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Roberto IACONO, Marco RANALDI

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Perceptions of Inequality and Redistribution: A Note*

Roberto Iacono[†] Marco Ranaldi[‡]

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Abstract

This paper shows that perceptions of inequality are a key factor in the formation of preferences for redistribution and thereby in the determination of the equilibrium redistribution level. We build on the novel stylized facts provided by the recent empirical and experimental literature on perceptions of income inequality. In brief, the emerging consensus is that agents incorrectly estimate the shape of the income distribution because of limited information. Agents with income above the mean believe they are poorer than they actually are, and agents with income below the mean believe themselves to be richer. We revisit the standard framework on the political economy of redistribution and extend it in two ways. First, we assume a more general two-sided inequality aversion. Second, we incorporate perceptions of income inequality in the model. We show analytically that the equilibrium redistribution level is crucially determined by the interplay between the information treatment correcting the bias in perceptions of inequality and fairness considerations specified by the degree of inequality aversion. By doing this, we add (biased) perceptions of inequality to the list of potential factors explaining why, notwithstanding high levels of inequality, in many countries, an increase in the desire for redistribution has not been observed.

JEL Classification: D63; H2; H3.

Keywords: Meltzer-Richard Model, Perceived Inequality, Inequality Aversion, Redistributive Preferences.

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1 Introduction

What determines individuals' preferences for redistribution? To answer this question, many scholars have investigated the role income inequality plays in the subject matter: does a high level of income inequality stimulate a higher demand for redistribution? Thus far, a clear relationship between these two dimensions has not been observed. Lately, the focus of the quest for the key determinants of redistributive preferences has shifted away from the *actual* inequality level to its *perception*. Individuals' perceptions of the level of macroeconomic and distributional variables can shape attitudes and modify preferences and voting choices. In turn, voting choices play a decisive role in the design of public policies in democratic societies. Understanding (and eventually altering) perceptions can therefore be crucial to achieving different equilibrium policy outcomes.

The shift in focus is primarily motivated by the fact that preferences for redistribution have indeed proven to correlate more with perceptions of inequality than with the actual inequality level (Gimpelson and Treisman, 2018; Choi, 2019). This paper investigates theoretically how perceptions of inequality influence both redistributive preferences and the resulting voting outcome in terms of taxation and redistribution.

Assume that there is a population of agents that care about income inequality¹ and that do not have perfect information about their own income ranking and income distribution in general. This assumption implies that preferences for redistribution will be biased, and as a consequence, agents will vote for a level of income taxation and equilibrium redistribution that is inconsistent with real preferences.²

An increasing number of surveys and experimental papers (Kuhn, 2011; Cruces et al., 2013; Gimpelson and Treisman, 2018; Hoy and Mager, 2018; etc.) have attempted to estimate individuals' bias in the perception of income inequality. Kuhn (2011) and Cruces et al. (2013)

¹Several studies in the economic literature have tested and accepted the hypothesis that fairness considerations are among the determinants of preferences for redistribution. See, e.g., the social survey data by Fong (2000), the empirical results in Isaksson and Lindskog, 2009, and the results from the large international survey conducted by Corneo and Gruner, 2002.

²The issue of perceptions of income inequality and their effect on the desire for redistribution was also analyzed in Pillacer, Piraino and Wegner (2018). However, the researchers assume that inequality is to some degree inevitable, and the desire for redistribution policy aimed at curbing inequality drops as a consequence. In the framework of this paper, redistribution policy, instead, effectively reduces inequality, making it a valuable policy choice.

design country-specific surveys for Switzerland and Argentina, respectively, whereas Gimpelson and Treisman (2018) and Hoy and Mager (2018) present evidence from 9 cross-national surveys and a large-scale 10-country survey, respectively. Considering that a multicountry study allows us to externally validate results with higher accuracy and precision, the evidence provided by the latter studies will feature prominently in our analysis.

Although studies from the literature differ somewhat in their approaches and results, a consensus seems to emerge: agents incorrectly estimate the shape of the income distribution due to limited information. Hence, due to a perception bias in the level of income inequality, individuals' preferences for redistribution cannot be deemed to reflect real preferences. More interestingly, there is an emerging consensus within the literature on the *sign* of this perception bias. This sign depends on whether an agent underestimates or rather overestimates her position in the income ranking. For instance, Cruces et al. (2013) show that the sign of the estimation bias depends on whether an agent belongs to a high-income or a low-income reference group. If an agent belongs to a high-income reference group (e.g., above the mean income), she tends to *overestimate* the income of the rest of the population. As a consequence, she *underestimates* her own income ranking, believing herself to be poorer than she actually is. On the other hand, an agent belonging to a low-income reference group tends to believe herself to be relatively richer than she actually is. Hoy and Mager (2018) also confirm the evidence whereby all agents believe themselves to belong to the middle class.

Building on this experimental consensus, this paper's objective is to analyze the effect of individuals' perceptions of inequality on the equilibrium redistribution level in an economy. To this end, we revisit the standard Meltzer-Richard (MR) (1981) political economy framework by building on the work of Galasso (2003). To the best of our knowledge, Galasso (2003) was the first to introduce altruistic preferences in an MR model by assuming that fair agents are one-sided inequality-averse. We generalize the contribution of Galasso (2003) in two ways. First, we introduce two-sided inequality aversion to make the model sufficiently flexible to incorporate the previously discussed findings of the experimental literature.³ Second, we incorporate perceptions of income inequality into the framework.

