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Preferences for redistribution and social structure

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Abstract

We model inter-individual differences in preferences for redistribution as a function of (a) self-interest; (b) stable ideological traits; (c) subjective perceptions of the relative importance of the main determinants of income differences (luck, effort, talent). Individuals base the latter on information obtained from their reference group. We analyse the consequences for redistributive preferences of homophilous reference group formation based on talent. We argue that our theoretical results make it possible to understand and integrate some of the main insights from the empirical literature. We illustrate with GSS data from 1987 how our model may help in structuring empirical work.

JEL-codes: D30, D63, D70.

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1 Introduction

Recently, the evidence that citizens have preferences for redistribution that go beyond their own narrow self-interest has been accumulating (see Alesina and Giuliano, 2011, for a recent overview). These preferences influence voting behavior and therefore redistributive government policies. Feedback mechanisms, with redistributive policies leading to economic outcomes that in their turn influence preferences again, may lead to multiple politico-economic equilibria (Alesina and Angeletos, 2005; Benabou and Tirole, 2006; Cervellati et al., 2010; Luttens and Valfort, 2012). In a dynamic setting, different initial conditions may, through their effect on preferences and voting outcomes, put economies on diverging development paths (Alesina et al., 2012).

Although the empirical literature is growing rapidly and becoming slightly disparate, it is possible to sketch some general findings. First, self-interest continues to play an important role: in general, respondents with larger incomes and better education are less in favour of redistribution. The effects are not always monotonic, however. For education, it is not uncommon to find a U-shaped pattern, with both the lowest and highest education levels in favour of greater redistribution (Georgiadis and Manning, 2012; Pittau et al., 2013). Positive economic prospects and the perception that one has opportunities to advance in society have a negative effect on the desire to redistribute (Benabou and Ok, 2001; Alesina and La Ferrara, 2005).

Second, values and beliefs about the causes of income differences are of great importance. People perceive income differences due to luck as illegitimate, and those due to effort as legitimate. Different beliefs regarding the relative importance of effort and luck in explaining actual income differences lead to different ideas about the desirability of redistribution (Corneo and Grüner, 2002; Fong, 2001). Ability falls somewhere in-between (Isaksson and Lindskog, 2009), as it is partly under the control of individuals (certainly

if it reflects investment in human capital), and partly the outcome of a natural lottery.

Third, there is strong evidence for reference group effects (Keely and Tan, 2008). Significant differences have been found between linguistic (Eugster et al., 2011) and ethnic groups after controlling for other economic and social characteristics. Two mechanisms are at work here. One is "identification": if people conform to the preferences of other group members, this may lead to the formation of rather stable (sub)cultural differences. The importance of stable cultural traits is illustrated by the fact that redistributive preferences of immigrants continue to be influenced by their country of origin (Guiso et al., 2006; Luttmer and Singhal, 2011). The other mechanism is linked to information: as individuals are not perfectly informed, they derive information about the actual income distribution from what they observe in their own reference group (Cruces et al., 2013). Moreover, consumers in the same social environment are more likely to observe the same media and hear the same stories about income inequality and its causes.

Fourth, there are direct effects of the neighborhood in which people are living. Luttmer (2001) found that support for welfare payments is lower for respondents living in a neighborhood with a larger welfare recipiency rate. In line with the reference group effect, he also found that support increases as the share of local recipients from the respondent's own racial group rises. In Japan, the level of community interaction in a region has a positive effect on the willingness of the rich to redistribute, but not of the poor (Yamamura, 2013).

Fifth, redistributive preferences change over time. Immigrants assimilate to some extent the values in their country of destination, although assimilation is slow and depends on the extent of social integration. Changes in the macroeconomic environment (e.g. in the degree of pre-tax inequality) lead to adaptations in the redistributive preferences of the population (Olivera, 2012), but the size and direction of the adaptation is mediated

by a complex mix of intervening variables (Georgiadis and Manning, 2012). Negative economic shocks in childhood or adolescence may have a lasting effect on redistributive preferences during adulthood (Alesina and Giuliano, 2011).

Much of the literature has tried to explain the differences between the US and Europe. Indeed, all of the mentioned effects contribute to the explanation of inter-country differences. However, at least as striking are the large inter-individual preference differences *within* countries. It is not easy to integrate the (sometimes conflicting) empirical findings into a more general explanation of these differences. For obvious reasons, most authors have focused on specific variables from the above list. Moreover, they have used different sets of control variables, dependent on the database that was available to them.

We propose a theoretical model that is able to integrate many findings from the empirical literature. As the perception and evaluation of causes of income differences are essential in understanding differences in preferences, we start from the extension of the self-interest model that has been proposed in the seminal paper by Alesina and Angeletos (2005). We follow them in assuming that income differences due to luck are considered illegitimate and those due to effort legitimate, but we introduce the possibility that income differences caused by ability may be seen as unjust. The individual's utility function is a linear combination of a self-interested and a social justice part. Individuals are characterized by two stable cultural traits: the relative weight given in their utility function to self-interest versus justice, and the degree of acceptance of income differences due to ability. Their desired degree of redistribution will then depend on the importance of luck, effort and ability for the explanation of income differences. We assume that individuals are not perfectly informed about these variables and that they derive information about them from what they observe in their reference groups. We obtain additional insights from a simple model of homophilous reference group formation

on the basis of ability indicators.

We do not build a complete model of the political equilibrium that would result from the preferences we analyze. The politico-economic models in the literature are necessarily based on more stylized descriptions of preferences. Our approach – going deeper into the explanation of individual preferences – is complementary to that work. The main limitation of our model is its static nature. We do not explicitly model mobility, nor do we analyze learning over time. We focus exclusively on social interactions and on the influence of reference groups. Despite these obvious limitations, we are still able to rationalize many of the findings in the literature. We suggest a possible channel explaining why, e.g. education may have a different effect in different circumstances. We explain how changes in beliefs may lead to changes in (reduced) redistributive preferences, despite the fact that individuals have stable cultural traits. We show how changes in the social structure, i.e. in the social stratification underlying reference group formation, may induce changes in redistributive preferences.

The next section describes our model of redistributive preferences. In Section 3 we explore the consequences of homophilous group formation. In Section 4 we reconsider the existing empirical evidence through the lens of our model. Section 5 presents an empirical analysis of data from the 1987 round of the General Social Survey (GSS). This analysis is only meant to be an illustration, as the database is too weak and small to implement our theoretical model: our only ambition is to sketch a direction in which future empirical work might go. Section 6 concludes.

2 Preferences for redistribution, cultural traits and beliefs

Assume a unit mass infinite population of consumers. Denote the pre-tax income of individual i by m_i. Redistribution is operationalized by a linear income tax scheme,

with tax rate $\tau \in [0,1]$ and a uniform lump sum transfer $\tau\bar{m}$, with $\overline{m}$ the average pre-tax income in society. Actual post-tax consumption c_i equals post-tax income, i.e.

$$c_i = (1-\tau)\, m_i + \tau\bar{m}. \tag{1}$$

We define preferences for redistribution in terms of preferences for τ.[1] These preferences should be seen as a reduced form, reflecting deeper underlying considerations.[2] We therefore build a structural model of preferences, in which we distinguish three sets of determinants.

The first set of determinants is related to the self-interest of the individuals, as captured by their own position within the income distribution. We assume that individual consumers differ in three income determinants: talent (productive capacity), ambition (taste for effort) and luck.

Second, preferences for redistribution are also motivated by the individual's views regarding fairness. We assume that these views are relatively stable cultural or ideological traits of the individual. A first trait is the relative weight given to fairness versus self-interest. A second trait is linked to the content of fairness itself. Ideas about the fairness of the income distribution reflect a position on the relative deservingness of incomes related to talent, ambition and luck. In line with the empirical literature, we assume that all fairness-minded citizens consider income differences due to luck as undeserved and income differences due to taste for effort as ethically acceptable.[3] However, empirical

[1] In political economy models of the determination of tax rates, each individual voter has a zero impact on outcome. We focus on individual preferences: the optimal τ is then determined as if the individual is a dictator.

[2] There is an immediate analogy with the distinction made by Postlewaite (2011) between "reduced form" and "deep" preferences in the context of social norms.

[3] Relaxing this assumption is easy within our model, but leads to a large number of empirically irrelevant cases requiring analysis.

work (Konow, 2003; Gaertner and Schokkaert, 2012) suggests that there is no consensus about the deservingness of income differences due to natural talent. We will interpret different opinions in this regard as a second stable trait.

Third, individuals with the same fundamental ideas about fairness and the same self-interest, may still have different preferences about τ, dependent on the characteristics of the society in which they are living. Since they are not perfectly informed about the distribution of talent, luck and ambition throughout their society, they have to form subjective perceptions and beliefs about these population characteristics. We assume that they form these beliefs on the basis of the information they derive from their own reference group. We return to the structure of these reference groups in the next section. For the moment we simply state that for each consumer $i \in \mathcal{I}$, there is a set of individuals $\mu(i) \subseteq \mathcal{I}$, observations of whom are used to estimate population characteristics. As an example, average income in society as perceived by individual i is $\bar{m}_{(i)} = \frac{1}{|\mu(i)|} \int_{j \in \mu(i)} m_j dj$. We will use the subscript (i) each time we refer to a variable that is "estimated" by individual i on the basis of observations in her reference group.[4]

To make these general ideas more specific, assume that the full utility of consumer i is a convex combination of private utility u_i and fairness:

$$U_i = (1 - \gamma)\, u_i - \gamma \Omega^{\zeta}_{(i)}, \tag{2}$$

in which $\Omega^{\zeta}_{(i)}$ stands for the social injustice in society, as perceived by consumer i, and $\gamma \in [0, 1]$ is a parameter indicating the relative weight of social injustice in overall utility. As mentioned before, γ is assumed to be a stable individual trait.[5]

[4] The index i is typically employed for the consumer assessing their preferences for redistribution, and j concerns typically consumers observed by them.

[5] To save on notation, we do not use subscripts for these cultural traits, but we will derive comparative statics results with respect to them.

Private utility, i.e. the first component of (2), is specified in a quasi-linear form as the difference between consumption and the disutility of effort

$$u_i = c_i - \frac{(e_i)^2}{2\beta_i},$$

where e_i is a measure of effort and $\beta_i \in \mathbb{R}^+$ is the individual taste for effort. Consumption c_i is given by eq. (1) with

$$m_i = \alpha_i e_i + \varepsilon_i.$$

Talent is denoted by $\alpha_i \in \mathbb{R}^+$ and luck $\varepsilon_i \in \mathbb{R}$ enters the expression in an additive way. Bringing all this together, anticipated private utility can be written as[6]

$$u_i = (1-\tau)(\alpha_i e_i + \varepsilon_i) + \tau \overline{m}_{(i)} - \frac{(e_i)^2}{2\beta_i}.$$

We assume that the consumers know their own personal parameters but estimate average income $\overline{m}_{(i)}$ on the basis of observations from their reference group. Luck is defined such that $\overline{\varepsilon}_{(i)} = 0$.

Consumers maximize their private utility to choose their optimal effort level e_i^*. Assuming that they neglect the effect of their own effort choice on average income[7], this yields

$$e_i^* = (1-\tau)\,\alpha_i \beta_i \tag{3}$$

such that the resulting consumption level can be written as:

$$c_i = (1-\tau)^2\,\beta_i a_i + (1-\tau)\varepsilon_i + \tau(1-\tau)\overline{a}_{(i)}\overline{\beta}_{(i)}, \tag{4}$$

[6] Note that we use 'anticipated' rather than 'expected' to avoid confusion: individual i knows her own income determinants α_i, β_i and ε_i when choosing effort and redistribution, such that no expectations are formed about the own pre-tax income. Yet, the individual has to estimate the distribution of the different income determinants in society, and thereby also $\bar{m}$, from her own social reference group.

[7] Since i has zero mass, this immediately follows from $|\mu(i)| > 0$.

where we denote for notational simplicity $a_i \equiv (\alpha_i)^2$, $\bar{a}_{(i)} \equiv \frac{1}{|\mu(i)|}\int_{j\in\mu(i)}(\alpha_j)^2\,dj$ and $\bar{\beta}_{(i)} \equiv \frac{1}{|\mu(i)|}\int_{j\in\mu(i)}\beta_j dj$.

