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Fairness and Redistribution*

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Abstract

Different beliefs about how fair social competition is and what determines income inequality, influence the redistributive policy chosen in a society. But the composition of income in equilibrium depends on tax policies. We show how this interaction between social beliefs and welfare policies may lead to multiple equilibria or multiple steady states. If a society believes that individual effort determines income, and that all have a right to enjoy the fruits of their effort, it will chose low redistribution and low taxes. In equilibrium, effort will be high and the role of luck will be limited, in which case market outcomes will be relatively fair and social beliefs will be self-fulfilled. If instead a society believes that luck, birth, connections and/or corruption determine wealth, it will tax a lot, thus distorting allocations and making these beliefs self-sustained as well. These insights may help explain the cross-country variation in perceptions about income inequality and choices of redistributive policies.

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1 Introduction

Pre-tax inequality is higher in the United States than in continental Western European countries ("Europe" in short). For example, the Gini coefficient in the pre-tax income distribution in the United States is 38.5 against 29.1 in Europe. Nevertheless, redistributive policies are more extensive in Europe. The income tax structure is more progressive in Europe, and the overall size of government is about 50 per cent larger in Europe than in the United States (that is, about 30 versus about 45 per cent of GDP). The largest difference is indeed in transfers and other social benefits, where Europeans spend about twice as much as Americans. Moreover, the public budget is only one of the means to support the poor; an important dimension of redistribution is legislation, and in particular the regulation of labor and product markets, which are much more intrusive in Europe than in the United States.[1]

The coexistence of high pre-tax inequality and low redistribution is prima facia inconsistent with the Meltzer-Richard paradigm of redistribution, as well as with the Mirrlees paradigm of social insurance. The difference in the political support for redistribution appears rather to reflect a difference in social perceptions regarding the fairness of market outcomes and the underlying sources of income inequality. Americans believe that poverty is due to bad choices or lack of effort; Europeans instead view poverty as a trap from which it is hard to escape. Americans perceive wealth and success as the outcome of individual talent, effort, and entrepreneurship; Europeans instead attribute a larger role to luck, corruption, and connections. According to the *World Values Survey*, 71 per cent of Americans versus 40 per cent of Europeans believe that the poor could become rich if they just tried hard enough; and a larger proportion of Europeans than Americans believe that luck and connections, rather than hard work, determine economic success.

The effect of social beliefs about how fair market outcomes are on actual policy choices is not limited to a comparison of the United States and Europe. Figure 1 shows a strong positive correlation between a country's GDP share of social spending and its belief that luck and connections determine income. This correlation is easy to interpret if political outcomes reflect a social desire for fairness. But, why do different counties have such different perceptions about market outcomes? Who is right, the Americans who think that effort determines success, or the Europeans who think that it is mostly luck?

[insert Figure 1 here]

[1] Alesina and Glaeser (2003) document extensively the sharp differences in redistribution between the United States and Europe.

In this paper we show that it is consistent with equilibrium behavior that luck is more important in one place and effort more important in another place, even if there are no intrinsic differences in economic fundamentals between the two places and no distortions in people's beliefs. Both Americans and Europeans can thus be correct in their perception of the sources of income inequality. The key element in our analysis is the idea of "social justice" or "fairness". With these terms we capture a social preference for reducing the degree of inequality induced by luck and unworthy activities, while rewarding individual talent and effort. Since the society cannot tell apart the component of an individual's income that is due to luck and unworthy activities (the "noise" in the income distribution) from the component that is due to talent and effort (the "signal"), the socially optimal level of redistribution is decreasing in the "signal-to-noise ratio" in the income distribution (the ratio of justifiable to unjustifiable inequality). Higher taxation, on the other hand, distorts private incentives and leads to lower effort and investment. As a result, the equilibrium signal-to-noise ratio in the income distribution is itself decreasing in the level of redistribution.

This interaction between the level of redistribution and the composition of inequality may lead to multiple equilibria. In the one equilibrium, taxes are higher, individuals invest and work less, and inequality is lower; but a relatively large share of total income is due to luck, which in turn makes high redistribution socially desirable. In the other equilibrium, taxes are lower, individuals invest and work more, and inequality is higher; but a larger fraction of income is due to effort rather than luck, which in turn sustains the lower tax rates as an equilibrium.

We should be clear from the outset that we do not mean to argue that "fundamentals" between Europe and the United States are identical, or that the multiplicity of equilibria we identify in our benchmark model is the only source of the politico-economic differences across the two sides of the Atlantic. Our multiple-equilibria mechanism should be interpreted more generally as a propagation mechanism that can help explain large and persistent differences in social outcomes on the basis of small differences in underlying fundamentals, initial conditions, or shocks.

How the different historical experiences of the two places (which by now are largely hard-wired in the different cultures of the two places) may explain the different attitudes and policies towards inequality, is indeed at the heart of our argument. In a dynamic variant of our model, we consider the implications of the fact that wealth is transmitted from one generation to the next through bequests or other sorts of parental investment. The distribution of wealth in one generation now depends, not only on the contribution of effort and luck in that generation, but also on the contribution of effort and luck in all previous generations. As a result, how fair the wealth distribution is in one period, and therefore what the optimal redistributive policy is in that period, depend on the history of policies and outcomes in all past periods. We conclude that the differences in perceptions, attitudes, and policies towards inequality (or more generally towards the market mechanism) across the two sides of the Atlantic may partly be understood on the basis of different initial conditions and different historical coincidences.

Following Rawls (1971) and Mirrlees (1971), fairness has been modeled before as a demand for insurance. However, the standard paradigm does not incorporate a distinction between justifiable and unjustifiable inequality, which is the heart of our approach.[2] Other papers have discussed multiple equilibria in related models. In Piketty (1995), multiple beliefs are possible because agents form their beliefs only on the basis of their personal experience and cannot learn the true costs and benefits of redistribution. In Benabou (2000), multiplicity originates in imperfect credit and insurance markets. Finally, in Benabou and Tirole (2003), multiple beliefs are possible because agents find it optimal to deliberately bias their own perception of the truth so as to offset another bias, namely procrastination. In our paper, instead, multiplicity originates merely in the social desire to implement fair economic outcomes and survives even when beliefs are fully unbiased, agents know the truth, and there are no important differences in capital markets or other economic fundamentals.

The rest of the paper is organized as follows. Section 2 reviews some evidence on fairness and redistribution, which motivates our modelling approach. Section 3 introduces the basic static model. Section 4 analyzes the interaction of economic and voting choices and derives the two regimes as multiple static equilibria. Section 5 introduces intergenerational links and derives the two regimes as multiple steady states. Section 6 concludes. All proofs are in the Appendix.

2 Fairness and Redistribution: a few facts

Our crucial assumption is that agents expect society to reward individual effort and hard work and the government to intervene and correct market outcomes to the extent that outcomes are driven by luck. The available empirical evidence is supportive of this assumption.[3]

[2] We bypass, however, the deeper question *why* some sources of inequality are considered justifiable and others not. See also the concluding remark in Section 6 and footnote 28.

[3] Complementary is also the evidence that fairness concerns affect labor relations. See, e.g., Rotemberg (2002) and the references cited therein.

Fairness and preferences for redistribution. Figure 1, which is reproduced from Alesina, Glaeser and Sacerdote (2001), illustrates the strong positive correlation between the share of social spending over GDP and the percentage of respondents to the *World Values Survey* who think that income is determined mostly by luck. As Table 1 shows, this correlation is robust to controlling for the Gini coefficient, per-capita GDP, and continent dummies. It is also robust to controlling for two political variables, the nature of the electoral system and Presidential versus parliamentary regime, which may influence the size of transfers, as argued by Persson and Tabellini (2003).[4]

`[insert Table 1 here]`

The impact of fairness perceptions is evident, not only in aggregate outcomes, but also in individual attitudes. The *World Values Survey* asks the respondent whether he identifies himself as being on the left of the political spectrum. We take this "leftist political orientation" as a proxy for favoring redistribution and government intervention. We then regress it against the individual's belief about what determines income together with a series of individual- and country-specific controls. As Table 2 shows, we find that the belief that luck determines income has a strong and significant effect on the probability of being leftist.[5]

Further evidence is provided by Fong (2002), Corneo and Gruner (2002), and Alesina and La Ferrara (2003). Using the *General Social Survey* for the United States, the latter study finds that individuals who think that income is determined by luck, connections, and family history rather than individual effort, education, and ability, are much more favorable to redistribution, even after controlling for an exhaustive set of other individual characteristics.

`[insert Table 2 here]`

Experimental evidence. Fehr and Schmidt (2001) provide an extensive review of the experimental evidence on altruism, reciprocity, and fairness. In dictator games, people give a small portion of their endowment to others, even though they could keep it all. In ultimatum games, people are ready to suffer a monetary loss themselves just to punish behavior that is considered "unfair". In gift exchange games, on the other hand, people are willing to

[4]The correlation looses some significance if one controls for the population share of the old, which is because the size of pensions depends heavily on this variable. However, the pension system is much more redistributive in Europe than in the United States (Alesina and Glaeser, 2003). Also the correlation between transfer payments and beliefs in luck remains very strong once we exclude pensions. More details are available in the working paper version of the paper.

[5]Table 2 reports Probit estimates; OLS give similar results.

suffer a loss in order to reward actions that they perceive as generous or fair. Finally, in public good games, cooperators tend to punish free-riders. These findings are quite robust to changes in the size of monetary stakes or the background of players. In short, there is plenty experimental evidence that people have an innate desire for fairness, and are ready to punish unfair behavior. What is more, the existing evidence rejects the hypothesis that altruism merely takes the form of absolute inequity aversion. People instead appear to desire equality relative to some reference point, namely what they consider to be "fair" payoffs.

