority rule

We now assume that, in a democracy, any policy to be implemented must be supported by a majority[8]. In our model, under the sufficient condition $\max_i \{a_i\} \leq 2\bar{a}$, preferences are single-peaked in τ. Thus the median-voter theorem applies. Define $\Delta = \bar{a} - a_m$, where a_m denotes the median a_i that we normalize $a_m = 2$. Assuming standardingly that the distribution of a is skewed to the right yields $\Delta \geq 0$. It follows from eq. (8) that the tax rate chosen under majority rule can be expressed as[9] $\tau_t^* = \frac{\Delta + 2\Phi(\mathcal{S}_{t-1})\tau^f}{2(1+\Delta+\Phi(\mathcal{S}_{t-1}))}$. Denote by $\tau^s = \frac{\Delta}{2(1+\Delta)}$ the tax rate chosen under majority rule if individuals were driven only by their self-interest, i.e. if $\varphi_{t-1} = 0$. This *selfish* tax rate exhibits the standard Meltzer-Richard effect: as income inequality rises, the

[8] As put forward by Corneo and Neher (2014), democracies implement to a large degree the level of redistribution demanded by the median voter.

[9] We implicitly assume that an immigrant of the first generation cannot vote in his new country.

median voter is poorer compared with the average, and then support a higher redistribution: $\frac{\partial \tau^s}{\partial \Delta} \geq 0$. The dynamics of redistribution under majority rule can then be expressed as a convex combination of the purely interested and the purely intuitively fair tax rates such that:

$$\tau_t^* = \xi_{t-1}\tau^s + \left(1 - \xi_{t-1}\right)\tau^f \tag{9}$$

where $\xi_{t-1} = \frac{1+\Delta}{1+\Delta+\Phi(\mathcal{S}_{t-1})} \in (0,1)$. Defining any local steady state τ^* as verifying $\left.\frac{d\tau_t^*}{d\tau_{t-1}^*}\right|_{\tau^*} \leq 1$, this then yields:

Proposition 2 *If $\Phi(0)$ is sufficiently high, $\frac{|\Phi'(0)|}{\Phi^2(0)}$ bounded, $\Phi\left(\left[\tau^f - \tau^s\right]^2\right)$ sufficiently low and $\left|\Phi'\left(\left[\tau^f - \tau^s\right]^2\right)\right|\left[\tau^f - \tau^s\right]^2 \leq \frac{1+\Delta}{2}$, there exists (at least) two local steady states τ^{US} and τ^{EU} characterized by $\tau^s \leq \tau^{US} < \tau^{EU} \leq \tau^f$.*

To understand this result, consider at date t the utility of the median voter $U_{mt} = u_{mt} - \varphi_{t-1}\left(\tau^f - \tau_t^*\right)^2$. We observe first that his optimal choice concerning redistribution, i.e. the level that will be implemented under majority rule at date t, is as close to the fair level as φ_{t-1} is high. Therefore, if people are socialized in an environment whose practices and institutions reflect intuitive fairness, i.e. the distance between τ^f and τ_{t-1}^* is weak, φ_{t-1} will be high and τ_t^* will stay close to τ^f in the next period. More precisely, if $\tau_{t-1}^* \in \left(\tau^{EU} - \tilde{\delta}, \tau^{EU}\right)$ where $\tilde{\delta} \geq 0$ is low enough and τ^{EU} close enough to τ^f, as $0 \leq \left.\frac{d\tau_t^*}{d\tau_{t-1}^*}\right|_{\tau^f} \leq 1$ $\left(\text{if } \frac{|\Phi'(0)|}{\Phi^2(0)} < +\infty\right)$ it yields $\tau_t^* > \tau_{t-1}^*$, $\left[\tau^f - \tau_t^*\right]^2 < \left[\tau^f - \tau_{t-1}^*\right]^2$ and then $\varphi_t > \varphi_{t-1}$. The generation that is young at date t is socialized in an environnement that is closer to the fair institution than the previous generation. Hence, they will support an institution that will be closer to fairness. This cultural transmission process ends with the implementation of the high redistribution level characterized by the tax rate τ^{EU}. The redistributive institution and the concern for fairness coevolve and are self-reinforcing such that $\lim_{t\to+\infty} \tau_t^* = \tau^{EU}$ and $\lim_{t\to+\infty} \varphi_{t-1} = \bar{\varphi}$. Note that if $\Phi(0) = +\infty$, then $\bar{\varphi} = +\infty$ and $\tau^{EU} = \tau^f$. In that case, if starting sufficiently close to the fair institution, the coevolution process will tend to implement the fair institution. In addition, as the deviation from the tax rate perceived as fair becomes infinitely large, this steady state is characterized with a complete conformism in the preferred redistribution level: $\tau_{i\infty} = \tau^f$ $\forall i$ even if individuals earn heterogenous income.

Consider alternatively that people are socialized in an environment where practices and institutions do not reflect the intuitive fairness: internalization of the observed norm "you should behave according to your own interests" will reduce individual responsibility regarding the intuitive moral duty. This yields that the concern for fairness φ_{t-1} is low, and the redistributive institution will stay far from fairness the next period. More precisely, if $\tau_{t-1}^* \in \left(\tau^{US}, \tau^{US} + \tilde{\delta}\right)$ where $\tilde{\delta} \geq 0$ is low enough and τ^{US} close enough to τ^s, as $0 \leq \left.\frac{d\tau_t^*}{d\tau_{t-1}^*}\right|_{\tau^s} \leq 1$ $\left(\text{if } \left|\Phi'\left(\left[\tau^f - \tau^s\right]^2\right)\right| \left[\tau^f - \tau^s\right]^2 \leq \frac{1+\Delta}{2}\right)$ it yields $\tau_t^* < \tau_{t-1}^*$, $\left[\tau^f - \tau_t^*\right]^2 > \left[\tau^f - \tau_{t-1}^*\right]^2$ and then $\varphi_t < \varphi_{t-1}$. In this case, the concern for fairness as well as the level of redistribution are decreasing with time such that $\lim_{t\to+\infty} \tau_t^* = \tau^{US} < \tau^f$ and $\lim_{t\to+\infty} \varphi_{t-1} = \underline{\varphi} < \bar{\varphi}$.