Fairness is defined as in Alesina and Angeletos (2005), by taking as a measure of social injustice the average squared difference between each individual's actual consumption c_j and his deserved (or fair) consumption level $\hat{c}_j^{\zeta}$. Different ideas about what is a fair consumption level are captured by the superscript ζ. Taking into account that individuals i have to extrapolate the information they gather from their own reference group, their perceived unfairness can be written as:[8]

$$\Omega_{(i)}^{\zeta} = \frac{1}{|\mu(i)|}\int_{j\in\mu(i)}\left(c_j - \hat{c}_j^{\zeta}\right)^2 dj. \tag{5}$$

We assume that individuals judge the fairness of the distribution in terms of the deservingness of the different income components, and that the deserved (or fair) consumption level of individual j is defined before redistribution, i.e. involves a position on the acceptability of pre-tax income $m_j = (1-\tau)a_j\beta_j + \varepsilon_j$. To calculate the fair consumption level, factors for which individuals are not held responsible are put at their mean value.[9] Luck is one of these.[10] The effort parameter β_i is considered to be individual

[8] The formulation in eq. (5) might suggest that individuals take a parochial attitude and are only interested in justice within their reference group. This is *not* our interpretation, however. We could have started from a more general society-wide measure of injustice. However, as will become clear, only the means and the variances of the different variables will enter the expressions for the preferred tax. Since we assume that these are estimated by the individuals on the basis of their own reference group, replacing eq. (5) by a more general formulation would not change any of our results. Moreover, in our theoretical analysis, reference groups can be interpreted very broadly, e.g. they can be seen as a (probably biased) sample of the overall population.

[9] This is similar to the conditional egalitarian approach in the theory of responsibility-sensitive egalitarianism - see, e.g., Fleurbaey (2008).

[10] Our setting allows for more extreme positions. At one extreme, we have the laissez-faire or libertarian conviction that considers all income differences to be justified, such that fairness warrants no

i's own responsibility.[11] As mentioned before, individuals differ in their ideas about the deservingness of talent. We therefore write in general that

$$\hat{c}_j^{\zeta} = (1-\tau)\,\beta_j\left(\zeta a_j + (1-\zeta)\,\bar{a}_{(i)}\right). \tag{6}$$

The cultural trait ζ indicates the degree to which talent is seen as resulting from deserving investments by the individual. A value $\zeta = 1$ represents the meritocratic view, in which all differences in talent are considered deserved (the case considered in Alesina and Angeletos, 2005), for $\zeta = 0$ the distribution of talent is fully undeserved and just follows from the "natural lottery" (as would be more consistent with a Rawlsian perspective).

Throughout the analysis, we assume that the conditional means of each of the income determinants are independent of the value of the other income determinants:

Condition 1 *Let* $E(\varepsilon|\beta,\alpha) = 0$ *and* $E(\beta|\varepsilon,\alpha) = E(\beta)$ *and* $E(\alpha|\varepsilon,\beta) = E(\alpha)$.

This assumption may seem unrealistic. It makes sense, however, if one takes into account that our model is not a model of the real economy, but a model of subjective perceptions. Moreover, it has an obvious interpretation in the theory of responsibility-sensitive egalitarianism. Suppose that individuals are not to be held responsible for luck and talent,

redistribution at all. This can be modelled as $\hat{c}_j^{\zeta} = m_j$ for all j. In this case, social injustice Ω_j equals the average income change due to taxation and it is minimized by setting $\tau = 0$. Note that this fairness ideal conflicts with self-interest for consumers with an income below average. At the other end of the spectrum, the pure egalitarian position corresponds to $\hat{c}_j^{\zeta} = \bar{m}_{(i)}$ for all j. We will not analyse this position as such (it is rarely defended explicitly).

[11] The philosophical literature on equality of opportunity has made a distinction between two possible perspectives: one that holds individuals responsible for their preferences (even if these are not freely chosen), and another that holds them responsible for their chosen effort levels (see, e.g., Fleurbaey, 2008, for an economic discussion). We use the preference terminology, but as shown by eq. (3), in our model there is a one-to-relationship between β_i and e_i^* (conditional on α_i and τ).

and that ambition is correlated with talent: can they then be held fully responsible for ambition? Especially Roemer (1998) has argued that this would be an incoherent view and that individuals should only be held responsible for that part of ambition that is *not* correlated with talent. He then proposes to measure talent and ambition in such a way that Condition 1 is satisfied. As a matter of fact, Roemer's specific proposal is to measure the degree of effort as the rank that someone occupies in the income distribution of all individuals with the same talent. This would mean that the effort distribution is uniform by assumption. We exploit these ideas about the uniform distribution in the next section, in which we propose a model of reference group formation.

In this section, we derive the preferences for redistribution, i.e. the optimal value of τ for the situation in which reference groups are given. To gain some intuition, we start with two simple cases: first, that of a purely selfish individual; and second, that of a "naive" idealist, who only cares about fairness ($\gamma = 1$). We finally analyze the full model of a sophisticated consumer. Most derivations are trivial, and are relegated to Appendix A.3. The comparative static results are summarized in Table 1.[12]

2.1 Preferences for redistribution of selfish consumers

The anticipated utility function of the purely self-interested consumer with $\gamma = 0$ reduces to:

$$EU_i = (1-\tau)^2 \beta_i a_i + \tau (1-\tau) \bar{a}_{(i)} \bar{\beta}_{(i)} - \frac{(1-\tau)^2 a_i \beta_i}{2}.$$

The first order condition is:

$$\frac{\partial EU_i}{\partial \tau} = \left(1 - 2\tau^{SI}\right) \bar{a}_{(i)} \bar{\beta}_{(i)} - \left(1 - \tau^{SI}\right) a_i \beta_i = 0, \tag{7}$$

[12] As will become clear, the actual tax rate τ^a has an effect on the preferences of naive individuals who neglect incentives.

Table 1: **Preferences for redistribution: comparative statics.**

	self-interest	naive fairness	incentive	sophisticated
self-interest				
a_i	$\leqslant 0$	0	0	$\leqslant 0$
β_i	$\leqslant 0$	0	0	$\leqslant 0$
cultural traits				
ζ	0	< 0	$< (>)\ 0,$ increasing with ζ	$< (>)\ 0,$ increasing with ζ
γ	0	0	0	$< (>)\ 0,$ increasing with m_i
perceptions				
$Var\left(\varepsilon\right)_{(i)}$	0	> 0	0	> 0
$Var\left(a\right)_{(i)}$	0	> 0 for $\zeta = 0,$ < 0 for $\zeta = 1,$ decreasing with ζ	> 0	> 0 for $\zeta = 0,$ < 0 for $\zeta = 1,$ decreasing with ζ
$\bar{\beta}_{(i)}$	> 0	$< (>)\ 0,$ decreasing with ζ	> 0	> 0 for $\zeta = 0,$ < 0 for $\zeta = 1,$ decreasing with ζ and γ
$Var\left(\beta\right)_{(i)}$	0	< 0	> 0	< 0
$\bar{a}_{(i)}$	> 0	< 0	> 0	$< (>)\ 0,$ decreasing with γ
actual tax rate				
τ^a	0	> 0	0	0

resulting in the optimal tax rate τ^{SI} (where the superscript indicates the self-interested case)

$$\tau^{SI} = \frac{a_i\beta_i - \overline{a}_{(i)}\overline{\beta}_{(i)}}{a_i\beta_i - 2\overline{a}_{(i)}\overline{\beta}_{(i)}}, \tag{8}$$

for an interior solution.

Individuals with zero pre-tax income ($a_i\beta_i = 0$) prefer a tax rate $\tau^{SI} = 0.5$. This brings them at the top of the Laffer-curve, i.e. it is the tax rate maximizing the lump sum transfer $\tau(1-\tau)\overline{a}_{(i)}\overline{\beta}_{(i)}$. When the pre-tax income increases, the corresponding value of τ^{SI} decreases. The constraint $\tau \geqslant 0$ becomes binding at $a_i\beta_i = \overline{a}_{(i)}\overline{\beta}_{(i)}$, i.e. for individuals who perceive themselves to have the average pre-tax income.[13] All these results are well known from the many papers in the tradition of Meltzer and Richard (1981). Cultural fairness traits obviously have no impact in this model. The (perceived) means $\overline{a}_{(i)}$ and $\overline{\beta}_{(i)}$ have a positive effect on τ^{SI}. If, as can be expected, individuals with differing talents and tastes for effort have different reference groups, talent and ambition will influence preferences for redistribution through this (indirect) channel. This will be the topic of the next section.

2.2 Preferences for redistribution of naive idealists

Someone who cares exclusively about fairness will choose τ so as to minimize $\Omega^{\zeta}_{(i)}$. We assume that she neglects incentive effects, i.e. that she observes the actual effort levels (for the actual observed tax rate τ^a) $(1-\tau^a)\,\alpha_j\beta_j$ and assumes that these remain fixed when the tax rate changes. The same is then true for the "fair" values $\hat{c}^{\zeta}_j =$

[13] The condition for strict concavity of the optimization problem is that $a_i\beta_i < 2\overline{a}_{(i)}\overline{\beta}_{(i)}$. We only consider individuals for which this assumption holds. More about the concavity of the objective function can be found in Appendix A.2.

$(1-\tau^a)\,\beta_j\left(\zeta a_j+(1-\zeta)\,\bar{a}_{(i)}\right)$.[14] The anticipated consumption level becomes

$$c_j=(1-\tau)\,(1-\tau^a)\beta_j a_j+(1-\tau)\varepsilon_j+\tau(1-\tau^a)\overline{a}_{(i)}\overline{\beta}_{(i)}, \tag{9}$$

which can be compared to eq. (4). Perceived social injustice can, after some algebraic manipulations (see Appendix A.1), be written as:

$$\begin{aligned}\Omega_{(i)}^{\zeta 0}=&\,(1-\tau)^2\,Var\,(\varepsilon)_{(i)}+(1-\tau^a)^2\,(1-\tau-\zeta)^2\left(\bar{\beta}_{(i)}\right)^2 Var\,(a)_{(i)}\\&+\tau^2\,(1-\tau^a)^2\left(\bar{a}_{(i)}\right)^2 Var\,(\beta)_{(i)}\,,\end{aligned} \tag{10}$$

where we use the superscript "0" to indicate that incentive effects are neglected. The "fair" tax rate τ_i^0 results from solving the FOC

$$\begin{aligned}\frac{\delta\Omega_{(i)}^{\zeta 0}}{\partial\tau}=&-2\left(1-\tau_i^0\right)Var\,(\varepsilon)_{(i)}\\&-2\left(1-\zeta-\tau_i^0\right)(1-\tau^a)^2\left(\bar{\beta}_i\right)^2 Var\,(a)_{(i)}\\&+2\tau_i^0\,(1-\tau^a)^2\left(\bar{a}_{(i)}\right)^2 Var\,(\beta)_{(i)}=0,\end{aligned} \tag{11}$$

yielding

$$\tau_i^0=\frac{Var\,(\varepsilon)_{(i)}+(1-\zeta)\,(1-\tau^a)^2\left(\bar{\beta}_{(i)}\right)^2 Var\,(a)_{(i)}}{Var\,(m)_{(i)}} \tag{12}$$

where $Var\,(m)_{(i)}$ captures the overall perceived income variation:

$$Var\,(m)_{(i)}=Var\,(\varepsilon)_{(i)}+(1-\tau^a)^2\left(\bar{\beta}_{(i)}\right)^2 Var\,(a)_{(i)}+(1-\tau^a)^2\left(\bar{a}_{(i)}\right)^2 Var\,(\beta)_{(i)}\,.$$

Eq. (12) reflects a trade-off between, on the one hand, undoing unfairness by taxing away income variation which is due to undeserved income determinants and, on the other, generating a new kind of unfairness by taxing away deserved income differences.

[14] An alternative approach would take as the reference a no-tax situation, with effort equal to $\alpha_j\beta_j$ and fair pre-tax income $\beta_j\left(\zeta a_j+(1-\zeta)\,\bar{a}_{(i)}\right)$. This would mean, however, that our "naive" consumer uses a sophisticated model to go from the observed situation to the counterfactual no-tax world. As a matter of fact, our comparative statics results remain valid under this assumption (simply set $\tau^a=0$ in all expressions).