³During the survey, the respondents are asked to evaluate the absolute distance in income *both* from the richest and the poorest in society.

Such a novel theoretical framework allows us to address the following questions: does the median voter demand more or less redistribution whenever she receives information (regarded as a treatment, as in Duflo and Saez, 2003; Chetty and Saez, 2013) on the actual shape of the income distribution? To what extent do the results depend on the degree of inequality aversion? Is it the inequality aversion with respect to the top incomes in society or with respect to the poorest in society that plays a larger role?

The main contribution of this paper is to show analytically that perceptions of inequality indeed play a decisive role in the determination of the equilibrium redistribution level. In addition, we show that the degree of inequality aversion of the fair agents crucially determines the magnitude of the effect of (biased) perceptions on the equilibrium redistribution level. In response to the information treatment (a mean-preserving spread in the income distribution) that corrects the perception bias, fair agents with income below the mean support a higher tax rate and demand greater equilibrium redistribution. In turn, the higher taxation and redistribution level will presumably increase the post-tax disposable income of poor agents and reduce the absolute level of inequality in society.

Apparently, this result does not deviate from the conventional framework of the political economy of redistribution (Meltzer and Richard, 1981; Benabou and Ok, 2001; Piketty, 1995)⁴, in which the rational median voter with income below the mean supports a positive level of taxation and redistribution, while agents with income above the mean prefer no redistribution. However, the mechanisms driving the result here differ substantially. In the conventional MR model, fairness considerations are totally absent, and agents are led only by selfish motives. In the framework of this paper, instead, it is both fairness considerations and selfish motives that drive the result.

In a nutshell, perceptions of inequality play a decisive role in the determination of the equilibrium redistribution level through the interplay with fairness considerations specified in the equality function. Without fairness considerations, the role of the perceptions of inequality would be undermined and not properly understood. We believe that these results can help understand various mechanisms at work behind real-world outcomes of voting on redistribu-

⁴This framework has been defined by Milanovic (2010) as the *median-voter hypothesis* that according to his work, should be clearly distinguished from the *redistribution hypothesis*.

tion issues, now that more data on and estimates of income inequality are reaching the larger public (hence, gradually reducing perception biases), and the attention given to inequality by policymakers is increasing.

The paper proceeds as follows. Section 2 introduces the modeling approach and constitutes the core part of the study, while section 3 discusses the results. Section 4 summarizes and concludes the paper.

2 The model

2.1 The economic environment

As stated in the introduction, in what follows, we build on the framework developed by Galasso (2003). Such a framework is itself an adaptation of the standard MR model with the introduction of fairness (i.e., a fraction of the population values fairness). The framework of Galasso (2003) is a good starting point for generalizing fairness considerations by assuming inequality aversion towards both extremes of the distribution.

Consider a unitary mass of individuals who differ from each other only with respect to their working ability given by e . These abilities are distributed on the support $[\underline{e}, \bar{e}] \subset \mathcal{R}_+$ according to the cumulative distribution function $F(\cdot)$. As in Galasso (2003), we assume the distribution of abilities to be skewed, and therefore, the median ability e^M is below the mean ability \bar{e} . An individual's income y is a function of her ability and her amount of labor supplied $n(e)$ and can thus be written as the following simplified production function: $y(e) = en(e)$.

Suppose that a fraction $\lambda \in [0, 1]$ of all agents in the population is of the selfish type and value consumption c and leisure l according to a standard quasilinear utility function $U(c, l) = c + u(l)$ that is twice-differentiable and concave. A fraction $1 - \lambda$ of the population is, on the other hand, composed of fair agents that value the degree of equality in the economy as well. The equality function, which measures the aversion to inequality, is given by E . As in Galasso (2003), we assume that the fairness considerations summarized by E do not enter the economic optimization problem. This choice leads to a higher degree of analytical tractability,

and it also implies that an individual's choice as to the labor supply is not influenced by how much the single agent dislikes inequality in society. In summary, the utility function of fair agents can therefore be written as $U(c, l) = c + u(l) + E$.

All agents choose consumption and leisure (facing the usual trade-off between leisure l and supply of labor n limited by the total amount of disposable time) to solve the economic maximization problem. Individuals pay a payroll tax on their income from labor at tax rate τ equal for all (no means-testing), and receive an equal transfer T . Their budget constraint is thus $c = (1 - \tau)en(e) + T$, with the balanced budget of the government given by $T = \tau \int en(e)dF(e)$. The maximization problem yields the usual result, i.e., $(1 - \tau)e = u'_l(l^*)$. In turn, one can make substitutions to determine the optimal amount of labor supply and of income $y^* = en^*$. The next subsection introduces the voting game.