Under the conditions in Proposition 2, the convergence towards different steady states depends only on the initial level of redistribution. The dynamics of redistribution is then history-dependent. In order to have a more global view of this dynamics, let us consider the following function $\Phi(\mathcal{S}_{t-1}) = \frac{\alpha}{\beta + \mathcal{S}_{t-1}}$. We can first note that this function has good properties when considering Proposition 2. Indeed, it exhibits $\lim_{\frac{\alpha}{\beta}=+\infty} \Phi(0) = +\infty$, $\lim_{\alpha=0^+} \Phi\left(\left[\tau^f - \tau^s\right]^2\right) = 0$, $\frac{|\Phi'(0)|}{\Phi^2(0)} = \frac{1}{\alpha}$ and $|\Phi'(\mathcal{S})| \mathcal{S}^2 = \frac{\alpha}{\left(1+\frac{\beta}{\mathcal{S}}\right)^2}$. Second, if $\beta = 0$, we can specify conveniently the entire dynamics, which gives us:

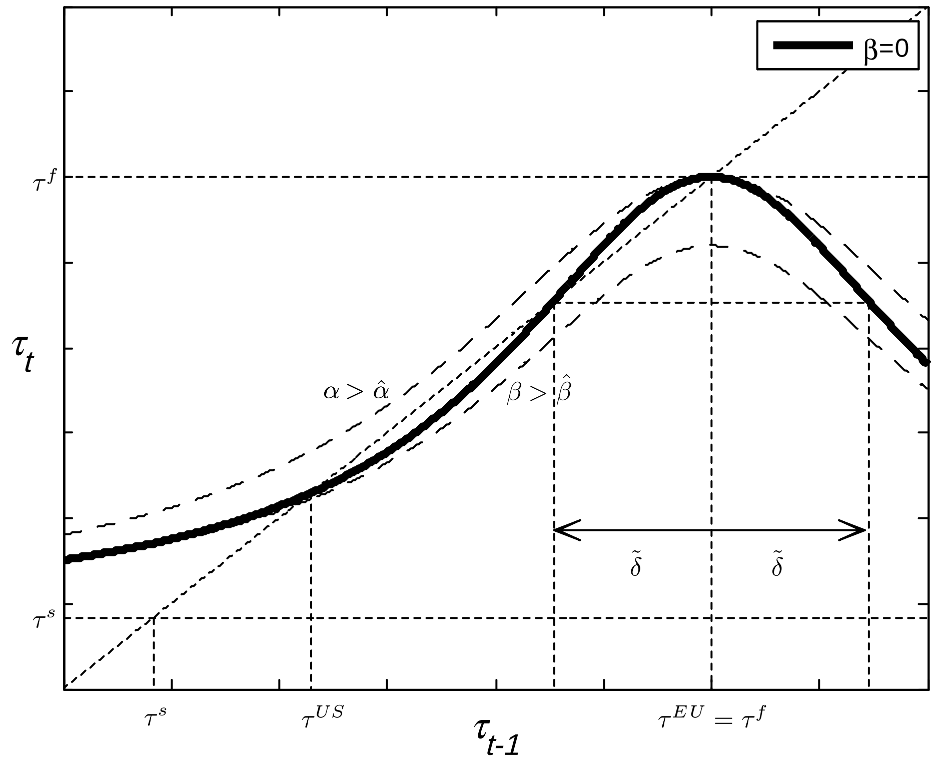

Figure 2: Multiplicity and history dependance of redistribution

Proposition 3 *Define* $\Phi(\mathcal{S}_{t-1}) = \frac{\alpha}{\beta+\mathcal{S}_{t-1}}$ *and denote* $\frac{\hat{\alpha}}{\left(\tau^f-\tau^s\right)^2} = \frac{1+\Delta}{4}$*. Assuming* $0 < \alpha \leq \hat{\alpha}$ *then there exists* $\hat{\beta} \geq 0$*,* $\delta_1 \geq 0$ *and* $\delta_2 \geq 0$ *such that* $\beta \leq \hat{\beta}$ *yields if* $\tau_0 \in \left(\tau^f - \tilde{\delta}_1; \tau^f + \tilde{\delta}_2\right)$ *then* $\lim\limits_{t\to\infty} \tau_t^* = \tau^{EU}$*, otherwise* $\lim\limits_{t\to\infty} \tau_t^* = \tau^{US}$*, where* $\tau^s < \tau^{US} < \tau^{EU} \leq \tau^f$*,* $\lim\limits_{\beta=0} \tau^{EU} = \tau^f$*,* $\lim\limits_{\beta=0} \tau^{US} = \frac{1}{2}\left(\tau^f + \tau^s - \sqrt{\left(\tau^f - \tau^s\right)^2 - \frac{4\alpha}{1+\Delta}}\right)$*,* $\lim\limits_{\beta=\hat{\beta}} \tilde{\delta}_1 = \lim\limits_{\beta=\hat{\beta}} \tilde{\delta}_2 = 0$ *and* $\lim\limits_{\beta=0} \tilde{\delta}_1 = \lim\limits_{\beta=0} \tilde{\delta}_2 = \frac{\tau^f-\tau^s-\sqrt{\left(\tau^f-\tau^s\right)^2-\frac{4\alpha}{1+\Delta}}}{2}$ *(Fig 2).*