The comparative statics can immediately be derived by differentiating eq. (12) and are summarized in Table 1. The personal income determinants (talent and taste for effort) do not have a direct influence on the fair tax rate: because consumer i has by assumption zero mass in $\mu(i)$, they only matter in the self-interested part of utility. The fair tax rate of naive observers will increase with the actual tax rate. This is easy to understand, as a higher observed tax rate τ^a decreases efforts, and, thus, the relative importance of (perceived) deserved versus undeserved income inequality.[15] An increase in ζ increases the deservingness of talent, thus increasing the deserved fraction of income variation and therefore decreasing the fair tax rate. As an extreme, in the pure meritocratic case where $\zeta = 1$, the fair tax rate simply equals the share of luck in the overall income variation (Alesina and Angeletos, 2005).

Given ζ, the "fair" tax rate is determined by perceptions regarding the relative importance of different income determinants. If the variance of luck, i.e. the importance of undeserved income variation in the overall income variation, increases, the ideal tax rate increases. If the importance of deserved income inequality $Var(\beta)_{(i)}$ increases, the ideal tax rate decreases. Since income is multiplicative in talent and effort, the sign of $\frac{\partial \tau_i^0}{\partial \bar{a}_{(i)}}$ is the same as that of $\frac{\partial \tau_i^0}{\partial Var(\beta)_{(i)}}$.

The effects of changes in the variation of talent are slightly more complex, as they depend on the value of ζ. Taking the derivative of eq. (12) yields

$$\frac{\partial \tau_i^0}{\partial Var(a)_{(i)}} = (1/(Var(m)_{(i)})^2 (1-\tau^a)^2 \left(\bar{\beta}_{(i)}\right)^2$$
$$((1-\zeta)(1-\tau^a)^2 \left(\bar{a}_{(i)}\right)^2 Var(\beta)_{(i)} - \zeta(Var(\varepsilon)_{(i)})) \lesseqgtr 0$$

Naturally, $\frac{\partial \tau_i^0}{\partial Var(a)_{(i)}} > 0$ when one considers talent to be fully the result of the natural

[15] This mechanism is analogous to the one that is described by Alesina and Angeletos (2005) to explain the differences between the European and the US welfare states.

lottery ($\zeta = 0$), since a greater $Var\,(a)_{(i)}$ then increases the relative magnitude of undeserved income variation. On the other hand, $\frac{\partial \tau_i^0}{\partial Var(a)_{(i)}} < 0$ for the meritocratic case, where talent is entirely a deserved determinant of income inequality ($\zeta = 1$). The sign of $\frac{\partial \tau_i^0}{\partial Var(a)_{(i)}}$ changes at

$$\bar{\zeta} = \frac{(1-\tau^a)^2 \left(\bar{a}_{(i)}\right)^2 Var\,(\beta)_{(i)}}{(1-\tau^a)^2 \left(\bar{a}_{(i)}\right)^2 Var\,(\beta)_{(i)} + Var\,(\varepsilon)_{(i)}}.$$

Hence, $\frac{\partial \tau_i^0}{\partial Var(a)_{(i)}} > 0 \Leftrightarrow \zeta \in \left[0, \bar{\zeta}\right[$, and this area $\left[0, \bar{\zeta}\right[$ shrinks if the variance of luck increases and expands if the variance of taste for effort increases. The effect of $\bar{\beta}_i$ is similar to that of $Var(a)_{(i)}$.

2.3 Preferences for redistribution of sophisticated consumers

We now bring together the insights from the two previous subsections and consider the preferences for redistribution of a sophisticated consumer, who is characterized by $\gamma \in]0, 1[$ and who does take incentive effects into account. This implies that she uses eq. (6) as her definition of $\hat{c}_j^{\zeta}$, i.e. that changes in τ, leading to changes in pre-tax income, also imply a change in the deserved consumption level. In fact, since τ (and τ^a) are the same for all individuals, this is only a proportional shift compared to the naive position.[16]

Introducing incentives in the fairness component of the utility function yields

$$\begin{aligned}\Omega_{(i)}^{\zeta} = &(1-\tau)^2 Var\,(\varepsilon)_{(i)} + (1-\tau)^2 (1-\zeta-\tau)^2 \left(\bar{\beta}_{(i)}\right)^2 Var\,(a)_{(i)} \\ &+\tau^2 (1-\tau)^2 \left(\bar{a}_{(i)}\right)^2 Var\,(\beta)_{(i)},\end{aligned}$$

which can be compared to eq. (10). The first derivative of this expression with respect

[16] Alesina et al. (2012) mention that it is debatable whether or not $(1-\tau)$ should enter the definition of the "fair" wealth. An alternative is to take as reference the no-tax situation $\tau = 0$. As in our model, this alternative assumption does not change the fundamental results.

to τ is

$$\begin{aligned}\frac{\partial \Omega_{(i)}^{\zeta}}{\partial \tau} = & -2\left(1-\tau\right) Var\left(\varepsilon\right)_{(i)} - 2\left(1-\zeta-\tau\right)\left(1-\tau\right)^{2}\left(\bar{\beta}_{(i)}\right)^{2} Var\left(a\right)_{(i)} \\ & +2\left(1-\tau\right)^{2}\tau\left(\bar{a}_{(i)}\right)^{2} Var\left(\beta\right)_{(i)} - 2\left(1-\tau\right)\tau^{2}\left(\bar{a}_{(i)}\right)^{2} Var\left(\beta\right)_{(i)} \\ & -2\left(1-\tau\right)\left(1-\zeta-\tau\right)^{2}\left(\bar{\beta}_{(i)}\right)^{2} Var\left(a\right)_{(i)}. \end{aligned} \tag{13}$$

Eq. (13) has to be combined with eq. (7) to find the overall first-order condition for the maximization of the full utility function w.r.t. τ, yielding:

$$\Upsilon_i \equiv \left(1-\gamma\right)\left[\left(1-2\tau\right)\bar{a}_{(i)}\bar{\beta}_{(i)} - \left(1-\tau\right)a_i\beta_i\right] - \gamma\frac{\partial \Omega_{(i)}^{\zeta}}{\partial \tau} = 0.$$

We mentioned in the previous subsection that the selfish part of the utility function is strictly concave only if the pre-tax income of the individual is not too high. As shown in Appendix A.2, strict concavity of the fairness part is guaranteed if $Var\left(\varepsilon\right)_{(i)}$ is not too small relative to the contributions of the other income determinants to the overall pre-tax income inequality. In what follows, we assume that both these conditions are satisfied.[17]

Under strict concavity, the choice problem of consumer i has a unique most preferred tax rate, denoted τ_i^*, which can be found as the solution to the equation $\Upsilon_i = 0$. It is not straightforward to derive a closed-form expression for τ_i^*, but the comparative statics with respect to the different parameters of the problem can be obtained by the implicit function theorem. Indeed, for interior solutions, the global strict concavity of the problem implies:

$$\operatorname{sgn}\left[\frac{\partial \tau_i^*}{\partial z}\right] = \operatorname{sgn}\left[\frac{\partial\left(\Upsilon_i = 0\right)}{\partial z}\right].$$

We exploit this fact to analyze the inter-individual variation in the preferences for redistribution.

[17] Note that the concavity condition proposed by Alesina and Angeletos (2005) is incorrect (see Appendix A.2).

The comparative statics results are summarized in Table 1.[18] These are essentially a straightforward combination of the effects from the two previous subsections. There is one additional twist, however, that follows from the fact that we now have an incentive component in the fairness part as well. We first explain this additional effect. Combining eqs. (11) and (13) yields:

$$\frac{\partial \Omega_{(i)}^{\zeta}}{\partial \tau} = \frac{\delta \Omega_{(i)}^{\zeta 0}}{\partial \tau}|_{\tau^a=\tau} - 2(1-\tau)\tau^2 \left(\bar{a}_{(i)}\right)^2 Var(\beta)_{(i)} \\ -2(1-\tau)(1-\zeta-\tau)^2 \left(\bar{\beta}_{(i)}\right)^2 Var(a)_{(i)}. \quad (14)$$

The first three terms on the right hand side of eq. (13) thus represent the original fairness considerations in the absence of incentive effects, and the last two terms capture the (new) incentive effects on fairness. These latter terms are both negative. The strict concavity of $\Omega_{(i)}^{\zeta}$ then implies that sophisticated consumers (taking into account incentive effects) will have a higher preferred tax rate than naive consumers if we only focus on fairness. Taking into account incentives lowers the relative importance of deserved income sources in the overall income inequality, and increases the relative contribution of luck (which is not affected by incentives). The resulting effects are summarized in the fourth column of Table 1.

More talented individuals and individuals with a larger taste for effort unambiguously prefer a lower degree of redistribution because of considerations of self-interest, with the caveat that we control for differences in their reference groups. For a sophisticated consumer (contrary to a naive one), the actual tax rate will not influence her perceptions of the optimal tax rate, because she fully understands the link between taxes and effort choices and therefore will discount this influence in her perception of reality.

We have seen before that consumers with a larger ζ, i.e. those who consider dif-

[18] The complete mathematical expressions can be found in Appendix A.3.

ferences in talent to be more deserving, prefer a smaller degree of redistribution when incentives are neglected. Taking into account incentives introduces an additional effect, that is increasing in ζ. For sufficiently large ζ, taxation reduces the deserved inequality enough for the incentive effects to come to dominate the direct fairness effect.

The preferred tax rate will increase with the weight given to fairness γ for individuals with

$$(1-\tau)a_i\beta_i > (1-2\tau)\overline{a}_{(i)}\bar{\beta}_{(i)}.$$

This condition obviously holds for all individuals with a higher than average pre-tax income, who would object to any taxation on purely self-interested grounds. However, for individuals with a low pre-tax income, who are striving for a large tax rate on self-interested grounds, increasing the weight of fairness decreases the selfish bias and hence also the preferred tax rate.

The effect of an increase in the perceived importance of luck is unambiguously positive. It is identical to the effect for a naive idealistic consumer, since luck does not enter the self-interested part of the utility function, nor does it influence incentives.

As seen before, the direct fairness component of an increase in the relative importance of taste for effort ($Var(\beta)_{(i)}$) has a negative effect on the preferred tax rate. However, as we know from eq. (14), the incentive effect works in the opposite direction. It can be shown, however, that this positive effect will only prevail if $\tau_i^* > 0.5$, i.e. if the economy is over the top of the Laffer-curve. We therefore can expect that $\frac{\partial \tau_i^*}{\partial Var(\beta)_{(i)}}$ will normally be negative.[19] This negative effect also plays for $\bar{a}_{(i)}$, yet the perceived average talent is also present in the self-interested component, where (obviously) it will have a positive effect as long as the economy has not yet reached the top of the Laffer-curve, i.e. when

[19] It is instructive to note that the variance of the taste for leisure also has a negative effect on the optimal tax rate in a full social welfare model with preference variation (Lockwood and Weinzierl, 2012).

$\tau_i^* < 0.5$. The overall effect of a change in $\bar{a}_{(i)}$ will therefore depend on the value of γ. The lower the weight given to fairness, the larger the probability that an individual that perceives a larger value of $\bar{a}_{(i)}$ will indeed prefer a larger tax rate.

The effect of $Var\,(a)_{(i)}$ is more complicated than that of $Var(\beta)_{(i)}$, because it depends on the value of ζ. Obviously, if $\zeta = 0$, i.e. when talent is seen as merely the result of the natural lottery, an increase in its variance will increase the optimal tax rate. In the situation without incentives, $\frac{\partial \tau_i^*}{\partial Var(a)_{(i)}}$ was unambiguously decreasing for increasing ζ and became negative for a large enough ζ. We see the same tendency here. The incentive component extends the range for which $\frac{\partial \tau_i^*}{\partial Var(a)_{(i)}} > 0$, but does not change the basic pattern (for $\tau_i^* \leqslant 0.5$). In the extreme meritocratic case, with $\zeta = 1$, income due to talent is as much deserved as income due to effort: from the fairness point of view, changes in $Var\,(a)_{(i)}$ and in $Var(\beta)_{(i)}$ are equivalent.

The relationship between $\bar{\beta}_{(i)}$ and $Var\,(a)_{(i)}$ is the same as that between $\bar{a}_{(i)}$ and $Var(\beta)_{(i)}$. Again, the self-interest effect will strengthen the positive effect of an increase in $\bar{\beta}_{(i)}$ on τ_i^* as long as $\tau_i^* < 0.5$. The overall effect will therefore also depend on the value of γ.