Further support in favor of our concept of fairness is provided by the evidence that experimental outcomes are sensitive to whether initial endowments are assigned randomly or as a function of previous achievement. In ultimatum games, Hoffman and Spitzer (1985) and Hoffman et al. (1998) find that proposers are more likely to make unequal offers, and responders are less likely to reject unequal offers, when the proposers have out-scored the respondents in a preceding trivia quiz, and even more if they have been explicitly told that they have "earned" their roles in the ultimatum game on the basis of their preceding performance. In double auction games, Ball et al. (1996) report a similar sensitivity of the division of surplus between buyers and sellers on whether market status is random or earned. Finally, in a public good game where groups of people with unequal endowments vote over two alternative contribution schemes, Clark (1998) finds that members of a group are more likely to vote for the scheme that effectively redistributes less from the rich to the poor members of the same group, when initial endowments depend on previous relative performance in a general-knowledge quiz rather than having been randomly assigned.

Psychologists, sociologists and political scientists have also stressed the importance of a sense of fairness in the private, social and political life of people. People enjoy great satisfaction when they know (or believe) that they live in a just world, where hard work and good behavior ultimately pay off.[6] In short, it is a fundamental conviction that one should get what one deserves and, conversely, that one should deserve whatever one gets.

3 The Basic Model

Consider a static economy with a large number (a measure-one continuum) of agents, indexed by $i \in [0, 1]$. Agents live for two periods and, in each period of life, agents engage in a productive activity, which can be interpreted as labor supply, accumulation of physical or

[6] The desire for a just world is so strong that people may actually distort their perception or interpretation of reality; see Lerner (1982) and Benabou and Tirole (2003).

human capital, entrepreneurship, etc.. The tax and redistributive policy is set in the middle of their lives.[7]

Income, redistribution, and budgets. Total pre-tax life-cycle income (y_i) is the combined outcome of inherent talent (A_i), investment during the first period of life (k_i), effort during the second period of life (e_i), and "noise" (η_i):

$$y_i = A_i[\alpha k_i + (1-\alpha)e_i] + \eta_i. \tag{1}$$

$\alpha \in (0,1)$ is a technological constant which parametrizes the share of income that is sunk when the tax rate is set. Both A_i and η_i are i.i.d. across agents. We interpret η_i either as pure random luck, or as the effect of socially unworthy activities, such as corruption, rent seeking, political subversion, theft, etc.

The government imposes a flat-rate tax on income and then redistributes the collected taxes in a lump-sum manner across agents. Individual i's budget is thus given by

$$c_i = (1-\tau)y_i + G, \tag{2}$$

whereas the government budget is $G = \tau\bar{y}$. c_i denotes consumption (also disposable income), τ is the rate of income taxation, G is the lump-sum transfer, and $\bar{y} \equiv \int_i y_i$ the average income in the population. This linear redistributive scheme is widely used in the literature following Romer (1975) and Meltzer and Richard (1981) because it is the simplest one to model. We conjecture that the qualitative nature of our results is not unduly sensitive to the precise nature of this scheme.[8]

Preferences. Individual preferences are given by

$$U_i \;=\; u_i - \gamma\Omega, \tag{3}$$

where u_i represents the private utility from own consumption, investment, and effort choices, Ω represents the common disutility generated by unfair social outcomes (to be defined below), and $\gamma \geq 0$ parametrizes the strength of the social demand for fairness. To simplify, we let

$$u_i = V_i(c_i, k_i, e_i) = c_i - \frac{1}{2\beta_i}\left[\alpha k_i^2 + (1-\alpha)e_i^2\right]. \tag{4}$$

The first term represents the utility of consumption (c_i), the second the costs of first-period investment (k_i) and second-period effort (e_i). The coefficients $\alpha/2$ and $(1-\alpha)/2$ are merely a

[7] The assumption that an effort/investment choice precedes the policy choice is made only to ensure that part of agents' wealth is fixed when the policy is chosen; this assumption will be relaxed in the dynamic extension of Section 5.

[8] See footnote 11 and the concluding remark in Section 6.

normalization. Finally, β_i is i.i.d. across agents and parametrizes the willingness to postpone consumption and work hard: a low β_i captures impatience or laziness, a high β_i captures "love for work".[9]

Fairness. Following the evidence in Section 2 that people share a common conviction that one should get what one deserves, and deserve what one gets, we define our measure of social injustice as

$$\Omega = \int_i (u_i - \hat{u}_i)^2, \tag{5}$$

where u_i denotes the actual level of utility and $\hat{u}_i$ denotes the "fair" level of utility. The latter is defined as the utility the agent deserves on the basis of his talent and effort, namely $\hat{u}_i = V_i(\hat{c}_i, k_i, e_i)$, where

$$\hat{c}_i \;=\; \hat{y}_i \;=\; A_i[\alpha k_i + (1-\alpha)e_i] \tag{6}$$

represent the "fair" levels of consumption and income. Similarly, the residual $y_i - \hat{y}_i = \eta_i$ measures the "unfair" component of income.

Policy and equilibrium. Because fairness is a public good, it is not essential for our results how exactly individual preferences are aggregated into political choices about redistribution: no matter what the weight of different agents in the political process, the concern for fairness will always be reflected in political choices. To be consistent with the related literature, we assume that the preferences of the government coincide with those of the median voter.[10]

Definition *An equilibrium is a tax rate τ and a collection of individual plans $\{k_i, e_i\}_{i\in[0,1]}$ such that (i) the plan (k_i, e_i) maximizes the utility of agent i for every i, and (ii) the tax rate τ maximizes the utility of the median agent.*

Note that the heterogeneity in the population is defined by the distribution of (A_i, η_i, β_i). For future reference, we let $\delta_i \equiv A_i^2\beta_i$ and assume that $Cov(\delta_i, \eta_i) = 0$ and that η_i has zero mean and median. We also denote $\sigma_\delta^2 \equiv Var(\delta_i)$, $\sigma_\eta^2 \equiv Var(\eta_i)$, and $\Delta \equiv \delta_m - \bar{\delta} \geq 0$, where δ_m and $\bar{\delta}$ are the median and the mean of δ_i. An economy is thus parametrized by $\mathcal{E} \equiv (\Delta, \gamma, \alpha, \sigma_\delta, \sigma_\eta)$. Δ and γ, in particular, parametrize the two sources of support for

[9] If agents suffered from procrastination and hyperbolic discounting, β_i could also be interpreted as the degree of self control, although in that case we would need to distinguish between ex ante and ex post preferences. For an elegant model where the anticipation of procrastination affects also the choice of "ideology", see Benabou and Tirole (2003).

[10] As shown in the Appendix, $\max_i\{\delta_i\} \leq 2\bar{\delta}$ actually suffices for preferences to be single-picked in τ and thus for the median-voter theorem to apply.

redistribution in our model: one is the standard "selfish" redistribution a la Meltzer and Richard (1981), which arises if and only $\Delta > 0$; another is the "altruistic" redistribution originating in the desire to correct for the effect of luck on income, which arrises if and only if $\gamma > 0$.

4 Equilibrium Analysis

4.1 Fairness and the signal-to-noise ratio

Because utility is quasi-linear in consumption, $u_i - \hat{u}_i = c_i - \hat{c}_i$ for every i, and therefore $\Omega = Var(c_i - \hat{c}_i)$, where Var denotes variance in the cross-section of the population. Combining this with (2), (6) and the property that $y_i - \hat{y}_i$ is independent of $\hat{y}$ (which will turn out to be true in equilibrium since η_i is independent of δ_i), we obtain social injustice as a weighted average of the "variance decomposition" of income inequality:

$$\Omega = \tau^2 Var(\hat{y}_i) + (1-\tau)^2 Var(y_i - \hat{y}_i). \tag{7}$$

In the absence of government intervention, the above would reduce to $\Omega = \int_i (y_i - \hat{y}_i)^2$, thus measuring how unfair the pre-tax income distribution is; in the presence of government intervention, Ω measures how unfair economic outcomes remain after redistribution.

Note that the weights of the variances in (7) depend on the level of redistribution (τ). If minimizing Ω were the only policy goal, taxation were not distortionary, and the income distribution were exogenous, the equilibrium tax rate would be given simply by:

$$\frac{1-\tau}{\tau} = \frac{Var(\hat{y}_i)}{Var(y_i - \hat{y}_i)}. \tag{8}$$

The right-hand side represents a "signal-to-noise ratio" in the pre-tax income distribution: the "signal" is the fair component of income, and the "noise" is the effect of luck. As the goal of redistribution is to correct for the effect of luck on income, the optimal tax rate is decreasing in this signal-to-noise ratio.[11]

This signal-to-noise ratio, however, is endogenous in equilibrium. To compute it, consider the investment and effort choices of agent i. Substituting (1) and (2) into (4), we have

$$u_i = (1-\tau)A_i[\alpha k_i + (1-\alpha)e_i] + G - \frac{1}{2\beta_i}\left[\alpha k_i^2 + (1-\alpha)e_i^2\right]. \tag{9}$$

[11] The implicit assumption that justifies the restriction of policy to a linear income/wealth tax is that the government cannot tell apart the fruits of talent and effort from the effect of luck: $(A_i, \beta_i, \eta_i, k_i, e_i)$ are private information to agent i. Therefore, the society would face a signal-extraction problem like the one identified above even if it could use a general non-linear redistributive scheme.