Compared with Proposition 1, the condition $\Phi(0)$ sufficiently high corresponds to $\beta \leq \hat{\beta}$ and the condition $\Phi\left(\left[\tau^f - \tau^s\right]^2\right)$ sufficiently low to $\alpha \leq \hat{\alpha}$. The history dependence of redistribution is then garantee only if both $\alpha \leq \hat{\alpha}$ and $\beta \leq \hat{\beta}$. By contrast, if $\alpha > \hat{\alpha}$ (while $\beta \leq \hat{\beta}$), there exists only one steady state, which is $\tau^* = \tau^{EU}$. Indeed, in that case, the distance between the existing institution and the fair one cannot be high enough to reduce the concern for fairness sufficiently and stop the convergence towards the high-redistribution steady state. Note that, as $\tau^f - \tau^s \leq 1$, $\tilde{\varphi} > \frac{1+\Delta}{4}$ is a sufficient condition such that $\tau^* = \tau^{EU}$ is the unique steady state. Alternatively, if $\beta > \hat{\beta}$ (while $\alpha \leq \hat{\alpha}$), the concern for fairness is always too low to initiate any convergence towards the high-redistribution steady state. The only steady state is then $\tau^* = \tau^{US}$, where $\lim\limits_{\beta=+\infty} \tau^{US} = \tau^s$.

If $\alpha \leq \hat{\alpha}$ and $\beta \leq \hat{\beta}$, persistent differences in redistribution can exist over long periods as they are linked to different preferences for redistribution sustained by a process of cultural transmission. As underlined in Proposition 1, if $\tau^f \geq \frac{1}{2}$ this may explain why immigrants from countries with a preference for greater redistribution continue to support higher redistribution in their destination country. In addition, as a high level of redistribution lowers the level of effort in the economy, a high-redistribution country is characterized by a lower level of income inequality. Our model then also provides a rationale for the negative correlation between income inequality and redistribution encountered in the data.

Note importantly that all our results have been obtained while assuming a constant and unanimously shared level of redistribution perceived as fair. However, as the level of effort decreases with redistribution, as mentioned in Alesina and Angeletos (2005), the importance of luck in the income determination increases, and we should observe a level of redistribution perceived as fair that is lower in the low-redistribution steady state than in the high. This suggests that the perception of fairness is endogenous to the level of taxation. In addition, due in particular to different concepts of distributive justice, it is likely that individuals have different perceptions of the just level of redistribution within a same country. In the next section, we investigate whether incorporating endogenous and heterogenous perceptions at the country level (ex-post) and at the individual level (ex-ante) fits with our mechanism of cultural transmission so as to explain the differences in redistribution observed between Europe and the United States.

4 Endogenous perceptions and robustness of the mechanism

To characterize the level of redistribution that would be perceived as socially optimal, studies show that individual merit is an important principle at both the individual and aggregate levels. As shown by Alesina, Glaeser and Sacerdote (2001) for example, the belief that luck rather than effort determines income[10] is a strong predictor of the national level of redistribution. How-

[10] From World Values Survey data, they highlight that 54% of Europeans versus 30% of Americans believe that *luck rather than effort determines income.*

ever, individual merit cannot sum up all the principles of distributive justice. Forsé and Parodi (2006) show for example that European countries share an identical hierarchy of moral principles: first, the guarantee of basic needs; second, merit; and far less important, equality of income. In addition, deontological principles such as "people should get what they deserve" can conflict with another moral concept, the greater good for all, i.e. the utilitarian concept of social justice initiated by Bentham and Stuart Mill. A great deal of literature has showed experimentally in recent years that these conflicts between deontological principles and utilitarism, which form the basis of moral dilemmas, are far from being of marginal importance, and are indeed a general feature of moral thinking (see Greene, 2008; Sinnott-Armstrong, 2008; Cushman and Young, 2009). Accordingly, based on individual merit, we first develop a more satisfying specification of the distributive justice perception. Second, we introduce a moral dilemma to underline that heterogenous perceptions are very likely between individuals. In both cases, we verify that these altenatives still fit with our mechanism to explain the differences in redistribution observed between Europe and the United States.

4.1 Individual merit

According to meritocratic theories, wealth and income should be distributed to match individual merit, which is usually understood as some combination of talent and hard work. In our setting, we can then define a deserved or fair income as $y_{it}^{f} = A_i e_{it}$, i.e. only related to individual talent and effort. In such a meritocratic perspective, luck as defined in the model is an unfair component of income. In that case, the level of redistribution perceived as fair should be such that $\frac{\partial \tau^f}{\partial \hat{\eta}} \geq 0$ and $\tau^f\left(\hat{\eta} = 0\right) = 0$, where $\hat{\eta} = \int_i |\eta_i|\, di$ characterises the importance of luck in the income determination. Reciprocally, if the entire income determination is characterized only by luck, i.e. $y_{it} = \eta_i \; \forall i$, equality of income appears intuitively fair as exhibited in the lab (see Bolton and Ockenfels, 2000, Fehr and Schmidt, 2006). Any relevant specification of the fair tax perception should be such that $\frac{\partial \tau^f}{\partial \bar{e}} \leq 0$ and $\tau^f(\bar{e} = 0) = 1 \; \forall \hat{\eta} > 0$, where $\bar{e} = \int_i e_i di$ denotes the mean effort and characterizes the importance of effort in the income determination. Accordingly, as the mean level of effort is decreasing linearly with the redistributive tax such that $\bar{e}(\tau = 1) = 0$ (eq. 6), we specify conveniently the level of redistribution perceived as fair under the individual merit principle as[11]:

$$\mathcal{T}^f(\tau) = \underline{\tau}^f + \left(1 - \underline{\tau}^f\right)\tau \tag{10}$$

where $0 < \underline{\tau}^f \leq 1$ if $\hat{\eta} > 0$. Introducing the new perception of fairness as defined in eq. (10) into utility (2) then yields $U_{it} = u_{it} - \varphi_{t-1}\left[\underline{\tau}^f(1 - \tau_t)\right]^2$. Assuming in addition that $\varphi_{t-1} = \Phi(\mathcal{S}_{t-1}) = \frac{\alpha}{\mathcal{S}_{t-1}}$ allows us to rewrite the utility as $U_{it} = u_{it} - \frac{\alpha}{(1-\tau_{t-1})^2}(1 - \tau_t)^2$, and the dynamics of redistribution