2.2 Voting game with a two-sided equity function

Galasso (2003) shows that the introduction of a fair agent type in a standard MR framework produces, *ceteris paribus*, an increase in the equilibrium tax rate and redistribution level, which is induced by fairness considerations. The type of fairness Galasso (2003) introduces is given by a *one-sided inequality-averse* agent, i.e., the fair agent compares the absolute distance between her income from that of the poorest in society.⁵

From now on, we intend to deviate from the framework in Galasso (2003). We believe that a theoretical framework seeking to incorporate the empirical findings observed by the experimental literature would strongly benefit from the introduction of a double-sided inequality-averse fair agent. Hence, we formulate a double-sided equality function E of the following form:

$$E = -\beta((1 - \tau)(y^* - \underline{y}^*)) - \gamma((1 - \tau)(\bar{y}^* - y^*)), \quad (1)$$

⁵In Galasso (2003), the equity function E that captures the aversion to inequality of the fair agent is specified as follows: $E = -\beta((1 - \tau)(y^* - \underline{y}^*))$. The asterisk refers to the variable's optimal value that follows directly from the agent's economic maximization problem. The variable \underline{y} is the income of the poorest in society, while $\beta = \frac{(\bar{y}^* - \underline{y}^*)}{(\bar{y}^* - y^*)}$ measures the magnitude of the fair agent's inequity aversion. In other words, β of Galasso (2003) captures the *relative* distance between the mean income of the population \bar{y}^* and the income of the richest in society y^* . The greater this distance is, the more the fair agent cares about the level of inequality in the society.

where $\beta = \frac{\tilde{y}^* - \underline{y}}{\tilde{y}^* - \underline{y}^*}$, $\gamma = \frac{\tilde{y}^* - \tilde{y}^*}{\tilde{y}^* - \underline{y}^*}$, and $\beta + \gamma = 1$.

The coefficients β and γ incorporate fair individuals' concern related to a specific side of the distribution (either the top or the bottom), depending on the society's mean income \tilde{y}^* , here taken as an indirect measure of the society's wellbeing. If the society's mean income \tilde{y}^* is closer to the top of the distribution, fair agents are relatively more concerned with the income of the poor. Such a mechanism mathematically results in a low γ and a high β . On the other hand, whenever the society's mean income \tilde{y}^* is closer to the bottom of the distribution, fair agents are more concerned with the income of the rich, reflected by a high γ and a low β .

The features of the median-voter equilibrium that results from the voting game with the introduction of the above equality function E are explained as follows. Recall the general economic setting of subsection 2.1. All agents make their voting decisions maximizing their indirect utility, and preferences are single-peaked as in MR and Galasso (2003).

Specifically, selfish agents maximize the utility function, $V^S(\tau) = (1 - \tau)y^* + T + u(l^*)$, whereas fair agents maximize the same function augmented by fairness considerations: $V^F(\tau) = V^S(\tau) + E$.

The following first-order condition is obtained by fair agents:

$$-y^* + \tilde{y}^* + \beta(y^* - \underline{y}) + \gamma(\tilde{y}^* - y^*) + \tau \frac{\partial \tilde{y}^*}{\partial \tau} = 0. \quad (2)$$

with $\frac{\partial \tilde{y}^*}{\partial \tau} < 0$. The first-order condition of the selfish agent can easily be obtained by setting $\beta = \gamma = 0$.

Solving for τ , it can be shown that a selfish agent with ability e chooses the tax rate

$$\tau^S = \frac{y^* - \tilde{y}^*}{\frac{\partial \tilde{y}^*}{\partial \tau}}, \quad (3)$$

whereas a fair agent with ability e chooses the tax rate

$$\tau^F = \frac{y^* - \tilde{y}^* - \beta(y^* - \underline{y}) - \gamma(\tilde{y}^* - y^*)}{\frac{\partial \tilde{y}^*}{\partial \tau}}. \quad (4)$$

This result clearly shows that a fair agent supports a higher level of redistribution than that supported by the selfish agent of the same ability, due to the effect of fairness considerations. Note that for any agent, the higher the income y^* is, the lower the willingness to support a

positive redistribution policy (this is due to purely selfish motives). However, fairness considerations enter the first-order condition of fair agents. For a fair agent to support a positive tax rate, her income y^* should be lower than mean income \bar{y}^* augmented by the terms introducing fairness considerations. Even with income y^* slightly above the mean \bar{y}^* , the fair agent will still vote for a positive tax rate due to the effect of inequality aversion.

For clarity, we combine the two types of agents within a single expression (a mathematical correspondence) that gives us, for any given positive level of tax rate τ , the corresponding mass of voters willing to support it. The correspondence between the income of a selfish agent and that of a fair agent choosing to vote for the same non-negative tax rate is given by:

$$y^S = (1 - \beta + \gamma)y^F + \beta \underline{y} - \gamma \bar{y}^*. \quad (5)$$

Hence, we are able to plot the masses of selfish and fair agents on the same diagram, as shown in Figure 1 below, ranked by the selfish voters' income, as done in Galasso (2003):

