

# Redistribution with Endogenous Sentiments

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## Abstract

In this paper we present a model of rational voting over redistribution where individual attitudes toward others are endogenously determined. Individuals differ in their productivity as well as their degree of social concern. Individuals' behavior is influenced by moral standards. This means, agents determine what they take to be proper behavior and they judge others accordingly. Esteem for those who perform in excess of the norm is increased, and esteem for those who work less than the norm is decreases. This also pertains to individuals' self-esteem, which varies in relation to their own performance. As a result, the desired extent of redistribution depends both on individual income and on individual attitudes toward others, which endogenously shape political views. The model has different types of equilibria. In one type all individuals conform to proper behavior, income inequality is small, the social esteem for others is not biased towards any particular type. Under these conditions equilibrium redistribution increases in response to larger inequality. In the other equilibria, average labor supply is larger with highly skilled workers work above the mean and are admired by everyone, while unskilled workers are considered lazy. In this equilibrium, income inequality is large and equilibrium redistribution may decrease in response of an increase in basic productivities. We find that the emergence of equilibria crucially depends on inequality, may subject to path dependence and may depend on cultural specificities. We contrast the US and EU social contracts in light of the predictions of the model.

Keywords: Social Contract, Endogenous Sentiments, Social Norms, Redistribution, Inequality, Politico-Economic Equilibrium.

JEL Classification: D64, D72, Z13, H3 and J2

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# 1 Introduction

The extent of the intervention of the government in market economy and, in particular, the degree of redistribution varies substantially across countries. This topic has attracted the attention of a large, and increasing, literature aiming at investigating individual preferences for redistribution and the economic and political determinants of the generosity of the social contract. Concerning the difference in the individual preferences over redistribution, the empirical evidence support the view that they depend on individual income (the so called egoistic component) as well as on individual social preferences (the altruistic component). It seems by now fair to say that, concerning the egoistic component, there is evidence that poorer individuals demand larger redistribution. The evidence on the determinants of the social (or political) component as well as the relative importance of the different driving motives of preferences for redistribution is the subject of active research, however. The empirical evidence document large variation in the social attitude toward redistribution across countries. Most notably the comparison of the different allocation of social concerns in continental Europe and in US have increasingly attracted the attention of economist and other social scientists. Interestingly the different social attitudes are typically coupled with very different individual behavior and labor market outcomes and different attitude toward work. In fact an increasing literature in economics focusing on moral values points out that effort provision and hard work represents (together with the family) a primary (self-reported) moral priority.<sup>1</sup>

The goal of the paper is to provide a theoretical benchmark to investigate the social contract, individual work behavior and social preferences are mutually interacting domains. To this end, we examine the choice fiscal redistribution, by rational individuals with endogenously determined political view. We provide a simple theory of the endogenous formation of sentiments toward others by part of individuals endowed with values concerning behavior. In particular, we consider moral standards concerning effort provision, "work values", which allow each agent to form a judgement on the observed behavior by any other individuals. In the same way self perception, or self esteem, depends on the correspondence between own behavior and the moral standards. Since the moral standards are context specific, individual behavior is endogenously influenced by the behavior of the rest of members of society. Individual attitudes or sentiments shape preferences over institutional environments (in particular, the welfare state and the extent of redistribution), institutions also influence individual attitudes. Therefore, attitudes and political choices must be treated jointly. We study the politico-economic equilibria characterized by different individual sentiments, labor supply behavior, and degrees of redistribution emerging from the interaction between the evolution of individual concerns and the equilibrium social contract.

Concerning the set up of the model, individuals supply labor and are paid their competitive wage which are subject to a purely redistributive proportional tax, the proceeds from which are distributed uniformly. Agents differ in their productivities and in their (initial) degrees of concern for others. Most importantly, their behavior and their sentiments are influenced by *moral standards*. By this we mean that agents determine what they take to be proper behavior – here identified with the average labor supply – and they judge other agents accordingly, that is, they tend to increase their concern or esteem for those who perform in excess of the norm and decrease their esteem for those who underperform. This pertains to their self-esteem as well, which varies in relation to their own performance. As agents' sentiments change, so too do their labor supply decisions, which affects other agents'

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<sup>1</sup>The economic literature on preferences for redistribution as well as the differences in the social contract and in labor market in US and in continental Europe is review in more details below. There we also discuss the literature on work related values and social preferences.

evaluations and hence their behavior, in turn. Consequently, we are led to consider steady states of this dynamic process. Two types of steady state equilibria emerge. In one type all individuals conform to the ethical norm and supply equal amounts of effort. In equilibrium, there is an inverse relation between the level of altruism (the total esteem felt for others) and income. We call this a *cohesive* equilibrium. In the second type of equilibrium society is divided into clusters. One consists of the most productive individuals, who in equilibrium work above the average and are object of larger social consideration while another consists of the least productive individuals, who work less than average and earn lower esteem. Whether an economy becomes cohesive or clustered crucially depends on the degree of inequality in individual skills (pre-tax income) and, possibly, on cultural features affecting the degree of industriousness in the different communities.

The model deliver several predictions concerning the features of the different equilibria. The main features of the different equilibria are as follows,

[1] **INEQUALITY:** *Cohesive equilibria emerge only if inequality in basic productivity is not too large. For larger inequality social clustering emerges. Productivity differences and pre-tax income inequality is lower in cohesive than in clustered equilibria.*

[2] **WORKING HOURS: LEVEL AND INEQUALITY.** *Clustered equilibria display both larger average working dispersion in working hours across the population than cohesive equilibria.*

[3] **INDIVIDUAL ATTITUDES:** *In a clustered equilibrium, the highly skilled are perceived as hard working and are admired by everyone, whereas the low skilled are seen as lazy and are admired by no one. Moreover, these sentiments are shared by everyone, including the low wage earners themselves. The bias in the allocation of social esteem is increasing with the degree of inequality. In contrast, in a cohesive equilibrium agents' sentiments show no bias toward those of a particular income group irrespective of income inequality.*

[4] **REDISTRIBUTION:** *In cohesive equilibria equilibrium redistribution is increasing with income inequality. In clustered equilibria the effect of inequality on redistribution is non-monotonic. In a clustered society even the poor would not be supportive of highly redistributive policies with the social aversion to redistribution being increasing in inequality (due to increasing bias in social concern). As a result equilibrium redistribution is eventually decreasing for large enough social clustering.*

While it is difficult to provide hard empirical evidence of the model in its different predictions it is possible to discuss the predictions by comparing the interesting examples of the social contracts in US and continental Europe. In fact one of the theoretical results imply that if a country with larger factor income inequality redistribute less it should be more socially clustered and it should be characterized by larger average labor supply and dispersion. We therefore contrast the cases of clustered and cohesive equilibria with the available evidence for the US and the EU.

Concerning the related literature, the contribution of the paper spans three areas: (i) voting over taxes, (ii) endogenous preferences and social norms, and (iii) inequality and redistribution and multiplicity of social contracts. We discuss each in turn.

(i) Our model is a extension of the classic positive analysis initiated by Romer (1975), Roberts (1977) and Meltzer and Richard (1981), (*henceforth M-R*) on voting over linear income tax schedules. Our claim is that individual attitudes toward others affect the desired tax structure which affects behavior which, in turn, affects attitudes. Hence, the problem of the choice of a “social contract” has to be modelled as a joint determination of attitudes, labor supplies and taxes. To this effect, we examine the case where individuals have social concern along with the standard egoistic motivation. The literature on this point is quite sparse<sup>2</sup> in spite of the fact that empirical evidence strongly suggests that individual attitudes

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<sup>2</sup>To the best of our knowledge, the only papers to address the political economy of taxation with altruistic

towards redistribution are affected by factors other than private gain.<sup>3</sup> In our model, agents' preferences over taxes depend on the esteem they feel for one another. Therefore, the individual choice of taxes will reflect a blend of the motives of the egoistic voter and of the social planner.

As mentioned above, we find that the model can deliver different equilibria with distinct patterns of sentiments, labor supply behavior and redistribution. As in M-R, larger income inequality increases the egoistic gains from redistribution by the poor and hence the demand for redistribution. However, our results depart from the classical formulation in several important respects. In the first place the social component of individual demand for redistribution may respond positively or negatively to inequality depending on the degree of social clustering which is associated to the bias in the allocation of social esteem. In particular while redistribution is expected to increase with inequality in cohesive societies (in which the egoistic and social demand for taxation by part of the poor are aligned) this is not the case in clustered societies. A large enough social clustering may lead to a reduction in redistribution in response to an increase in inequality. It follows that we may observe that the society with lower pre-tax earnings inequality – because it has remained cohesive – chooses to redistribute more than the society with larger inequality. Therefore, the model does not support the unconditional prediction of a negative relationship between inequality and redistribution.

(ii) The paper also contributes to the growing literature on the role of norms of behavior, moral values and endogenous preferences. Here we bring together different lines of research on work-related norms in a common framework, and we extend it to include the formation of attitudes toward others. Several important works have considered the role of social norms and ethics on economic behavior and on labor effort in particular. Elster (1898) made the point that effort provision can be influenced by norms, which are sustained by both the approval and disapproval by others and the psychological costs of violating the norm, possibly associated with feelings of anxiety and guilt. Our modelling of moral persuasion follows the second line. In this sense, our approach is close to the idea of “intrinsic motivation” of individual behavior.<sup>4</sup> The papers of Moffit (1983) and Besley and Coate (2003) are particularly relevant to the analysis of this type of moral persuasion. They consider the case of social norms against living on transfers and the threat of ‘welfare stigma.’ Lindbeck, Nyberg, and Weibull (1999) have extended this analysis to include individuals voting over welfare benefits. In that work, the social norm is to “live off one’s own work,” and individuals can choose between working full-time for a wage or living on an unemployment subsidy. The psychological cost of deviating from the norm depends on the extent of compliance with the rule. Hence, the observed behavior of others influences one’s attitude toward deviating, and the cost of deviating may affect the decision to do so. Our model also considers the “psychic costs” of deviating from the social norm. However, it departs from the work of Lindbeck, Nyberg, and Weibull (1999) in two essential ways. First, we focus on the intensity of work effort, which in our model varies continuously, versus the discrete choice of working full-time or living on transfers. And second, it is crucial in our model that moral judgements befall on others as well as oneself. We assume it is the contrast between “normal” behavior and observed behavior which influences

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agents are Kranich (2001) and Snyder and Kramer (1988), even though Romer (1975) suggested that altruism might be necessary to explain the emergence of progressive income taxation.

<sup>3</sup>See Corneo and Grüner (2002) and Fong (2001) for evidence that individual attitudes toward redistribution cannot be explained by egoistic motives alone. Since the influential work of Rabin (1993) the role of utility externalities and the perception of fairness in determining individual behavior has been widely acknowledged.

<sup>4</sup>See the survey by Frey and Jegen (2001) and the paper by Falk and Fehr (2002).

the esteem for the individual.<sup>5,6</sup> In our model, the contemporaneous choice of labor supply depends on the current attitudes toward others as well as ones' self-esteem and in turn affects future parameters and thus labor supply decisions. Hence, we face a dynamic interdependence between social and economic interactions.

(iii) Finally, the paper contributes to the growing literature which attempts to explain why the US and EU have such different “social contracts” and labor market equilibria in spite of the similarities in their fundamentals. We devote a discussion to this issue and thus defer doing so here in any great detail. There we provide evidence in support of the claim that the US is in a clustered equilibrium while the EU is in a cohesive equilibrium. We would emphasize that our model offers a unified framework for explaining differences in tax structure as well as documented differences in the level and variance of labor time, in attitudes toward the poor and toward the redistributive role of the state. We argue that the two types “fit” the available evidence for the US and the EU quite well. The contrast between the US and (continental) European (EU) societies has been the subject of increasing academic interest. In spite of their exhibiting similar economic fundamentals, these regions differ considerably in the form of their “social contracts,” the attitudes (toward others and toward work) or circumstances that give rise to such differences, and the behavior that ensues under the two systems.<sup>7</sup> A number of contributions have attempted to explain these differences. Generally, this is viewed as an instance of multiple equilibrium, but the causes of such multiplicities vary. Thus far, explanations have included capital market imperfections, differences in real or perceived income mobility, among others. In this paper, we provide a different explanation of why economies with similar economic fundamentals and political institutions may nonetheless implement very different social contracts.

The paper is organized as follows. Section 2 describes the basic model. Section 3 studies individual preferences for redistribution and individual labor supply. Section 4 examines the evolution of individual attitudes and behavior and characterizes the stationary equilibria. Section 5 is devoted to politico-economic equilibria where taxes, sentiments and labor supply are simultaneously determined. In Section 6 we pin down functional forms which allow to analytically characterized the different equilibria and study in details the relationship between inequality, social cohesion and redistribution. Section 7 contrasts the testable implications of the model with the available evidence for the US and the EU and reviews the literature on alternative explanations for the differences in question.