[11] In Alesina and Angeletos (2005) the tax level perceived socially as fair is defined as $\mathcal{T}^f(\tau) = \arg\min_{\tau' \in [0,1]} \left\{ \int_i \left(u_i^d - u_i^f\right)^2 di \right\}$, where $u_i^f = A_i e_i(\tau) - \frac{e_i(\tau)^2}{2}$ denotes the level of utility perceived as fair for an adult of type i, and $u_i^d = [A_i e_i(\tau) + \eta_i](1 - \tau') + \tau' A_i \bar{e}(\tau) - \frac{e_i(\tau)^2}{2}$ the effective level of utility after redistribution. This then yields $\mathcal{T}^f(\tau) = \frac{\sigma_\eta^2}{\sigma_\eta^2 + (1-\tau)^2 \sigma_a^2}$, where σ_η^2 and σ_a^2 denote respectively the variance of η and a. Using this function appears unattractive for our purpose. Indeed, if asuming $\frac{\sigma_\eta^2}{\sigma_a^2} \leq \frac{1}{4}$, equation $\tau = \mathcal{T}^f(\tau)$ would exhibit two or three real roots that are particularly uninformative and irrelevant concerning our mechanism. Uninformative because the mechanism underlying these multiple roots is closely related to the mechanism described in Alesina and Angeletos (2005), and not to ours. And irrelevant because, if assuming that $\Phi(0) = +\infty$, these three real roots are also three steady states with unsatisfactory properties. Indeed, any individual coming from a country characterized by one of these steady states and living in a country characterized by one of the two other steady states would have a strictly similar attitude toward redistribution as a native with the same characteristics.

becomes $\tau_t^* = \xi_{t-1}\tau^s + \left(1-\xi_{t-1}\right)$ where $\xi_{t-1} = \frac{1+\Delta}{1+\Delta+\frac{\alpha}{(1-\tau_{t-1})^2}}$. Following Proposition 3, this then yields straightforwardly:

Corollary 4 *Define* $\Phi\left(\mathcal{S}_{t-1}\right) = \frac{\alpha}{\mathcal{S}_{t-1}}$ *and* $\mathcal{T}^f\left(\tau\right) = \underline{\tau}^f + \left(1-\underline{\tau}^f\right)\tau$, $0 < \underline{\tau}^f \leq 1$. *If* $0 < \alpha \leq \frac{1+\Delta}{4}\left(1-\tau^s\right)^2$ *the model exhibits two steady states* τ^{US} *and* τ^{EU} *such that* $\tau^s < \tau^{US} = \frac{1}{2}\left(1+\tau^s - \sqrt{\left(1-\tau^s\right)^2 - \frac{4\alpha}{1+\Delta}}\right) < \tau^{EU} = 1$.

Assuming that $\Phi\left(\mathcal{S}_{t-1}\right) = \frac{\alpha}{\mathcal{S}_{t-1}}$, then at first glance Corollary 4 seems to involve that defining the level of redistribution perceived as fair as in eq. (10) is strictly similar to setting $\tau^f = 1$. Indeed, the dynamics and therefore the levels of redistribution obtained both in the low and in the high-redistribution steady states do not depend on $\underline{\tau}^f$, which can be in particular $\underline{\tau}^f = 1$, i.e. $\mathcal{T}^f\left(\tau\right) = 1\ \forall\tau$. However, defining τ^f as in eq. (10) has important consequences in terms of the perception of fairness in different countries. Indeed, at steady states, the higher the level of redistribution, the higher the level of redistribution perceived as fair: $\mathcal{T}^f\left(\tau^{US}\right) < \mathcal{T}^f\left(\tau^{EU}\right)$. In addition, if assuming $\mathcal{T}^f\left(\tau^{US}\right) \geq \frac{1}{2}$, or equivalently $\underline{\tau}^f \geq \frac{\frac{1}{2}-\tau^{US}}{1-\tau^{US}}$, so that Proposition 1 holds, this also yields that $\tau_{a_i}^{US,US} = \sup\left(\frac{\bar{a}-a_i+\frac{2\alpha}{(1-\tau^{US})^2}}{2\bar{a}-a_i+\frac{2\alpha}{(1-\tau^{US})^2}}, 0\right) \leq \tau_{a_i}^{EU,US} = \mathcal{T}^f\left(\tau^{US}\right) < \tau_{a_i}^{EU,EU} = \mathcal{T}^f\left(\tau^{EU}\right)$. Compared with the previous section using a constant perception of fairness, an individual socialized when young in the high-redistribution country will support less redistribution if he moves as an adult in the low-redistribution country (because the perceived inequity in the income distribution appears lower), while still supporting a higher redistribution in his destination country than do the natives.