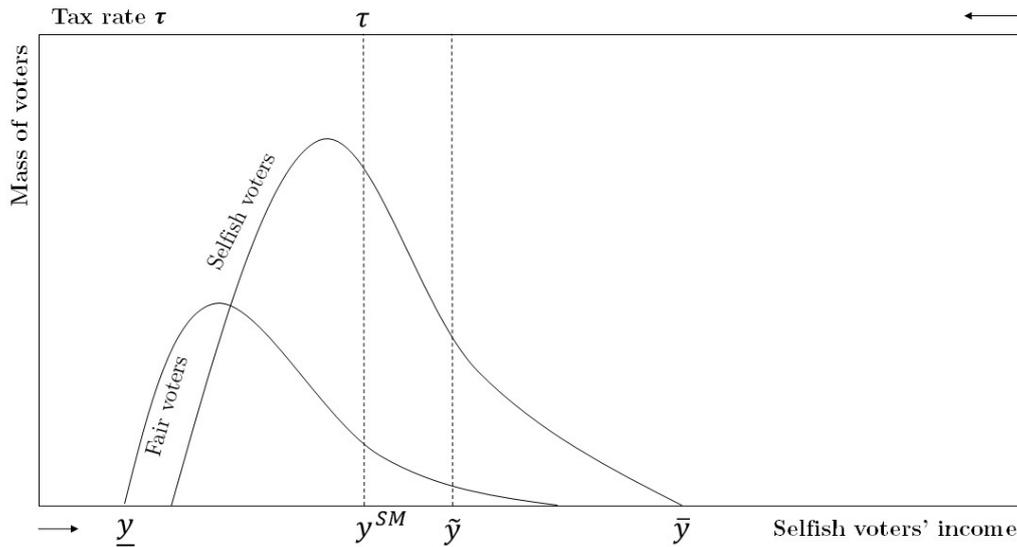


Figure 1: Selfish Median (SM) voter equilibrium

Figure 1 shows that a higher tax rate τ is supported by low-income agents, while a lower τ is voted for by high-income agents, consistent with the standard MR model and with Galasso

(2003). The correspondence plotted in Figure 1 is also useful for visualizing the (selfish) median voter equilibrium (y^{SM}) of this voting game, which can be determined through the following expression:

$$y^{SM} = \left\{ y \mid \lambda F(y) + (1 - \lambda) F\left(\frac{y - \beta \underline{y} + \gamma \bar{y}}{1 - \beta + \gamma}\right) = \frac{1}{2} \right\}. \quad (6)$$

in which λ is the fraction of selfish voters.

A couple of remarks as regards a comparison between our framework and that of Galasso (2003) should be inserted here. It is easy to appreciate that the median voter's income (y^{SM}) in the context of double-sided inequality aversion is lower than in the context of one-sided inequality aversion (Galasso, 2003). In addition, in Galasso (2003) the minimum income fair agents can earn corresponds to the minimum income of selfish agents voting for the same tax rate. This result can be obtained by simply substituting y^F for \underline{y} in the correspondence equation of Galasso (2003).⁶ However, once we perform the same operation with equation 5, which establishes a relationship between the incomes of selfish and fair agents choosing the same tax rate in the context of double-sided inequality aversion, we obtain a lower minimum income for fair agents than in the previous scenario. Specifically, this income equals $\underline{y} - \gamma \bar{y}$. The maximum income of fair agents both in the context of single- and double-sided inequality aversion will however be the same. Therefore, the median of the fair agents' voting distribution will be lower in a double-sided inequality aversion context than in a single-sided one. In summary, by applying equity considerations on both sides of the income distribution, the median voter will be willing to support a higher level of equilibrium redistribution.

In the next subsection 2.3, we expand the framework presented in 2.1 and 2.2 to introduce the role of perceptions of inequality.

2.3 Perceptions of inequality

In this subsection, we introduce perceptions of inequality in our theoretical framework. The next subsection will instead deal with analyzing the effect of these perceptions on the equilibrium redistribution level. Let us first introduce the type of perception we will be dealing

⁶Recall that the correspondence equation in Galasso (2003) is as follows: $y^S = (1 - \beta)y^F + \beta \underline{y}^*$.

with. To the best of our knowledge, only survey-based measures of perceived inequality have been proposed in the literature (Choi, 2019; Engelhardt and Wagener, 2014; Schalembier, 2015). In contrast, in this paper, we introduce a simple analytical formulation of perceptions of inequality, aiming at reproducing the consensus from the experimental literature within the theoretical framework constructed in subsection 2.1 and 2.2.

We assume for simplicity that the mean income \tilde{y}^* in the society is public knowledge. The agents also know with certainty their own income y^* . We also assume that to solve their economic maximization problem, the agents only need to know the income level of the richest and the poorest in society, i.e., the extreme ends of the distribution. Further, we assume that all individuals form their perceptions concerning the extreme ends of the distribution in the same manner.

Agents form a perception of the highest income in society, which we denote by \bar{y}^{*P} , and of the lowest income, denoted by \underline{y}^{*P} . Furthermore, we define \bar{y}^{*P} and \underline{y}^{*P} as follows: $\bar{y}^{*P} = \bar{y}^* + \zeta$ and $\underline{y}^{*P} = \underline{y}^* + \eta$, with $\zeta, \eta \in \mathbb{R}$ and $\zeta, \eta \neq 0$.⁷ Such a simple formalization of the perceived incomes of the richest and the poorest in society will allow us to perform a tractable and straightforward analysis of all possible cases of perceptions playing a role in the voting outcome.