## 2 Set Up

Consider an economy with a unit mass of individuals endowed with a constant marginal productivity of labor, which equals the wage in a competitive market. Individual productivity can be of two types  $\beta_s$  and  $\beta_u$  corresponding to skilled and unskilled labor, respectively, with

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<sup>5</sup>This formulation of sentiments is similar to Levine (1998) where individuals take the private welfare of others into consideration much as in our model. However, there, actual sentiments are fixed but private information, and the weight one attaches to other agents' utility depends on the perception of their sentiments toward you. Hence, individuals play a signalling game to convey their intentions or their true sentiments. In contrast, we consider large societies and assume away strategic behavior.

<sup>6</sup>Brekke, Kverndokk, and Nyborg (2003) and Akerlof and Kranton (2000) also consider cases in which agents derive utility from conforming with a social norm or belonging to a group. The former considers a similar question of voluntary contributions to a public good, and the latter investigates group identification and identity. Both focus on self-image rather than passing moral judgement on others.

<sup>7</sup>See Alesina and Glaeser (2004) for a comprehensive analysis of the differential features of the two societies.

$\beta_u < \beta_s$ . The proportion of the population with skilled labor is  $\pi$  while the proportion of unskilled is  $(1 - \pi)$ . We assume that a majority is unskilled and hence  $\pi < \frac{1}{2}$ . Average productivity is denoted by  $\beta$ .

**Preferences.** The overall utility evaluation of an individual of type  $i = u, s$  is denoted  $V_i$  and depends on its private utility,  $v_i$ , as well as on social utility,  $w_i$ , where the latter captures the effect on the individual's own well-being derived from the esteem felt for others. Hence, we have,

$$V_i = v_i + w_i. \quad (1)$$

Concerning the social-altruistic component we assume that individuals care about others in as much as they feel esteem for them. We denote by  $\alpha_{i,j} \in [0, 1]$  the esteem or concern felt by an individual of type  $i$  towards an individual of type  $j$ .<sup>8</sup> This esteem is then the weight that  $i$  assigns to the (private) utility of  $j$  in an additive extended utility function.<sup>9</sup> We shall denote by  $\alpha_i$  agent  $i$ 's weights  $(\alpha_{i,u}, \alpha_{i,s})$ , and by  $\alpha$  the full matrix of weights.

Hence, the social component of overall utility is

$$\begin{aligned} w_i &= (1 - \pi)\alpha_{i,u}v_u + \pi\alpha_{i,s}v_s = \\ &= \alpha_i [(1 - \sigma_i)v_u + \sigma_i v_s] \equiv \alpha_i \tilde{w}_i, \end{aligned} \quad (2)$$

where  $\alpha_i$  is the (average) social concern of individual  $i$ ,

$$\alpha_i \equiv (1 - \pi)\alpha_{i,u} + \pi\alpha_{i,s}, \quad (3)$$

and

$$\sigma_i \equiv \frac{\alpha_{i,s}\pi}{\alpha_i} \quad (4)$$

is the *share* of social concern that individual  $i$  allocates to the group of agents of type  $s$ . Therefore, the social component of overall utility can be written as the product of the individual specific weighted social utility  $\tilde{w}_i$  and the degree of social concern  $\alpha_i$ . Individuals are thus partly egoistic and partly (possibly biased) social planners, with the role of the latter depends on the degree of social concern.

We can then write individual *total* utility as,

$$V_i = v_i + \alpha_i \tilde{w}_i. \quad (5)$$

Individual *private* utility depends on consumption,  $c_i \geq 0$ , leisure  $l_i \in [0, 1]$  and, as in Lindbeck et al (1999), on a parameter  $\varphi_i \geq 0$  which relates to the self-image or self-esteem,

$$v_i = v(c_i, l_i, \varphi_i) \quad (6)$$

We assume private utility to be increasing (and weakly concave) in all arguments,

ASSUMPTION A1. The utility function  $v$  have standard properties:  $v_c > 0$ ,  $v_{cc} \leq 0$ ,  $v_l > 0$ ,  $v_{ll} \leq 0$  and  $v_{cl} \geq 0$ . Also  $v_\varphi > 0$ ,  $v_{\varphi\varphi} \leq 0$ .

This implies that individuals derive utility from consumption, leisure as well as larger self-esteem. As studied below  $\varphi_i$ , which is for the moment taken as exogenous, (and will be determined endogenously through social interactions) influence the individual propensity

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<sup>8</sup>Note that by taking that  $\alpha_{i,j} \geq 0$  we are excluding malevolence. We impose this restriction for expositional convenience. Our results only require that sentiments be bounded below.

<sup>9</sup>See Sen (1966) and Ray and Ueda (1996) for earlier models of individual behavior with extended preferences.

to labor supply. Work effort is given by  $L_i = 1 - l_i$ . The vector of self esteem parameters  $(\varphi_u, \varphi_s)$  is denoted by  $\varphi$ .

**Public policy: fiscal redistribution.** Concerning the public policy we consider the possibility of fiscal redistribution. The government can redistribute income across individual out of a public budget. For simplicity, and without loss of generality, we assume as in Meltzer and Richard (1981) and Roberts (1977), that labor income is subject to a purely redistributive linear income tax characterized by the pair  $(\tau, T)$ , where  $\tau \in [0, 1]$  is the constant marginal tax rate and  $T$  is a uniform per capita transfer.<sup>10</sup> The public budget constraint implies,

$$T(\tau) \leq \tau [(1 - \pi)y_u + \pi y_s] \equiv \tau \bar{y}, \quad (7)$$

where  $y_i$  is pre-tax income of individual  $i$  and  $\bar{y}$  is the average income. Individual after-tax, disposable, income is fully consumed and it is given by,

$$c_i = (1 - \tau)y_i + T = (1 - \tau)\beta_i L_i + T \quad (8)$$

We now investigate individual labor supply and preferences for redistribution in this set up.

### 3 Labor Supply and Preferences over Redistribution

This set up represents an extension of the standard framework used to study the problem of voting over taxes with endogenous labor supply. In this section we investigate individual preferences over labor supply and over the extent of redistribution.

**Labor supply.** In the labor market each individual is price taker and, for any given level of redistribution, self-esteem  $\varphi_i$  and social esteem  $\alpha$ , labor supply is chosen optimally to maximize utility. Social utility plays a role concerning preferences for redistribution. When it comes to choosing the individual labor supply, only the private component of utility matters, however. Individuals are of a negligible size and hence by their private decisions they cannot affect the well-being of the others. Therefore optimal labor supply maximizes private utility and, considering (8), is given by,

$$L(\beta_i, \varphi_i, \tau) = \arg \max_L v(c_i, l_i, \varphi_i) \text{ s.t. } c_i = (1 - \tau)\beta_i L_i + T \quad (9)$$

which is implicitly characterized by the interior first order condition,

$$v_c((1 - \tau)\beta_i L_i + T, l_i, \varphi_i) (1 - \tau)\beta_i - v_l((1 - \tau)\beta_i L_i + T, l_i, \varphi_i) = 0 \quad (10)$$

While the second order condition reads,

$$D \equiv v_{cc}(\cdot) (1 - \tau)^2 \beta_i^2 - 2v_{cl}(\cdot) (1 - \tau)\beta_i + v_{ll}(\cdot) < 0 \quad (11)$$

Rearranging (10) we have the usual condition that, at the optimum, the marginal rate of substitution between consumption and leisure is equal to the net wage,

$$\frac{v_l(\beta_i, \varphi_i, \tau)}{v_c(\beta_i, \varphi_i, \tau)} = (1 - \tau)\beta_i \quad (12)$$

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<sup>10</sup>Focussing on linear progressive taxation makes the results more directly comparable with the cited literature and allow to simplify notation but, as clarified below, it is not essential for the main argument.

The novelty with respect to the standard set up is that, as studied below, the marginal rate of substitution between consumption and labor depends on  $\varphi_i$  which, therefore, affects individual labor supply decisions. In order to highlight the different role of work motivation and economic incentives for labor supply, we restrict attention to labor supply which is increasing in net wage. To this end we follow the literature in labor economics and restrict attention to the case in which labor supply is increasing in net wage for any amount of public transfers so that,<sup>11</sup>

$$\frac{dL_i}{d\beta_i} = -\frac{1}{D} (1 - \tau) \{v_{cc}(\cdot) (1 - \tau) \beta_i L_i + v_c(\cdot) + v_{cl}(\cdot) L_i\} > 0 \quad (13)$$

where  $-1/D > 0$  by second order conditions.<sup>12</sup>

**Preferences over redistribution.** We investigate individual preferences for redistribution  $\tau$  we follow the approach developed by Romer (1975), Roberts (1977) and Meltzer and Richard (1981) in which agents are aware of the distortions caused by income taxation on labor supply and anticipate the existence of a public budget constraint.

Economic and political choices are based on *current* preferences. Individuals anticipate the effect of taxation on labor supply decisions but not the evolution of preferences possibly triggered by a change in the degree of redistribution. Therefore, when comparing alternative tax regimes, individuals take as given the vector  $\varphi$  and the matrix  $\alpha$ . Later, these parameters will be made endogenous and determined in equilibrium jointly with the chosen taxes and labor supplies. But for now we consider them exogenous.

The degree of redistribution preferred by an individual maximizes his *total* (indirect) utility (5), subject to the public budget constraint (7). The individual preferences over taxes are a weighted mix of its egoistic preferences and its perception of the social good.

Differentiating the egoistic (indirect) utility  $v_i$  with respect to  $\tau$  we get,

$$\frac{dv_i}{d\tau} = \frac{\partial v_i}{\partial c} \left[ \bar{y} - y_i + \tau \frac{d\bar{y}}{d\tau} + (1 - \tau) \beta_i \frac{dL_i}{d\tau} \right] + \frac{\partial v_i}{\partial L_i} \frac{dL_i}{d\tau} = 0$$

and considering the first order condition (10) we have,

$$\frac{dv_i}{d\tau} = \frac{dv_i}{dc} \left[ \bar{y} - y_i + \tau \frac{d\bar{y}}{d\tau} \right] \quad (14)$$

From (5) we obtain the first order condition which implicitly identifies the level of redistribution preferred by individual  $i$  in the current set up with social preferences,

$$\frac{dV_i}{d\tau} = \frac{dv_i}{d\tau} + \alpha_i \left[ (1 - \sigma_i) \frac{dv_u}{d\tau} + \sigma_i \frac{dv_s}{d\tau} \right] = 0 \quad (15)$$

With no social concern, i.e.  $\alpha_i = 0$ , the problem is identical to the one studied in Meltzer and Richard (1981). Equation (14) characterizes individual preferences of an egoistic

<sup>11</sup>In general with a multiplicity of productivity types the most productive agents can possibly be located on the backward bending part of their labor supply. Since we consider two social categories, of skilled and unskilled workers, it is natural to restrict attention to the case in which a larger wage induces larger effort provision.

<sup>12</sup>Labor supply to respond positively to wage if the elasticity of the marginal utility of consumption with respect to labor is sufficiently small (i.e.  $\varepsilon_{v_c, L} < 1$ ) since in this case the substitution dominates the income effect.

**Idea of Proof:** By computing the elasticity of the marginal utility of consumption with respect to labor and use it to sign equation (13).

agent. While all individuals richer the average oppose any taxation, the poor demand an amount of redistribution which is increasing in inequality (i.e. in  $\bar{y} - y_u$ ). This results in the standard prediction that in the egoistic benchmark equilibrium redistribution (mirroring the preferences of the poor) should increase with inequality.<sup>13</sup>

Relative to this benchmark, when  $\alpha_i > 0$  preferences over redistribution will be affected by the degree of social concern  $\alpha_i$  and by the bias in the allocation of individuals' social esteem (i.e. on the political preferences). Re-expressing (15) using (14), we obtain the first order condition characterizing preferences for taxation. Denoting by  $\tau^i$  the level of redistribution preferred by agent  $i \in \{u, s\}$  we have,

**Proposition 1 (Individual Preferences over Redistribution).** *For each individual  $i$  with  $\beta_i$  the preferred level of redistribution,  $\tau^i$ , is implicitly characterized by either,*

$$\begin{aligned} \frac{dV_i(\tau^i)}{d\tau} = 0 \Leftrightarrow 0 = \frac{dv_i}{dc} \left[ \bar{y} - y_i + \tau \frac{d\bar{y}}{d\tau} \right] + \\ + \alpha_i \left\{ (1 - \sigma_i) \frac{dv_u}{dc} \left[ \bar{y} - y_u + \tau \frac{d\bar{y}}{d\tau} \right] + \sigma_i \frac{dv_s}{dc} \left[ \bar{y} - y_s + \tau \frac{d\bar{y}}{d\tau} \right] \right\} \end{aligned} \quad (16)$$

or is given by  $\tau^i = 0$  if  $dV_i/d\tau < 0$  for each  $\tau \in [0, 1]$ .

Consider preferences for redistribution as compared to the egoistic benchmark.