Recall that agents choose e_i after the policy is set, but k_i before. First-period investment is thus a function of the *anticipated* tax rate and is sunk when the actual tax rate is chosen. To distinguish the anticipated tax rate from the realized one, we henceforth denote the former by τ_e and the latter by τ. (Of course, $\tau_e = \tau$ in equilibrium.) The first-order conditions then imply

$$k_i = (1 - \tau_e)\beta_i A_i \quad \text{and} \quad e_i = (1 - \tau)\beta_i A_i. \tag{10}$$

Next, substituting into (6) gives

$$\hat{y}_i = [1 - \alpha\tau_e - (1 - \alpha)\tau]\delta_i, \tag{11}$$

where $\delta_i \equiv \beta_i A_i^2$. Combining the above with $y_i - \hat{y}_i = \eta_i$, we conclude the equilibrium signal-to-noise ratio in the income distribution is

$$\frac{Var(\hat{y}_i)}{Var(y_i - \hat{y}_i)} = [1 - \alpha\tau_e - (1 - \alpha)\tau]^2 \frac{\sigma_\delta^2}{\sigma_\eta^2}, \tag{12}$$

where $\sigma_\delta^2 \equiv Var(\delta_i) \equiv Var(\beta_i A_i^2)$ and $\sigma_\eta^2 \equiv Var(\eta_i)$. Hence, heterogeneity in talent or willingness to work increases the signal, whereas luck increases the noise. Most importantly, the signal-to-noise ratio is itself decreasing in the tax rate, reflecting the distortionary effects of taxation.

4.2 Optimal policy

The optimal policy maximizes the utility of the median voter. Assuming that luck has zero mean and median, the median voter, denoted by $i = m$, is an agent with characteristics $\delta_m = median(\delta_i)$ and $\eta_m = 0$. Letting $\Delta \equiv \bar{\delta} - \delta_m$ and normalizing $\delta_m = 2$, the utility of the median voter in equilibrium reduces to[12]

$$U_m = (1 - \alpha\tau_e^2) - (1 - \alpha)\tau^2 + [1 - \alpha\tau_e - (1 - \alpha)\tau]\tau\Delta - \gamma\Omega. \tag{13}$$

The first and second terms in (13) capture the welfare losses due to the distortion of first-period investment and second-period effort, respectively. The third term measures the net transfer the median voter enjoys from the tax system, reflecting the fact that a positive tax rate effectively redistributes from the mean to the median of the income distribution. This term introduces a "selfish" motive for redistribution as in Meltzer and Richard (1981).

The last term instead captures the "altruistic" motive originating in the social concern for fairness. From (7) and (11), the equilibrium value of Ω is

$$\Omega = \tau^2[1 - \alpha\tau_e - (1 - \alpha)\tau]^2\sigma_\delta^2 + (1 - \tau)^2\sigma_\eta^2 \tag{14}$$

[12] See the Appendix for the derivation of (13).

where $\sigma_\delta^2 = Var(\delta_i)$ and $\sigma_\eta^2 = Var(\eta_i)$. Note that Ω depends on both τ_e and τ. The negative dependence on τ_e reflects the fact that the anticipation of high taxation, by distorting first-period incentives, results in a large relative contribution of luck to income. The dependence on τ reflects, not only a similar distortion of second-period incentives, but also the property that, keeping the pre-tax income distribution constant, more redistribution may correct for the effect of luck, thus obtaining a fairer distribution of after-tax disposable income.[13]

Lemma 1 *When the ex-ante anticipated policy is τ_e, the ex-post optimal policy is*

$$f(\tau_e;\mathcal{E}) \equiv \arg\min_{\tau\in[0,1]} \left\{ \begin{array}{l} (1-\alpha)\tau^2 + \tau^2 \left(1-\alpha\tau_e-(1-\alpha)\tau\right)^2 \gamma\sigma_\delta^2 \\ \quad +(1-\tau)^2\gamma\sigma_\eta^2 - \tau[1-\alpha\tau_e-(1-\alpha)\tau]\Delta \end{array} \right\}. \tag{15}$$

If $\gamma = 0$, then $f = 0$ if $\Delta = 0$, $f > 0$ and $\partial f/\partial\Delta > 0 > \partial f/\partial\tau_e$ if $\Delta > 0$, and $\partial f/\partial\sigma_\delta = \partial f/\partial\sigma_\eta = 0$ in either case.

If, instead, $\gamma > 0$, then $f > 0$ and $\partial f/\partial\sigma_\eta > 0$ necessarily, whereas there exists $\hat{\tau}_e > 0$ such that $\partial f/\partial\sigma_\delta < 0$ and $\partial f/\partial\Delta > 0$ if and only if $\tau_e < \hat{\tau}_e$, where the threshold $\hat{\tau}_e$ is increasing in $\gamma\sigma_\eta^2$ and reaches 1 at $\gamma\sigma_\eta^2 = 1-\alpha$. Finally, $\alpha > 1/3$ and $\gamma > \Delta/\left(2-3\left(1-\alpha\right)\right)$ suffice for $\partial f/\partial\tau_e > 1$ for all $\tau_e < \tilde{\tau}_e$ and some $\tilde{\tau}_e > 0$.

The intuition of these results is simple. If there is neither a concern for fairness ($\gamma = 0$), nor a difference between the mean and the median of the income distribution ($\Delta = 0$), the optimal tax is zero, as redistribution has only costs and no benefits from the perspective of the median voter. When the median is poorer than the mean ($\Delta > 0$), the Meltzer-Richard effect kicks in, implying that the optimal tax rate is positive and increasing in Δ. Nevertheless, as long as the there is no demand for fairness ($\gamma = 0$), the optimal tax remains independent of the sources of income inequality. Moreover, the ex-post optimal policy is decreasing in the ex-ante anticipated policy, as a higher distortion of first-period incentives reduces the income difference between the mean and the median, and therefore also reduces the benefit of redistribution from the perspective of the median voter.

Things are quite different in the presence of a demand for fairness ($\gamma > 0$). The society then seeks a positive level of redistribution in order to correct for the undesirable effect of luck on income inequality. As a result, the optimal tax is positive even if the median and the mean of the population coincide ($\Delta = 0$). The optimal tax then trades less efficiency for more fairness. As σ_η increases, more of the observed income inequality originates in luck,

[13] Note that τ_e is taken as given when τ is set, reflecting the fact that the agents' first-period investments are sunk. In other words, the government lacks commitment. In Sections 4.4 and 5, we explain why commitment is inessential once intergenerational links are introduced.

which implies a higher optimal tax rate. The opposite consideration holds for higher σ_δ, as this implies a larger relative contribution of ability and effort in income inequality. Finally, the relationship between τ_e and τ is generally non-monotonic. To understand this non-monotonicity, note that an increase in τ_e has an unambiguous adverse effect on the fairness of the income distribution, as it distorts first-period incentives. An increase in τ, instead, has two opposing effects. On the one hand, as in the case of τ_e, a higher τ reduces the "fair" component of income variation because it distorts second-period incentives. On the other hand, a higher τ redistributes more from the poor to the rich and may thus "correct" for the effect of luck. When τ_e is small, the second effect dominates; τ increases with τ_e in order to expand redistribution and thus "correct" for the relatively larger effect of luck. When instead τ_e is high, the first effect dominates; τ falls with τ_e in order to encourage more effort and thus "substitute" for the adverse effect of a higher τ_e.

4.3 Multiple equilibria

In equilibrium, expectations must be validated and therefore $\tau_e = \tau$. The equilibrium set thus coincides with the fixed points of f. If there is no demand for fairness, f is decreasing in τ, implying that the equilibrium is unique, as in the standard Meltzer-Richard framework. But if the demand for fairness is sufficiently high, the complementarity between the optimal level of taxation and the equilibrium signal-to-noise ratio in the income distribution can sustain multiple equilibria.

Theorem 1 *An equilibrium always exists and corresponds to any fixed point of f, where f is given by (15).*

If $\gamma = 0$, the equilibrium is necessarily ***unique****. The tax rate is $\tau \in [0, 1)$, increasing in Δ, and independent of σ_δ and σ_η.*

If, instead, $\gamma > 0$, there robustly exist ***multiple*** *equilibria in some economies. In any stable equilibrium,*[14] *the tax rate is $\tau \in (0, 1)$, always increasing in σ_η, and, at least for $(\sigma_\eta, \sigma_\delta, \Delta)$ sufficiently low, also decreasing in σ_δ and increasing in Δ. The equilibrium with the lowest tax is the one with the highest inequality but also the highest signal-to-noise ratio.*

The possibility of multiple equilibria is illustrated in Figure 2. The solid curve, which intersects three times with the 45^o line, depicts the best-response function f for particular

[14] Stability is defined in the usual manner. Let $f^{(n)}$ be the n-th iteration of the best response: $f^{(1)} = f$ and $f^{(n+1)} = f^{(n)} \circ f$ for any $n \geq 1$. An equilibrium point $\tau = f(\tau)$ is locally stable if and only if, for some $\varepsilon > 0$ and any $x \in (\tau - \varepsilon, \tau + \varepsilon)$, $\lim_{n\to\infty} f^{(n)}(x) = \tau$. Given differentiability, τ is locally stable if $f'(\tau) \in (-1, +1)$ and unstable if $f'(\tau) \notin [-1, +1]$.

parameter values.[15] The two extreme intersection points (US and EU) represent stable equilibria, while the middle one represents an unstable equilibrium.[16] In point EU, the anticipation of high taxes induces agents to exert little effort in the first period. This in turn implies that the bulk of income heterogeneity is due to luck and makes it ex post optimal for society to undertake large redistributive programs, thus vindicating initial expectations. In point US, instead, the anticipation of low taxes induces agents to exert high effort and implies that income variation is mostly the outcome of heterogeneity in talent and effort, which in turn makes low redistribution self-sustained in the political process. What is more, the level of inequality (as measured by the total variance of income) is lowest in EU, but the decomposition of inequality (as measured by the signal-to-noise ratio) is fairest in US, which explains why more inequality may be consistent with lower taxes.