Recall that only fair agents form perceptions of inequality, since selfish agents do not take fairness into account. Hence, after the introduction of perceptions the equality function of the fair agents specified in equation 1 becomes

$$E^{(P)} = -\beta^P(1 - \tau)(y^* - \underline{y}^{*P}) - \gamma^P(1 - \tau)(\bar{y}^{*P} - y^*), \quad (7)$$

where $\beta^P = \frac{\bar{y}^* - \underline{y}^{*P}}{\bar{y}^{*P} - \underline{y}^{*P}}$ and $\gamma^P = \frac{\bar{y}^{*P} - \bar{y}^*}{\bar{y}^{*P} - \underline{y}^{*P}}$, with $\beta^P + \gamma^P = 1$.

Performing the same optimization procedure as in subsection 2.2 results in the following optimal lump sum tax rate for the fair agent with ability e in the context of perceptions of inequality:

$$\tau^{F(P)} = \left(\frac{1}{\frac{\partial \tilde{y}^*}{\partial \tau}} \right) \left(y^* - \tilde{y}^* - \beta^P(y^* - \underline{y}^{*P}) - \gamma^P(\bar{y}^{*P} - y^*) \right). \quad (8)$$

The effect of correcting the bias in perceptions of inequality can therefore be pinned down through a before-and-after comparison of the above equation 8 with the tax rate resulting from

⁷We shall further assume that $\underline{y}^{*P} \leq \bar{y}^{*P}$.

the elimination of the perception bias for terms \underline{y}^{*P} and \bar{y}^{*P} (i.e., when (η, ζ) tends to $(0, 0)$).

The entire set of possible scenarios that can arise is summarized in the diagram below:

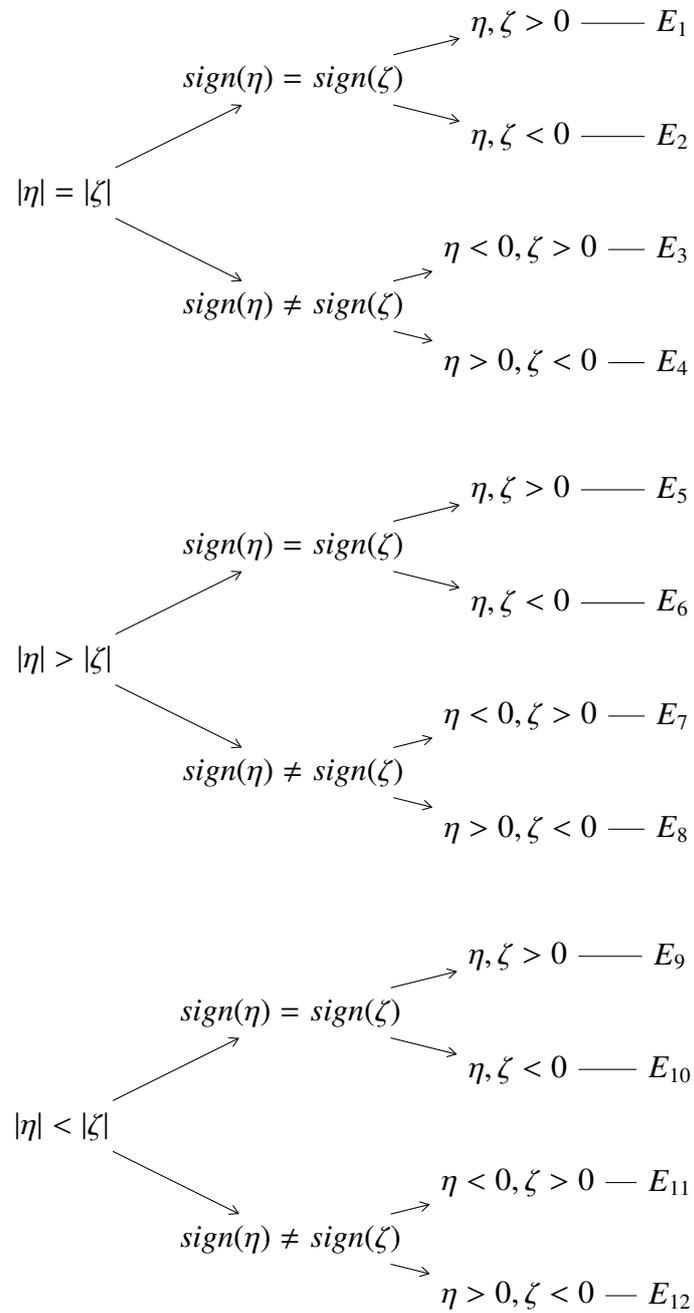


Figure 2: Tree diagram with magnitude and sign of perception biases η, ζ

According to the values of perception biases η and ζ , we identify 12 scenarios that de-

scribe all possible realizations of perceptions of inequality. These 12 scenarios depend on the relationship between η and ζ in terms of both their magnitudes and signs. Any one of these scenarios affects the equality function $E^{(P)}$ in a different manner. In the first tree of the diagram, the magnitude of the perception biases is equal with respect to both ends of the distribution ($|\eta| = |\zeta|$). In the remaining two trees of the diagram, instead, the bias is either stronger when it comes to estimating the income of the poorest in society (the cases in which $|\eta| > |\zeta|$) or, on the contrary, is stronger when it comes to estimating the income of the richest in society (whenever $|\eta| < |\zeta|$).