**Lemma 1.** *If individuals have social preferences,  $\alpha_i > 0$ , then for any given allocation of social esteem across groups  $\sigma$ , and any vector  $\{\varphi, \beta\}$  such that  $y_u < y$  we have that:*

- (i)  $\tau^u$  is inferior to the one of the egoistic benchmark and it is decreasing in  $\alpha_u$ .
- (ii)  $\tau^s$  is (weakly) larger to the one of the egoistic benchmark and it is (weakly) increasing in  $\alpha_s$ .<sup>14</sup>

**Proof of Lemma 1.** (i) Rearrange (16) to get

$$\frac{dv_u}{dc} (1 + \alpha_u(1 - \sigma_u)) \left[ \bar{y} - y_u + \tau \frac{d\bar{y}}{d\tau} \right] = -\sigma_u \alpha_u \frac{dv_s}{dc} \left[ \bar{y} - y_s + \tau \frac{d\bar{y}}{d\tau} \right] \quad (17)$$

and since the RHS is positive also the LHS must be positive which implies that

$$\bar{y} - y_u + \tau \frac{d\bar{y}}{d\tau} > 0 \quad (18)$$

which is the case only if the level of redistribution preferred by the poor is smaller than in the egoistic case. A larger  $\alpha_u$  increase the weight of the social part relative to the egoistic one and accordingly reduces the demand for taxation by part of the poor.

(ii) Similarly, the preferences of the rich are given characterized by,

$$\frac{dv_s}{dc} (1 + \alpha_s \sigma_s) \left[ \bar{y} - y_s + \tau \frac{d\bar{y}}{d\tau} \right] + (1 - \sigma_s) \alpha_s \frac{dv_u}{dc} \left[ \bar{y} - y_u + \tau \frac{d\bar{y}}{d\tau} \right] \leq 0 \quad (19)$$

<sup>13</sup>In the egoistic case the preferred level of redistribution is either implicitly characterized by (interior) first order condition,  $\bar{y} - y_i + \tau (d\bar{y}/d\tau) = 0$  delivering a  $\tau^i > 0$  or implies a preferred level of redistribution equal to zero if  $dv_i/d\tau < 0$  for each  $\tau$ . The rich agents prefer  $\tau = 0$  since  $\tau (d\bar{y}/d\tau) < 0 \forall \tau \in [0, 1]$ . As discussed later on, despite a large research effort, this prediction do not find support in the empirical literature.

<sup>14</sup>This also implies that while rich oppose any taxation in the egoistic benchmark while they may support redistribution if they have social preferences.

where  $\left[\bar{y} - y_s + \tau \frac{d\bar{y}}{d\tau}\right] < 0$  implying that the egoistic preferences of the skilled require  $\tau^s = 0$ . The same is true if equation (19) holds with the strict inequality. In this case both the egoistic and the extended formulation imply that the skilled oppose redistribution. Nonetheless equation (19) may hold as equality. In this case,

$$\frac{dv_s}{dc} (1 + \alpha_s \sigma_s) \left[\bar{y} - y_s + \tau \frac{d\bar{y}}{d\tau}\right] = (1 - \sigma_s) \alpha_s \frac{dv_u}{dc} \left[\bar{y} - y_u + \tau \frac{d\bar{y}}{d\tau}\right] \quad (20)$$

the first order condition imply  $\left[\bar{y} - y_u + \tau \frac{d\bar{y}}{d\tau}\right] > 0$  and a positive degree of redistribution. This is the case only if the benefits of redistribution for the poor are sufficiently considered.

Altruistic agents internalize the effects of redistribution on the well being of others. Compared to the egoistic case, the individual demand for redistribution depends on both the extent of social concern  $\alpha_i$  and the bias in its allocation across social groups. As a result, preferences over taxation compromise between the egoistic preferences of the different groups. Hence, the effect of social concern is to reduce the preferred tax relative to the egoistic case among the individuals who were favorable to redistribution and make those who egoistically oppose redistribution less averse to taxation. Poor individuals with unbiased altruism will weight the cost of taxation to the rich together with the benefits of redistribution towards the poor. As a result, their redistributive demands will be more moderate than under pure egoism. Similarly the rich may partly behave as (generalized) utilitarian social planner and, accordingly, support redistribution. This also implies that the larger the social concern,  $\alpha_i$ , the lower the conflict of interest over redistribution. As for the role of the bias in individual sentiments, the direction in which redistribution diverges from the benchmark case is determined by the bias in the allocation of social concern among the different groups, i.e. whether the individuals have a pro-poor or pro-rich bias.

In the next section we provide a simple benchmark which allows to study the evolution of social and self esteem in response to observed behavior as compared to moral standards. We then move on by characterizing the stationary states of the dynamic process.

## 4 Endogenous Sentiments

In this section we provide a simple modeling of the dynamic evolution of social and self-esteem. Agents are endowed with an ethical view concerning standards of behavior. We concentrate on standards about labor supply: agents have moral *work* values according to which "industriousness is good and idleness is bad".<sup>15</sup> The comparison between actual behavior and the standards drives the evolution of sentiments in the form of both social and self esteem. All agents judge the degree of industriousness of each person on the basis of that person's labor effort relative to the standard. In response to the observed behavior, they increase their esteem for those who work above the standard and decrease their esteem for those who work below. Similarly self-esteem changes in response to own past behavior as compared to the moral standard. For any given level of redistribution, the evolution of social and self esteem triggers changes in individual labor supply which, in turns, may induces further changes in sentiments. In this section we lay down the benchmark model. We then turn to study and stationary state of the system for a given level of redistribution. Finally we concentrate attention to the politico-economic equilibria in which also redistribution is endogenous and respond to individual sentiments.

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<sup>15</sup> Cite here few contribution documenting the importance of work values???

**Evolution of Social and Self-Esteem.** Treating time as a discrete variable, denote by  $L_j^i(t)$  as the moral standard of agent  $i$  concerning agent  $j$ , i.e. the labor that agent  $i$  thinks should be contributed by agent  $j$  at time  $t$ . We investigate the benchmark in which all individuals are judged in comparison to a unique, and community specific, moral standard which coincide with mean behavior in the community:  $L_j^i(t-1) = L(t-1)$ . Individuals observe labor efforts in period  $(t-1)$  and compare it with the average effort  $L(t-1)$ . Denote by,

$$\bar{L}_i(t-1) \equiv \frac{L_i(t-1)}{L(t-1)} \quad (21)$$

as the labor supply of individuals of type  $i$  relative to the average. Individuals working above average are regarded as industrious and, accordingly, they receive larger social consideration and enjoy larger self-esteem.

In particular, for the purposes of this paper, it is sufficient to make the simple assumption that the social consideration, by part of each individual  $i$ , of to the different groups is increasing with their contribution to total labor supply (i.e. the share of labor supply of this group) so that,

$$\sigma_i(t) = \pi f(\bar{L}_i(t-1)) \quad (22)$$

with  $f' > 0$  with  $f(1) = 1$ . This implies that, when comparing the different social groups, each agent weights more the more industrious individuals. This also imply that all individuals are equally considered whenever they behave in line with the moral standard.<sup>16</sup>

Symmetrically, the comparison between own behavior and the standard influences, in turn, the relative weight between the self and the social esteem. This implies that individuals that perceive themselves as 'lazy' experience a reduction of self-esteem which is associated to a lower private utility and a reduction of the weight of the private *versus* the social component in the total utility.

This idea is formalized by postulating,

$$\varphi(t) = g(\alpha(t)) \quad (23)$$

with  $g' < 0$ ,  $\underline{\varphi} = \inf g = g(0) < \infty$  and  $\bar{\varphi} = \sup g = g(1) \geq 0$  and by assuming that individuals that perceive themselves as industrious enjoy a larger self-esteem,

$$\bar{L}_i(t-1) \geq 1 \implies \varphi_i(t) \geq \varphi_i(t-1) \quad (24)$$

For the purposes of this paper it is sufficient to assume that, in qualitative terms, self-esteem is increased or decreased depending if an individual perceives himself industrious or lazy, implying that agent  $i$  suffer a reduction of self-esteem whenever falling short of (community and time contingent) labor standard while he enjoys an increase in self-esteem whenever he works above the standard.<sup>17</sup>

<sup>16</sup>For notational simplicity we model the evolution of individual sentiments referring to the observation of the behavior of the different social categories rather than each individual. This view appears justified in a large society in which only 'average behavior' of the differently skilled individuals is likely to be observed. Strictly speaking this representation implicitly assumes that all individuals with the same productivity behave identically. Notice, however that this assumption is not restrictive since the postulated evolution of sentiments implies that in any stationary state individuals with identical productivity behave identically no matter the initial conditions in terms of social and self-esteem.

<sup>17</sup>Accordingly, and given (23), this imply a change in social esteem so that,

$$\bar{L}_i(t-1) \geq 1 \implies \alpha_i(t) \leq \alpha_i(t-1) \quad (25)$$

so that the social consideration of others whenever by comparing himself to the average of the community an agent provide less labor.

**Sentiments, utility and behavior.** As discussed in details below, those who are object of *social* consideration enjoy a prize, in the form of larger utility, coming from public policies (redistribution) which are closer to their preferred ones. Similarly, a larger self-esteem implies a prize in terms of private utility. Since the focus is on ethical principles concerning effort we consider the case in which the utility received by the a given amount of leisure time  $l_i$  is increasing with  $\varphi_i$  so that self-esteem increases private utility and influence the marginal rate of substitution between consumption and effort. This is stated in the following,

ASSUMPTION A2 The marginal rate of substitution between consumption and leisure is increasing in  $\varphi_i$  :

$$\frac{d}{d\varphi} \left( \frac{v_l}{v_c} \right) = \frac{1}{v_c} (v_{l\varphi}(\cdot) - v_{c\varphi}(\cdot) (1 - \tau) \beta_i) > 0 \quad (26)$$

While leaving the exact relationship between self-esteem, leisure and consumption unrestricted this assumption simply implies that a larger self-esteem increases the relative enjoyment of leisure.<sup>18</sup> This assumption formalizes the argument that when comparing his past behavior to the observed standard an individual, perceives himself as industrious then he enjoys a larger self-esteem and a larger marginal utility form leisure. Symmetrically, those individuals who, on the base of their past behavior perceive themselves as lazy have a low self-esteem and do not enjoy an effective leisure as much as those who have a better self-image.<sup>19</sup> This, in turns, leads to a change in individual attitude toward labor supply as,

$$\frac{dL_i}{d\varphi_i} = -\frac{1}{D} \{v_{c\varphi}(\cdot) (1 - \tau) \beta_i - v_{l\varphi}(\cdot)\} < 0 \quad (27)$$

from first order conditions for labor supply  $(1 - \tau) \beta_i = v_l/v_c$  and from (26).

This set up formalizes the view that better economic rewards (net wage) and increased moral pressure associated to a reduction in self-esteem (for falling short of moral standards) represent complementary incentives inducing an increase in labor effort.<sup>20</sup>

At this point, few comments on the assumed behavior are in order. First, as formulated here, self-esteem provides a built in mechanism reducing polarization of labor supply: those

<sup>18</sup>Technically, using the first order condition for optimal labor supply (10), re-express (26) as,

$$\frac{\partial}{\partial \varphi} \left( \frac{v_l}{v_c} \right) = \left( \frac{v_l}{v_c} \varphi \right) \left[ \frac{v_{l\varphi}}{\varphi v_l} - \frac{v_{c\varphi}}{\varphi v_c} \right] = \left( \frac{v_l}{v_c} \varphi \right) [\varepsilon_{v_l, \varphi} - \varepsilon_{v_c, \varphi}]$$

so that Assumption A2 is equivalent to assume that the elasticity of the marginal utility of leisure with respect to self-esteem is larger than the elasticity of marginal utility of consumption:  $[\varepsilon_{v_l, \varphi} - \varepsilon_{v_c, \varphi}] > 0$ . This assumption appear justified in this set up in which self-esteem is related to work effort rather than consumption. Note also that the MRS between consumption and leisure is increasing in both  $\varphi_i$  and  $L_i$ . This implies that the importance of leisure increases with industriousness and with self-esteem.

<sup>19</sup>Falk and Fehr (2002, p. 713) make the point that “the convention to take the disutility of effort as exogenously given induces economists to disregard potential determinants of the (dis) utility of effort.” Alesina and Angeletos (2005) and Bisin and Verdier (2005) also consider the possibility that marginal rate of substitution between consumption and leisure may depend on individual attitude toward work (see more below).

<sup>20</sup>Deci (1971) was the first to argue that besides external rewards “internal motivation” plays a key role in the supply of individual effort. Lindbeck et al (1999) assume instead that the moral component of the utility function is additively separable, thus ruling out any influence on the substitution of labor for consumption. For them this is a lump-sum psychological cost. In this paper we allow the marginal disutility of effort to vary *with the level of effort*; with the strenght of this effect which is affected by the behavior of others. [See also Murdoch (2002) for a related concept of intrinsic motivation.] This topic has recently attracted the attention of economists. [See Kreps (1997) and Frey (1997) and more recently Bénabou and Tirole (2003) .] As for the empirical evidence that effort may depend on moral motivation, see Deci, Koestner, and Ryan (1999) and Gneezy and Rustichini (2001) and Frey and Jegen (2001) .

with low self-esteem face pressure and have an incentive to work more and those with high self-esteem have an incentive to work less. This is similar to welfare stigma effect in Lindbeck et al. (1999) for which by staying on welfare individuals face a moral pressure to work and they receive a utility prize from behaving according to their moral principles. The role of moral values is interpreted as inducing individuals to provide effort in line with the standard of the community as, dynamically, supplying larger labor increases private utility via an increase in self-esteem. A polarized behavior would always occur if we were to assume that the pride of having worked hard induces individuals to enjoy their leisure time even less and work even more (and the ones with low self-esteem to work even less). As seen below, in spite of this tendency to depolarize, there may be stationary equilibria in which unskilled workers work uniformly less than skilled workers. Second, we abstract from consideration of the possibility that agents might behave strategically for the purpose of eliciting greater esteem from others or even greater self-esteem. Rather, individuals are assumed to behave sincerely on the basis of their current sentiments, which are treated as fixed at the point of decision-making. Our third comment is that this ethical rule does not take personal circumstances into account when passing judgement on the behavior of others. While there are certainly times when special circumstances warrant special consideration, in the aggregate the “average work week” is often used as a benchmark.<sup>21</sup> This seems a reasonable starting point when modelling attitudes in large societies in which each individual is negligible.