Considering this result, one may express concern about its generality and relevancy when observing that $\tau^{EU} = \mathcal{T}^f\left(\tau^{EU}\right) = 1$ in the case studied. However, following Proposition 3, this can be generalized with $\Phi\left(\mathcal{S}_{t-1}\right) =$

$\frac{\alpha}{\beta+\mathcal{S}_{t-1}}$ so that $0 < \beta \leq \hat{\beta}\left(\underline{\tau}^f\right)^2$ yields $\tau^{EU} < 1$ and then $\mathcal{T}^f\left(\tau^{EU}\right) < 1$. More deeply, $\tau^{EU} = \mathcal{T}^f\left(\tau^{EU}\right) = 1$ results also from having the individual merit as the only principle governing the perception of distributive justice.

4.2 Moral dilemma and heterogeneity

In addition to the deontological principle "people should get what they deserve", consider distributive justice as also governed by the utilitarian concept so that the pure utilitarist redistributive taxation is define as $\tau^{\bar{u}} = \arg\max_{\tau\in[0,1]}\left\{\int_i u_{it}di\right\}$. Obviously, as people are risk-neutral in our setting, this optimal utilitarist redistributive taxation is nil, $\tau^{\bar{u}} = 0$. In that case, the deontological and utilitarist minds provide two different answers to the question of distributive justice[12]. Assuming that this moral dilemma is resolved with a unique perception specified by $\tau^f\mathcal{T}^f(\tau)+\left(1-\tau^f\right)\tau^{\bar{u}}$, where $\tau^f \in [0,1]$ denotes the intensity of the deontologist mind compared to the utilitarist, we can redefine utility as $U_{it} = u_{it} - \varphi_{t-1}\left[\tau^f\mathcal{T}^f(\tau_t) - \tau_t\right]^2$. Following Proposition 3 and Corollary 4, this then yields that if $\Phi\left(\mathcal{S}_{t-1}\right) = \frac{\alpha}{\mathcal{S}_{t-1}}$, $\tau^f \in \left[\frac{1}{2}, 1\right]$ and $0 < \alpha \leq \hat{\alpha}$ the model exhibits two steady states τ^{US} and τ^{EU} with good properties such that $\tau^s < \tau^{US} = \frac{1}{2}\left(\tau^f + \tau^s - \sqrt{\left(\tau^f - \tau^s\right)^2 - \frac{4\alpha}{1+\Delta}}\right) < \tau^{EU} = \tau^f$. In this way, the concern about having $\tau^{EU} = 1$ has been addressed. Going one step further, knowing that τ^f characterizes one type of personality, there is no objective reason to consider that each individual would be char-

[12] In the new synthesis in moral psychology, the deontological and utilitarist signals are conveyed through dissociable psychological processes. Conversely to traditional philosophy, this literature shows through functional neuroimaging that the deontological signal is associated with an emotional answer, while the utilitarist signal is associated with an unemotional reasoning (see Greene, 2008; Sinnott-Armstrong, 2008; Cushman and Young, 2009).

acterized with the same personality. Therefore, assuming for simplicity and with no loss of generality that $\underline{\tau}^f = 1$, we consider new utilities specified as $U_{it} = u_{it} - \varphi_{t-1}\left[\tau_i^f - \tau_t\right]^2$, where τ_i^f is assumed i.i.d across individuals, i.e. that each individual is associated with a deontologist intensity τ_i^f irrespective of his own income.

As τ_i^f is i.i.d across agents, the social distance between the perceived social optimal tax rate and the chosen one at date $t-1$, $\mathcal{S}_{t-1} = \int_i \left[\tau_i^f - \tau_{t-1}^*\right]^2 di$, can be expressed as:

$$\mathcal{S}_{t-1} = \sigma_{\tau^f}^2 + \left[\bar{\tau}^f - \tau_{t-1}^*\right]^2 \tag{11}$$

where $\bar{\tau}^f$ and $\sigma_{\tau^f}^2$ denote respectively the mean and the variance of τ_i^f. If $\sigma_{\tau^f}^2 = 0$, the perception of $\bar{\tau}^f$ as the fair redistribution is unanimously shared in the society. It is the case in section 3. By contrast, if $\sigma_{\tau^f}^2$ is high, $\bar{\tau}^f$ is of low significance in the population for defining a shared norm of fair level of redistribution. Therefore, everything else being equal, the social distance between the perceived social optimal tax rate grows with the variance of τ_i^f. If the distributions of a_i and τ_i^f are both symetric, the pivotal voter is the individual with the mean talent $\bar{a}$[13] and the mean personality and perception $\bar{\tau}^f$ (see Di Tella and Dubra, 2013). The dynamics of redistribution under majority rule can then be expressed as

$$\tau_t^* = \frac{\Phi\left(\mathcal{S}_{t-1}\right)}{1 + \Phi\left(\mathcal{S}_{t-1}\right)} \bar{\tau}^f \tag{12}$$

and this yields according to Proposition 3:

Corollary 5 *Define* $\Phi\left(\mathcal{S}_{t-1}\right) = \frac{\alpha}{\mathcal{S}_{t-1}}$. *If* $0 < \alpha \leq \hat{\alpha}$ *and* $\sigma_{\tau^f}^2 \leq \hat{\beta}$ *the model exhibits two steady states* τ^{US} *and* τ^{EU} *such that* $\tau^s\,(=0) < \tau^{US} < \tau^{EU} \leq \bar{\tau}^f$,

[13] In that case, $\tau^s = 0$ and the model can no longer exhibit the Meltzer-Richard effect.

$$\lim_{\sigma^2_{\tau^f}=0} \tau^{US} = \frac{1}{2}\left(\bar{\tau}^f - \sqrt{\left(\bar{\tau}^f\right)^2 - 4\alpha}\right) \textit{ and } \lim_{\sigma^2_{\tau^f}=0} \tau^{EU} = \bar{\tau}^f.$$