3 Social interactions and formation of beliefs

The model of the previous section establishes a link between redistributive preferences and the perceived variances and means $Var\,(\varepsilon)_{(i)}$, $Var\,(a)_{(i)}$, $Var(\beta)_{(i)}$, $\bar{\beta}_{(i)}$ and $\bar{a}_{(i)}$. This relationship may lead to inter-country differences in reduced preferences even if there are no ideological differences and if individuals are perfectly informed. However, it is more realistic to assume that individuals are not perfectly informed. Boundedly rational (naive) consumers may then derive the needed information from what they observe in their own reference group and act as if this reference group were representative

of the entire population (Cruces et al., 2013). Even sophisticated consumers, who realize that the information derived from their neighborhood is biased, will find it hard to correct for such bias with more information.[20]

In traditional societies, networks remain rather stable over time. In modern societies, stable factors such as ethnicity admittedly still play an important role. Yet, when social mobility increases, individuals get the opportunity to choose to a larger extent their own reference groups. Modelling this process of network formation yields additional insights in the causes of differences in redistributive preferences. It is well documented that social networks tend to be homophilous: like tend to meet like much more than proportionally (see e.g. McPherson et al. (2001) for a survey). To model this in the simplest way, we assume that reference groups are formed on the basis of two relevant characteristics: natural talent a_i and an income-irrelevant quality q_i (examples being religion, skin color, geographical location or lifestyle). The former is related to education and is a natural candidate as a factor of social stratification.[21] Talent and the income irrelevant quality are distributed according to a joint distribution function $\Phi(a, q)$, with marginal distributions $\Phi^a(a)$ and $\Phi^q(q)$. The joint and marginal density functions are denoted respectively $\phi(a, q)$, $\phi^a(a)$ and $\phi^q(q)$.

Assume that maintaining a social relation comes at a constant disutility cost $c > 0$, and that the benefits $B(i, j)$ for consumer i from a relationship with consumer j are

[20] Consumers may use other information sources, such as what they see and hear in mass media. Of course, this information is also biased. The (interesting) question of how consumers may combine biased information from different sources is not analysed in this paper.

[21] Ambition and taste for effort are more difficult to observe and therefore less likely to be the driving force behind network formation. However, one can easily study homophily in ambition or luck by replacing a_i or q_i by β_i or ε_i.

decreasing with the distance between them:

$$B(i,j) = \frac{\xi}{\delta |a_i - a_j| + (1-\delta)|q_i - q_j|},$$

with ξ a parameter indicating the constant marginal utility of $\frac{1}{\delta|a_i-a_j|+(1-\delta)|q_i-q_j|}$ and $\delta \in [0,1]$ indicating the relative importance of talent in the formation of social relationships. Establishing a relationship is worthwhile if

$$\delta |a_i - a_j| + (1-\delta)|q_i - q_j| \leqslant \pi \tag{15}$$

with $\pi \equiv (\xi/c)$. This parameter π can be seen as a measure of network size.

The effects of changes in a_i, π and δ on network formation depend in an intricate way on the form of the distribution $\Phi(a,q)$. Here we will focus on the case where talent and the quality q are independently and uniformly distributed, since this allows us to derive clear-cut conclusions.[22] As argued before, the uniformity assumption is less unrealistic than may seem at first sight, at least in a model of perceptions and subjective beliefs. One natural interpretation is that a and q are measured as the rank individuals occupy in the ordering of respectively talent and the income irrelevant-quality.

It follows directly from eq. (15) that

$$\mu(i) = \{j | \delta |a_i - a_j| + (1-\delta)|q_i - q_j| \leqslant \pi\}. \tag{16}$$

In traditional societies with low social and geographical mobility, δ, i.e. the relative importance of the productive quality, is most likely low. If δ increases, then the range of productivities observed in the social network $\mu(i)$ decreases. In the Cartesian (a,q) plane, if $\delta \in]0,1[$, then $\mu(i)$ is a rhombus with edges

$$\left\{\left(a_i - \frac{\pi}{\delta}, q_i\right), \left(a_i, q_i + \frac{\pi}{(1-\delta)}\right), \left(a_i + \frac{\pi}{\delta}, q_i\right), \left(a_i, q_i - \frac{\pi}{(1-\delta)}\right)\right\}.$$

[22] A discussion of reference group formation for generic distribution functions in the case where only natural talent matters is presented in Appendix A.4.

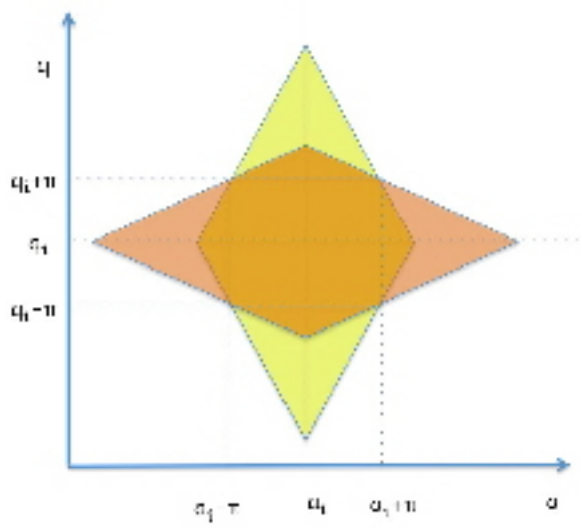

Figure 1: Network structure in two-dimensional case

If $\delta = 1$, we are back in the one-dimensional situation with $\mu(i) = \{j | a_j \in [a_i - \pi, a_i + \pi]\}$, i.e. a vertical band of width 2π around a_i, on which the perceived distribution coincides with ϕ^a. For $\delta = 0$, the social network is a horizontal band around q_i, i.e. $\mu(i) = \{j | q_j \in [q_i - \pi, q_i + \pi]\}$. In this case we get that $\forall i, j \in \mathcal{I} : Var(a)_{(i)} = Var(a)_{(j)}$ and $\bar{a}_{(i)} = \bar{a}_{(j)}$ if a and q are independently distributed.

The most interesting question is what happens if $\delta \in]0, 1[$ increases, i.e. if the productive dimension a becomes more salient for social network formation. Note that the four points $\{(a_i \pm \pi, q_i \pm \pi)\}$ are always on the frontier. Indeed, the edges of the rhombus pivot around these four points (see Figure 1). The effect of changes in δ on the perceived average $\bar{a}_{(i)}$ or the perceived variance $Var(a)_{(i)}$ depend in a complex way upon the shape of the distribution function $\Phi(a, q)$.

Consider now the special case in which $\Phi^a(a)$ and $\Phi^q(q)$ are independent and uniform, with compact support on a rectangle $[\theta_L, \theta_R] \times [\theta_D, \theta_U]$. Then $|\mu(i)| = \frac{2}{L_1 L_2}\left(\frac{\pi^2}{(1-\delta)\delta}\right)$, with $L_1 = \theta_R - \theta_L$ and $L_2 = \theta_U - \theta_D$. The perceived density function becomes a symmet-

ric triangular density function around mean a_i, i.e. $\frac{\psi(a|q_i,\delta)}{|\mu(i)|} = (\delta/\pi)^2 ((\pi/\delta) - |a - a_i|)$ for $a \in [a_i - (\pi/\delta), a_i + (\pi/\delta)]$ and 0 elsewhere.[23] With this density function, it is obvious that $\frac{\partial \overline{a}_{(i)}}{\partial a_i} = 1$ and $\frac{\partial \overline{a}_{(i)}}{\partial \pi} = \frac{\partial \overline{a}_{(i)}}{\partial \delta} = 0$. More interestingly, we can derive that

$$Var(a)_{(i)} = \frac{1}{6}(\frac{\pi}{\delta})^2.$$

Hence, as long as $\mu(i) \subset \text{supp}(\Phi(\alpha))$, we have that $\frac{\partial Var(a)_{(i)}}{\partial \delta} < 0$, $\frac{\partial Var(a)_{(i)}}{\partial \pi} > 0$, and $\frac{\partial Var(a)_{(i)}}{\partial a_i} = 0$. Increasing the weight δ given to talent in network formation or decreasing the size of the network π decreases the perceived variance of talent. We summarize these results in Table 2.

Table 2: **Effects of endogenous network formation with uniform distributions**

	$Var(a)_{(i)}$	$\overline{a}_{(i)}$
a_i	0	1
π (network size)	> 0	0
δ (weight given to talent)	< 0	0

4 Applications: Redistributive preferences and social structure

We will now show how the empirical findings summarized in the introduction can be fitted into our model. This is, of course, not a formal "test" of the theory, but just an illustration of the kind of empirically meaningful hypotheses that can be derived, and that may help to explain some of the empirical puzzles.

Our model is built on the assumption that reference groups are essential in the formation of redistributive preferences, and it is therefore immediately applicable to explain different attitudes between, e.g., linguistic, ethnic or religious groups. The most

[23] For simplicity, we restrict our attention to cases where the support of $\mu(i)$ is in the interior of the support $[\theta_L, \theta_R] \times [\theta_D, \theta_U]$.

popular explanation of these differences is in terms of underlying ideological preferences. We suggest that informational aspects should not be neglected. Different beliefs will induce differences in redistributive preferences, even when individuals have the same underlying cultural traits. This channel, linking redistributive preferences to features of the economic environment, offers a broadened perspective on ethnic differences. Surely, ethnicity has an important effect on network formation. If black citizens perceive that luck is more important in the explanation of income differences and that effort is not rewarded, they will be more in favour of redistribution than white citizens who believe that effort and ability are the dominant factors in explaining income differences.

The informational approach is especially relevant when there is no clear *a priori* explanation for the occurrence of ideological differences. Commonly-found regional differences within a country offer a straightforward application. It is more natural to assume that different regions are characterized by different socioeconomic environments than that they have different ideologies. At least, it is an interesting empirical exercise to attempt explaining inter-regional differences as much as possible with socioeconomic variables and to treat "ideology" as a residual category. As a specific example, the information channel may contribute to explaining the findings of Luttmer (2001) that the support for welfare payments is lower among respondents living in a neighborhood with a larger welfare recipiency rate. In such a neighborhood, the perceived average income is likely to be smaller, such that selfish voters in such a neighborhood are less supportive for redistribution because they underestimate its material gains for them. Moreover, the effect of ability differences will be perceived to be smaller. This would also lead to a decrease in redistributive preferences for individuals that consider such differences to be undeserved.

Researchers who have looked into the effect of the increase in inequality on redistrib-

utive preferences over time have found mixed results (Olivera (2012) gives an overview). Our model suggests that this can be due to the fact that changes in inequality, i.e. in $Var(m)_{(i)}$, as such are irrelevant. What matters are changes in the relative contributions of the different factors (talent, effort and luck). If people think that the increase in inequality is due to the increased importance of luck (e.g. if it follows from international competition), they will be more in favour of redistribution. If, however, they think that it reflects a larger spread of ability differences (e.g. due to a larger dispersion of skills), the effect on redistributive preferences will depend on underlying cultural values and on the perceived causes for a greater dispersion of skills (e.g. larger differences in starting position or a more pronounced amplification of such initial differences through education).

More interesting insights follow when we take into account the process of endogenous group formation, i.e. merge the results from Tables 1 and **??**. Consider the effect of a variable such as education. In a simple self-interest model, education should have a negative effect on the willingness-to-redistribute, *if* one controls for reference group effects – see Table 1. However, in a world with homophilous group formation, higher educated people may have a larger perceived $\overline{a}_{(i)}$ than lower educated people - and it is even likely that they overestimate the average productivity in society. This theoretical prediction is corroborated in the empirical results of Cruces et al. (2013). The positive effect of a_i on $\overline{a}_{(i)}$ will generate a more positive attitude towards redistribution among higher educated self-interested citizens. The interplay between the different factors may then generate the non-monotonic relationship that has been found in empirical work.

Second, while the existence of stable cultural traits explains why migrants keep - to a large extent - the redistributive preferences prevailing in their native country, the gradual assimilation to the values in the country of destination may reflect a shift in

their perceptions about the relative importance of talent, effort and luck. The longer the immigrants live in their new country, the less important their origin will become for network formation – and the more representative their network will be for the relevant distributions in the country of destination. If, in addition, gradual assimilation implies that they form more homophilous networks in terms of talent (in our model this is represented by an increase in δ), this will decrease their perception of the variance of talent. The effect on their (reduced form) redistributive preferences will then depend on the value of ζ. Immigrants in the US will often come from countries that are less meritocratic (i.e. have a lower value of ζ). A reduction in the perceived variance because of the integration in more homophilous networks will then lead to a decrease in the desired redistribution over time, even when their ideological background does not change.