Summing up, this set up takes on board the idea that the consideration of others as well as self esteem influence both public policies and individual behavior. In particular, larger esteem for a social group, measured with a larger share of social consideration, implies a larger political consideration of their well being the moment of expressing preferences over redistributive policies. This means that agents which are socially considered are prized with larger utility in the form of public policies which are closer to their interests. Similarly larger self-esteem, derived from behaving in line with moral standards, implies the enjoyment of larger private utility. While the simple formulation presented here represents a useful benchmark, any alternative set up mirroring these features would be equivalent for the purposes of the paper.

## 5 Politico-Economic Equilibria

We now investigate the stationary points of the dynamic process by which individual sentiments condition individual and political choices and, in turn, such choices influence future sentiments. The preferences over redistribution, in turns, depends on social and self-esteem.

Economic inequality creates conflict of interests about redistributive policies. This requires, before proceeding, to make assumptions about the process of aggregation of individual preferences over taxation. In this model the endogenous evolution of social esteem, self esteem and redistribution leads to, and it is sustained by, different political views. As shown below, in any stationary state, these social preferences may differ depending on basic inequality but tend to be homogenous inside each economy since they emerge from the comparison between observed behavior and the moral standard emerging from a common ethical principle. This

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<sup>21</sup>Similarly, Besley and Coate (2003) consider both the statistical discrimination and tax payer resentment view for the case of welfare stigma. In the former case, the individual conditions, i.e. being needy or not being needy, matter for moral judgments. In the second, the stigma is linked to the status of the welfare recipient and not conditioned on personal characteristics. In our model we follow the second view. On this line Lindbeck et al (1999) assume that the psychological cost of living on unemployment benefits is not conditional on one’s productivity.

feature implies that the qualitative results of this paper do not depend on the assumption about the process mapping individual preferences into implemented policies.<sup>22</sup>

To make the results more directly comparable with the contributions previously cited, we adopt the benchmark in which preferences are aggregated in a direct and perfect democracy and the policy is chosen by simple majority voting. In our representation with two social categories the median voter belongs to the group of unskilled individuals so that equilibrium redistribution reflects the preferences of this group.

Conditional on a given level of redistribution  $\tau$ , a (socio)economic steady state consists of a pattern of work effort,  $L(t)$ , social esteem  $\alpha$  and self-esteem such that  $L_i(t) = L_i(t-1)$ ,  $\sigma_i(t) = \sigma_i(t-1)$  for and  $\varphi_i(t) = \varphi_i(t-1)$  for all  $i$ . The economy is in a politico economic equilibrium if, in turns, given the individual sentiments (concerning both self and social esteem) we observe an equilibrium level of redistribution  $\tau$  which induces no change in labor supply and therefore triggers no change in sentiments.

Formally, a stationary politico economic equilibrium is defined by a steady state of individual sentiments  $\alpha$ , a level (of politically chosen) redistribution  $\tau$  and a vector of optimal labor supply  $\mathbf{L}$  under which no agent has incentive to revise his  $\alpha_i$ . This is stated in,

**Definition 1.**  $\langle \alpha^*, \mathbf{L}^*, \tau^* \rangle$  represents a *politico economic stationary equilibrium* for the economy iff,

- a) The distribution of social consideration  $\alpha^*$  is a steady state of (22) and (25) given  $\mathbf{L}$ ;
- b) Labor supply is optimal:  $\mathbf{L} = \mathbf{L}^*$  as (10) given  $\alpha^*$  and  $\tau^*$ ;
- c) Taxation  $\tau^*$  is selected by majority voting and it implicitly characterized by (15) for  $i = u$  for any given  $\alpha^*$ ;

The postulated process of sentiments evolution implies that agents failing to meet the moral standard experience a reduction in their self-esteem which, in turns, induces an increased moral pressure and, accordingly, leads to a larger effort provision. Symmetrically agents perceiving themselves as industrious can enjoy a larger utility from leisure. As a result the dynamic evolution of sentiments may induce the emergence of conformism in labor supply, i.e. endogenous work norms.

**Cohesive and Clustered Equilibria.** In the model there can be different types of stationary equilibria. This essentially depends on the possibility of moral motivation to compensate for the gap in economic incentives and successfully induce conformism in economic behavior. The first type corresponds to the case in which all agents supply the same number of work hours and are object of equal social consideration. Because of this feature we call this type of stationary outcome cohesive. In the second type of equilibrium more productive individuals are persistently more industrious and receive larger social consideration than the unskilled. In the latter case social sentiments are biased toward the more industrious individuals and the social contract mirrors this political view.

The former stationary states are characterized by all agents conforming to an (endogenously determined) moral standard. Whatever is the matrix  $\alpha$  of coefficients necessary to support such behavior, no agent will have a reason to modify its esteem for any other agent or its own self-esteem. Furthermore, since in this case all agents supply the same quantity of labor, it turns out that individuals allocate their esteem over others without any bias or discrimination and hence  $\sigma_i = \pi_i$  for all  $i$ .

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<sup>22</sup>As shown below agents differ in the egoistic component and in the weight of the social component of preferences for redistribution but not on the social preferences which are community specific being driven by the observation of behavior.

**Lemma 2 (Cohesive Equilibria).** *A **cohesive** stationary equilibrium is characterized by all agents providing the same work effort and being equally socially considered so that  $L_i = L \forall i$ ,  $\sigma_u = \pi$ ,  $\sigma_s = \pi$  which implies  $\alpha_{i,j} = \alpha_i \forall i, j$ .*

The model can also be characterized by stationary equilibria given by corner solutions of the dynamic process of socio-economic interactions. Equilibria with biased social esteem emerge whenever one set of individuals works above the mean and another set works below. In such an equilibrium, we shall have endogenous social clustering: those working above the mean will be perceived as industrious and will be the object of social admiration, whereas the others will be perceived as lazy and will receive inferior social consideration. Social esteem is stationary because the hard working types receive the large admiration by part of everyone while the other types loose social esteem. Thus sentiments become polarized and biased in favor of the hard working types. In such an equilibrium the first group of workers will be regarded as lazy – even by themselves – and suffer from both low social consideration and low self-esteem.<sup>23</sup> For these features we call these equilibria *clustered*.<sup>24</sup>

**Lemma 3 (Clustered Equilibria).** *A **clustered** stationary equilibrium is characterized by a group of agents  $i$  working more than average, and enjoying of larger social consideration by part of all individuals, and a group of agents  $j$  supplying labor below average and receiving lower social consideration:  $L_i > L_j$   $\sigma_i > s_i$  and  $\sigma_j < s_j$ .*

We now turn to investigate the relationship between inequality and the emergence of biased social sentiments.

**Inequality and Social Cohesion.** In the model, the emergence of conformism in labor supply is due to the dynamic adjustment of individual attitude as resulting from social interactions. The smaller is the heterogeneity in terms of inequality in the spread of productivity the lower is the differential in moral motivation needed to induce conformism in equilibrium. This implies that the emergence of conformism is possible as long as the increasing pressure to work, through a reduction in self-esteem, can compensate for the difference in economic incentives. Nonetheless, if there is a limit to this moral pressure, as it is the case in the formulation (23), then cohesive equilibria fail to exist whenever the differential in the wage gap is large enough. In this case the equilibrium is characterized by a social concern biased toward the most industrious agents.<sup>25</sup>

From equation (13) and (27), one can deduce that in this type of equilibria the skilled workers work more than the unskilled even if the latter group faces the largest pressure to effort provision. The maximum labor compatible with a cohesive equilibrium corresponds to the case in which the most motivated individuals – the unskilled – attain the maximal

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<sup>23</sup>Here we abstract from personal circumstances in judging the behavior of others. However, suppose we had type-specific standards of behavior. Then the same type of equilibrium would survive if we expected the unskilled to work less than the skilled provided the actual effort by the former remained below our expectations and that of the latter exceeded our expectations.

<sup>24</sup>Notice, however, that as shown below, the deviation from social cohesion and the bias in social sentiments depends on inequality which implies that, in fact, there can be different degrees of social 'clustering'.

<sup>25</sup>The model provides a novel mechanism for the emergence of conformism in behavior which is complementary to the contribution of Berhneim (1994) (*include references*) which is based on a signaling game in which individuals types are unobservable and agents derive utility from conforming to a standard of behavior. Despite the very different channel leading to conformism he also finds that separating equilibria may emerge if the social component of the utility function is weak (i.e. if preferences for social status are weak) and when heterogeneity is large.

level of social consideration,  $\alpha_u = 1$  and lower self-esteem  $\varphi_u = \underline{\varphi}$ , while the minimum labor corresponds to the case in which the least concerned – the skilled – attain the minimum level of social concern and the larger self-esteem,  $\alpha_s = 0$  and  $\varphi_s = \bar{\varphi}$ . If the spread in basic productivity  $\beta_s > \beta_u$  is too large then the process of sentiments evolution leads to a corner solution in which the optimal labor supply of the unskilled is permanently inferior to the one of the skilled. In this case the skilled workers face larger economic incentives to effort provision. If the spread is large enough so that for some  $\beta'_s > \beta'_u$  we have  $L(\beta'_u, \underline{\varphi}, \tau) < L(\beta'_s, \bar{\varphi}, \tau)$  then the stationary state can only be characterized by social clustering with the most productive individuals working above average.<sup>26</sup> We first restrict attention to the emergence of social clustering,

**Proposition 2 (Clustered Politico-Economic Equilibria).** *Consider any given  $\tau' \in [0, 1]$ . If for any given  $\beta$ ,*

$$\bar{L}(\beta, \tau) \equiv L(\beta_u, \underline{\varphi}, \tau) < L(\beta_s, \bar{\varphi}, \tau) \equiv \underline{L}(\beta, \tau) \quad (28)$$

*then politico-economic stationary state is clustered with  $L_u = L(\beta_u, \underline{\varphi}, \tau) < L < L_s = L(\beta_s, \bar{\varphi}, \tau)$   $L_i = L$  with  $\sigma_i > \pi$  for each  $i \in \{u, s\}$ . The equilibrium level of redistribution is implicitly characterized by (16). This equilibrium is globally stable and unique.*

**Proof.** *We first show that for any given level of  $\varphi_i$  individual labor supply of the different types of agents does not re-rank following a change in the taxation rate  $\tau$ . Consider two arbitrary values of  $\varphi_s$  and  $\varphi_u$  and an arbitrary level of taxation  $\tau'$  such that the optimal labor supply of one group is strictly larger than the respective labor supply of the other group. For example*

$$L(\beta_s, \varphi_s, \tau') > L(\beta_u, \varphi_u, \tau') \quad (29)$$

*To show that, under these conditions, there does not exist a level  $\tau''$  for which  $L(\beta_s, \varphi_s, \tau'') < L(\beta_u, \varphi_u, \tau'')$  consider the following mental exercise. Imagine to impose to the unskilled workers a lower tax rate  $\tau_0 < \tau'$ . From equation (13) we know that labor supply is strictly increasing in net wage so that reducing taxation we induce an increase in labor supply and assume that  $\tau_0$  is low enough such that  $L(\beta_s, \varphi_s, \tau') = L(\beta_u, \varphi_u, \tau_0)$ . This implies that  $L(\beta_s, \varphi_s, \tau_0) > L(\beta_u, \varphi_u, \tau_0)$ , however, which allows to conclude that if (29) holds then  $L(\beta_s, \varphi_s, \tau) > L(\beta_u, \varphi_u, \tau)$  for any  $\tau \in [0, 1]$ . From (27) we know, in turns, that optimal labor supply is strictly decreasing in  $\varphi_i$ . Therefore for any  $\tau$  the maximum labor supply of the unskilled is obtained with  $\varphi_u = \underline{\varphi}$ , while the minimum labor supply of the skilled is obtained with  $\varphi_s = \bar{\varphi}$ . If for some  $\tau$  we have  $L(\beta_u, \underline{\varphi}, \tau') < L(\beta_s, \bar{\varphi}, \tau')$  then this true for any  $\tau \in [0, 1]$  implying that no cohesive stationary state is feasible. Note also that, under these conditions the skilled workers provide less effort at each moment in time no matter (the initial conditions in terms of) redistribution and individual sentiments  $\varphi_i$ . This implies that from the process of dynamic evolution of self-esteem we have  $\frac{\partial \varphi_u(t)}{\partial t} < 0$  with  $\lim_{t \rightarrow \infty} \varphi_u = \underline{\varphi}$  while  $\frac{\partial \varphi_s(t)}{\partial t} > 0$  and  $\lim_{t \rightarrow \infty} \varphi_s = \bar{\varphi}$  which proves that the process is globally stable. Since, as proved above the labor supply of the two groups do not re-rank in response to any  $\tau$ , then the level of equilibrium redistribution is implicitly characterized by (16) for  $\sigma_i > \pi$  as in (22). QED*

<sup>26</sup>Due to the negative monotonicity of labor supply in  $\varphi_i$ , in this case we have that for any starting value  $\varphi_u(0)$  and  $\varphi_s(0)$  then  $L(\beta'_u, \varphi_u(0), \tau) < L(\beta'_s, \varphi_s(0), \tau)$ . The adjustment process is characterized by the unskilled providing relative more labor overtime but still supplying inferior effort in the long run.