[insert Figure 2 here]

The assumption that a fraction of income is sunk when the tax is set ($\alpha > 0$) is essential for the existence of multiple equilibria: if α were zero, the income distribution would be independent of the anticipated tax, and therefore the equilibrium would be unique.[17] On the other hand, $\alpha < 1$ is not essential and only ensures that agents internalize part of the distortionary costs of taxation when voting on the tax rate. Indeed, an extreme but particularly simple version of our result holds when $\alpha = 1$ and $\Delta > 0$.[18] If $\gamma = 0$, the unique equilibrium is $\tau = 1$, because the median voter sees a positive benefit and a zero cost in raising τ as long as $\tau_e < 1$. If $\gamma > 0$, the fixed-point relation $\tau = f(\tau)$ reduces to

$$(1-\tau)\left(\tau(1-\tau) - \frac{\sigma_\eta^2 + \Delta/(2\gamma)}{\sigma_\delta^2}\right) = 0 \tag{16}$$

In this case, $\tau = 1$ remains an equilibrium, because $\tau_e = 1$ implies that all income inequality is the outcome of luck and makes full redistribution optimal from a fairness perspective as well. Moreover, if $\left(\sigma_\eta^2 + \Delta/(2\gamma)\right)/\sigma_\delta^2 > 1/4$, there is no other equilibrium. If, however, $\left(\sigma_\eta^2 + \Delta/(2\gamma)\right)/\sigma_\delta^2 < 1/4$, there is in addition another stable equilibrium, corresponding to the lowest solution of (16). This equilibrium is the analogue of US in Figure 2 and is such

[15] The example is only illustrative and claims no quantitative value; it assumes $\alpha = .5$, $\Delta = 0$, $\gamma = 1$, $\sigma_\delta = 2.5$, and $\sigma_\eta = 1$.

[16] Because $f(\tau) = \tau$ is a cubic equation in our model, multiplicity always takes the form of three equilibria (except for degenerate cases of two solutions).

[17] In the dynamic model of the next section, $\alpha > 0$ will mean that part of the agents' wealth is determined by their family history.

[18] We thank a referee for higlighting this example.

that τ is increasing in σ_η and decreasing in σ_δ (reflecting the effect of fairness), as well as increasing in Δ (reflecting the standard Meltzer-Richard effect).

The assumption $\alpha < 1$ thus only implies that EU does not take the extreme form $\tau = 1$. Numerical simulations then suggest that the US- and EU-type equilibria coexist as long as γ is sufficiently high and σ_η is neither too large nor too small relative to σ_δ. Instead, only the high-tax regime survives when the effect of luck is sufficiently strong relative to the effect of talent and effort in shaping the income distribution (high σ_η); and only the low-tax regime survives if there is either little demand for fairness (low γ) or little noise to correct (low σ_η). These situations are illustrated, respectively, by the upper and lower dashed lines in Figure 2. Finally, the existence of multiple equilibria does not rely on whether there is a standard Meltzer-Richard motive for redistribution in addition to the fairness motive, although *ceteris paribus* a higher Δ makes it more likely that only the high-tax regime survives.

4.4 Comments

The critical features of the model that generate equilibrium multiplicity are (i) that the optimal tax rate is decreasing in the signal-to-noise ratio and (ii) that the equilibrium signal-to-noise ratio is in turn decreasing in the tax rate. To deliver the second feature, we have chosen a simple specification for income in which "luck" enters additively and thus does not interact with effort or investment. Nevertheless, this simplification is not essential *per se*. What is essential is that higher taxes, by distorting effort and investment, result in a reduction in the level of justifiable inequality *relative* to the level of unjustifiable inequality. For this to be true, it is necessary and sufficient that higher taxes reduce the fair *more* than the unfair component of income, which we believe to be a plausible scenario.[19] Note also that, in our model, the role of heterogeneity in A_i and/or β_i is to generate endogenous variation in the "fair" level of income. Endogenizing the concept of fairness, and understanding why societies consider some sources of inequality justifiable and others unfair, is an exciting direction for future research, but it is beyond the scope of this paper.

The pure Meltzer-Richard model predicts that greater inequality is correlated with more redistribution. Pure inequity aversion would predict a similar positive correlation. However, the evidence suggests a negative or null correlation between inequality and redistributive effort (e.g., Perotti, 1996; Alesina, Glaeser and Sacerdote, 2001). Our model can deliver such

[19] In Alesina and Angeletos (2004), we investigate a different model in which unfair income originates in rent seeking and corruption. Higher taxes and bigger governments may then reduce the signal-to-noise ratio, not only because they distort effort, but also because they increase rent seeking.

a negative correlation even after controlling for exogenous fundamentals: in the example of Figure 2, US has both a lower τ and a higher $Var(y_i)$ than EU, simply because lower taxes generate higher – but also more justifiable – levels of inequality.

The prediction that higher redistribution should be correlated with higher belief that income inequality is unfair is clearly consistent with the evidence discussed in Section 2. But, what about the prediction that higher tax distortions should be correlated with lower levels of effort and investment? As we noted before, tax distortions are much higher in Europe; the income tax is much more progressive and the total tax burden is about 50 per cent higher than in the United States. At the same time, hours worked are much lower in Europe. In 2001, the average worked time per employee was about 1200 hours in Europe as compared to 1600 in the United States. Given the lower labor participation rate in Europe, the difference becomes even more striking when measured per person rather than per employee. Prescott (2003) computes an effective marginal tax on labor income that properly accounts for consumption taxes and social security contributions. He finds this to be about 50 per cent lower in the United States than in France and Germany, and argues that this difference can explain a large fraction of the difference in labor supply across the two continents. Consistent with a distortionary effect of government intervention is also the observation that growth rates and various measures of investment in intangible capital are higher in the United States.[20] In short, relative to Europeans, Americans are taxed less, work more, invest more in intangible capital, and obtain higher rewards.[21]

The two equilibria in Figure 2 can easily be ranked from the perspective of the median voter: the one with lower taxes is superior. This is both because there are fewer distortions, more investment, and more aggregate income, and because income inequality originates relatively more in ability than in luck. Poorer agents, however, may prefer the high-tax equilibrium, as it redistributes more from the rich to the poor. Also, the high-tax equilibrium provides more insurance against the risk of being born with little talent or willingness to

[20] For example, the United States spend 2.8 per cent of GDP in R&D, while the 15 EU countries spend 1.9 per cent (OECD data, 2001). Moreover, the fraction of this investment which is private (not government sponsored) is double in the United States. The percentage of college-educated individuals is 37.3 in the United States as compared to 18.8 in Europe (OECD data, 2001, individulas between the age of 25 and 64). This difference is even more striking if one considers that, in most European countries, college education is publicly provided and largely financed by general government revenues.

[21] In addition to these measurable effects of taxation and regulation, there may be other, more subtle disincentive effects of the welfare state; these may involve changes in social norm that disengage individuals from market activities, as argued by Lindbeck, Nyberg and Weibull (1999) in theory and by Lindbeck et al (1994) as an explanation of the effects of the welfare state in Sweden.

work and may thus be preferred behind the veil of ignorance (that is, before the idiosyncratic shocks are realized).

Finally, it is of course unrealistic to think that an economy could "jump" from one regime to another by simply revising equilibrium expectations from one day to another. In the next section, we consider a dynamic variant of our model, in which history determines what beliefs the society holds and what redistributive policies it selects. The two regimes then re-emerge as multiple steady states along a unique equilibrium path. Similarly, whereas only the low-tax regime would survive in the static economy if the society could credibly commit to its tax policies before agents make their early-in-life investment choices, such commitment has little bite in the dynamic economy, where the wealth distribution is largely determined by policies and outcomes from earlier generations.

5 Intergenerational Links and History Dependence

One important determinant of wealth and success in life is being born to a wealthy family. To explore this issue, we now introduce intergenerational wealth transfers and parental investment (e.g., bequests, education, status, etc.) that link individual income to family history.[22] Since we now wish to concentrate on the effect of history rather than on self-fulfilling expectations, we abstract from investment choices made within a generation before the tax is set. The optimal policy is then uniquely determined in any given generation, but it depends on the decomposition of wealth in all previous generations.

5.1 The environment

The economy is populated by a sequence of non-overlapping generations, indexed by $t \in \{.., -1, 0, 1, ...\}$. Each generation lives for one period. Within each generation, there is a single effort choice and it takes place after the tax is voted on. Parents enjoy utility for leaving a bequest to their children; by "bequests" we mean, not only monetary transfers, but also all other sorts of parental investment.[23]

[22] For a recent discussion on the intergenerational transfer of wealth and its effect on entrepreneurship, see Caselli and Gennaioili (2003).

[23] This is of course a short-cut, which is easier to model than adding the utility function of the children into that of the parents. It also rules out the dependence of political decisions in one generation on expectations about political decisions in future generations.

Pre-tax wealth is the outcome of talent and effort, random luck, and parental investment:

$$y_{it} = A_{it}e_{it} + \eta_{it} + k_{it-1}, \tag{17}$$

where k_{it-1} now represents the bequest or other parental investment received by the previous generation. A_{it} continues to denote innate talent and η_{it} the luck or other unworthy income *within* the life of the agent. The individual's budget constraint, on the other hand, is given by

$$c_{it} + k_{it} \;=\; w_{it} \;\equiv\; (1-\tau_t)y_{it} + G_t, \tag{18}$$

where c_{it} denotes own consumption, k_{it} is the bequest left to the next generation, w_{it} denotes disposable wealth, τ_t is the tax rate, $G_t = \tau_t\bar{y}_t$ is the lump-sum transfer, and $\bar{y}_t \equiv \int_i y_{it}$ is mean income in generation t.