Third, an increase in regional social capital (measured by participation in community activities, as in Yamamura, 2013) can be interpreted as a decrease in δ (the importance given to ability) and an increase in network size π. Both effects lead to an increase in the perceived variance of talent and, hence, to an increase in redistributive preferences for the less meritocratic individuals. While it is not in our model, it is likely that an increase in π will also lead to an increase in the perceived variance of luck. If this effect is stronger for the rich (again a reasonable assumption), it may explain why the increase in redistributive preferences resulting from social integration is stronger amongst the rich than amongst the poor (as observed by Yamamura). Yamamura (2013) argues that his results point to the existence of psychological externalities, but the information channel in our model offers an alternative explanation.

Fourth, long run changes in the social structure of societies can also be interpreted in terms of changes in the network formation parameters π and δ. Sociologists have documented the downfall of the great ideologies and the rise of secularization. Moreover, the

revolutionary improvement of transport and communication infrastructure has reduced the salience of the location of consumers. Both mechanisms have diminished the importance of non-productive individual characteristics (such as religion or location) for the formation of networks and have increased the potential to form networks that are more homophilous in talent a. In our model, this is translated as an increase in δ, implying in its turn a smaller perceived variation in productive talents. Our results then predict a decrease in the preferences for redistribution within the less meritocratic (more "Rawlsian") societies. This is exactly what has been observed during recent decades within Western Europe. Our model also predicts that these developments will lead (*ceteris paribus*) to a more positive attitude towards redistribution in more meritocratic societies.

5 Empirical illustration

Many of the papers in the empirical literature use clever research designs, but the derived insights often remain partial or are not fully integrated within an overall coherent framework. In this section we offer a sketch of how a more structural approach could look. Application of our model requires the finding of empirical counterparts for its theoretical parameters (talent, taste for effort, cultural traits, perceived variances, etc.) and then to exploit the structure that is suggested by the theory. We are unaware of any dataset that is sufficiently rich to implement our full model. As a first approach, we will make use of one round of the General Social Survey (GSS). Obviously with cross-sectional data it is nearly impossible to identify any causal relationships. We will therefore only be able to show some suggestive associations. This empirical analysis is only an illustration and definitely not a "test" of the theory.

The General Social Survey was set up by the National Opinion Research Center at

the University of Chicago in 1972, and collected its 29th round in 2012. We use the 1987 round, as it contains two topical modules which cover part of our data needs: the GSS topical module on "Sociopolitical Participation" and the 1987 International Social Survey Program (ISSP) module on "Social Inequality". The former module provides detailed data about group membership and social interactions. The latter does not only contain a broad variety of indicators of the support for redistribution, but also questions on the respondents' beliefs about the relative importance of various determinants of income. The 1987 round of the GSS contains data for 1819 randomly chosen respondents.[24]

We measure preferences for redistribution (τ) as the first principal component obtained from four variables[25]: *redist1*, based on responses to the statement "Some people think that the government in Washington ought to reduce the income differences between the rich and the poor, perhaps by raising the taxes of wealthy families or by giving income assistance to the poor. Others think that the government should not concern itself with reducing this income difference between the rich and the poor" (0-6 scale); *redist2*, which collects responses to the question "It is the responsibility of the government to reduce the differences in income between people with high incomes and those with low incomes" (responses ranging from 0 (disagree strongly) to 4 (agree strongly)); *incdiff* with responses to the statement "Differences in income in America are too large" (ranging from 0 (disagree strongly) to 4 (agree strongly)); and *txshrri* "Do you think that people with high incomes should pay a larger share of their income in taxes than those with low incomes, the same share, or a smaller share...", with responses ranging from 0 (much lower share) to 4 (much higher share). The summary statistics of these four variables are provided in Table 3. Factor analysis yields a unique factor *FactRedis,* for which the

[24] The exact definitions of all variables are provided in Appendix B.

[25] We renormalized all variables such that a higher value stands for a more positive attitude towards redistribution.

factor loadings and specific variances after a traditional varimax rotation are also shown in Table 3. We take the factor scores for *FactRedis*, obtained through regression scoring, as our preferred measure of preferences for redistribution, as we believe that this is the best way to exploit the richness of the data and to filter out idiosyncratic noise. The previous literature has often made use of *redist1* (see, e.g., Alesina and Giuliano, 2011). For comparison purposes, the results with that variable are shown in Appendix C. They are very similar to the results obtained with *FactRedis.*

Table 3: **Dependent variables and factor loadings**

Summary statistics							Redistribution Factor: FactRedis	
variable	**mean**	**sd**	**p50**	**min**	**max**	**N**	Rotated factor loading	Uniqueness
redist1	3.4	2	3	0	6	1786	0.7417	0.4498
redist2	1.9	1.2	2	0	4	1484	0.8010	0.3584
txshrri	2.9	.8	3	0	4	1454	0.5572	0.6895
incdiff	2.5	1	3	0	4	1490	0.7411	0.4507

Ideological parameters and perceptions of the relative importance of the various income determinants play a crucial role in our explanatory framework. The GSS 1987 contains many variables that are relevant in this context. The summary statistics of these beliefs and perceptions are displayed in Table 4. A first series characterizes respondents' beliefs about the importance of 13 determinants of success in life, ranging from 0 (not important at all) to 4 (essential): coming from a wealthy family *(belwealf)*, having well educated parents *(beledupa)*, having a good education *(beledu)*, ambition *(belambit)*, natural abilities (*belabil*), hard work (*belwork*), having the right connections (*belcnnct*), having good political connections (*belpolcn*), race (*belrace*), having the right religion (*belrelig*), coming from the right region (*belregio*), gender (*belsex*) and having the right political views (*belpolvi*). A second series of variables captures respondents' perceptions

Table 4: **Summary statistics of perceptions and beliefs**

variable	mean	sd	p50	min	max	N
belwealf	1.6	1.1	2	0	4	1514
beledupa	2.2	.95	2	0	4	1533
beledu	3.2	.72	3	0	4	1542
belambit	3.3	.7	3	0	4	1530
belabil	2.7	.76	3	0	4	1529
belwork	3.2	.69	3	0	4	1547
belcnnct	2.4	.86	2	0	4	1539
belpolcn	1.6	1	2	0	4	1485
belrace	1.4	1.1	1	0	4	1498
belrelig	1.2	1.2	1	0	4	1508
belregio	.98	.99	1	0	4	1510
belsex	1.3	1.1	1	0	4	1494
belpolvi	1.2	1	1	0	4	1486
incmoti	1.9	.81	2	0	3	1459
incresp	2.7	1	3	0	4	1519
incskil	2.4	1.1	3	0	4	1506
incedu	2.8	1.1	3	0	4	1519
incprosp	2	1	2	0	4	1458
belbuspr	2.3	1.1	2	0	4	1477

of the incentive effects of income inequality. The variable *incmoti* indicates whether respondents think that large differences in pay are necessary to induce people to work hard, with answers ranging from 0 (definitely not necessary) to 3 (absolutely necessary). The variable *incresp* asks whether people believe that differences in pay are necessary for people to take responsibility. The answers to this and the next 4 questions range from 0 (strongly disagree) to 4 (strongly agree). *Incskil* asks whether pay differences are necessary for people to acquire extra skills and qualifications. *Incedu* asks whether pay differences are necessary for people to study. *Incprosp* asks whether respondents deem large income differences necessary for America's prosperity. *Incbuspr* asks whether good business profits enhance everyone's standard of living. Finally, the variable *polviews* captures the respondent's self-rated position on the political spectrum, from 1 (extremely liberal) to 7 (extremely conservative).

We again use factor analysis to structure this information. The variables *belabil* and *polviews* are kept out of this factor analysis, as their unique variance is too high (respectively more than 66% and 74% of their variance). For the other 18 variables, we retain five factors with an eigenvalue greater than 1 on the basis of a principal-component factor analysis. The factor scores obtained by regression scoring are used in the further analysis. The factor loadings, again after varimax rotation, are depicted in Table 5. With due caution, we can link these variables to our theoretical concepts. We interpret *polviews* as a cultural trait (related to γ). Moreover, the interpretation of *belabil* and *factorEff* as approximations of $Var(a)_{(i)}$ and $Var(\beta)_{(i)}$ is natural. If one is willing to interpret as "luck" all income determinants that are neither effort nor ability, then one could venture to interpret the perceived importance of discrimination (*FactorDi*) and of social capital by parentage (*FactorPa*) as related to $Var(\varepsilon)_{(i)}$. The perception of incentive effects, both the particular ones in *FactorPIn* (effect of pay differences on particular

Table 5: **Beliefs: rotated factor loadings and uniqueness**

Variable	FactorDi	FactorPa	FactorPIn	FactorEff	FactorGIn	Uniqueness
belwealf	0.2054	0.7249	0.0176	-0.0940	-0.0039	0.4232
beledupa	0.0307	0.7228	0.0383	0.1074	0.0980	0.4541
beledu	-0.0839	0.4067	0.0094	0.6008	-0.0656	0.4623
belambit	-0.0541	0.0596	-0.0206	0.7409	0.0092	0.4441
belwork	0.0314	-0.1552	0.1144	0.7703	0.0561	0.3653
belcnnct	0.2973	0.6371	0.1219	0.0588	0.0264	0.4867
belpolcn	0.4326	0.5884	0.0849	-0.0386	0.0413	0.4563
belrace	0.6554	0.2736	0.0760	-0.0603	-0.0932	0.4775
belrelig	0.7554	-0.0173	0.0185	-0.0113	0.0849	0.4214
belregio	0.7684	0.1064	0.1028	0.0046	0.0423	0.3859
belsex	0.6513	0.2118	0.0022	-0.0340	0.0297	0.5289
belpolvi	0.7357	0.1827	0.0125	-0.0120	0.1188	0.4109
incmoti	0.1312	0.0869	0.1959	0.1026	0.4984	0.6780
incresp	0.0517	0.0567	0.8001	0.0801	0.0849	0.3403
incskil	0.0466	0.0042	0.8031	0.0191	0.0578	0.3491
incedu	0.0553	0.1205	0.6502	-0.0130	0.1602	0.5339
incprosp	0.0784	0.0386	0.1773	-0.0100	0.7814	0.3502
belbuspr	0.0216	0.0196	0.0119	0.0180	0.7523	0.4327

effort decisions) and the general ones in *FactorGIn* (effect of pay differences on general prosperity) do not appear as such in our theoretical model, because we did not allow for inter-individual differences in beliefs about incentives. However, it seems important to control for them in our regressions.

Table 6: **Descriptive statistics independent variables**

variable	**mean**	**sd**	**p50**	**min**	**max**	**N**
rlincome	28	23	21	.5	90	1665
prospect	2.8	.92	3	0	4	1509
educ	12	3.3	12	0	20	1809
female	.57	.49	1	0	1	1819
black	.3	.46	0	0	1	1819
raceoth	.029	.17	0	0	1	1819
age	45	18	41	18	89	1807
occmobi	1.1	.74	1	0	2	1367
granborn	.92	1.5	0	0	4	1693
memnum	1.6	1.9	1	0	16	1808
attend	4.1	2.5	4	0	8	1806
racehome	.34	.47	0	0	1	1819
comsize	4.7	14	.23	0	71	1819
comedu	58	177	3.1	0	1414	1809

Finally, we include a number of socioeconomic control variables. Summary statistics are provided in Table 6. *Rlincome* is the household income, *prospect* the expectation of future standard of living, *educ* the respondents' years of education, *age* is the respondents' age, *female*, *black* and *raceoth* are dummies indicating respondents' gender and race (the latter indicates non-white and non-black), *granborn* the number of the respondents' grandparents born outside of the U.S.A. and *comsize* is the number of inhabitants

in the respondent's commune. *Occmobi* measures how different the status of the present profession of the respondent is from her father's profession when the respondent was 16 (answers range from 0 "about the same" to 2 "much higher" or "much lower")[26], *attend* indicates church attendance with answers ranging from 0 (never) to 7 (every week). *Racehome* is a dummy variable which indicates that the respondent has had somebody of another race for dinner at her house in the recent years. *Memnum* indicates the respondent's number of memberships of organizations and clubs. *Comedu*, finally, is an interaction term between education and community size.