As stated by Corollary 5, the existence of multiple steady states does not rely on the assumption that the perception of the fair redistributive tax is unanimously shared in the population, i.e. $\sigma^2_{\tau^f} = 0$. In addition, even if assuming $\Phi(0) = +\infty$, as long as $0 < \sigma^2_{\tau^f} \leq \hat{\sigma}^2_{\tau^f}$ then the high-redistribution steady state is no longer characterized by a complete conformism in the preferred levels of redistribution. As a consequence, this high-redistribution steady state exhibits a level of redistribution that is lower than the mean fair level $\bar{\tau}^f$. Interestingly, if $\sigma^2_{\tau^f} > \hat{\beta}$, then the unique steady state is the low-redistribution one. Indeed, in that case, the significance of $\bar{\tau}^f$ is too low in the population to define a reliable norm of fairness. The concern for fairness is then too low to initiate any convergence towards a high-redistribution steady state. If assuming that $\tau^f_i \in [0, 1]$, we can no longer assert that coming from a high-redistribution country is a sufficient condition to support a higher redistribution. In particular, if we consider an individual of type $\left(a_i, \tau^f_i = 0\right)$, the more intense the person's concern for distributive justice, the lower the support for redistribution. However, after controlling for observable individual characteristics, only types $\left(a_i, \bar{\tau}^f\right)$ are considered. Therefore, we only need to assume $\bar{\tau}^f \geq \frac{1}{2}$ to be consistent with surveys.

5 Conclusion

If it is accepted that humans are driven solely by self-interest, Meltzer and Richard (1981) show that the level of redistribution in a democratic society is increased by inequality in the income distribution. However, this result has only weak support in the data. In this paper, we argue that the failure of the canonical model is due in part to its behavioral assumptions. Departing from traditional economics, empirical studies and individual surveys show that individuals do care about fairness in their demand for redistribution. These studies also show that the cultural environment in which individuals grow up affects their preferences about redistribution. We include these two components of the demand for redistribution in order to propose a mechanism for the cultural transmission of the concern for fairness. The preferences of the young are partially shaped through observation and imitation of other's choices in a way that is consistent with the socialization process. More specifically, observing during childhood how adults have collectively failed to implement fair redistributive policies lowers the concern for fairness or the moral cost of not supporting a fair taxation. Based on this mechanism and assuming that the perception of the fair level of taxation is exogenous and unanimously shared in the population, the model exhibits a multiplicity of history-dependent steady states that may account for the huge and persistent differences in redistribution observed between Europe and the United States. It also explains why immigrants from countries with a high preference for redistribution continue to support higher redistribution in their destination country. These results have been shown to be robust for extended specifications of the perception of the fair level of taxation, in particular if they are heterogenous across individuals.

In the specifications we have used, we have considered for simplicity childhood only as a passive period during which individuals are socialized and internalize cultural practices. However, childhood is also a crucial period during which individuals can actively invest in their human capital through effort at school. Knowing that effort at school depends on the expected return, which is negatively impacted by the future level of redistribution, introducing education explicitly in our model would result in a dynamic of redistribution that is driven not only by history but also by expectations. From this perspective, incorporating investment in human capital in the present analysis appears to be a promising avenue for further research.

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Appendix. Proof of Propositions and Corollaries

Proposition 1

From eq. (8) it follows that:

$$\tau_{a_i t} = \begin{cases} \frac{\bar{a}-a_i+2\Phi(\mathcal{S}_{t-1})\tau^f}{2\bar{a}-a_i+2\Phi(\mathcal{S}_{t-1})} & \text{if } a_i - \bar{a} \leq 2\Phi\left(\mathcal{S}_{t-1}\right)\tau^f \\ 0 & \text{otherwise} \end{cases}$$

Accordingly, it yields:

$$\frac{\partial \tau_{a_i t}}{\partial \tau^*_{t-1}} = \begin{cases} -4\Phi' \frac{\tau^f(2\bar{a}-a_i)-(\bar{a}-a_i)}{(2\bar{a}-a_i+2\Phi(\mathcal{S}_{t-1}))^2}\left[\tau^f - \tau^*_{t-1}\right] & \text{if } a_i - \bar{a} \leq \frac{\tilde{\varphi}}{\sigma^2_{\tau^f}+\left[\bar{\tau}^f-\tau^*_{t-1}\right]^2}\tau^f \\ 0 & \text{otherwise} \end{cases}$$

Therefore, if $\tau^f \geq \left.\frac{\bar{a}-a_i}{2\bar{a}-a_i}\right|_{\max_i\{a_i\}\leq 2\bar{a}}$ and $\tau^*_{t-1} \leq \tau^f$, $\frac{\partial \tau_{a_i t}}{\partial \tau^*_{t-1}} \geq 0$. As $\tau^f \geq \frac{1}{2}$ yields $\tau^f \geq \frac{\bar{a}-a_i}{2\bar{a}-a_i}$ $\forall a_i \leq 2\bar{a}$, it follows that if $\tau^f \geq \frac{1}{2}$ and $\tau^*_{t-1} \leq \tau^f$, $\frac{\partial \tau_{a_i t}}{\partial \tau^*_{t-1}} \geq 0$ $\forall a_i \leq 2\bar{a}$.

Proposition 2

As the dynamics of redistribution is specified as $\tau^*_t = \xi_{t-1}\tau^s + \left(1-\xi_{t-1}\right)\tau^f$ where $\xi_{t-1} = \frac{1+\Delta}{1+\Delta+\Phi\left(\left[\tau^f-\tau^*_{t-1}\right]^2\right)}$ and $\Phi\left(\left[\tau^f - \tau^*_{t-1}\right]^2\right) \geq 0$, any root τ^* of the stationary equation is such that $\tau^* \in \left[\tau^s, \tau^f\right]$. As $\Phi' \leq 0$, consider first the case where $\Phi(0)$ is high enough such that $\Phi(0) = +\infty$. In that case, $\tau^* = \tau^f$ is a root of the stationary equation. Consider in another case that $\Phi\left(\left[\tau^f - \tau^s\right]^2\right)$ such that $\Phi\left(\left[\tau^f - \tau^s\right]^2\right) = 0$. This yields that $\tau^* = \tau^s$ is also a root of the stationary equation.