Due to the monotonicity of labor supply in  $\beta_i$  stated in (13) and the negative monotonicity in  $\varphi_i$  from (27) it is clear that if  $\beta_u = \beta_s = \beta$  then  $L(\beta, \underline{\varphi}, \tau) > L(\beta, \overline{\varphi}, \tau)$ . In this case the process of dynamic interaction eventually leads to a cohesive equilibrium.<sup>27</sup> The previous proposition state that if the process of sentiments evolution leads to a clustered equilibrium this is necessarily unique. Concerning cohesive equilibria, in turns, it is clear from the labor supply expression (27) and by equation (13) that a cohesive equilibrium can only be achieved if the moral motivation of low productivity individuals is larger than the one of the skilled workers in order to compensate for their inferior economic incentives. Therefore larger  $L$  can be sustained by larger moral motivation by part of *all* individuals (i.e. larger  $\alpha_i$  for all  $i \in \{u, s\}$ ). This implies that as long as  $\overline{L}(\beta, \underline{\varphi}, \tau) > \underline{L}(\beta, \overline{\varphi}, \tau)$  there can be many cohesive equilibria which can be parameterized by the associated equilibrium level of labor supply. From Lemma 1 we also know that for any  $\beta$  equilibrium taxation is strictly decreasing with  $\alpha_u$ . We have the following,

**Proposition 3 (Cohesive Politico-Economic Equilibria).** *Consider any given  $\tau' \in [0, 1]$ . If for any given  $\beta$ ,*

$$\overline{L}(\beta, \tau) \equiv L(\beta_u, \underline{\varphi}, \tau) \geq L(\beta_s, \overline{\varphi}, \tau) \equiv \underline{L}(\beta, \tau) \quad (30)$$

*then the economy settles in a cohesive equilibrium with  $L_u = L_s = L$  and  $\sigma_i = \pi$  for each  $i \in \{u, s\}$ . If (30) holds with strict inequality there exists a multiplicity of cohesive equilibria  $\{L, \tau, \alpha\}$  with larger average labor supply  $L$  being sustained by larger social esteem  $\alpha$  and lower equilibrium redistribution  $\tau$  implicitly characterized by (16) for  $\sigma_u = \pi$ .*

**Proof:** *From the proof of proposition 2 we know that for any  $\{\beta, \varphi\}$  the labor supply of the different groups do not re-rank as a function of  $\tau$ . This also implies that if  $L(\beta_u, \varphi_u, \tau') = L(\beta_s, \varphi_s, \tau')$  then this is true for any  $\tau' \in [0, 1]$ . Consider first the case in which  $\varphi_u = \underline{\varphi}$  and consider the case in which equation (30) holds as strict inequality:  $L(\beta_u, \underline{\varphi}, \tau) > L(\beta_s, \overline{\varphi}, \tau)$ . For the strict (negative) monotonicity of  $L$  in  $\varphi$  there exists  $\varphi' < \overline{\varphi}$  such that  $L(\beta_u, \underline{\varphi}, \tau) = L(\beta_s, \varphi', \tau) = L'$  for any  $\tau \in [0, 1]$ . This configuration of sentiments is sustained as a politico-economic equilibrium with equilibrium redistribution  $\tau'$  characterized by (16) for  $\sigma_u = \pi$  and  $\alpha_u = \overline{\alpha}_u = g^{-1}(\varphi)$  from (23). To prove the multiplicity consider the opposite extreme in which  $\varphi_s = \overline{\varphi}$ . For the same argument we can identify  $\varphi_u = \varphi'' > \varphi'$  such that  $L(\beta_u, \varphi'', \tau) = L(\beta_s, \overline{\varphi}, \tau) = L''$  with equilibrium redistribution  $\tau''$  characterized by (16) for  $\sigma_u = \pi$  and  $\alpha_u'' = g^{-1}(\varphi'') < \overline{\alpha}_u$ . Both the former and the latter configuration of sentiments sustain cohesive equilibria with  $L'' < L'$  and  $\tau'' > \tau'$  since  $\alpha_u'' < \overline{\alpha}_u$  from Lemma 1. In fact there exists a continuum of vectors  $\varphi$  with  $\varphi_u \in [\underline{\varphi}, \varphi'']$  and  $\varphi_s \in [\varphi', \overline{\varphi}]$  which can be sustained as cohesive equilibria. Notice, finally that, multiplicity vanishes only if  $L(\beta_u, \underline{\varphi}, \tau) = L(\beta_s, \overline{\varphi}, \tau)$ . QED*

The possibility of multiple cohesive equilibria is associated to the emergence of *endogenous* work norms since the economy may converge to different average labor supply out of the same economic fundamentals  $\beta$ .<sup>28</sup> The economy can therefore endogenously settle in different

<sup>27</sup>As studied in more details below the process is stable as long as sentiments do not adjust too quickly to observed differential in labor supply (since otherwise cycles in labor supply and sentiments can be observed).

<sup>28</sup>In fact as shown below, we can observe different moral standards due to path dependence and/or the speed of adjustment of labor supply of different individuals to changes in productivity (e.g. biased technical change).

cohesive equilibria with higher moral pressure sustaining larger labor supply and production and lower redistribution.<sup>29</sup>

Concerning the relation between inequality and social cohesion we know from Proposition ?? that in clustered equilibria the workers with higher skills work more than the unskilled, while in cohesive equilibria all work the same and that clustered equilibria emerge for larger basic inequality in the distribution  $\beta$ . As a corollary we have the following,

**Remark 1.** *Earned income is more unequally distributed in a clustered equilibrium than in any cohesive equilibrium.*

**Social Cohesion and Redistribution.** We conclude this section by investigating the relationship between social cohesion and equilibrium redistribution by relating the social contract to economic inequality.<sup>30</sup> Proposition ?? shows that inequality in the distribution of basic productivity represents a primary determinant of social cohesion and the emergence of political bias.

For future reference, we define an inequality index,  $I$ , by the relative gap between mean and low income,

$$I \equiv \frac{\bar{y} - y_u}{\bar{y}}. \quad (31)$$

We now turn to investigate the consequences, in terms of redistribution, for settling in equilibria with unbiased or biased social sentiments. In the model, in which agents emulate the industrious, the emergence of conformity in labor supply is associated to concern for others and it is coupled with an unbiased distribution of social esteem which, as in Lemma 1, moderates rather than exacerbates the desire for redistribution even among the population with low income. In any *cohesive* steady states the level of equilibrium redistribution is implicitly characterized by,

$$0 = \frac{dV_u}{d\tau} = \frac{dv_u}{dc} \left[ \bar{y} - y_u + \tau \frac{d\bar{y}}{d\tau} \right] + \alpha_u \left\{ (1 - \pi) \frac{dv_u}{dc} \left[ \bar{y} - y_u + \tau \frac{d\bar{y}}{d\tau} \right] + \pi \frac{dv_s}{dc} \left[ \bar{y} - y_s + \tau \frac{d\bar{y}}{d\tau} \right] \right\} \quad (32)$$

Using the definition of  $\bar{y}$  can be expressed as, where  $\varepsilon_{\bar{y},\tau} = \frac{\tau}{\bar{y}} \frac{d\bar{y}}{d\tau}$  is the elasticity of average income with respect to taxation.

$$\frac{dV_u}{d\tau} = \frac{dv_u}{dc} [I + \varepsilon_{\bar{y},\tau}] + \alpha_u \left\{ \frac{dv_u}{dc} (1 - \pi) [I + \varepsilon_{\bar{y},\tau}] + \frac{dv_s}{dc} \pi \left[ I + \varepsilon_{\bar{y},\tau} - \frac{I}{\pi} \right] \right\} = 0 \quad (33)$$

Note from Lemma 1 that it must be the case that  $[I + \varepsilon_{\bar{y},\tau}] > 0$  which can be factored leaving

$$\begin{aligned} 0 &= \frac{dV_u}{d\tau} = \frac{dv_u}{dc} + \alpha_u \left\{ \frac{dv_u}{dc} (1 - \pi) + \frac{dv_s}{dc} \pi \left[ 1 - \frac{I}{[I + \varepsilon_{\bar{y},\tau}] \pi} \right] \right\} = \\ &= \frac{dv_u}{dc} [1 + \alpha_u (1 - \pi)] + \frac{dv_s}{dc} \left[ \pi - \frac{I}{[I + \varepsilon_{\bar{y},\tau}]} \right] \end{aligned}$$

<sup>29</sup>In section 6 we investigate how this feature of the model could help rationalizing the observation of different change in different economies in both average hours worked and equilibrium redistribution following a change in inequality in the distribution of skills. There we also provide a simple simulation illustrating the process of convergence and the emergence of endogenous work standards.

<sup>30</sup>This relationship is further investigated in the following section by focussing attention to a version of the model allowing for explicit analytical solutions.

In order to study the role of inequality we perform the standard comparative statics exercise originally proposed by Meltzer and Richard (1981) consisting in relating equilibrium redistribution to a reduction of the (relative) productivity of the decisive voter (under the assumption that the elasticity of income to taxation is constant). The change in equilibrium redistribution following a change in the relative income (productivity) of the unskilled is implicitly characterized by differentiating (32),

$$\frac{d\tau}{dI} = -\frac{1}{D(\tau)} \frac{d}{dI} \left( \frac{dV_u}{d\tau} \right) \geq 0 \quad (34)$$

This is in line with the standard result in M-R for which larger inequality is expected to lead to larger redistribution and size of government. The intuition of the result is as follows. The first term of (??) represents the egoistic gain from redistribution. As in the standard egoistic benchmark an increase in inequality leads to a larger egoistic gain by part of the poor (which is stronger the more concave is utility in consumption and the larger the marginal utility  $v_c$ ). The second term, in turns, is the social component which, in a cohesive steady state and for a given weight  $\alpha_u$ , represents the preferences for redistribution of a pure utilitarian social planner. This is the case since in cohesive equilibria social sentiments are unbiased. Since an increase in inequality increases the gap between the utility of the skilled and the unskilled an utilitarian social planner would increase redistribution in response to increasing inequality. Consequently in a cohesive society both the egoistic and the social demand for redistribution increase in response to larger inequality which is therefore expected to lead to more generous redistribution schemes.<sup>31</sup>

In a clustered equilibrium social sentiments are, in turns, biased toward the most industrious (and rich) individuals. This bias tend to reduce the demand of taxation by part of all individuals including, especially, the poor. The degree of equilibrium redistribution in an economy with polarized social sentiments is implicitly characterized by,

$$\frac{dV_u}{d\tau} = \frac{dv_u}{dc} \left[ \bar{y} - y_u + \tau \frac{d\bar{y}}{d\tau} \right] + (1 - \sigma_u) \frac{dv_u}{dc} \left[ \bar{y} - y_u + \tau \frac{d\bar{y}}{d\tau} \right] + \sigma_u \frac{dv_s}{dc} \left[ \bar{y} - y_s + \tau \frac{d\bar{y}}{d\tau} \right] = 0 \quad (35)$$

which can be re-expressed as,

$$\frac{dV_u}{d\tau} = \frac{dv_u}{dc} \left[ \frac{\bar{y} - y_u}{\bar{y}} + \varepsilon_{\bar{y},\tau} \right] + \left( (1 - \sigma_u) \frac{dv_u}{dc} \left[ \frac{\bar{y} - y_u}{\bar{y}} + \varepsilon_{\bar{y},\tau} \right] - \sigma_u \left[ \frac{\bar{y} - y_u}{\bar{y}} \left( \frac{1 - \pi}{\pi} \right) + \varepsilon_{\bar{y},\tau} \right] \frac{dv_s}{dc} \right) = 0 \quad (36)$$

Starting from a clustered equilibrium, an increase in inequality still leads to an increase in the *egoistic* demand for redistribution. Nonetheless there are two reasons for which the *social* demand for redistribution may decrease following the increase in inequality. In the first place, the social component is characterized by a bias  $\sigma_u > \pi$  implying that the private utility of the skilled workers weights more than the utility of the unskilled. Therefore an increase in inequality implies that the skilled workers, who get relatively richer, are harmed more by fiscal redistribution. The larger the bias in social sentiments, the larger the consideration of the sacrifice of the skilled and the larger the social pressure toward a reduction in the generosity of redistribution. In the second place, from equation (23), the bias in the allocation of social esteem is increasing with economic inequality since,

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<sup>31</sup>As pointed out before, the actual demand for taxation is still inferior to the one of the egoist case since also the interests of the rich are considered in the choice. Contrary to the egoistic benchmark also the skilled workers may favor redistribution to the poor (even if lower than the one preferred by the poor themselves).