Table 7 presents a set of regressions explaining preferences for redistribution. Tables 8 and 9 report the results of 7 OLS regressions, explaining individual beliefs and perceptions as a function of the extended set of control variables. For the overall interpretation of our results, these different tables have, of course, to be combined. Let us first look at Table 7. The first column shows the result of the simplest regression possible, in which we introduce the most essential demographic and economic variables. The second column extends the set of explanatory variables. None of the results are surprising. Self-interest plays a role as expected: income and the prospect of being better off in the future decrease support for redistribution. It is worth noting that being female has no significant effect, but that blacks have a much stronger preference for redistribution.[27] In line with earlier work on the persistence of preferences for redistribution among the offspring of recent migrants, we observe, on average, more support for redistribution if more of the respondent's grandparents were born outside the U.S.

[26] We focus on absolute differences to capture the feature of our model that what matters most are the *variances* of the observations.

[27] While the effect of "education" is negative, it is barely significant. As shown in the Appendix, its effect in these simple regressions is stronger with the alternative (simpler) definition of redistributive preferences.

Table 7: **Explaining preferences for redistribution**

	(1)		(2)		(3)		(4)	
	FactRedis		FactRedis		FactRedis		FactRedis	
rlincome	-0.00527***	(0.00134)	-0.00535***	(0.00138)	-0.00433***	(0.00138)	-0.00438***	(0.00138)
prospect	-0.170***	(0.0312)	-0.177***	(0.0330)	-0.116***	(0.0346)	-0.122***	(0.0345)
educ	-0.0136	(0.0105)	-0.0221*	(0.0119)	-0.0299**	(0.0133)	0.0395	(0.0413)
female	0.0531	(0.0565)	0.0384	(0.0598)	0.0950	(0.0624)	0.684***	(0.220)
black	0.391***	(0.0674)	0.388***	(0.0794)	0.326***	(0.0857)	0.228	(0.286)
raceoth	0.289*	(0.173)	0.0465	(0.190)	-0.147	(0.219)	-0.198	(0.218)
age	0.00282	(0.00179)	0.000909	(0.00199)	0.00143	(0.00211)	0.00143	(0.00210)
occmobi			0.0916**	(0.0394)	0.0871**	(0.0412)	0.0852**	(0.0410)
granborn			0.0720***	(0.0205)	0.0566***	(0.0215)	0.0577***	(0.0214)
memnum			-0.0147	(0.0164)	-0.0277*	(0.0165)	-0.0264	(0.0164)
attend			-0.00286	(0.0123)	0.00759	(0.0129)	0.00620	(0.0129)
racehome			0.0292	(0.0660)	0.0103	(0.0675)	-0.00204	(0.0674)
comsize			-0.0162*	(0.00905)	-0.0157*	(0.00902)	-0.0169*	(0.00904)
comedu			0.00155**	(0.000684)	0.00145**	(0.000670)	0.00154**	(0.000670)
FactorDi					0.0596*	(0.0331)	0.0548*	(0.0331)
FactorPa					0.0908***	(0.0321)	0.0815**	(0.0321)
FactorPIn					0.126***	(0.0309)	0.123***	(0.0307)
FactorEff					-0.0731**	(0.0314)	-0.0746**	(0.0314)
FactorGIn					-0.161***	(0.0314)	-0.159***	(0.0313)
belabil					0.0855**	(0.0432)	0.520***	(0.201)
polviews					-0.102***	(0.0234)	-0.102***	(0.0233)
abil_edu							-0.0243*	(0.0143)
abil_fem							-0.219***	(0.0797)
abil_bla							0.0417	(0.0984)
_cons	0.517***	(0.197)	0.581***	(0.213)	0.628**	(0.283)	-0.578	(0.606)
N	1150		1039		859		859	
R^2	0.103		0.121		0.238		0.248	

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 8: **Explaining Beliefs and Perceptions (Part 1)**

	(1)		(2)		(3)	
	FactorDi		FactorPa		FactorPIn	
rlincome	-0.00362**	(0.00144)	-0.00376***	(0.00145)	-0.000888	(0.00146)
prospect	0.000473	(0.0351)	-0.0550	(0.0354)	-0.0251	(0.0357)
educ	-0.00421	(0.0132)	0.0122	(0.0133)	-0.0662***	(0.0134)
female	-0.0597	(0.0640)	-0.225***	(0.0645)	-0.00409	(0.0651)
black	0.308***	(0.0874)	0.359***	(0.0881)	0.0610	(0.0889)
raceoth	-0.0230	(0.216)	0.0708	(0.218)	-0.0139	(0.220)
age	0.0104***	(0.00215)	-0.000165	(0.00217)	-0.000102	(0.00219)
occmobi	-0.000689	(0.0429)	0.0118	(0.0433)	0.0870**	(0.0437)
granborn	-0.0171	(0.0221)	0.0306	(0.0223)	0.00151	(0.0225)
memnum	0.00336	(0.0175)	0.0200	(0.0177)	-0.0288	(0.0178)
attend	0.0235*	(0.0132)	-0.0498***	(0.0133)	-0.00532	(0.0134)
racehome	-0.133*	(0.0710)	0.0564	(0.0716)	-0.0750	(0.0723)
comsize	-0.00797	(0.00948)	0.0220**	(0.00956)	-0.00406	(0.00965)
comedu	0.000777	(0.000700)	-0.00124*	(0.000706)	0.0000577	(0.000712)
_cons	-0.397*	(0.232)	0.220	(0.234)	0.959***	(0.236)
N	951		951		951	
R^2	0.073		0.082		0.063	

Standard errors in parentheses

$^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$

Table 9: **Explaining Beliefs and Perceptions (Part 2)**

	(1)		(2)		(3)		(4)	
	FactorEff		FactorGIn		belabil		polviews	
rlincome	-0.00105	(0.00145)	0.00200	(0.00144)	-0.00149	(0.00104)	-0.000107	(0.00187)
prospect	0.226***	(0.0354)	0.178***	(0.0352)	-0.00249	(0.0246)	0.0502	(0.0439)
educ	0.0185	(0.0133)	-0.0718***	(0.0132)	-0.0292***	(0.00897)	-0.0106	(0.0165)
female	0.209***	(0.0646)	-0.0721	(0.0642)	-0.0447	(0.0452)	-0.138*	(0.0810)
black	-0.158*	(0.0882)	-0.00675	(0.0876)	0.219***	(0.0595)	-0.418***	(0.108)
raceoth	-0.0723	(0.219)	0.0564	(0.217)	0.259*	(0.137)	0.0494	(0.259)
age	-0.00386*	(0.00217)	0.00365*	(0.00215)	0.00308**	(0.00149)	0.00205	(0.00270)
occmobi	0.0819*	(0.0433)	0.178***	(0.0430)	0.0326	(0.0296)	-0.0729	(0.0532)
granborn	-0.0208	(0.0223)	0.00646	(0.0222)	0.0325**	(0.0156)	-0.0869***	(0.0279)
memnum	0.0273	(0.0177)	-0.00785	(0.0176)	0.0106	(0.0121)	-0.00505	(0.0215)
attend	-0.0181	(0.0133)	0.00549	(0.0132)	-0.00939	(0.00924)	0.0816***	(0.0167)
racehome	0.0713	(0.0717)	0.0104	(0.0712)	-0.0207	(0.0498)	-0.260***	(0.0893)
comsize	0.0128	(0.00957)	0.00272	(0.00951)	0.00673	(0.00688)	0.0174	(0.0125)
comedu	-0.000832	(0.000707)	0.0000599	(0.000702)	-0.000254	(0.000514)	-0.00173*	(0.000929)
_cons	-0.813***	(0.234)	0.0310	(0.233)	2.898***	(0.160)	4.053***	(0.288)
N	951		951		1132		1099	
R^2	0.072		0.100		0.062		0.080	

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

In the third column, we move closer to our theoretical model and include the variables capturing beliefs and perceptions. These variables add much to the explanatory power of the regression.[28] They all go in the expected direction. Decreases of γ (*polviews* increases when individuals become less liberal) and of $Var(\beta)_{(i)}$ (FactorEff) decrease the desired degree of redistribution. The factors related to luck (*FactorDi* and *FactorPa*) increase the preferences for redistribution. The positive effect of *FactorPIn* may seem surprising at first, but this factor is heavily influenced by the perception that skills and education are important in explaining income differences and is therefore also related to *belabil.* Following our suggestion that *belabil* is positively correlated with $Var(a)_{(i)}$, its significantly positive effect suggests that respondents are *not* meritocratic and rather treat ability differences as resulting from the natural lottery (see Table 1). One could have expected (or hoped) that the introduction of beliefs and perceptions would decrease the importance of demographic variables such as being black or having grandparents with a foreign nationality: there is indeed some effect, but it remains small.

Our theoretical model offers scope for different ideas about the deservingness of talent (through the parameter ζ). We do not have a variable that measures this trait directly, but, rather than assuming that *belabil* has the same effect for everybody, we can try to measure differences in opinions by introducing interaction effects. The results are reported in the fourth column of Table 7. Given the small number of observations, caution is needed when interpreting these results, but they are still suggestive. Females are less inclined than males to increase the degree of redistribution when the importance of talent increases. Moreover, there is a significant interaction effect with education. As

[28] "Explanatory" is meant to refer to statistical features and does not imply causality. Indeed, one does not have to be particularly cynical to note that regressing "attitudes" on other "attitudes" is bound to lead to strong associations.

a matter of fact, *belabil* has a negative effect on preferences for redistribution for highly educated females.[29] The direct effect of being female now becomes significantly positive, but the interaction effect with *belabil* implies that the net effect becomes negative for women who believe that $Var(a)_{(i)}$ is large (*belabil* equal to 4). Introducing these interaction effects removes any (significant) differences between blacks and whites – but the loss of significance may be due to the strong increase in the estimated standard errors.

In any case, our results suggest that beliefs and perceptions are important to explain inter-individual differences in redistributive preferences. We therefore now consider Tables 8 and 9. Most of the results speak for themselves and we will only comment on some of them. Black respondents are less conservative, and perceive luck and ability to be more important in explaining income differences and effort to be less important. Respondents with more grandparents born outside the USA are also more liberal and believe that differences in talent are an important factor contributing to income differences. Females believe less in the importance of luck and more in the importance of effort.[30] Higher income respondents are less inclined to believe that luck is important. Having a higher education lowers the perception of the importance of talent, but remember that education seems to have a strong influence on the ideological trait ζ. All of these results stand to reason and offer a rich picture of the pattern of inter-individual differences in redistributive preferences.

The results are disappointing in terms of the approach to reference group formation as sketched in Section 3. Except for the lower-educated respondents, living in a larger commune increases the preferences for redistribution. Possibly, inhabitants of larger cities are confronted with more variation in economic activities, luck and success, but

[29] Remember from Table 4 that the range of the education variable is from 0 to 20.

[30] The latter result is opposite to what was found by Fisman and O'Neill (2009).

this hypothesis is not corroborated by the findings in Tables 8 and 9. The results for other variables intended to capture social interactions (like *memnum, racehome* and *attend*) are equally disappointing. This is not difficult to understand, given the poor quality of these variables as proxies for our underlying theoretical concepts. To thoroughly test our theory, direct measurement of the essential variables (as in Cruces et al., 2013) is necessary.

6 Conclusion

We propose a theoretical model of redistributive preferences that is able to integrate many findings from the empirical literature. We follow the seminal paper by Alesina and Angeletos (2005) in assuming that income differences due to luck are considered illegitimate and those due to effort legitimate, but we introduce the possibility that income differences caused by ability are seen as unjust. The individual's utility function is a linear combination of a self-interested and a social justice part. Individuals are characterized by two stable cultural traits: the relative weight given to self-interest versus justice arguments in their utility function and the degree of acceptance of income differences due to ability. Their desired degree of redistribution will then depend on the importance of luck, effort and ability for the explanation of income differences. We assume that individuals are not perfectly informed about these variables and that they derive information about them from what they observe within their reference groups. We obtain additional insights from a simple model of homophilous reference group formation on the basis of ability indicators.

Modelling the interplay between self-interest, stable cultural traits and (imperfect) information acquisition seems a promising approach to get a better insight into inter-individual differences in redistributive preferences. Yet it is clear that our model is only

a first step in that direction. The most obvious shortcoming is on the empirical side. A real test of our model would require the estimation of a full structural model. To make this possible, a specific survey must be set up to collect direct measures of the relevant theoretical concepts.