Individual preferences are again $U_{it} = u_{it} - \gamma\Omega_t$, but the private utility is now

$$u_{it} \;=\; V_{it}(c_{it}, k_{it}, e_{it}) \;=\; \tfrac{1}{(1-\alpha)^{1-\alpha}\alpha^{\alpha}}\,(c_{it})^{1-\alpha}\,(k_{it})^{\alpha} - \tfrac{1}{\beta_{it}}(e_{it})^2. \tag{19}$$

The first term in (19) represents the utility from own consumption and bequests, whereas the second term is the disutility of effort. For simplicity, we have assumed a Cobb-Douglas aggregator over consumption and bequests, with $\alpha \in (0,1)$ now parametrizing to the fraction of wealth allocated to bequests. The constant $1/\left((1-\alpha)^{1-\alpha}\alpha^{\alpha}\right)$ is an innocuous normalization, and β_{it} denotes again willingness to work. We assume that $\delta_{it} \equiv \beta_{it}\left(A_{it}\right)^2$ and η_{it} are i.i.d. across agents but fully persistent over time.

Finally, social injustice is again the distance between actual and fair utility in any given generation:

$$\Omega_t \equiv \int_i \left(u_{it} - \hat{u}_{it}\right)^2, \tag{20}$$

where $u_{it} = V_{it}(c_{it}, k_{it}, e_{it})$ and $\hat{u}_{it} = V_{it}(\hat{c}_{it}, \hat{k}_{it}, e_{it})$. The fair levels of consumption and bequests $(\hat{c}_{it}, \hat{k}_{it})$ are defined below.

5.2 History and fairness

Household i in generation t chooses consumption, bequest, and effort (c_{it}, k_{it}, e_{it}) so as to maximize its utility subject to its budget constraint, taking political and social outcomes (τ_t, Ω_t) as given. It follows that the optimal consumption and bequests are

$$c_{it} = (1-\alpha)w_{it} \quad \text{and} \quad k_{it} = \alpha w_{it} \tag{21}$$

Utility thus reduces to $u_{it} = w_{it} - e_{it}/(2\beta_{it})$, which in turn implies that the optimal level of effort is $e_{it} = (1-\tau_t)A_{it}\beta_{it}$.

Since wealth in one generation depends on bequests and parental investment from the previous generation, which in turn depend on wealth in the previous generation, the wealth of any given individual depends on the contribution of talent and effort and the realization luck, not only during his own lifetime, but also along his whole family tree. We thus need to adjust our measures of fair outcomes for the propagation of luck through intergenerational transfers. Assuming that bequests and parental investments are considered fair only to the extent that they reflect effort and talent, not pure luck, we define fair outcomes as the luck-free counterparts of consumption, bequests, and wealth: $\hat{c}_{it} = (1-\alpha)\hat{y}_{it}$, $\hat{k}_{it} = (1-\alpha)\hat{y}_{it}$, and $\hat{w}_{it} = \hat{y}_{it} = A_{it}e_{it} + \hat{k}_{it-1}$. Iterating the latter backwards, we infer that the fair level of wealth is given by the cumulative effect of talent and effort throughout the individual's family history:[24]

$$\hat{w}_{it} = \hat{y}_{it} = \sum_{s \leq t} \alpha^{s-t} A_s^i e_s^i. \tag{22}$$

Similarly, the residual between actual and fair wealth, $w_{it} - \hat{w}_{it}$, captures the cumulative effect of luck and redistribution.

Consider next the interaction between redistribution and fairness. Note that $u_{it} - \hat{u}_{it} = w_{it} - \hat{w}_{it}$ and therefore $\Omega_t = Var(w_{it} - \hat{w}_{it})$, or equivalently

$$\Omega_t = \tau_t^2 Var(\hat{y}_{it}) + (1-\tau_t)^2 Var(y_{it} - \hat{y}_{it}) + 2\tau_t (1-\tau_t) Cov(\hat{y}_{it}, y_{it} - \hat{y}_{it}). \tag{23}$$

Apart from the covariance term, this is identical to the corresponding expression (7) in the benchmark model. Thus once again the optimal tax rate is bound to decrease with the signal-to-noise ratio in the pre-tax wealth distribution. As shown in the Appendix, the signal-to-noise ratio in turn depends on the policies chosen by all past generations. In particular, a society that has a history of high distortions will tend to have inherited a rather unfair wealth distribution, which makes it more likely that it favors aggressive redistribution in the present.[25] High levels of taxation and redistribution can thus be self-reproducing, opening the door to multiple steady states.

[24] We assume that the parents are *fully* entitled to make different transfers to their children deriving from different levels of effort. However, the society may not want to keep children responsible for their parents' laziness and lack of talent. There may then be a conflict between what is fair vis-a-vis parents and what is fair vis-a-vis children. In the working-paper version of this article, we considered a simple extension in which, from a fairness perspective, children were entitled only to a fraction λ of their parents' justifiable bequests. The multiplicity survives for λ sufficiently high.

[25] However, there is an offseting effect, namely that higher taxation in the past has already partly corrected for the impact of past luck, which explains why the impact of past policies on the singal-to-noise ratio is non-monotonic in general.

5.3 Multiple steady states

We look for fixed points such that, if $\tau_s = \tau$ for all generations $s \leq t-1$, then $\tau_t = \tau$ is optimal for generation t. We first characterize the optimal policy for a given stationary history.

Lemma 2 *When all past generations have chosen* τ, *the optimal tax for the current generation is* $\tau' = \phi(\tau;\mathcal{E})$, *where*

$$\phi(\tau;\mathcal{E}) \equiv \arg\min_{\tau_t\in[0,1]} \left\{ \tfrac{1}{2}\tau_t^2 - \tau_t\left[(1-\tau_t) + \tfrac{\alpha(1-\tau)}{1-\alpha(1-\tau)}(1-\tau)\right]\Delta + \gamma(1-\tau_t)^2\left[1+\tfrac{\alpha(1-\tau)}{1-\alpha(1-\tau)}\right]^2\sigma_\eta^2 \right.$$
$$\left. +\gamma\left[(1-\tau_t)\tau_t - \tfrac{\alpha(1-\tau)}{1-\alpha(1-\tau)}(1-\tau_t)(1-\tau) + \tfrac{\alpha}{1-\alpha}(1-\tau)^2\right]\sigma_\delta^2 \right\}.$$

Comparing the above with Lemma 1, we see that, apart from the fact that ϕ now represents the best reaction against the historical policies rather than against same-period market expectations, ϕ has similar properties with f in the static model. In particular, ϕ is increasing in Δ, reflecting the Meltzer-Richard effect.[26] Moreover, when $\gamma = 0$, ϕ is decreasing in τ, for a higher tax in the past means lower wealth inequality in the present and therefore a weaker Meltzer-Richard motive for redistribution. By implication, ϕ has a unique fixed point when $\gamma = 0$. When instead $\gamma > 0$, ϕ can be increasing in τ, for higher tax distortions in the past imply more unfair wealth distribution in the present. As a result, ϕ can have multiple fixed points when $\gamma > 0$.

Theorem 2 *If* $\gamma = 0$, *there exists a* ***unique*** *steady state. If instead* $\gamma > 0$, *there robustly exist* ***multiple*** *steady states.*

The multiple equilibria of our benchmark model can thus be reinterpreted as multiple steady states of the dynamic model. Like in the static model, multiple steady states exist only when the social desire for fairness is sufficiently high. The one steady state (US) is then characterized by persistently lower taxation, lower distortions, and fairer outcomes, but the other (EU) might be preferred behind the veil of ignorance. But unlike the static model, it is different initial conditions or different shocks, not different self-fulfilling expectations, that explains which regime an economy rests on. We conclude that different historical experiences may have lead different societies to different steady states, in which different social beliefs and political outcomes are self-reproducing.

[26] Note, however, that the Meltzer-Richard motive now applies to redistribution of both contemporaneous income and inherited bequests.

6 Conclusion

The heart of our results is the politico-economic complementarity introduced by the demand that "people should get what they deserve and deserve what they get." The possibility of multiple equilibria or multiple steady states was only an extreme manifestation of this complementarity. More generally, a demand for fairness introduces persistence in social beliefs and political choices. This also suggests that reforms of the welfare state and the regulatory system may need to be large and persistent to be politically sustainable. In practice, this means that policy makers need to persuade their electorates that, although such reforms may generate rather unfair outcomes in the short run, they will ultimately ensure both more efficient and fairer outcomes for future generations.

Although we focused on income taxation, the demand for fairness may have similar implications for a broader spectrum of policy choices, such as the inheritance tax, the public provision of education, or the regulation of product and labor markets. For example, if a society perceives differences in wealth and family backgrounds largely as the effect of luck and connections, it may consider the "death penalty" quite fair, and may also find it desirable, albeit costly, to limit the options for private education.

Our analysis thus sheds some light on why differences in attitudes towards the market mechanism are so rooted in American and European cultures. In Europe, opportunities for wealth and success have been severely restrained by class differences at least since medieval times.[27] At the time of the extension of the franchise, the distribution of income was perceived as unfair because it was generated more by birth and nobility than by ability and effort. The "invisible hand" has frequently favored the lucky and privileged rather than the talented and hard-working. Europeans have thus favored aggressive redistributive polices and other forms of government intervention. In the "land of opportunities," on the other hand, the perception was that those who were wealthy and successful had "made it" on their own. Americans have thus chosen strong property protection, limited regulation, and low redistribution, which in turn have resulted to fewer distortions, more efficient market outcomes, and a smaller effect of "luck". Today, the "self-made man" remains very much an American "icon"; and Americans remain more averse to government intervention than Europeans.

Of course, this is only part of the story. Was slavery a justifiable source of inequality

[27] Marx and Engels had already identified in the lack of a feudal period as one of the reasons why in the United States it would have been much harder to create a Communist party committed to wealth expropriation. See Alesina and Glaeser (2004) for more discussion.

in the United States? And is the sustained income differential between white and blacks a fair outcome? Probably not. Also, part of the reason why the median in the United States believes that the poor deserve to be poor may be that the median tends to be white and the poor tend to be black. And there is certainly much to the point that Americans overestimate social mobility, while Europeans underestimate it, and that some of the welfare programs in Europe, such as in public education or public health, may actually help reduce the effect of luck. An important question thus remains as to whether different beliefs reflect different facts or simply different ideologies and stereotypes.