**Remark 2.** *In a clustered equilibrium, the share of total labor supply and income production produced by the skilled workers is increasing with the productivity gap  $(\beta_s - \beta_u)$ . This leads to an increase in the share of social concern for the skilled,  $\sigma_i$ , by part of all agents  $i \in \{u, s\}$ .*

This implies that the bias toward the skilled workers increases with inequality and this makes taxation even less appealing from a social perspective. As a result the effect of an increase in economic inequality in a stationary state with biased social sentiments cannot be established in general since while the egoistic component call for increasing redistribution the social component may induce agents to reduce the fiscal pressure. These considerations are recorded in,

**Lemma 4.** *Consider social and self esteem  $\langle \varphi, \alpha \rangle$  compatible with a clustered equilibrium. A reduction of  $\beta_u$  implies an increasing egoistic demand and a, possibly, decreasing social demand for taxation. As a result equilibrium redistribution  $\tau^*$  may either increase or decrease.*

The joint consideration of the results of Lemma ?? and 4 implies that the model does not support the standard, unconditional, prediction that larger inequality should be associated to larger redistribution. In fact the relationship between inequality and redistribution crucially depends on social cohesion. Inequality in the distribution of skills represents the main force driving the social contract by directly affecting the egoistic demand for redistribution and by shaping the political view and social cohesion. Social cohesion, in turns, shape the social contract and the extent of redistribution. The previous results suggest that in cohesive societies, which can be sustained if inequality is not too large, the political view emerging from social interactions support fiscal transfers and the economy respond to increasing inequality with an increase in the generosity of redistribution. Larger inequality, in turns, leads to clustered equilibria in which social sentiments are biased toward the most industrious and rich individuals. At this stage, a sufficiently large inequality, and political bias, may create political opposition to redistribution even by part of the poor. As a result we expect a possibly non monotonic relationship between inequality and equilibrium redistribution.

In order to further investigate the role of inequality for the social contract and labor supply we next study a version of the model with functional specifications which allow to analytically characterize the different equilibria. This allows to investigate explicitly the conditions for existence of the different equilibria as well as to study the differences between the two types of equilibria. This also permit to illustrate the working of the model by studying the static and dynamic role of inequality. To this end we provide a simple dynamic simulation of the model to illustrate how an increase in the skill premium can trigger adjustments in both labor supply, individual attitudes and lead to a change in the extent of redistribution. Finally we discuss the different predictions of the model and compare them with the social contracts in US and in continental Europe and their respective evolution overtime.

## 6 An Analytical Characterization.

**Functional specifications.**<sup>32</sup> Consider a the following specification for the private utility,<sup>33</sup>

<sup>32</sup>This simple utility formulation has the advantage of allowing a closed form solution of the model and it often adopted in the literature. See. e.g. Alesina and Angeletos (2005) in which the marginal utility utility of leisure can differ (exogenously) across individuals and Bisin and Verdier (2005) which consider the possibility of cultural trasmission of work values by part of parents in an environment in which all individuals are identically productive.

<sup>33</sup>Notice that with this quasi-linear utility, the social motive for redistribution is substantially weakened. Hence, the main results on the impact of social cohesion on redistribution would be even stronger with concave

$$v(c_i, L_i, \varphi_i) = c_i + \left(1 - \frac{L_i^2}{2}\right) \varphi_i. \quad (37)$$

and a simple specification for the relationship between social and self-esteem,

$$\varphi_i(t) = \frac{1}{[m + \alpha_i(t)]} \quad (38)$$

where  $m \in R^+$ . Repeating the analysis presented above with these functional forms, we compute optimal labor supply and preferences over redistribution. We then move to the study of the different politico-economic equilibria.

**Labor supply and equilibrium redistribution.** From the first order conditions for a maximum we obtain the labor supply

$$L_i(\beta_i, \varphi_i, \tau) = (1 - \tau) \beta_i \frac{1}{\varphi_i} = (1 - \tau) \beta_i [m + \alpha_i(t)]. \quad (39)$$

Labor supply is increasing with the net wage  $(1 - \tau) \beta_i$  as well as with the moral motivation to effort provision  $(m + \alpha_i)$  which may depend on component which is common to all agents and the individual social concern  $\alpha_i$ .<sup>34</sup>

We explicitly characterize the choice of redistribution. Denoting by  $\delta$  of the bias by the unskilled in allocating its esteem between the two types as,

$$\delta \equiv \frac{\bar{y} - \tilde{y}^u}{\bar{y}} \quad (40)$$

where  $\tilde{y}^u \equiv [(1 - \sigma_u)y_u + \sigma_u y_s]$  while  $I \equiv (y - y_u)/y$ . The equilibrium redistribution is given by,<sup>35</sup>

**Lemma 5.** *For any  $\langle \alpha, \beta, \pi \rangle$  the tax rate  $\tau_u$  preferred by an unskilled individual is given by*

$$\tau_u = \frac{I + \alpha_u \delta}{1 + \alpha_u + I + \alpha_u \delta}, \quad (41)$$

with all the variables evaluated at  $\tau_u$ .<sup>36</sup>

**Politico-Economic Equilibria.** From the individual labor supply function (39) and (??), we have that for all cohesive equilibria,

$$L_i = (1 - \tau) \beta_i (m + \alpha_i), \text{ for all } i. \quad (42)$$

In any cohesive equilibrium the common labor supply  $L$  must therefore satisfy

$$(1 - \tau) \beta_s m \leq L \leq (1 - \tau) \beta_u (m + 1). \quad (43)$$

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utility in consumption.

<sup>34</sup>In principle  $m$ , which represents the exogenous part of moral motivation, could be community specific being related to the culture or institutions of a community.

<sup>35</sup>If an individual has no such bias and allocates its esteem uniformly across the population – thus making  $\sigma_u = \pi$  – then  $\bar{y} = \tilde{y}^u$  and  $\delta = 0$ . When  $u$ 's esteem is biased in favor of low productivity individuals, then  $\sigma_u < \pi$  and we have  $\bar{y} > \tilde{y}^u$  and hence  $\delta > 0$ . Conversely,  $\delta < 0$  when  $u$ 's esteem exhibits the opposite bias.

<sup>36</sup>The egoistic component of the demand for redistribution, is increasing with ethical bias  $\delta$  so that redistribution is larger the larger the social consideration earned by the unskilled agents and it is decreasing in the degree of social consideration  $\alpha_u$  since more socially minded individuals moderate their private demand for redistribution. Proof in the Appendix.

Expression (43) gives the pairs  $(\tau, L)$  that are consistent with a cohesive stationary equilibrium. The possibility of sustaining a given level of effort  $L$  in a cohesive equilibrium depends on both the spread in the distribution of productivities and the degree of redistribution. From (43) it is immediate that for a cohesive equilibrium to exist at all, it is necessary that the interval of values for the equilibrium  $L$  be non-empty. In a cohesive equilibrium all individuals work the same amount and hence the relative gap in productivities is identical to the relative gap in earnings. Taking into account that all individuals provide the same effort, it is immediate from (31) that the degree of equilibrium inequality in a cohesive equilibrium is

$$I = I_\beta = \pi \frac{\beta_s - \beta_u}{\beta}. \quad (44)$$

From (43) it is clear that a necessary condition for the emergence of a cohesive equilibrium is given by (using  $\beta_u = \beta(1 - I)$ ),

$$\frac{(\beta_s - \beta_u)}{\beta_u} m \leq 1 \Leftrightarrow \frac{I}{\pi(1 - I)} m \leq 1 \quad (45)$$

The previous condition defines an upper bound on inequality below which cohesive equilibria can be sustained,

$$\bar{I} = \frac{\pi}{m + \pi} \quad (46)$$

As shown in the previous section, for cohesive stationary equilibrium to be sustainable, inequality cannot be too large. A second remark is on the fact that for any given basic inequality the possibility of sustaining a cohesive equilibrium is reduced by a larger exogenous component of motivation to work  $m$ . In fact the larger  $m$  the less effective is the leverage of individual attitude, i.e.  $\alpha_i$ , in compensating differences in economic incentives.

Let us now turn to the existence of politico-economic equilibria. Considering the case of cohesive equilibria, these can exist only if the ratio of  $L$  to  $(1 - \tau)$  is within fixed exogenous bounds, as given by (43). There is nothing to preclude the tax preferred by the unskilled workers from violating this condition for each  $L$ .

Consider any distribution of social concerns compatible with a cohesive equilibrium. Since all groups contribute to total labor supply in proportion of their size then individual esteem is unbiased and  $\delta = 0$ . Hence, substituting into (41) we obtain the following politico-economic equilibrium tax  $\tau$ :

$$\tau = \frac{I}{1 + \alpha_u + I}. \quad (47)$$

**Proof of Computation analytical characterization.** *The indirect private utility of an individual of type  $i$  is*

$$v(\tau, T, \beta_i, \varphi_i) = \frac{(1 - \tau)^2 \beta_i^2}{2\varphi_i} + T + \varphi_i. \quad (48)$$

Using (39), we obtain the following expressions for the effects of  $\tau$  on labor, gross earnings and transfers, respectively:

$$\frac{dL_i}{d\tau} = -\frac{L_i}{1 - \tau}, \quad \frac{dy_i}{d\tau} = -\frac{y_i}{1 - \tau} \quad \text{and} \quad \frac{dT}{d\tau} = \frac{1 - 2\tau}{1 - \tau} \bar{y}. \quad (49)$$

Differentiating the egoistic (indirect) utility  $v_i$  (48) with respect to  $\tau$  we obtain,

$$\frac{dv_i}{d\tau} = \bar{y} - y_i - \frac{\tau}{1 - \tau} \bar{y}. \quad (50)$$

Then from (5) we obtain the first order condition

$$\frac{dV_u}{d\tau} = (1 + \alpha_u) \frac{1 - 2\tau}{1 - \tau} \bar{y} - y_u - \alpha_u \tilde{y}^u = 0. \quad (51)$$

Solving (51) and using the definitions of  $I$  and  $\delta$ , we obtain the unique most preferred tax by an unskilled individual,  $\tau_u$ .

It is easy to verify that solving equation (41) and substituting appropriately yields  $\tau_u = \frac{I + \hat{\alpha}_u \delta}{1 + \hat{\alpha}_u + I + \hat{\alpha}_u \delta}$  QED.

As anticipated above, there can be a continuum of values of  $\alpha_u$  for which a politico-economic equilibrium may exist. However, these values are bounded above by 1 and below by  $\hat{\alpha}_u(I)$ . The lower bound  $\hat{\alpha}_u(I)$  corresponds to the case in which the skilled workers are perfectly egoistic. From (42) and using (44), we find that the limit social concern of the unskilled satisfies

$$\hat{\alpha}_u(I) = \frac{\beta_s - \beta_u}{\beta_u} m = \frac{I}{\pi(1 - I)} m. \quad (52)$$

which is increasing with inequality. Note that the previous equation delivers condition (45) for the emergence of a cohesive equilibrium since social concern is bounded from above at  $\alpha = 1$ .

As shown in Proposition 1, redistribution is decreasing with  $\alpha_u$  while labor supply is, in turn, increasing in  $\alpha_i \forall i$ . As a result the economy can sustain a multiplicity of cohesive equilibria which can be parametrized by the degree of social concern of the unskilled with more industrious labor standard being associated to lower redistribution. The maximum labor supply, and minimum redistribution is associated to  $\alpha_u = 1$  and while minimum labor supply and maximum redistribution are associated to  $\hat{\alpha}_u(I)$ .

Writing equilibrium redistribution (47) explicitly, starting from a distribution of sentiments compatible with a cohesive equilibrium and solving for  $\tau^*$  we get the equilibrium level of redistribution:  $\tau^* = (\bar{\beta} - \beta_u) / (2\beta - \beta_u + \alpha_u \beta)$ . This tax rate must be jointly compatible with optimal labor supply. Hence, using the expression for  $\tau^*$  together with (42) we obtain the expression for the locus,

$$TT : L = (1 - \tau^*)^2 \beta_u (\beta - \beta_u) / (\tau^* \beta) + (m - 1) (1 - \tau) \beta_u \quad (53)$$

which is a strictly decreasing function taking infinite value and slope at  $\tau = 0$  and zero value and slope at  $\tau = 1$ .

$$L = (1 - \tau^*)^2 \beta_u I / \tau^* + (m - 1) (1 - \tau) \beta_u \quad (54)$$

This implies that whenever condition (45) is satisfied then  $\hat{\alpha}_u(I) \leq 1$  and for any  $\alpha_u \in [\hat{\alpha}_u(I), 1]$  there exists a unique vector  $\{L_u(\alpha_u), \tau^c(\alpha_u)\}$  in which  $L_i(\alpha_i) = L(\alpha_u)$  for any  $i$  satisfying the first order conditions for optimal labor supply (39) and equilibrium redistribution (41).