From a theoretical perspective, extensions and refinements are possible in at least three directions. First, redistributive preferences have implications for instruments other than the marginal tax rate τ in a linear income tax scheme. In fact, as soon as one distinguishes different individuals on the basis of personal characteristics related to effort, talent and need, redistributive instruments such as tagging, social insurance, the provision of public goods and the public provision of private goods such as education and health care, immediately become relevant. Second, the description of individual preferences could be refined to go beyond the responsibility-sensitive egalitarian approach that has been modelled in this paper. Libertarian and utilitarian perspectives may not be very popular amongst the population, but they have dominated the academic literature until now. Third, and most importantly, our model of information acquisition and learning should be refined. It would be useful to model explicitly a process of Bayesian updating of *a priori* information (e.g. obtained from one's parents or "imported" from a home country) on the basis of the actual observations in the reference group. Our simple model of network formation could be expanded. Last but not least, individuals do not only acquire information through their social neighborhood, but they use also other informational sources (e.g. mass media), and it is an open question how they combine the pieces of information obtained from these different sources.

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A Mathematical appendix: proofs

A.1 Derivation of equation (10)

By definition

$$\begin{aligned}\Omega_{(i)}^{\zeta 0} &= \frac{1}{|\mu(i)|}\int_{j\in\mu(i)}\left(c_j-\hat{c}_j^{\zeta}\right)^2 dj \\ &= \frac{1}{|\mu(i)|}\int_{j\in\mu(i)}\begin{pmatrix}(1-\tau)\left((1-\tau^a)\beta_j a_j+\varepsilon_j\right)+\tau(1-\tau^a)\bar{a}_{(i)}\bar{\beta}_{(i)}\\ -\zeta(1-\tau^a)\beta_j a_j-(1-\zeta)(1-\tau^a)\beta_j\bar{a}_{(i)}\end{pmatrix}^2 dj \\ &= \frac{1}{|\mu(i)|}\int_{j\in\mu(i)}\begin{pmatrix}(1-\tau)\varepsilon_j+(1-\tau)(1-\zeta)(1-\tau^a)\beta_j\left(a_j-\bar{a}_{(i)}\right)\\ -\tau\zeta(1-\tau^a)\beta_j\left(a_j-\bar{a}_{(i)}\right)-\tau\bar{a}_i\ \left((1-\tau^a)\beta_j-(1-\tau^a)\bar{\beta}_{(i)}\right)\end{pmatrix}^2 dj.\end{aligned}$$

Expanding this gives

$$\begin{aligned}\Omega_{(i)}^{\zeta 0} = {} & (1-\tau)^2 Var(\varepsilon)_{(i)}+(1-\tau)^2(1-\zeta)^2(1-\tau^a)^2\left(\bar{\beta}_{(i)}\right)^2 Var(a)_{(i)} \\ & +\tau^2\zeta^2(1-\tau^a)^2\left(\bar{\beta}_{(i)}\right)^2 Var(a)_{(i)}+\tau^2\left(\bar{a}_{(i)}\right)^2(1-\tau^a)^2 Var(\beta)_{(i)} \\ & -2(1-\tau)\tau\zeta(1-\zeta)(1-\tau^a)^2\frac{1}{|\mu(i)|}\int_{j\in\mu(i)}\beta_j\left(a_j-\bar{a}_{(i)}\right)\beta_j\left(a_j-\bar{a}_{(i)}\right)dj \\ & -2(1-\tau)(1-\zeta)(1-\tau^a)^2\tau\bar{a}_{(i)}\frac{1}{|\mu(i)|}\int_{j\in\mu(i)}\beta_j\left(\beta_j-\bar{\beta}_{(i)}\right)\left(a_j-\bar{a}_{(i)}\right)dj \\ & +2\tau\zeta\tau\bar{a}_{(i)}(1-\tau^a)^2\frac{1}{|\mu(i)|}\int_{j\in\mu(i)}\beta_j\left(a_j-\bar{a}_{(i)}\right)\left(\beta_j-\bar{\beta}_{(i)}\right)dj \\ & +2(1-\tau)(1-\zeta)(1-\tau^a)\frac{1}{|\mu(i)|}\int_{j\in\mu(i)}\varepsilon_j\beta_j\left(a_j-\bar{a}_{(i)}\right)dj \\ & -2\tau\zeta(1-\tau^a)\frac{1}{|\mu(i)|}\int_{j\in\mu(i)}\varepsilon_j\beta_j\left(a_j-\bar{a}_{(i)}\right)dj.\end{aligned}$$

By Condition 1, this simplifies to

$$\begin{aligned}\Omega_{(i)}^{\zeta 0} = {} & (1-\tau)^2 Var(\varepsilon)_{(i)}+(1-\tau)^2(1-\zeta)^2(1-\tau^a)^2\left(\bar{\beta}_{(i)}\right)^2 Var(a)_{(i)} \\ & +\tau^2\zeta^2(1-\tau^a)^2\left(\bar{\beta}_{(i)}\right)^2 Var(a)_{(i)}+\tau^2\left(\bar{a}_{(i)}\right)^2(1-\tau^a)^2 Var(\beta)_{(i)} \\ & -2(1-\tau)(1-\zeta)\tau\zeta(1-\tau^a)^2\left(\bar{\beta}_{(i)}\right)^2 Var(a)_{(i)},\end{aligned}$$

which can be simplified further to equation (10).

A.2 Second order conditions

Note that

$$\frac{\partial^2 EU_i}{\partial^2 \tau} = (1-\gamma)\left(a_i\beta_i - 2\bar{a}_{(i)}\bar{\beta}_{(i)}\right) - \gamma\frac{\partial^2 \Omega^{\zeta}_{(i)}}{\partial^2 \tau},$$

in which private utility is strictly concave for $a_i\beta_i < 2\bar{a}_i\bar{\beta}_i$ (as in Alesina and Angeletos, 2005), while

$$\begin{aligned}\frac{\partial^2 \Omega^{\zeta}_{(i)}}{\partial^2 \tau} =& 2Var\left(\varepsilon\right)_{(i)} + 2\left(\zeta^2 - 6\left(1-\tau\right)\zeta + 6\left(1-\tau\right)^2\right)\left(\bar{\beta}_{(i)}\right)^2 Var\left(a\right)_{(i)} \\ &+ \left(2 - 12\tau + 12\tau^2\right)\left(\bar{a}_{(i)}\right)^2 Var\left(\beta\right)_{(i)}.\end{aligned}$$

The factor $\left(\zeta^2 - 6\left(1-\tau\right)\zeta + 6\left(1-\tau\right)^2\right)$ is minimal at $\zeta = 1$ and $\tau = \frac{1}{2}$, and $\left(2 - 12\tau + 12\tau^2\right)$ is minimal at $\tau = \frac{1}{2}$. Substituting these values into $\frac{\partial^2 \Omega^{\zeta}_{(i)}}{\partial^2 \tau}$, we get the following condition to guarantee global strict concavity of the optimal tax problem:

Condition 2 *Let*

$$Var\left(\varepsilon\right)_{(i)} > \frac{\left(1-\tau\right)^2\left(\bar{\beta}_{(i)}\right)^2 Var\left(a\right)_{(i)} + \left(\bar{a}_{(i)}\right)^2 Var\left(\beta\right)_{(i)}}{2}.$$

A.3 Comparative statics for sophisticated consumers

Because $\text{sgn}\left[\frac{\partial \tau_i^*}{\partial z}\right] = \text{sgn}\left[\frac{\partial(\Upsilon_i = 0)}{\partial z}\right]$, and

$$\Upsilon_i \equiv (1-\gamma)\left[\left(1-2\tau\right)\bar{a}_{(i)}\bar{\beta}_{(i)} - \left(1-\tau\right)a_i\beta_i\right] - \gamma\frac{\partial \Omega^{\zeta}_{(i)}}{\partial \tau} = 0$$

with

$$\begin{aligned}\frac{\partial \Omega^{\zeta}_{(i)}}{\partial \tau} =& -2\left(1-\tau\right)Var\left(\varepsilon\right)_{(i)} - 2\left(1-\zeta-\tau\right)\left(2-\zeta-2\tau\right)\left(1-\tau\right)\left(\bar{\beta}_{(i)}\right)^2 Var\left(a\right)_{(i)} \\ &+2\left(1-\tau\right)\tau\left(1-2\tau\right)\left(\bar{a}_{(i)}\right)^2 Var\left(\beta\right)_{(i)}.\end{aligned}$$

we have for self interest

$$\frac{\partial\left(\Upsilon_i=0\right)}{\partial\beta_i}=-\left(1-\gamma\right)\left(1-\tau_i^*\right)a_i\leq 0$$
$$\frac{\partial\left(\Upsilon_i=0\right)}{\partial a_i}=-\left(1-\gamma\right)\left(1-\tau_i^*\right)\beta_i\leq 0$$

For the cultural traits

$$\frac{\partial\left(\Upsilon_i=0\right)}{\partial\zeta}=(2\gamma(1-\tau_i^*)\left(\bar{\beta}_{(i)}\right)^2 Var\left(a\right)_{(i)}\left[2\zeta-3\left(1-\tau_i^*\right)\right]>0\Leftrightarrow\frac{2}{3}\zeta>\left(1-\tau_i^*\right)$$
$$\frac{\partial\left(\Upsilon_i=0\right)}{\partial\gamma}=-\left[\left(1-2\tau\right)\bar{a}_{(i)}\bar{\beta}_{(i)}-\left(1-\tau\right)a_i\beta_i\right]-\frac{\partial\Omega_{(i)}^{\zeta}}{\partial\tau}=\frac{\Upsilon_i-\left[\left(1-2\tau\right)\bar{a}_{(i)}\bar{\beta}_{(i)}-\left(1-\tau\right)a_i\beta_i\right]}{\gamma}$$
$$=\frac{\left(1-\tau_i^*\right)\beta_i a_i-\left(1-2\tau_i^*\right)\bar{\beta}_{(i)}\bar{a}_{(i)}}{\gamma}.$$

For the perceptions and beliefs

$$\frac{\partial\left(\Upsilon_i=0\right)}{\partial Var\left(\varepsilon\right)_{(i)}}=\left(2\gamma\left(1-\tau_i^*\right)\right)\geq 0$$
$$\frac{\partial\left(\Upsilon_i=0\right)}{\partial Var\left(\beta\right)_{(i)}}=2\gamma\tau_i^*\left(1-\tau_i^*\right)(2\tau_i^*-1)\left(\bar{a}_{(i)}\right)^2\leq 0\text{ for }\tau_i^*\leq\frac{1}{2}$$
$$\frac{\partial\left(\Upsilon_i=0\right)}{\partial\bar{a}_{(i)}}=\left(1-\gamma\right)\left(1-2\tau_i^*\right)\bar{\beta}_{(i)}+4\gamma\tau_i^*\left(1-\tau_i^*\right)(2\tau_i^*-1)\,\bar{a}_{(i)}Var\left(\beta\right)_{(i)}$$
$$\frac{\partial\left(\Upsilon_i=0\right)}{\partial Var\left(a\right)_{(i)}}=2\gamma\left(1-\tau_i^*\right)\left(1-\zeta-\tau_i^*\right)(2-2\tau_i^*-\zeta)(\bar{\beta}_{(i)})^2$$
$$\frac{\partial\left(\Upsilon_i=0\right)}{\partial\bar{\beta}_{(i)}}=\left(1-\gamma\right)\left(1-2\tau_i^*\right)\bar{a}_{(i)}+4\gamma\left(1-\tau_i^*\right)\left(1-\zeta-\tau_i^*\right)(2-2\tau_i^*-\zeta)\bar{\beta}_{(i)}Var\left(a\right)_{(i)}).$$

A.4 Unidimensional reference group formation based on talent

If $\delta=1$, individual i only takes into account professional talent in the formation of her reference group, so that eq. (16) reduces to $\mu\left(i\right)=\left\{j\right|\left|a_i-a_j\right|\leq\pi\}$. We derive for the perceived mean and variance of a :

$$\bar{a}_{(i)}=\frac{\int_{a_i-\pi}^{a_i+\pi}s\phi^a\left(s\right)ds}{\Phi^a\left(a_i+\pi\right)-\Phi^a\left(a_i-\pi\right)}$$

$$Var\left(a\right)_{(i)} = \frac{\int_{a_i-\pi}^{a_i+\pi}\left(z-\bar{a}_{(i)}\right)^2\phi^a\left(z\right)dz}{\Phi^a\left(a_i+\pi\right)-\Phi^a\left(a_i-\pi\right)}.$$

These expressions immediately show that the beliefs of individual i will be influenced by her position in the distribution of talents. It is obvious that $\partial\bar{a}_{(i)}/\partial a_i > 0$. The sign of $\partial Var(a)_{(i)}/\partial a_i$ is less straightforward, as it depends on the shape of $\phi^a(a)$. If $\phi^a(a)$ is the uniform density, natural talent a_i has no effect on the perceived variance.