Consider now that any root must verify in their neighborhood $\left|\frac{d\tau^*_t}{d\tau^*_{t-1}}\right| \leq 1$ to be considered as a local steady state of the dynamic process, where $\frac{d\tau^*_t}{d\tau^*_{t-1}} = 2\left|\Phi'\left(\left[\tau^f - \tau^*\right]^2\right)\right|\left(\tau^f - \tau^s\right)\left(\tau^f - \tau^*\right)\frac{1+\Delta}{\left[1+\Delta+\Phi\left(\left[\tau^f-\tau^*\right]^2\right)\right]^2} \geq 0$. Therefore, if

$\Phi(0) = +\infty$ and $\frac{|\Phi'(0)|}{\Phi(0)} < +\infty$, $\left.\frac{d\tau_t^*}{d\tau_{t-1}^*}\right|_{\tau^*=\tau^f} = 0$ and $\tau^* = \tau^f$ is a steady state of the dynamic process (9). In addition, if $\Phi\left(\left[\tau^f - \tau^s\right]^2\right) = 0$ and $\left|\Phi'\left(\left[\tau^f - \tau^s\right]^2\right)\right| \left(\tau^f - \tau^s\right)^2 \leq \frac{1+\Delta}{2}$, $\left.\frac{d\tau_t^*}{d\tau_{t-1}^*}\right|_{\tau^*=\tau^f} \leq 1$ and $\tau^* = \tau^s$ is a also a steady state of the dynamic process. Therefore, we can assert that if $\Phi(0)$ is sufficiently high, $\frac{|\Phi'(0)|}{\Phi^2(0)}$ is bounded, $\Phi\left(\left[\tau^f - \tau^s\right]^2\right)$ is sufficiently low and $\left|\Phi'\left(\left[\tau^f - \tau^s\right]^2\right)\right| \left[\tau^f - \tau^s\right]^2 \leq \frac{1+\Delta}{2}$, there exists two local steady states τ^{US} and τ^{EU} characterized by $\tau^s \leq \tau^{US} < \tau^{EU} \leq \tau^f$.

Proposition 3

Let us define $\Phi(\mathcal{S}_{t-1}) = \frac{\alpha}{\beta + \mathcal{S}_{t-1}}$ and $\delta_t = \tau^f - \tau_t^*$ the difference between the mean fair and the effective level of taxation. Assuming first that $\beta = 0$, eq. (9) can be rewritten as:

$$\delta_t = \frac{1+\Delta}{1+\Delta+\frac{\alpha}{\delta_{t-1}^2}}\left(\tau^f - \tau^s\right) \tag{13}$$

and stationarity is then defined by:

$$\delta^3 - \left(\tau^f - \tau^s\right)\delta^2 + \frac{\alpha}{1+\Delta}\delta = 0 \tag{14}$$

If $\frac{\alpha}{\left(\tau^f-\tau^s\right)^2} \leq \frac{1+\Delta}{4}$, eq. (14) exhibits three real roots $\delta = 0$, $\delta = \frac{\tau^f-\tau^s+\sqrt{\left(\tau^f-\tau^s\right)^2 - \frac{4\alpha}{1+\Delta}}}{2}$ and $\delta = \frac{\tau^f-\tau^s-\sqrt{\left(\tau^f-\tau^s\right)^2 - \frac{4\alpha}{1+\Delta}}}{2}$.

In addition, as $\frac{1+\Delta}{1+\Delta+\frac{\alpha}{\delta_{t-1}^2}}\left(\tau^f - \tau^s\right)$ is continuous and monotonous in δ_{t-1}^2, as $\frac{\partial\left[\frac{1+\Delta}{1+\Delta+\frac{\alpha}{\delta_{t-1}^2}}\left(\tau^f-\tau^s\right)\right]}{\partial\delta_{t-1}^2} \geq 0$, and as $\lim_{\delta_{t-1}^2 \to 0} \frac{\partial\left[\frac{1+\Delta}{1+\Delta+\frac{\alpha}{\delta_{t-1}^2}}\left(\tau^f-\tau^s\right)\right]}{\partial\delta_{t-1}^2} = 0$, if $\tau^f - \tau^s \geq 2\sqrt{\frac{\tilde{\varphi}}{1+\Delta}}$, there exists two steady states characterized by $\left|\frac{d\delta_t}{d\delta_{t-1}}\right| \leq 1$ which are $\delta = 0$ and $\delta = \frac{\tau^f-\tau^s+\sqrt{\left(\tau^f-\tau^s\right)^2 - \frac{4\alpha}{1+\Delta}}}{2}$, where $\tau^s = \frac{\Delta}{2(1+\Delta)}$ and $\Delta = \bar{a} - a_m$.

In addition, as long as $|\delta_0| < \frac{\tau^f-\tau^s-\sqrt{\left(\tau^f-\tau^s\right)^2-\frac{4\alpha}{1+\Delta}}}{2}$, $\lim\limits_{t\to\infty}\delta_t = 0$, otherwise $\lim\limits_{t\to\infty}\delta_t = \frac{\tau^f-\tau^s+\sqrt{\left(\tau^f-\tau^s\right)^2-\frac{4\alpha}{1+\Delta}}}{2}$.