The figure below displays the range of sustainable cohesive equilibria.<sup>37</sup>

Different equilibria differ in the level of equilibrium effort and in the degree of redistribution. We depict the combinations of  $L$  and  $\tau$  compatible with the bounds (43) by the gray area in Figure 1. The locus  $TT$  contains the vectors  $(\tau, L)$  for which individual labor supply and the chosen level of redistribution are mutually compatible.<sup>38</sup> It is immediate that, as discussed before, in any cohesive politico-economic equilibrium the higher the tax, the lower

<sup>37</sup>The emergence of a given equilibrium depends on both initial conditions and on relative speed of adjustments of individual sentiments. These points are illustrated below with a simple dynamic simulation.

<sup>38</sup>The expression for equilibrium tax rate in any cohesive equilibrium is reported in the proof of proposition in the appendix.

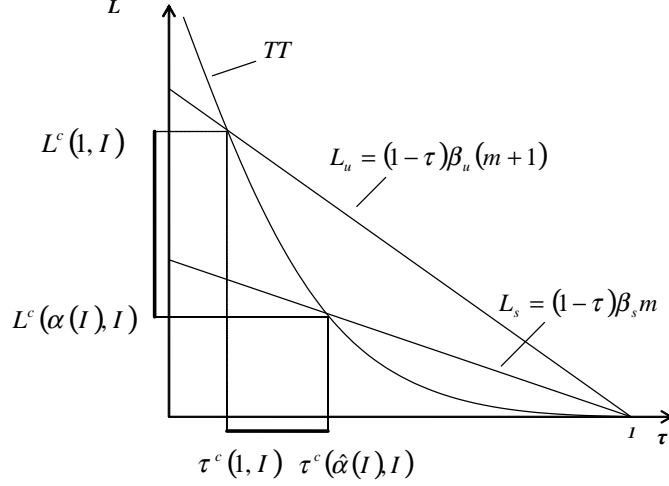


Figure 1: Cohesive Stationary Equilibria

is the labor supply and output. The different cohesive equilibria can be parametrized by the degree of labor supply. Larger labor supply is associated to a larger social concern  $\alpha_i$  and lower redistribution. This discussion is recorded in,

**Lemma 6.** *For any  $I \leq \bar{I}$  there exists a multiplicity of cohesive equilibria: any  $\alpha_u \in [\hat{\alpha}_u(I), 1]$  can emerge as a cohesive equilibrium in which equilibrium labor supply and redistribution  $\{L(\alpha_u), \tau(\alpha_u)\}$  are as in (42) and (47), with  $L(\alpha_u) \in [\underline{L}(I), \bar{L}(I)]$  and  $\tau(\alpha_u) \in [\tau(\hat{\alpha}_u(I)), \tau(1)]$ .<sup>39</sup>*

The multiplicity of cohesive equilibria shrinks as  $I$  gets larger and in the limit the cohesive equilibrium is unique since  $\lim_{I \rightarrow \bar{I}} \hat{\alpha}(I) = 1$  so that  $\underline{L}(\bar{I}) = \bar{L}(\bar{I})$  and  $\bar{\tau}(\bar{I}) = \underline{\tau}(\bar{I})$ .

For larger inequality condition (45) do not hold and the economy settles in a unique clustered equilibrium. Hence, we have the following Lemma,

**Lemma 7.** *For any  $I > \bar{I}$  there exists a unique clustered politico-economic equilibrium characterized by the skilled individuals working above average so that  $L_s(I) > L_u(I)$  and enjoying larger social esteem by part of all individuals  $\sigma_u > \pi$ , and  $\sigma_s > \pi$ .<sup>40</sup>*

**Inequality, Redistribution and Labor Supply.** In order to compare the social contract implemented in the different equilibria consider how the preferred level of redistribution changes with inequality for any given distribution of social sentiments compatible with the different stationary equilibria. Concerning the bias in the allocation of sentiments note that for, any degree of inequality sentiments are unbiased in any cohesive equilibrium which implies that  $\delta^c(I) = 0$ . Notice that according to (44), in spite of there being many possible steady state cohesive equilibria, there is a unique equilibrium level of inequality  $I^c$ . This implies that for any  $\beta$  compatible with (45) the economy can be characterized by different labor supply and redistribution but the same degree of income inequality  $I$ . The minimum

<sup>39</sup>The expressions for  $\underline{L}(I)$ ,  $\bar{L}(I)$ ,  $\tau(\hat{\alpha}_u(I))$  and  $\tau(1)$ , are computed in the appendix.

<sup>40</sup>Proof in the Appendix.

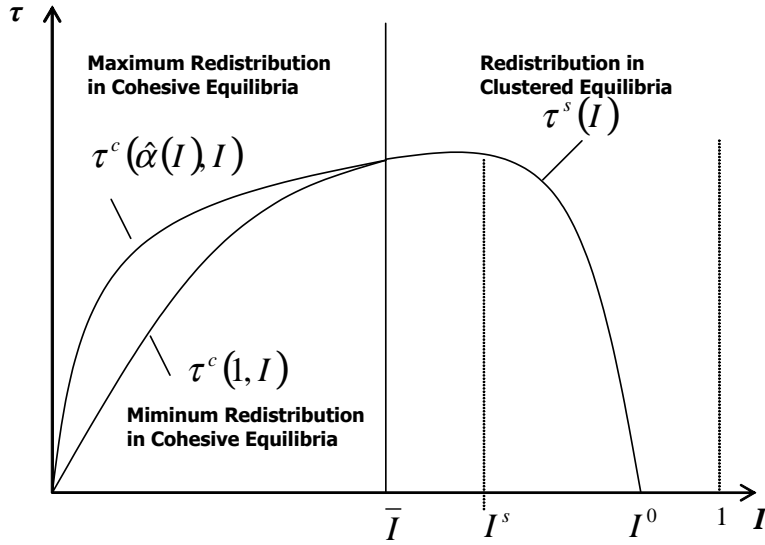


Figure 2: Inequality, Social Cohesion and Redistribution

and maximum level of redistribution for any  $I$  are given by (55) and (58) and it can readily be verified that they are both increasing with the degree of inequality. This is due to the fact that whenever the allocation of social esteem is unbiased,  $\delta^c(I) = 0$  the social demand for redistribution is unaltered but an increase in inequality leads to an increase in the egoistic demand for redistribution which raises equilibrium taxation.<sup>41</sup>

In clustered economies, in turns, differently skilled individuals are differently industrious and are object of differentiated social consideration so that  $\delta^s(I) < 0$ . The extent of the bias in social sentiments depends on inequality, however. Consider first the degree of inequality  $\bar{I}$  associated to the maximum spread of basic productivity compatible with a cohesive equilibrium as in equation (45). If  $I = \bar{I}$  then  $\alpha_u = 1$ ,  $\alpha_s = 0$  and  $\delta^c = \delta^s = 0$ . The larger inequality the larger the contribution of skilled individuals to the total labor supply and this implies that a relatively larger social consideration is allocated to the skilled so that  $\sigma_u$  increases and  $\delta^s(I)$  gets larger (in absolute terms).

From Remark 1 clustered equilibria are more unequal. Therefore in a clustered equilibrium higher inequality is associated to a larger egoistic demand for redistribution. Concerning the social component, the increasing bias towards the most productives leads to a lower social demand for redistribution. Which of the two forces dominates and precipitates more or less redistribution in the clustered than in a cohesive equilibrium depends on the degree of inequality. For levels of inequality slightly above  $\bar{I}$  the egoistic demand predominates and this leads to increasing redistribution.<sup>42</sup> As inequality gets larger the spread in labor supply increases and the bias in the allocation of social esteem gets larger, accordingly. The figure below illustrate these findings,

<sup>41</sup>Notice that in the general formulation this result is even stronger since with concave utility the egoistic pressure to tax would be coupled with an increasing social demand for redistribution.

<sup>42</sup>In fact, in terms of allocation of social consideration clustered equilibria are not really different from cohesive ones for values of  $I$  close to  $\bar{I}$ .

The model predicts a non monotonic change of equilibrium redistribution in response to increasing inequality.

The model predicts that while in cohesive societies the demand for redistribution increases with income inequality this is not the case in clustered societies. Therefore our model rejects the standard unconditional prediction of a negative relationship between inequality and redistribution across countries. A sufficiently large inequality (larger than  $I^s$ ) leads to lower redistribution since it is associated to social clustering involving a large enough ethical bias toward the more productive members of society. Also any further increase in the degree of inequality reinforce the social opposition to taxation and reduces redistribution.

## 7 Discussion

The reasons why the US and European societies have implemented such different social contracts in spite their having such similar fundamentals is a matter of current debate. We now consider the predictions of our model in light of the evidence.

Our model yields two very distinct types of equilibria, cohesive and clustered; and behavior, attitudes and taxes differ between the two. Which kind of equilibrium corresponds to each case? Here the model yields a clear prediction: *if one of two countries has more inequality and less redistribution, then it must be in a clustered equilibrium while the other country is in a cohesive equilibrium.* Indeed, if both countries are in the same type of equilibrium, more inequality necessarily leads to more redistribution. Our contention is thus that the US, having more inequality and less redistribution, must be in a clustered equilibrium while the EU is in a cohesive equilibrium. In this section we consider the testable features of each type of equilibrium and check whether the available evidence supports this view. We end the section by surveying the various arguments that have been advanced in the literature and contrast them with our own.

**Testable Implications of the Model: US vs. EU.** In the model we present each type of politico-economic equilibrium is characterized by the following features:

[1] **PRE-TAX INCOME INEQUALITY:** *Productivity differences and thus pre-tax income inequality is lower in cohesive than in clustered equilibria.*

Concerning pre-tax earnings inequality, Katz and Autor (1999) report that the log of the ratio of the 90th percentile to the 10th percentile earner in 1994 was 1.45 in the US and 0.81 in Germany, for instance. Furthermore, they find that the dispersion has increased over the 70s to the 90s.<sup>43</sup> This trend toward an increased dispersion in earnings in the US economy has lead some sociologists and economists to argue that the middle class is the process of disappearing.<sup>44</sup>

The second dimension of inequality relevant to the model is the distribution of skills. Katz and Autor (1999) report a significantly higher spread in individual skills in the US, possibly driven by the technological shocks of the 80s and 90s. Skills in production are not only difficult to measure. They are not easy to define. The work of Devroye and Freeman (2001) addresses this problem using the OECD's International Adult Literacy Survey to assess the cognitive skills of the respondents. They document a much larger variation in the US, UK

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<sup>43</sup>See also Devroye and Freeman (2001) .

<sup>44</sup>See, for instance, Kosters and Ross (1988) and Horrigan and Haugen (1988) and Duncan, Smeeding, and Rodgers (1991). Wolfson (1994) and Esteban and Ray (1994) mention this phenomenon as a motivation for the concept of "polarization" of a distribution.

and Canada than in continental Europe.<sup>45</sup> For Acemoglu (2003), high school graduates in the US enjoy a skill premium that is about 50% larger than in Europe.

[2] LABOR MARKET: *Clustered equilibria display larger average labor supply as well as larger dispersion in working hours across the population than cohesive equilibria.*

Several recent contributions investigate the determinant of the large differences in the average labor supply. Prescott (2004) points out that americans actually work 50% more than germans, frenchs and italians and argue that most of the observed difference is explained by the different degree of income taxation. Rogerson (2005) investigates in details the origins of this striking observation (and more in general on the differences and the evolution overtime in the labor markets on the sides of the oceans) and also relate the observed difference to different taxation. Nonetheless he also points out the very different dynamic path of labor supply overtime. Alesina, Glaeser and Sacerdote (2005) provide an extensive analysis of the different attitude toward labor supply to explain the observation of large differences in average work week (for example american work on average 25.1 while the germans work 18.6 hours per week). They argue that the different taxation cannot fully explain the observed differences and suggest that a social multiplier could help explain the differences.

Concerning the heterogeneity of labor supply across the population, Evans, Lippoldt, and Marianna (2001) and Jacobs (2003) show that there is substantially more dispersion in hours worked in the US (and the UK) than in continental Europe.<sup>46</sup> Jacobs (2003) based on data from the Current Population Survey, finds that in the US 27 percent of the male labor force works 48 hours or more per week (28 percent in the UK). In contrast, Evans, Lippoldt, and Marianna (2001) find that only 9 percent of the German and French male labor force works 50 hours or more (2 percent in the Netherlands).<sup>47</sup> Moreover, the distribution of the population over the weekly hours worked depicted<sup>48</sup> in Evans et al (2001) show a strong concentration of the population around 38-40 hours for EU countries, while for the UK (US is not included in the study) the largest share of respondents concentrate on 50 hours or more. As a matter of fact, in the UK the share of the population that works 38-40 hours (25%) is smaller than the share working 50 hours or more. In Germany, France and the Netherlands this share is around 65-70% of the population.