An increase in π (i.e. an increase in the marginal utility of social relations ξ or a decrease in the cost c) will lead to an extension of the reference group of the individual. This results in

$$\frac{\partial\bar{a}_{(i)}}{\partial\pi} = \frac{\left(\left(a_i+\pi\right)\phi^a\left(a_i+\pi\right)+\left(a_i-\pi\right)\phi^a\left(a_i-\pi\right)\right)}{\Phi^a\left(a_i+\pi\right)-\Phi^a\left(a_i-\pi\right)} - \frac{\left(\phi^a\left(a_i+\pi\right)+\phi^a\left(a_i-\pi\right)\right)\bar{a}_{(i)}}{\Phi^a\left(a_i+\pi\right)-\Phi^a\left(a_i-\pi\right)},$$

which is positive iff

$$\frac{\bar{a}_{(i)}-\left(a_i-\pi\right)}{\left(a_i+\pi\right)-\bar{a}_{(i)}} < \frac{\phi^a\left(a_i+\pi\right)}{\phi^a\left(a_i-\pi\right)}.$$

Again, the effect of changes in π will depend on the shape of $\phi^a(a)$. If $\phi^a(a)$ is uniform and if $\mu\left(i\right)$ is strictly within the support of $\phi^a(a)$, the perceived mean $\bar{a}_{(i)}$ obviously does not change with changes in π.

The effect on the perceived variance is

$$\frac{\partial Var\left(a\right)_{(i)}}{\partial \pi} = \frac{\left(\begin{array}{c} -2\int_{a_i-\pi}^{a_i+\pi}\left(z-\bar{a}_{(i)}\right)\frac{\partial \bar{a}_{(i)}}{\partial \pi}\phi^a\left(z\right)dz \\ +\left(\begin{array}{c}\left(\left(a_i+\pi\right)-\bar{a}_{(i)}\right)^2\phi^a\left(a_i+\pi\right) \\ +\left(\left(a_i-\pi\right)-\bar{a}_{(i)}\right)^2\phi^a\left(a_i-\pi\right)\end{array}\right) \\ -\left(\phi^a\left(a_i+\pi\right)+\phi^a\left(a_i-\pi\right)\right)Var\left(a\right)_{(i)}\end{array}\right)}{\Phi^a\left(a_i+\pi\right)-\Phi^a\left(a_i-\pi\right)}$$

$$= \frac{\begin{array}{c}\left(\left(a_i+\pi-\bar{a}_{(i)}\right)^2-Var\left(a\right)_{(i)}\right)\phi^a\left(a_i+\pi\right) \\ +\left(a_i-\pi-\bar{a}_{(i)}\right)^2-Var\left(a\right)_{(i)}\Big)\phi^a\left(a_i-\pi\right)\end{array}}{\Phi^a\left(a_i+\pi\right)-\Phi^a\left(a_i-\pi\right)}.$$

This expression is positive iff

$$\begin{aligned}&((a_i+\pi-\overline{a}_{(i)})^2-Var(a)_{(i)})\phi^a(a_i+\pi)\\ &\quad+((a_i-\pi-\bar{a}_{(i)})^2-Var\left(a\right)_{(i)})\phi^a\left(a_i-\pi\right)>0\end{aligned}$$

A sufficient condition for this is that Φ^a is not too skewed around a_i, so that both

$$Var\left(a\right)_{(i)}-\left(\left(a_i+\pi\right)-\bar{a}_{(i)}\right)^2<0$$

and

$$Var\left(a\right)_{(i)}-\left(\left(a_i-\pi\right)-\bar{a}_{(i)}\right)^2<0.$$

This condition is definitely satisfied if Φ^a is uniform.

B Data appendix: Variable definitions

B.1 Dependent variables

We use following dependent variables, which were redefined if necessary to ensure that a higher value means a higher preferred level of redistribution.

★ *Redist1* (original variable *eqwlth*): responses to the statement "Some people think that the government in Washington ought to reduce the income differences between the rich and the poor, perhaps by raising the taxes of wealthy families or by giving income assistance to the poor. Others think that the government should not concern itself with reducing this income difference between the rich and the poor.", with responses ranging from 0 (government should not concern itself with reducing income differences) to 6 (the government ought to reduce the income differences between rich and poor).

★ *Redist2* (original variable eqincome): responses to the statement "It is the responsibility of the government to reduce the differences in income between people with high incomes and those with low incomes.", with responses ranging from 0 (disagree strongly) to 4 (agree strongly)

★ *Incdiff* (original variable incgap): responses to the statement "Differences in income in America are too large.", with responses ranging from 0 (disagree strongly) to 4 (agree strongly)

★ *Txshrri* (original variable taxshare): responses to the statement "Do you think that people with high incomes should pay a larger share of their income in taxes than those with low incomes, the same share, or a smaller share...", with responses ranging from 0 (much lower share) to 4 (much higher share)

B.2 Beliefs and perceptions

First, following variables characterize respondents' beliefs about the determinants of success in life. The opening statement reads: "To begin, we have some questions about opportunities for getting ahead... Please show for each of these how important you think it is for getting ahead in life..." These variables were redefined such that responses range from 0 (not important at all) to 4 (essential).

★ *Belwealf* (original variable opwlth): "Coming from a wealthy family?"

★ *Beledupa* (original variable oppared): "Having well educated parents?"

★ *Beledu* (original variable opeduc): "Having a good education yourself?"

★ *Belambit* (original variable opambit): "Ambition? – how important is that?"

★ *Belabil* (original variable opable): "Natural ability? – how important is that?"

★ *Belwork* (original variable ophrdwrk): "Hard work – how important is that for getting ahead in life?"

★ *Belcnnct* (original variable opknow): "Knowing the right people?"

★ *Belpolcn* (original variable opclout): "Having political connections?"

★ *Belrace* (original variable oprace): "A person's race – how important is that?"

★ *Belrelig* (original variable oprelig): "A person's religion?"

★ *Belregio* (original variable opregion): "A person's region?"

★ *Belsex* (original variable opsex): "Being born a man or a woman – how important is that for getting ahead in life?"

★ *Belpolvi* (original variable oppol): "A person's political beliefs?"

Second, the following variables capture respondents' perception of the incentive effects of income inequality.

★ *Incmoti* (original variable incentiv) states "Some people earn a lot of money while others do not earn very much at all. In order to get people to work hard, do you think large differences in pay are...", with responses ranging from 0 (definitely not necessary) to 3 (absolutely necessary)

★ *Incresp* (original variable inequal1) states "People would not want to take extra responsibility at work unless they were paid extra for it", with responses ranging from 0 (strongly disagree) to 4 (strongly agree)

★ *Incskil* (original variable inequal2) states "Workers would not bother to get skills

and qualifications unless they were paid extra for having them", with responses ranging from 0 (strongly disagree) to 4 (strongly agree)

★ *Incedu* (original variable inequal4) states "No one would study for years to become a lawyer or doctor unless they expected to earn a lot more than ordinary workers.", with responses ranging from 0 (strongly disagree) to 4 (strongly agree)

★ *Incprosp* (original variable inequal5) states "Large differences in income are necessary for America's prosperity", with responses ranging from 0 (strongly disagree) to 4 (strongly agree)

★ *Incbuspr* (original variable inequal6) states "Allowing business to make good profits is the best way to improve everyone's standard of living.", with responses ranging from 0 (strongly disagree) to 4 (strongly agree)

Third, we include respondents' general political attitude, as in Alesina and Giuliano (2011).

★ *Polviews*: collects responses to the statement " We hear a lot of talk these days about liberals and conservatives. I'm going to show you a seven-point scale on which the political views that people might hold are arranged from extremely liberal – point 1 – to extremely conservative – point 7. Where would you place yourself on this scale?"

B.3 Control variables

We use the following baseline control variables in all regressions:

★ *Rlincome* (original variable realinc): household income in 1986 dollars.

★ *Prospect* (original variable goodlife): expectations for the future standard of living, reponses to the statement "The way things are in America, people like me and my family have a good chance of improving our standard of living.", with responses ranging from 0 (strongly disagree) to 4 (strongly agree).

★ *Educ*: years of education, responses to the statement "What is the highest grade in elementary school or high school that you finished and got credit for?"

★ *Age* and *agesq*: respondents' age, and the square of age.

★ *Female* (original variable sex): dummy variable, 1 if the respondent is female.

★ *Black* and *raceoth* (original variable race): dummy variables, resp. 1 if respondent is black and if respondent is non-white and non-black.

★ *Granborn*: number of the respondent's grandparents born outside the U.S.

★ *Comsize* (original variable size): the size of the respondent's commune or city, expressed in 100 000's of inhabitants.

★ *Attend*: church attendance, answers to the question "How often do you attend religious services?", ranging from 0 (never) to 7 (every week).

★ *Racehome*: dummy variable which is 1 if respondents answered 'yes' to the question "During the last few years, has anyone in your family brought a friend who was a (negro/black/African-American) home for dinner?"

★ *Memnum*: number of organisations that respondent is member of

★ *Occmobi* (original variable occmobil): difference in professional status from father, answers to the question "Please think of your present job (or your last one if you don't have one now). If you compare this job with the job your father had when you were 16, would you say that the level or status of your job is (or was)..." with responses either 0 (about equal), 1 ("higher" or "lower") or 2 ("much higher" and "much lower").

C Additional regressions

Table 10: **Explaining preferences for redistribution as Redist1**

	(1)		(2)		(3)		(4)	
	redist1		redist1		redist1		redist1	
rlincome	-0.00910***	(0.00251)	-0.00941***	(0.00260)	-0.00847***	(0.00270)	-0.00843***	(0.00270)
prospect	-0.251***	(0.0580)	-0.270***	(0.0615)	-0.145**	(0.0673)	-0.153**	(0.0674)
educ	-0.0386**	(0.0195)	-0.0509**	(0.0223)	-0.0578**	(0.0261)	-0.0495	(0.0811)
female	0.128	(0.106)	0.203*	(0.113)	0.288**	(0.122)	0.811*	(0.436)
black	0.615***	(0.125)	0.621***	(0.149)	0.550***	(0.169)	-0.414	(0.561)
raceoth	0.442	(0.306)	0.277	(0.338)	-0.561	(0.408)	-0.574	(0.408)
age	-0.00219	(0.00334)	-0.00319	(0.00373)	-0.00246	(0.00410)	-0.00238	(0.00409)
occmobi			0.0250	(0.0739)	0.0610	(0.0812)	0.0582	(0.0812)
granborn			0.0949**	(0.0386)	0.0671	(0.0421)	0.0707*	(0.0421)
memnum			0.0222	(0.0302)	0.00318	(0.0325)	0.00284	(0.0325)
attend			-0.0193	(0.0230)	-0.00201	(0.0252)	-0.00170	(0.0252)
racehome			-0.0923	(0.124)	-0.113	(0.133)	-0.124	(0.133)
comsize			-0.0297*	(0.0172)	-0.0374**	(0.0177)	-0.0376**	(0.0178)
comedu			0.00270**	(0.00129)	0.00300**	(0.00130)	0.00298**	(0.00131)
FactorDi					0.113*	(0.0629)	0.105*	(0.0630)
FactorPa					0.114*	(0.0620)	0.105*	(0.0622)
FactorPIn					0.120**	(0.0602)	0.117*	(0.0602)
FactorEff					-0.114*	(0.0619)	-0.119*	(0.0620)
FactorGIn					-0.209***	(0.0617)	-0.211***	(0.0617)
belabil					0.177**	(0.0848)	0.247	(0.397)
polviews					-0.210***	(0.0455)	-0.211***	(0.0455)
abil_edu							-0.00247	(0.0282)
abil_fem							-0.199	(0.157)
abil_bla							0.350*	(0.192)
_cons	4.625***	(0.365)	4.771***	(0.398)	4.770***	(0.551)	4.581***	(1.191)
N	1281		1144		915		915	
R^2	0.075		0.083		0.156		0.160	

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$