Equivalently, as $\delta_t = \tau^f - \tau_t^*$, we can assert that assuming $\frac{\alpha}{\left(\tau^f-\tau^s\right)^2} \leq \frac{1+\Delta}{4}$, if $\tau_0 \in \left]\tau^f - \tilde{\delta}; \tau^f + \tilde{\delta}\right[$ then $\lim\limits_{t\to\infty}\tau_t^* = \tau^f$, otherwise $\lim\limits_{t\to\infty}\tau_t^* = \frac{1}{2}\left(\tau^f + \tau^s - \sqrt{\left(\tau^f - \tau^s\right)^2 - \frac{4\alpha}{1+\Delta}}\right)$, where $\tilde{\delta} = \frac{\tau^f-\tau^s-\sqrt{\left(\tau^f-\tau^s\right)^2-\frac{4\alpha}{1+\Delta}}}{2}$.

Besides, the dynamic process enxhibits only one steady state τ_L if β is large enough such that $\lim\limits_{\beta=+\infty}\xi = 1 \Leftrightarrow \lim\limits_{\beta=+\infty}\tau_L = \tau^s$.

As $\frac{\partial\xi}{\partial\beta} > 0$ and $\lim\limits_{\tau^*=\tau^f}\xi = 0$, it follows that if $\frac{\alpha}{\left(\tau^f-\tau^s\right)^2} \leq \frac{1+\Delta}{4}$ there exists $\hat{\beta} \geq 0$, $\delta_1 > 0$ and $\delta_2 > 0$ such that $\beta \leq \hat{\beta}$ yields if $\tau_0 \in \left(\tau^f - \tilde{\delta}_1; \tau^f + \tilde{\delta}_2\right)$ then $\lim\limits_{t\to\infty}\tau_t^* = \tau^{EU}$, otherwise $\lim\limits_{t\to\infty}\tau_t^* = \tau^{US}$, where $\tau^s < \tau^{US} < \tau^{EU} \leq \tau^f$, $\lim\limits_{\beta=0}\tau^{EU} = \tau^f$, $\lim\limits_{\beta=0}\tau^{US} = \frac{1}{2}\left(\tau^f + \tau^s - \sqrt{\left(\tau^f - \tau^s\right)^2 - \frac{4\alpha}{1+\Delta}}\right)$, $\lim\limits_{\beta=0}\tilde{\delta}_1 = \lim\limits_{\beta=0}\tilde{\delta}_2 = \frac{\tau^f-\tau^s-\sqrt{\left(\tau^f-\tau^s\right)^2-\frac{4\alpha}{1+\Delta}}}{2}$ and $\lim\limits_{\beta=\hat{\beta}}\tilde{\delta}_1 = \lim\limits_{\beta=\hat{\beta}}\tilde{\delta}_2 = 0$.

Corollary 4

Define $\Phi\left(\mathcal{S}_{t-1}\right) = \frac{\alpha}{\mathcal{S}_{t-1}}$ and $\mathcal{T}^f(\tau) = \underline{\tau}^f + \left(1 - \underline{\tau}^f\right)\tau$, $1 \geq \bar{\tau}^f \geq \underline{\tau}^f > 0$. In that case, utility (2) can be rewritten as $U_{it} = u_{it} - \frac{\alpha}{\left(1-\tau_{t-1}^*\right)^2}\left(1-\tau_t\right)^2$. Identifying 1 with τ^f, it goes straightforwardly that the dynamics of redistribution (9) can be expressed as

$$\tau_t^* = \xi_{t-1}\tau^s + \left(1 - \xi_{t-1}\right)$$

where $\xi_{t-1} = \frac{1+\Delta}{1+\Delta+\frac{\alpha}{\left(1-\tau_{t-1}^*\right)^2}}$, and then, according to Proposition 3, that $0 < \alpha \leq \frac{1+\Delta}{4}\left(1-\tau^s\right)^2$ the model exhibits two steady states τ^{US} and τ^{EU} such that $\tau^s < \tau^{US} = \frac{1}{2}\left(1 + \tau^s - \sqrt{\left(1-\tau^s\right)^2 - \frac{4\alpha}{1+\Delta}}\right) < \tau^{EU} = 1$.

Corollary 5

Define $\Phi\left(\mathcal{S}_{t-1}\right) = \frac{\alpha}{\mathcal{S}_{t-1}}$ where $\mathcal{S}_{t-1} = \sigma^2_{\tau^f} + \left[\bar{\tau}^f - \tau^*_{t-1}\right]^2$. Assuming that a_i and τ^f_i are symetric, the dynamics of redistribution can be expressed as $\tau^*_t = \frac{\Phi(\mathcal{S}_{t-1})}{1+\Phi(\mathcal{S}_{t-1})}\bar{\tau}^f$, or equivalently as:

$$\tau^*_t = \left(1 - \xi_{t-1}\right)\bar{\tau}^f$$

where $\xi_{t-1} = \frac{1}{1+\frac{\alpha}{\sigma^2_{\tau^f}+\left[\tau^f_m - \tau^*_{t-1}\right]^2}}\bar{\tau}^f$. Following Proposition 3, if $0 < \alpha \leq \hat{\alpha}$ and $\sigma^2_{\tau^f} \leq \hat{\beta}$ the model exhibits two steady states τ^{US} and τ^{EU}such that $\tau^s\,(=0) < \tau^{US} < \tau^{EU} \leq \bar{\tau}^f$, $\lim\limits_{\sigma^2_{\tau^f}=0} \tau^{US} = \frac{1}{2}\left(\bar{\tau}^f - \sqrt{\left(\bar{\tau}^f\right)^2 - 4\alpha}\right)$ and $\lim\limits_{\sigma^2_{\tau^f}=0} \tau^{EU} = \bar{\tau}^f$.