[3] INDIVIDUAL ATTITUDES: *In a clustered equilibrium, the highly skilled are perceived as hard working and are admired by everyone, whereas the low skilled are seen as lazy and are admired by no one. Moreover, these sentiments are shared by everyone, including the low wage earners themselves. In contrast, in a cohesive equilibrium agents' sentiments show no bias toward those of a particular income group.*

Attitudinal differences are more difficult to quantify than, say, hours worked or incomes. However, and with all due caution, there is some evidence to suggest that the behavior predicted by our model accords with the available data for the US and the EU countries.

In this respect, we venture the following claims:

a) *Role of work ethics.* While fundamental, this point is probably beyond the scope of hard evidence. Yet, it is obvious that modern Western culture seems deeply permeated by

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<sup>45</sup>The mean and standard deviation (in brackets) are respectively: US 283 (60). UK 281 (53), Germany 291 (40) and the Netherlands 295 (40).

<sup>46</sup>Alesina, Glaeser, and Sacerdote (2001) also mention the spread in hours worked as a differential characteristic of the US. Using data from the Luxemburg income study they present a table with the median and the mean hours per income quintile.

<sup>47</sup>These figures are very similar to the ones for the year 1994 published at OECD, *Employment Outlook (Chapter 5, p. 158)*, based on the *European Union Labor Force Survey (Eurostat)* and the *Current Population Survey* for the US.

<sup>48</sup>The data were not supplied.

this idea. Christian – and most emphatically Protestant – ethics assign a major role to the virtues of working hard. In a recent in-depth study, Lamont (2000) investigates the social attitudes of the US and French working classes. She finds that the hypothesis that Americans and Europeans have fundamentally different values is not supported by evidence. In both countries workers put hard work (together with the family) among the highest values and priorities.<sup>49</sup>

b) *Attitudes toward the poor.* Lamont (2000) documents important differences concerning the perception of others. While in France, workers value positively redistribution to the poor as a device to avoid social exclusion, the American counterparts explicitly state that the poor should not be supported because their situation is mainly due to their lack of effort. Another source of evidence is the World Values Survey. As reported in Alesina, Glaeser, and Sacerdote (2001) this survey shows that while 60% of Americans believe the poor are lazy, only 26% of Europeans share this belief, also in accordance with the predictions of our model. Finally, Fong (2001), based on the US 1998 Gallup Poll Social Audit (Gallup, 1998), which is restricted to American attitudes, finds that 40% of the respondents believe that lack of effort is the cause of poverty and 57% that effort is responsible for a person being rich.

[4] REDISTRIBUTION: *In either equilibrium, higher inequality leads to higher taxation, but for the same degree of inequality there is necessarily more redistribution in a cohesive equilibrium than in a clustered equilibrium. Further, in a clustered society even the poor would not be supportive of highly redistributive policies.*

Government intervention in the market economy is historically less in the US than in Europe, but this difference has substantially increased over the last thirty years. The share of welfare transfers over GDP in 2000 was 11 percent in the US and 18 percent in Europe, and the share of total government spending for the same year (excluding interest payments) was 30 percent and 45 percent, respectively. But this is not the only channel through which Europe has built a more redistributive society than the US. Income taxes are more progressive, education and health are publicly provided, and the labor market is much more regulated. On this point, we refer the interested reader to the comprehensive analysis of Alesina and Glaeser (2004) and Alesina, Glaeser, and Sacerdote (2001).

We do not have direct, uniform evidence comparing the *distribution* of attitudes toward redistribution across the income spectrum for the US versus EU; we have only the degree of redistribution actually chosen by the voters. The only indirect data available pertains to peoples' feelings about inequality at different income levels. This information has been assembled by Alesina, Di Tella, and MacCulloch (2003), based on the US General Social Survey (1972-1997) and the Euro-Barometer Survey Series (1975-1992) where they question individuals about their happiness. They find that in Europe, the happiness of the poor is strongly negatively affected by inequality, while in the US poor seem to be totally unaffected by inequality.

There is evidence concerning the attitudes in the US only. According to the US 1998 Gallup Poll (Gallup, 1998) – as cited in Fong (2001) – among American families with incomes of \$10,000 or less, 35 percent report that the government should not redistribute wealth by heavy taxes on the rich and 21 percent believe that the poor should help themselves rather than this being the government's responsibility.<sup>50</sup> More interestingly, Fong finds that income is a very poor predictor of redistributive attitudes.<sup>51</sup>

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<sup>49</sup>See also Rokeach (1973).

<sup>50</sup>For the entire sample these percentages are 53.9 percent and 30.2 percent, respectively.

<sup>51</sup>Using data from the 1992 International Social Survey Program (for 12 countries including US and European countries), Corneo and Grüner (2002) find that self interest, individual work ethic, and a social rivalry effect all matter. They find the variable "hard work is key" to be significant in all specifications for all countries.

## 8 Appendix

**Computation of range for cohesive equilibria [Lemma 6]**. The cohesive equilibrium with larger labor supply and lower redistribution is characterized by (using the definition of  $I$ ),

$$(1 - \tau)^2 \beta_u I / \tau + (m - 1)(1 - \tau) \beta_u = (1 - \tau) \beta_u (m + 1)$$

and solving for  $\tau$ ,

$$\underline{\tau}(I) = \frac{I}{2 + I} \quad (55)$$

Hence, the cohesive equilibria with larger labor supply associated to  $\alpha_u = 1$  are characterized by,

$$\bar{L}(I) = \frac{2}{2 + I} \beta (1 - I) (m + 1) \quad (56)$$

Repeating the exercise for  $\alpha_u = \hat{\alpha}_u(I)$  and using (52) we have,

$$\begin{aligned} (1 - \tau)^2 \beta_u I / (\tau) + (m - 1)(1 - \tau) \beta_u &= (1 - \tau) \beta_u \left( m + \frac{I}{\pi(1 - I)} \right) \Leftrightarrow \\ (1 - \tau) I / (\tau) - 1 &= \frac{I}{\pi(1 - I)} \end{aligned} \quad (57)$$

and solving for  $\tau$  we have the maximum level of redistribution, and accordingly the minimum labor supply associated in a cohesive equilibrium as a function of  $I$

$$\bar{\tau}(I) = \frac{I\pi(1 - I)}{I(1 - I\pi) + \pi} \quad (58)$$

and,

$$\underline{L}(I) = \frac{I(1 - \pi) + \pi}{I(1 - \pi I) + \pi} \beta \frac{m\pi(1 - I) + I}{\pi} \quad (59)$$

where  $\bar{L}(I) > \underline{L}(I)$  since in any cohesive equilibria equation (45) holds.

**Uniqueness of Clustered Equilibrium [Lemma ]**. In view of (41) we can re-express the clustered politico-economic equilibrium tax. From (31) the degree of inequality  $I$  in a clustering (separating) equilibrium is given by,

$$I = \pi \frac{\beta_s \ell - \beta_u}{\pi \beta_s \ell + (1 - \pi) \beta_u} > I_\beta \quad (60)$$

where  $\ell^s$  is the unique equilibrium value of the ratio between the labor supplies of the two types of workers,  $\ell^s = \frac{L_s^s}{L_u^s} > 1$ .

**Inequality and Redistribution (Analytical Characterization)**. From Lemma , for any  $I \leq \bar{I}$  only cohesive equilibria emerge in any stationary state. Note also that in any

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Consistent with our comparison of clustered and cohesive societies, they also find that the selfish motive alone – the variable “I would gain from redistribution” – would lead Americans to redistribute more than Germans. Overall, US workers seem to be more averse to redistribution due to their individual work ethics; the variable “hard work is key” reduces the demand for redistribution in the US but not in Germany.

cohesive steady state  $I_\beta = I$  since income inequality equals the inequality in basic productivity (as all agents works the same).

In turns, from Lemma , in for any  $I > \bar{I}$ , the equilibrium is clustered and the level of redistribution is given by

$$\tau = \frac{I + \delta}{2 + I + \delta}. \quad (61)$$

where  $\delta < 0$ . In turns,  $(I + \delta)$ , can be expressed as,

$$I + \delta(I) = \frac{y - y_u}{y} + \frac{y - \tilde{y}}{y} = \frac{2y - y_u - \tilde{y}}{y} \quad (62)$$

$$I + \delta(I) = \frac{2(1 - \pi)y_u + 2\pi y_s - y_u - (1 - \sigma_u)y_u - \sigma_u y_s}{y} \quad (63)$$

Using the notation  $\gamma = \beta_s/\beta_s$  we can re-express income inequality as,

$$\begin{aligned} I(\gamma) &= \frac{\pi\gamma\ell - \pi}{\pi\gamma\ell + (1 - \pi)} = \frac{\pi\gamma^2 \frac{m}{m+1} - \pi}{\pi\gamma^2 \frac{m}{m+1} + (1 - \pi)} = \\ &= \frac{\pi\gamma^2 m - \pi(m + 1)}{\pi\gamma^2 m + (1 - \pi)(m + 1)} \end{aligned} \quad (64)$$

which is a strictly increasing (and concave) function of  $\gamma \in [1, \infty)$ . Hence the non monotonicity in  $\gamma$  maps one to one into a non monotonicity in income inequality. Substituting  $\sigma_u$  from (22) and rewrite as,

$$(I^s + \delta^s) = h(m, \gamma) = \left[ 2 - \frac{m\gamma}{(1 - \pi)(m + 1) + \pi m\gamma} \right] \left[ \pi \frac{\gamma^2 m - (m + 1)}{(1 - \pi)(m + 1) + \pi m\gamma^2} \right] \quad (65)$$

which depends on both  $m$  and the degree of inequality  $\gamma$ . Notice also that equation ( ) can be expressed as,

$$(I^s + \delta^s) = h(m, \gamma) = [2 - \bar{L}_s(\gamma)] I(\gamma)$$

by definition of relative labor supply (21).

Consider now,

$$\begin{aligned} \frac{\partial h(m, \gamma)}{\partial \gamma} &= -\frac{\pi(1 - \pi)m(m + 1)}{[(1 - \pi)(m + 1) + \pi m\gamma]^2} \frac{\gamma^2 m - (m + 1)}{[(1 - \pi)(m + 1) + \pi m\gamma^2]} + \\ &+ \frac{2\gamma m(m + 1)}{[(1 - \pi)(m + 1) + \pi m\gamma^2]^2} \left[ 2\pi - \frac{\pi m\gamma}{(1 - \pi)(m + 1) + \pi m\gamma} \right] \geq 0 \end{aligned} \quad (66)$$

$$\begin{aligned} &\frac{m(m + 1)}{[(1 - \pi)(m + 1) + \pi m\gamma^2]} \left\{ -\frac{\pi(1 - \pi)(\gamma^2 m - (m + 1))}{[(1 - \pi)(m + 1) + \pi m\gamma]^2} + \right. \\ &\left. + \frac{2\gamma}{[(1 - \pi)(m + 1) + \pi m\gamma^2]} \left[ 2\pi - \frac{\pi m\gamma}{(1 - \pi)(m + 1) + \pi m\gamma} \right] \right\} \end{aligned} \quad (67)$$

whose sign is ambiguous since the first term is always negative while the sign of the second changes with  $\gamma$ .

$$\begin{aligned} \frac{\partial h(m, \gamma)}{\partial \gamma} &= -\frac{\pi(1 - \pi)m(m + 1)}{[(1 - \pi)(m + 1) + \pi m\gamma]^2} I(\gamma) + \\ &+ \frac{2\gamma m(m + 1)}{[(1 - \pi)(m + 1) + \pi m\gamma^2]^2} \pi [2 - \bar{L}_s(\gamma)] \geq 0 \end{aligned}$$

Given the definition of  $\bar{I}$  we have at  $I = \bar{I}$  that  $\gamma(\bar{I}) = (m + 1) / m$ . Note that the function  $h(\cdot)$  is positive with positive slope at  $\bar{I}$  while it is negative for  $\gamma$  large enough, since from (65)  $h(m, \gamma(\bar{I})) > 0$  and

$$\begin{aligned} \frac{\partial h(m, \gamma)}{\partial \gamma} \Big|_{\gamma=\gamma(\bar{I})} &= \frac{\pi m^2}{\pi + m} \left[ \frac{2}{\pi + m} - \frac{1 - \pi}{m + 1} \right] = \\ &= \frac{\pi m^2}{\pi + m} [2 - \pi(1 - \pi) + m(1 + \pi)] > 0 \end{aligned} \quad (68)$$

Also  $h(m, \infty) < 0$ . This by continuity and intermediate value theorem implies that there exist at least a  $\gamma_0 > 1$  such that  $h(m, \gamma_0) = 0$ . From (65) noting that the second term is strictly positive since  $I(\gamma) > 0$  we can derive  $\gamma_0$  solving for  $\bar{L}_s(\gamma) = 2$ .

$$\gamma_0 = \frac{2(1 - \pi)(m + 1)}{(1 - 2\pi)m} > 1 \quad (69)$$

Substituting  $\gamma_0$  into (66) it is immediate that  $\frac{\partial h(m, \gamma_0)}{\partial \gamma} < 0$ . This implies that  $h(m, \gamma)$  is first increasing, then decreasing and eventually negative.

Finally from equation (64) we know that income inequality  $I$  is monotonically related to  $\gamma$ . The relationship between inequality and redistribution follows, from (61) which implies that equilibrium tax rate in clustered stationary states co-moves with  $h(m, \gamma)$ .

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