In conclusion, this subsection defined perceptions of inequality and presented the entire set of possible scenarios in terms of magnitude and sign of perception biases. In other words, this subsection prepared the ground for the analysis of the effect that the elimination of perception biases (which happens when the pair (η, ζ) tends to $(0, 0)$) can have on the equilibrium tax rate chosen by the median voter.

2.4 Effect of perceptions on redistribution

This subsection aims at complementing the subsection 2.3 by pinning down the effect of perceptions of inequality on the equilibrium redistribution level. A real-world example of an information “treatment” or “shock” that corrects the perception bias can, e.g., be a pre-election television debate on inequality and redistribution, in which precise information regarding the income of the poorest and the richest in society (i.e., the absolute level of income inequality in society at that time) is disclosed to the public.

More importantly, we intend to depart from the results and consensus emerging from the experimental literature on perceptions of inequality. To this end, let us start by recalling the insights from the multicountry surveys of perceptions of inequality mentioned in the introduction.

Gimpelson and Treisman (2018) present an overview of the results from nine large cross-national surveys that point in the same direction: agents know *neither* the shape of the distribution of income in their country nor their own position along the income rank. This phenomenon can be justified either by missing information or by bounded rationality arguments.

Based on this striking stylized fact, Gimpelson and Treisman (2018) state that the common assumption that rational economic agents accurately observe the level of income inequality in society should be disregarded in future studies. In other words, Gimpelson and Treisman (2018) advocate that a more in-depth analysis of *perceptions* of inequality (including how they are formed) should be included in forthcoming political economy models of redistribution, which is justified by the fact that survey evidence shows that preferences for redistribution happen to be more strongly correlated with *perceptions of* inequality rather than with the actual inequality level. This is exactly the rationale behind the framework of this paper, which uses as a starting point the fact that agents do not know the absolute distance in income from the richest to the poorest in society. More precisely, the perceived income of the richest in society is different from the real income, $\bar{y}^P \neq \bar{y}$, and the same occurs for the poorest in society, $\underline{y}^P \neq \underline{y}$, due to a systematic perception bias that we denote by parameters $\zeta, \eta \in \mathbb{R}$.

The survey experiments conducted by Hoy and Mager (2018) across 10 countries with over 30 000 participants and by Cruces et al. (2013) confirm the result of Gimpelson and Treisman (2018) regarding the fact that agents incorrectly estimate the real inequality level. In addition, Cruces et al. (2013) and Hoy and Mager (2018) provide evidence regarding an interesting and novel stylized fact. Namely, survey evidence shows that a majority of agents tend to believe they are positioned around the middle of the national income distribution, regardless of whether they belong to a high or poor reference group (a sort of middle-class bias).

More specifically, agents belonging to a high-income reference group (e.g., above the mean income) tend to *underestimate* their own income rank; hence, they believe that they are relatively poorer than they actually are. This means that the distance from the above-the-mean income of an agent to the income of the richest in society is smaller in reality than in perception. On the other hand, agents belonging to a low-income reference group tend to *overestimate* their own income rank; hence, they believe they are relatively richer than they actually are. This means that the distance from the below-the-mean income of an agent to the income of the poorest agent in society is smaller in reality than in perception.

In the following, we intend to incorporate this stylized fact from the literature in our theoretical framework augmented with perceptions in which a fraction of fair agents is double-sided inequality-averse. What will be the effect of the information treatment on the equilib-

rium redistribution level supported by the median voter? Let us translate the abovementioned consensus from the literature into the framework provided by subsection 2.3.

To this end, we need to identify the case (among those specified in the tree diagram of subsection 2.3) for which the income distribution is subject to a mean-preserving spread after the information treatment (when the pair (η, ζ) tends to $(0, 0)$). In other words, the consensus of the experimental literature is most closely identified by the case of the tree diagram for which the richest in society are *richer* in reality than an agent thinks, and the poorest are *poorer* in reality than an agent thinks (with the magnitudes of the biases being equal to ensure the mean-preserving spread feature). This result corresponds to the case given by E_4 in the tree diagram, in which we have $|\eta| = |\zeta|$ with $\eta > 0, \zeta < 0$.

To find out whether the information treatment will induce the fair agent to support a higher/lower equilibrium redistribution level, we need to pin down the effect on the fair agent's equality function. The effect on the equality function specified in 7 is given in turn by the effects on (i) the coefficients of inequality aversion β and γ and on (ii) the absolute distances from income of the median voter to the ends of the distribution. In summary:

[E_4 : $|\eta| = |\zeta|$ with $\eta > 0, \zeta < 0$.] Correcting the bias in perceptions (hence, going from the equality function of equation 7 including perceptions to the function in equation 1) has a net effect resulting in a higher tax rate τ^F and equilibrium redistribution chosen by the fair agent, which we explain as follows.

The features of the mean-preserving spread leave both coefficients of aversion unchanged after the information treatment: $\Delta\beta = \beta - \beta^P = 0$ and $\Delta\gamma = \gamma - \gamma^P = 0$. This result implies that the degree of inequality aversion of the fair agent with respect to both ends of the distribution is unchanged.