Finally, the definition of fairness in this paper was embedded in individual preferences. An important question is where such preferences originate from, why societies consider particular sources of income as "fair" and others as "unfair". One may think of such preferences for fairness as a metaphor for a social norm that supports a socially preferable outcome. This seems particularly valid if one interprets "luck" as the effect of corruption, rent seeking, theft, and the like – activities that involve private but no social benefits and may thus be naturally treated by society as "unjust". Alternatively, one may follow the Mirrlees paradigm and model fairness as social insurance. Since taxing luck or rent-seeking may involve no or little efficiency costs as compared to taxing productive effort, the optimal level of redistribution is again likely to decrease with the signal-to-noise ratio in the income distribution.[28] We leave these issues open for future research.

[28] Amador, Angeletos and Werning (2004) consider a Mirrlees model with two types of privately-observed idiosyncratic shocks, one which is desirable to insure ("taste shocks") and another which is undesirable to insure ("self-control shocks"). Although their environment is very different from ours, one of their findings is reassuring: in simulations, the optimal level of redistribution tends to decrease with the variance of taste shocks relative to the variance of self-control shocks.

Appendix

Proof of Lemma 1. Conditions (2), (10), and (11) imply that, in equilibrium, the level of consumption and the cost of investment and effort for agent i are

$$c_i = (1-\tau)y_i + \tau\bar{y} = [1-\alpha\tau_e - (1-\alpha)\tau][\delta_i + \tau(\bar{\delta}-\delta_i)] + [\eta_i + \tau(\overline{\eta}-\eta_i)],$$
$$\frac{1}{2\beta_i}\left[\alpha k_i^2 + (1-\alpha)e_i^2\right] = \frac{1}{2}\left[\alpha(1-\tau_e)^2 + (1-\alpha)(1-\tau)^2\right]\delta_i.$$

Combining, we infer that the equilibrium utility of agent i is

$$U_i = \left[1-\alpha\tau_e^2 - (1-\alpha)\tau^2\right]\frac{\delta_i}{2} + [1-\alpha\tau_e - (1-\alpha)\tau]\tau(\bar{\delta}-\delta_i) + [\eta_i + \tau(\overline{\eta}-\eta_i)] - \gamma\Omega, \quad (24)$$

with Ω as in (14). It follows that

$$\frac{\partial^2 U_i}{\partial\tau^2} = -(1-\alpha)(2\bar{\delta}-\delta_i) - 2\gamma\left\{\sigma_\delta^2\left[1-2\tau(1-\alpha)-\alpha\tau_e\right]^2 + \sigma_\eta^2\right\}.$$

and therefore $2\bar{\delta} > \max\{\delta_i\}$ suffices for preferences to be single-picked in τ for all agents, in which case the median voter theorem applies. In any event, we assume that the policy maximizes the utility of the median voter. Evaluating (24) for $i = m$, using $\eta_m = 0$, $\Delta = \bar{\delta}-\delta_m$, and the normalization $\delta_m = 2$, gives (13). Next, define $W(\tau,\tau_e) = (1-\alpha\tau_e^2) - U_m$, or equivalently

$$W(\tau,\tau_e) = (1-\alpha)\tau^2 + \tau^2[1-\alpha\tau_e - (1-\alpha)\tau]^2\gamma\sigma_\delta^2 + (1-\tau)^2\gamma\sigma_\eta^2 - \tau\left[1-\alpha\tau_e - (1-\alpha)\tau\right]\Delta.$$

Define also $H(\tau,\tau_e) = \partial W/\partial\tau$. Letting $f(\tau_e) = \arg\min_{\tau\in[0,1]} W(\tau,\tau_e)$ gives (15). Note that W is strictly convex, since $\partial^2 W/\partial\tau^2 = 2(1-\alpha)(1+\Delta) + 2\gamma\left\{\sigma_\delta^2\left[1-2\tau(1-\alpha)-\alpha\tau_e\right]^2 + \sigma_\eta^2\right\} > 0$. By implication, the first-order condition is both necessary and sufficient, in which case $\tau = f(\tau_e)$ is the unique solution to $H(\tau,\tau_e) = 0$.

If $\gamma = \Delta = 0$, it is immediate that $f(\tau_e) = 0$ for all $\tau_e \in [0,1]$. But if $\gamma > 0$ and/or $\Delta > 0$, $H(0,\tau_e) = -2\gamma\sigma_\eta^2 - \Delta(1-\alpha\tau_e) < 0$, which ensures $f(\tau_e) > 0$ for all $\tau_e \in [0,1]$. Moreover, if $\Delta > 0$ but $\gamma = 0$, the first-order condition gives $f(\tau_e) = \Delta(1-\alpha\tau_e)/\left(2(1+\Delta)\right)$ and therefore $\partial f/\partial\tau^e < 0$, $\partial f/\partial\Delta > 0$, and $\partial f/\partial\sigma_\delta = \partial f/\partial\sigma_\eta = 0$.

For $\gamma > 0$, the solution can be analyzed using the Implicit Function Theorem. By the second-order condition, $\partial H/\partial\tau = \partial^2 W/\partial\tau^2 > 0$. Next, it is easy to check that $\partial H/\partial\sigma_\eta = -2(1-\tau)$, $\partial H/\partial\sigma_\delta = 2\gamma\sigma_\delta^2[1-\alpha\tau_e - (1-\alpha)\tau][1-\alpha\tau_e - 2(1-\alpha)\tau]$, and $\partial H/\partial\Delta = -[1-\alpha\tau_e - 2(1-\alpha)\tau]$. It follows that $\partial f/\partial\sigma_\eta > 0$ necessarily. On the other hand, $\partial f/\partial\sigma_\delta < 0 \Leftrightarrow \partial f/\partial\Delta > 0 \Leftrightarrow \tau < (1-\alpha\tau_e)/2(1-\alpha)$. Let

$$h(\tau_e) \equiv H\left(\tfrac{1-\alpha\tau_e}{2(1-\alpha)}, \tau_e\right) = \tfrac{1}{1-\alpha}\{[1-\alpha-(1-2\alpha)\gamma\sigma_\eta^2] - \alpha[1-\alpha+\gamma\sigma_\eta^2]\tau_e\}$$

and note that $\tau < (1-\alpha\tau_e)/2(1-\alpha)$ if and only if $h(\tau_e) > 0$. Since $h'(\tau e) < 0$, there exist a unique $\widehat{\tau}_e$ such that $h(\tau_e) > 0$ if and only if $\tau_e < \widehat{\tau}_e$; this threshold is $\widehat{\tau}_e = \left(1-\alpha-(1-2\alpha)\gamma\sigma_\eta^2\right)/\left(\alpha(1-\alpha+\gamma\sigma_\eta^2)\right)$. We conclude that $\partial f/\partial\sigma_\delta < 0$ and $\partial f/\partial\Delta$ if and only if $\tau_e < \widehat{\tau}_e$, where $\widehat{\tau}_e$ is decreasing in $\gamma\sigma_\eta^2$ and satisfies $\widehat{\tau}_e \geq 1$ if and only if $\gamma\sigma_\eta^2 \leq 1-\alpha$. Finally, $\partial H/\partial\tau^e|_{\tau^e=0} = -\gamma\alpha\sigma_\delta^2\tau\{[2-3(1-\alpha)\tau]-\Delta/\gamma\}$. It follows that $\alpha > 1/3$ and $\gamma > \Delta/[2-3(1-\alpha)]$ suffice for $\partial H/\partial\tau^e|_{\tau^e=0} < 0$, in which case $f'(0) > 0$; that is, f is initially increasing in τ_e. ■

Proof of Theorem 1. That f has at least one fixed point follows immediately from the fact that f is bounded and continuous. First, note that $\tau = \tau_e = 1$ implies $\frac{\partial W}{\partial\tau} = (1-\alpha)(2+\Delta)$ and thus, for any $\Delta \geq 0$, $f(1) < 1$ if and only if $\alpha < 1$. Therefore, $\alpha < 1$ is necessary and sufficient for $\tau = 1$ not to be a fixed point. Next, note that Lemma 1 established that f is non-increasing in τ for either $\gamma = 0$ or $\alpha = 0$. It follows that f has a unique fixed point whenever $\gamma = 0$ or $\alpha = 0$, and by continuity also when γ or α are sufficiently close to zero. For γ and α sufficiently high, on the other hand, f is increasing over some portions, which opens the door to multiple fixed points. An example of an economy with multiple fixed points is given by Figure 2 in the main text (that is, by $\alpha = .5$, $\Delta = 0$, $\gamma = 1$, $\sigma_\delta = 2.5$, $\sigma_\eta = 1$). Since all three fixed point in this example are non-singular (in the sense that $f'(\tau) \neq 1$) and since f is continuous in $\mathcal{E} = (\alpha,\Delta,\gamma,\sigma_\sigma,\sigma_\eta)$, there is an open set of $\mathcal{E}$ for which $f(\tau) = \tau$ admits multiple fixed points, which proves that multiplicity emerges *robustly* in some economies. Finally, the comparative statics of the equilibria with respect to σ_δ and σ_η follow directly from the comparative statics of f (see Lemma 1 again), whereas the equilibrium level and the decomposition of inequality are given by $Var(y_i) = (1-\tau)^2\sigma_\delta^2 + \sigma_\eta^2$ and $Var(\hat{y}_i)/Var(y_i-\hat{y}_i) = (1-\tau)^2\sigma_\delta^2/\sigma_\eta^2$, which clearly are both decreasing in τ. ■