As to the absolute distance between the fair agent's income and the extreme ends of the distribution, the distance from the highest income (which is now $\bar{\bar{y}} > \bar{y}$) has increased by exactly as much as the distance from the lowest income in society (which is now $\underline{\underline{y}} < \underline{y}$). Hence, the two terms that multiply β and γ in 7 both increase compared to values before the information treatment. All in all, we can conclude that as long as $\eta > 0, \zeta < 0$ with $|\eta| = |\zeta|$, the change in the equality function of the fair agents induced by the information treatment is negative in value, due to the increase in the level of absolute inequality caused by the mean-

preserving spread: $\Delta E = E - E^P < 0$. The effect on the desired tax rate by fair agents τ^F is then positive, due to the negative denominator given by $\frac{\partial \bar{y}^*}{\partial \tau} < 0$. Figure 3 plots this effect:

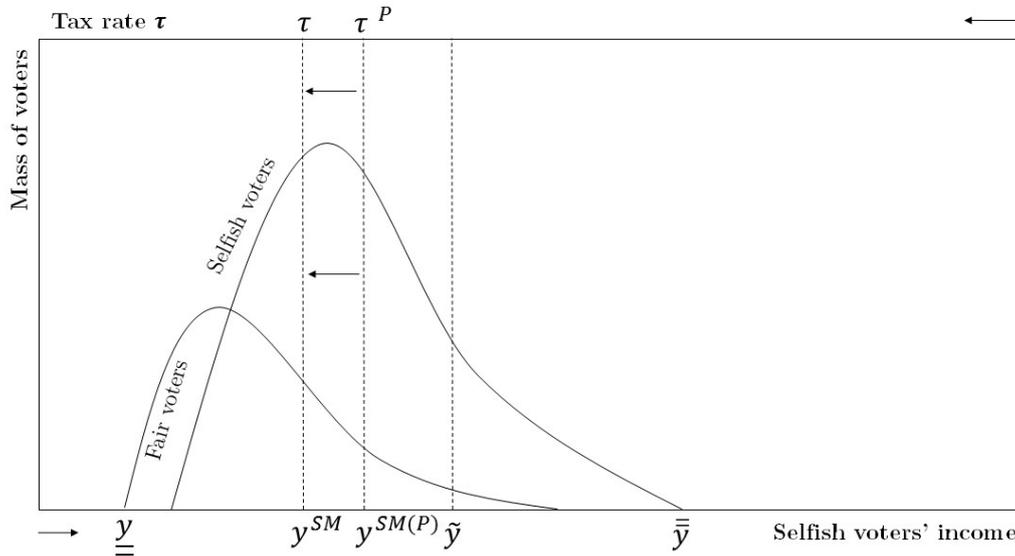


Figure 3: Selfish Median (SM) voter equilibrium after correction in perception bias

Figure 3 above shows the reduction in the median voter equilibrium (y^{SM}) after the information treatment correcting the bias in perceptions, and the resulting higher tax rate τ . The information treatment results in an increase in the level of absolute inequality in society, and the behavioral response of fair agents with two-sided inequality aversion is that of supporting a higher tax rate and redistribution level. This in turn implies that the median voter of the population comprising both selfish and fair voters will support a higher tax rate and redistribution level after the information treatment (this follows straightforwardly from equation 6). A thorough discussion and interpretation of this result can be found in the next section 3.

3 Discussion

It is worth discussing the main result of section 2, especially its main determinants. The fair agents with income below the mean react to a mean-preserving increase in inequality (caused by the information treatment) by supporting a higher tax rate and demanding higher equilibrium redistribution, which will presumably increase her post-tax disposable income and reduce the absolute level of inequality in society. This result appears to be consistent with the conventional MR framework of political economy of redistribution. However, in the conventional MR model, fairness considerations were absent, and the median voter was led only by selfish motives. In the framework of this paper, both fairness considerations and selfish motives instead affect the result.

More importantly, the result of section 2 shows that the perceptions of inequality play a decisive role in the determination of the equilibrium redistribution level through the interplay with fairness considerations specified in the equality function. Without the specification of fairness consideration as done in the current framework, the role of perceptions of inequality in determining the level of redistribution would not be properly understood.

There is one additional interpretation of the result of the model in this paper. In the literature, it has been shown that increasing inequality is not necessarily correlated with higher redistribution (see Lind, 2005). This puzzle has been referred to as the Robin Hood paradox (Lindert, 2004, page 15): *“History reveals a “Robin Hood paradox,” in which redistribution from rich to poor is least present when and where it seems most needed”*. Namely, redistribution is higher in countries in which we observe lower inequality, and vice versa. In our view, the result of this paper qualifies perceptions of inequality as one of the possible causes that can contribute to explaining the Robin Hood paradox. As soon as the perception bias is resolved, our model indicates that fair agents (and hence the median voter) demand a higher equilibrium redistribution level. In other words, it is exactly the perception bias as to the real level of inequality that could in part explain the paradox of low demand for redistribution in countries with high level of inequality. If agents (with a certain degree of inequality aversion) were provided with full and correct information about the level of inequality in society, they would indeed vote for higher equilibrium redistribution.