Proof of Lemma 2 and Theorem 2. Iterating (17) and (21), after-tax wealth in period t reduces to

$$w_{it} = \sum_{s\leq t}\alpha^{t-s}\left(1-\tilde{\tau}_{s+1,t-1}\right)\left[(1-\tau_s)\left(A_s^i e_s^i + \eta_s^i\right) + G_s\right], \tag{25}$$

where $\tilde{\tau}_{s,t} \equiv 1-\prod_{j=s}^{t}(1-\tau_j)$ denotes the cumulative tax rate between periods s and t (with the convention that $\tilde{\tau}_{s,t} = 0$ for $s > t$). Combining with (22), the residual between actual and fair wealth reduces to

$$w_{it} - \hat{w}_{it} = \sum_{s\leq t}\alpha^{t-s}\left[\left(1-\tilde{\tau}_{s,t-1}\right)\eta_s^i - \tilde{\tau}_{s,t-1}A_s^i e_s^i + \left(1-\tilde{\tau}_{s+1,t-1}\right)G_s\right]. \tag{26}$$

Next, note that $y_{it} = A_{it}e_{it} + \eta_{it} + \alpha w_{it-1}$, $\hat{y}_{it} = A_{it}e_{it} + \alpha\hat{w}_{it-1}$, and therefore $y_{it} - \hat{y}_{it} = \eta_{it} + \alpha(w_{it-1} - \hat{w}_{it})$. Using (25) and (26) for $t-1$, and substituting $e_{is} = (1-\tau_s)A_{is}\beta_{is}$, we get

$$y_{it}-\hat{y}_{it}=\eta_i+\alpha\sum_{s\leq t-1}\alpha^{t-1-s}\left[\left(1-\tilde{\tau}_{s,t-2}\right)\eta_i-\tilde{\tau}_{s,t-2}\left(1-\tau_s\right)\delta_i+\left(1-\tilde{\tau}_{s+1,t-2}\right)G_s\right]$$

Using the above and (22) to compute $Var\left(y_{it}-\hat{y}_{it}\right)$ and $Var\left(\hat{y}_{it}\right)$, we conclude that the equilibrium signal-to-noise ratio is given by

$$\frac{Var(\hat{y}_{it})}{Var(y_{it}-\hat{y}_{it})}=\frac{\left(\sum_{s\leq t}\alpha^{s-t}(1-\tau_s)\right)^2\sigma_\delta^2}{\left(\sum_{s\leq t}\alpha^{t-s}\left(1-\tilde{\tau}_{s,t-1}\right)\right)^2\sigma_\eta^2+\left(\sum_{s\leq t-1}\alpha^{t-s}\tilde{\tau}_{s,t-2}\left(1-\tau_s\right)\right)^2\sigma_\delta^2}, \tag{27}$$

where $\tilde{\tau}_{s,t}\equiv 1-\prod_{j=s}^{t}\left(1-\tau_j\right)$ denotes the cumulative tax rate between periods s and t (with the convention that $\tilde{\tau}_{s,t}=0$ for $s>t$). Note that the above depends on τ_s for every $s\leq t$, which proves the claim in the main text that how fair the wealth distribution is in generation t depends, not only on the policies chosen by the same generation, but also on the policies chosen by all past generations.

Next, consider a stationary history $\tau_s=\tau$ for all $s\leq t-1$. It follows that, for all $s\leq t-1$, $w_{is}=w_i$, where

$$w_i=\left(1-\tau\right)y_i+G=\left(1-\tau\right)^2\delta_i+\left(1-\tau\right)\eta_i+\left(1-\tau\right)\alpha w_i+G$$

or equivalently

$$w_i=\tfrac{1}{1-\alpha(1-\tau)}\left(\left(1-\tau\right)^2\delta_i+G+\left(1-\tau\right)\eta_i\right),$$

Similarly, for $s\leq t-1$, $\hat{w}_{is}=\hat{w}_i=\left(1-\tau\right)\delta_i/\left(1-\alpha\right)$. In period t, on the other hand,

$$w_{it}=\left(1-\tau_t\right)^2\delta_i+\left(1-\tau_t\right)\eta_i+\left(1-\tau_t\right)\alpha w_i+G \tag{28}$$

and similarly $\hat{w}_{it}=\left(1-\tau_t\right)\delta_i+\alpha\hat{w}_i$. It follows that

$$\begin{aligned}
w_{it}-\hat{w}_{it} &= -\left(1-\tau_t\right)\tau_t\delta_i+\left(1-\tau_t\right)\eta_i+\left(1-\tau_t\right)\alpha w_i-\alpha\hat{w}_i+G_t\\
&= \left\{-\left(1-\tau_t\right)\tau_t+\frac{\alpha}{1-\alpha\left(1-\tau\right)}\left(1-\tau_t\right)\left(1-\tau\right)^2-\frac{\alpha}{1-\alpha}\left(1-\tau\right)\right\}\delta_i\\
&\quad+\left\{\left(1-\tau_t\right)+\left(1-\tau_t\right)\frac{\alpha}{1-\alpha\left(1-\tau\right)}\left(1-\tau\right)\right\}\eta_i\\
&\quad+\left(1-\tau_t\right)\alpha\frac{1}{1-\alpha\left(1-\tau\right)}G+G_t
\end{aligned}$$

and therefore $\Omega_t=Var(w_{it}-\hat{w}_{it})$ reduces to

$$\begin{aligned}
\Omega_t &= \left\{\left(1-\tau_t\right)\tau_t-\frac{\alpha}{1-\alpha\left(1-\tau\right)}\left(1-\tau_t\right)\left(1-\tau\right)^2+\frac{\alpha}{1-\alpha}\left(1-\tau\right)\right\}^2\sigma_\delta^2\\
&\quad+\left(1-\tau_t\right)\left\{1+\frac{\alpha\left(1-\tau\right)}{1-\alpha\left(1-\tau\right)}\right\}^2\sigma_\eta^2
\end{aligned} \tag{29}$$

The private utility of an agent, on the other hand, can be computed as follows. Noting that and $\bar{y} = \bar{w}$ and using $G_t = \tau_t \left[(1-\tau_t)\,\delta + \alpha \bar{w} \right]$ into (28) gives

$$w_{it} = (1-\tau_t)\,\delta_i + (1-\tau_t)\,\eta_i + \alpha w_i + \tau_t (1-\tau_t)(\delta - \delta_i) + \tau_t \alpha (\bar{w} - w_i)\,. \tag{30}$$

Similarly, $w_i = (1-\tau)\,\delta_i + (1-\tau)\,\eta_i + \alpha w_i + \tau (1-\tau)(\delta - \delta_i) + \tau \alpha (\bar{w} - w_i)$ and therefore $\bar{w} = (1-\tau)\,\delta / (1-\alpha)$ and

$$\bar{w} - w_i = \frac{1}{1-\alpha(1-\tau)} \left[(1-\tau)^2 (\delta - \delta_i) - (1-\tau)\,\eta_i \right].$$

Substituting the above into (30), we get

$$w_{it} = (1-\tau_t)\,\delta_i + (1-\tau_t)\,\eta_i + \alpha w_i + \tau_t (1-\tau_t)(\delta - \delta_i) + \tau_t \frac{\alpha(1-\tau)}{1-\alpha(1-\tau)} \left[(1-\tau)(\delta - \delta_i) - \eta_i \right].$$

Combining this with $u_{it} = w_{it} - e_{it}^2/2$ and (**??**), we conclude that

$$u_{it} = \frac{1}{2}\delta_i + \alpha w_i + (1-\tau_t)\,\eta_i - \frac{1}{2}\tau_t^2 \delta_i + \tau_t (1-\tau_t)(\delta - \delta_i) + \tau_t \frac{\alpha(1-\tau)}{1-\alpha(1-\tau)} \left[(1-\tau)(\delta - \delta_i) - \eta_i \right].$$

Noting that the first two terms do not depend on τ_t and evaluating the above at $\delta_i = \delta_m$ and $\eta_i = 0$, we infer that the private utility of the median voter reduces to

$$u_{mt} = -\frac{1}{2}\tau_t^2 + \tau_t \left[(1-\tau_t) + \tfrac{\alpha(1-\tau)}{1-\alpha(1-\tau)} (1-\tau) \right] \Delta \tag{31}$$

where we normalized $\delta_m = 1$ and let $\Delta = \bar{\delta} - \delta_m$. Combining (29) and (31) gives the definition of ϕ and completes the proof of Lemma 2.