As to possible future extensions of the framework developed in this paper, there is a restrictive assumption in the model that deserves to be discussed. In section 2.4, we introduced perceptions in the form of individuals' beliefs as to the incomes of the richest and the poorest in society. Moreover, we assumed these beliefs to be the same for all individuals. However, it may be argued that rich agents are better than poor agents at perceiving the highest income in society, and *vice versa*, that poor agents are better than rich agents at perceiving the lowest income in society.

A possible way of embedding this intuition in the model is to write each individual's perception of the gap between her income and the income of the richest in society ($\bar{\mathcal{G}}^P$) as well as the gap between her income and the income of the poorest in society ($\underline{\mathcal{G}}^P$) in the following way:

$$\underline{\mathcal{G}}^P = (y - \underline{y})^P = (y - \underline{y}) + \underline{\epsilon}, \quad (9)$$

and

$$\bar{\mathcal{G}}^P = (\bar{y} - y)^P = (\bar{y} - y) + \bar{\epsilon}, \quad (10)$$

where $\underline{\epsilon}$ and $\bar{\epsilon}$ are *perception probabilities*. The perception probabilities can be functions of individuals' income: the higher (lower) an individual's income is, the higher (lower) her ability to perceive the highest income in society; similarly, the lower (higher) an individual's income is, the higher (lower) her ability to perceive the lowest income in society. To capture this mechanism, we can define $\underline{\epsilon}$ and $\bar{\epsilon}$ as two statistically *dependent* normal distributions of the form $\underline{\epsilon} \sim \mathcal{N}(0, \underline{\mathcal{G}} + 1)$ and $\bar{\epsilon} \sim \mathcal{N}(0, \bar{\mathcal{G}} + 1)$. The phenomenon underlying such formalization is that although on average individuals correctly estimate the extremes of the distribution, the farther away their income is from the extreme income they are asked to estimate, the higher the probability they make a mistake in their estimation.

Although the previous formalization has the advantage of capturing simply the dynamics at stake, it has the disadvantage of making the model analytically intractable. Indeed, given that the two distributions $\underline{\epsilon}$ and $\bar{\epsilon}$ are mutually dependent, it is difficult to explicitly derive the distribution of the resulting equity function E in a simple way. However, using numeric computations and simulation techniques, it would be possible to determine the effect of the introduction of these perception probabilities on the equity function E and therefore on the

equilibrium redistribution level in the economy. Considering that such exercise goes well beyond the scope of this study, we leave it to future research on the subject.

4 Concluding remarks

In this paper, we embedded recent empirical findings from the experimental literature on perceptions of inequality into a political economy model of redistribution. These findings indicate that biased perceptions of income inequality influence behavioral responses and outcomes of voting on issues of taxation and redistribution. Indirectly, this implies that altering or rather correcting the bias in individuals' perceptions of inequality can have an important effect on the desired level of taxation and redistribution.

More specifically, we introduced perceptions of inequality in a simple political economy model of redistribution, which closely resembles that proposed by Meltzer and Richard (1981). However, we accounted for fairness considerations similarly to own work of Galasso (2003). Our innovation with respect to the framework of Galasso (2003) is that we extend individuals' fairness to account for a double-sided inequality aversion. Indeed, we argue that double-sided inequality aversion allows us to better incorporate the stylized facts of the experimental literature on perceptions of inequality.

To obtain an estimate of the hypothetical effect of correcting individuals' bias in their perceptions of inequality, we assumed information on the income distribution to be disclosed to agents as a treatment through a public announcement. Consistent with observations highlighted in the experimental literature, the real level of absolute inequality ends up being higher than the perceived level. To recreate this stylized fact in our framework, we hypothesized that information treatment entailed a mean-preserving spread in the distribution of income.

Fair agents with double-sided inequality aversion react to this information treatment by demanding a higher tax rate and redistribution level. In other words, the role of perceptions of inequality is indirectly pinned down by the elimination of biased perceptions and crucially hinges on the degree of double-sided inequality aversion of a fraction of agents in the population. Without fairness considerations (as in the conventional models à la Meltzer and Richard,

1981), the role of perceptions of inequality in driving the results would not be decisive.

In our view, the result of this work can also contribute to the broader debate in the economic literature on inequality and redistributive preferences. Lind (2005) and others have pointed out that the level of redistribution observed in many Western countries does not appear to be inversely related to the degree of income inequality, as one could expect. Lindert (2004) has called this empirical regularity the Robin Hood paradox. Namely, redistribution is higher in countries in which we observe lower inequality, and vice versa. More equal countries continue to redistribute wealth, although they are already relatively more equal (e.g., Scandinavian countries are often cited in this context), while more unequal countries choose not to redistribute wealth, hence becoming even more unequal.

This paper adds perceptions of inequality to factors that contribute to explaining one side of the Robin Hood paradox. As soon as the fair agents receive the information treatment disclosing that the absolute level of income inequality has increased, our model indicates that voting outcomes imply a higher equilibrium redistribution level. In other words, it is precisely the bias in perception of the level of inequality that could partially explain why we observe low demand for redistribution in countries with relatively higher levels of inequality. If agents with fairness considerations were provided with full and correct information about the level of inequality in society, we would indeed observe higher equilibrium redistribution in more unequal countries.

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