Finally, to prove Theorem 2, note the following. When $\gamma = 0$, the best-response function ϕ reduces to

$$\phi(\tau) = \arg\min_{\tau_t} \{-u_{mt}\} = -\left[1 + \frac{\alpha(1-\tau)^2}{1-\alpha(1-\tau)} \right] \frac{\Delta}{1+2\Delta}$$

which is clearly decreasing in τ. Hence, ϕ has a unique fixed point if $\gamma = 0$. If instead $\gamma > 0$, the are open sets of $\mathcal{E}$ for which which ϕ has multiple fixed points: one robust example is given by $\alpha = .5$, $\Delta = .15$, $\gamma = .39$, $\sigma_\delta = 2$, $\sigma_\eta = .75$. ■

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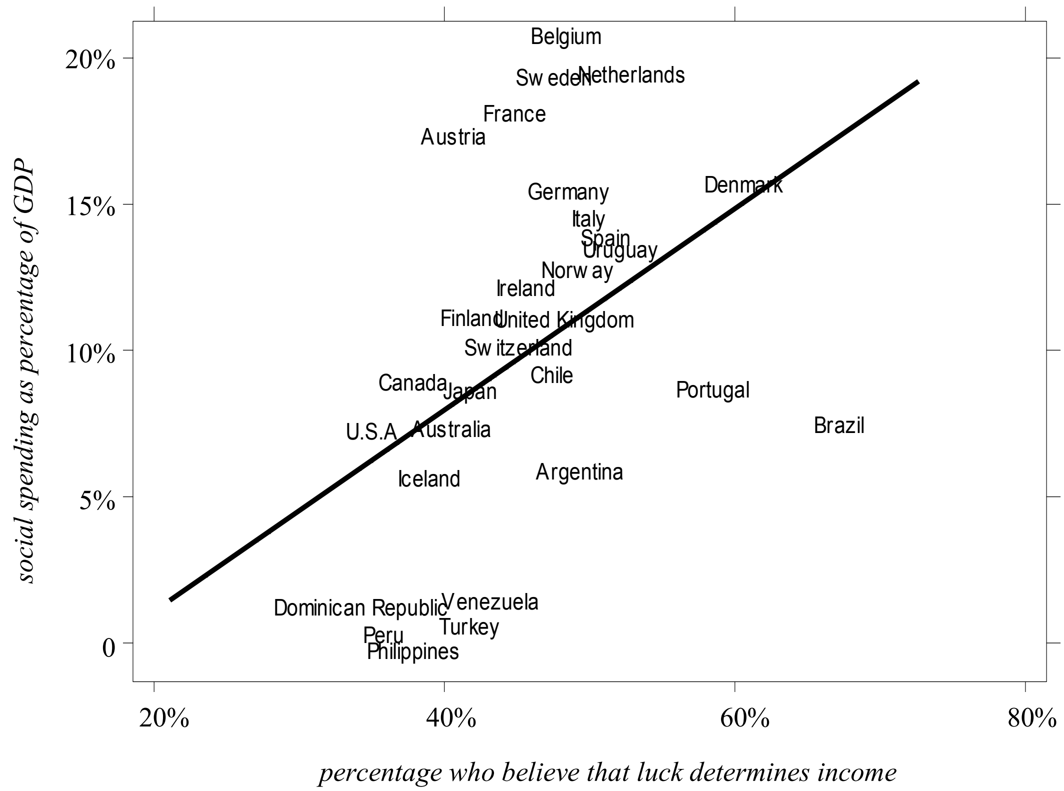

Figure 1

Reproduced from Alesina, Gleaser and Sacerdote (2001). This scatterplot illustrates the positive cross-country correlation between the percentage of GDP allocated to social spending and the fraction of respondents to the *World Value Survey* who believe that luck determines income.

Table 1

The effect of the belief that luck determines income on aggregate social spending

Dependent variable: Social spending as percent of GDP				
	1	**2**	**3**	**4**
Mean belief that luck determines income	**32.728***** (2.925)	**32.272***** (3.064)	**36.430***** (3.305)	**31.782**** (2.521)
Gini coefficient		-0.306* (1.724)	-0.238* (1.739)	-0.115 (0.613)
GDP per capita			3.148 (1.348)	4.754 (1.548)
Majoritarian			0.493 (0.184)	0.031 (0.011)
Presidential				-4.24 (1.392)
Latin America	-6.950*** (3.887)	-4.323 (1.472)	-2.992 (0.941)	0.413 (0.098)
Asia	-9.244*** (6.684)	-6.075** (2.153)	-0.808 (0.142)	4.657 (0.618)
Constant	-3.088 (0.590)	7.907 (1.396)	-25.207 (1.152)	-41.401 (1.425)
Observations	29	26	26	26
Adjusted R-squared	0.431	0.494	0.495	0.496

Source: Total social spending is social spending as a percentage of GDP, from Persson and Tebellini (2000); original source: IMF. Majoritarian, presidential, and age structure are from Persson and Tabellini (2002). Ethnic fractionalization is from Alesina et al (2002). Mean belief that luck determines income is constructed using World Value Survey data for 1981-97 from the Institute for Social Research, University of Michigan. This variable corresponds to the response to the following question: “In the long run, hard work usually brings a better life. Or, hard work does not generally bring success; it’s more a matter of luck and connections.” The answers are coded 1 to 10. We recoded on a scale 0 to 1, with 1 indicating the strongest belief in luck. We report OLS estimates, with robust *t* statistics in parentheses. (* significant at 10%; ** significant at 5%; *** significant at 1%.)

Table 2

The effect of the belief that luck determines income on individual political orientation

Dependent variable: Being left on the political spectrum			
	1	2	3
Individual belief that luck determines income		**0.541***** (3.69)	**0.607***** (3.78)
Gini coefficient			-0.627*** (1.93)
Income	-0.01*** (7.20)	-0.009*** (3.31)	-0.009*** (3.88)
Years of education	-0.004*** (3.79)	-0.002 (0.74)	0.000 (0.07)
City population	0.01*** (7.43)	0.01*** (4.29)	0.009*** (4.40)
White	0.036 (4.83)	0.051*** (3.13)	0.033** (2.11)
Married	-0.026*** (3.22)	-0.03*** (2.97)	-0.032*** (3.11)
No. of children	-0.009*** (3.63)	-0.01*** (3.09)	-0.013*** (3.59)
Female	-0.044*** (6.93)	-0.043*** (3.43)	-0.039*** (3.39)
US resident	-0.125*** (12.14)	-0.096*** (3.31)	-0.051 (1.37)
Age group 18-24	0.11*** (6.19)	0.078*** (3.41)	0.007*** (3.11)
Age group 25-34	0.131*** (11.73)	0.116*** (7.23)	0.114*** (7.00)
Age group 35-44	0.126*** (12.03)	0.117*** (8.96)	0.12*** (9.27)
Age group 45-54	0.085*** (7.98)	0.081*** (6.37)	0.08*** (6.03)
Age group 55-64	0.039*** (3.55)	0.038*** (3.25)	0.037*** (3.00)
Constant	0.347*** (16.15)	0.045 (0.62)	0.218 (1.64)
Observations	20269	16478	14998
R-squared	0.03	0.03	0.04

Source: The dependent variable is constructed using data from the World Value Survey. It is a 0 to 1 indicator for whether the respondent classifies himself/herself as being on the left of the political spectrum. The question is formulated as follows: "In political matters, people talk of left and right. How would you place your views on this scale, generally speaking?" The respondent is given a scale 1 to 10, 1 being the most leftist. We classified as leftist anyone who answered with a score of 5 or below. All other individual characteristics are also from World Value Survey. We report Probit estimates, with absolute value of *t* statistics in parentheses. (* significant at 10%; ** significant at 5%; *** significant at 1%.)

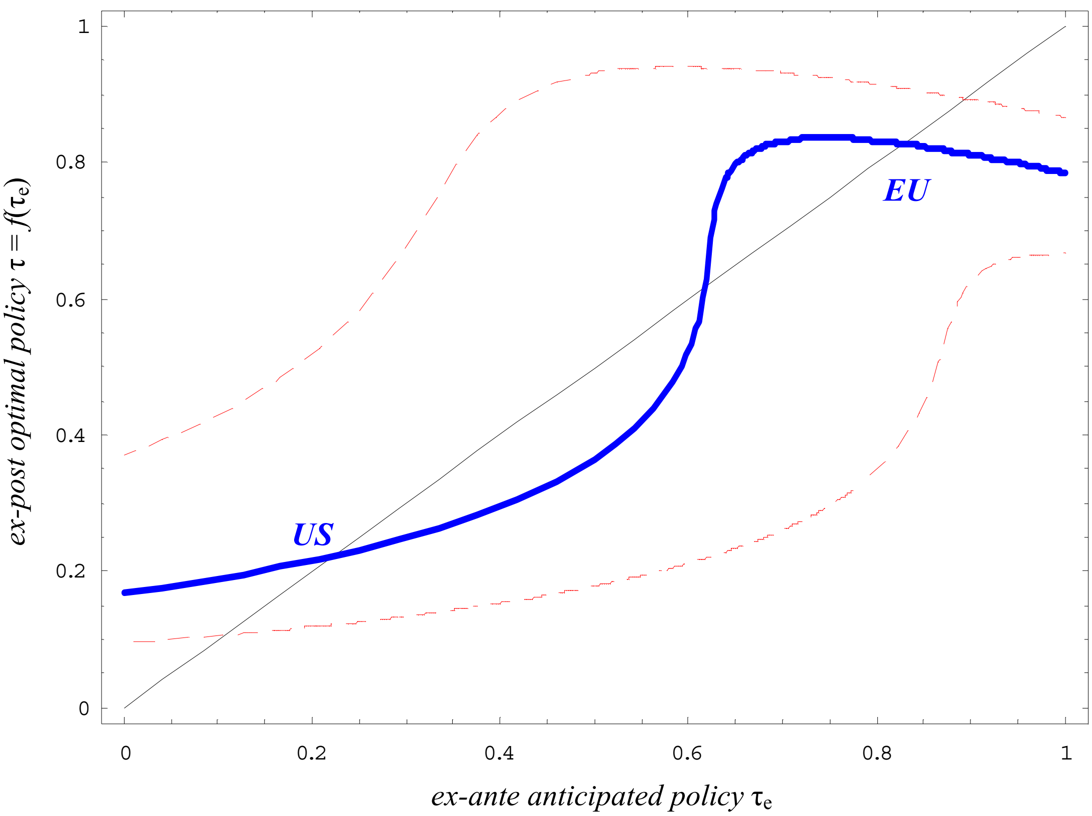

Figure 2

The figure depicts the relation between the tax rate that agents anticipate ex ante (horizontal axis), and the tax rate that the society finds optimal ex post (vertical axis). The solid curve represents an economy where the effect of luck is moderate as compared to talent and effort. An equilibrium corresponds to any intersection of this curve with the 45-degree line. There are two stable equilibria, one with low taxation, high inequality, and low injustice (*US*), and one with high taxation, low inequality, and high injustice (*EU*). The lower dashed line represents an economy where the effect of luck is very small, in which case only the low-tax regime survives. Finally, the upper dashed line represents an economy where luck dominates, in which case only the high-tax regime survives.