Positional Concern and Low Demand for Redistribution of the Poor*

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Abstract

Two observations, that (1) some low income citizens demand low redistribution and (2) as income inequality gets severer a larger proportion of them demands redistribution less (Kelly and Enns (2010)), are counter-intuitive because people oppose redistribution which could be beneficial to themselves. Understanding the main driving factor that leads to economic conservatism of the poor is crucial as it guides how policymakers should design redistribution. I show that positional concern can be one of the main factors. When citizens care for their relative position on consumption, and their labor productivity is slightly perturbed when a new tax policy is implemented, only the middle income citizens may vote for redistribution. Compared with the prospect of upward mobility hypothesis, I provide a testable prediction for the relationship between economic inequality and economic conservatism of the poor. If positional concern is the main driving factor, policymakers should focus on increasing the low income citizens' standard of living to the middle class, while the prospect of upward mobility is main, they should focus on minimizing income gaps.

Keywords: economic conservatism; economic inequality; redistribution; externality; positional concern

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1 Introduction

My research questions originate from Kelly and Enns (2010), who reported that severer income inequality makes the poor more inclined to oppose redistribution.[1] Why are

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[1]According to Gallup's Economy and Personal Finance survey on April 9–12, 2015, 35% of respondents whose household income was under $30,000 answered that the government should not redistribute wealth

some of the poor economically conservative?[2] Why do more of the poor demand less redistribution when income inequality gets severer? Given that the observations reported are true, it is a bit of a conundrum, because economic models, á la Meltzer and Richard (1981) with the assumption of self-interested rational agents, typically predict that anyone whose income or productivity is below that of the decisive voter should vote for redistribution, and severer income inequality, which leads to a larger gap between the median income and the mean income, raises social demand for redistribution. Even if we may understand the higher income earners' support for redistribution by taking into account some types of social preferences, such as altruism and/or inequity aversion, it is still hard to explain the lower income citizens' low demand for redistribution. Understanding the main driving factor that leads to the economic conservatism of the poor could be crucial for policymakers in that it could alter the desirable form of economic redistribution. Thus, the primary purpose of this research is to answer the following question. What can policymakers who deal with economic inequality learn from the changes in economic conservatism of the poor?

There are several studies addressing economic conservatism of the poor, which are discussed in subsection 1.1 in detail. The main contribution of this paper is to provide an additional attribute which has not been explored well but significantly helps us to understand the low demand for redistribution by the poor. I provide a stripped-down model that yields the following two predictions: (1) The poor and the rich oppose a proposed redistribution policy that offers some help to the poor, but only the middle support it, henceforth I call 'the observation,'[3] and (2) as income inequality gets severer, the economic conservatism of the poor is more pervasive, which I call 'the dynamics.'

More specifically, I consider a continuum of workers whose labor productivity (type) is one among three: low, middle, and high. Each worker compares his/her indirect utility under a "laissez-faire" economy with that of an economy that has an income tax rate of $t \in (0,1)$ and a lump-sum transfer. Although I believe that concern for a future generation's welfare would enable us to describe the dynamics across generations, and the coexistence of labor and capital income earners would help us to understand interactions between classes, I consider neither the overlapping generation nor capitalists on purpose, to focus on how public opinion on the redistribution policy for the current gen-

by heavy taxes on the rich. "Americans Continue to Say U.S. Wealth Distribution Is Unfair". gallup.com. Access: 10/8/2015.

[2]Some of the primitive ideas, not the main contributions, appeared in a more preliminary form in Kim and Choi (2015).

[3]A more relevant and realistic observation that we should try to understand may be that citizens whose income or productivity is below that of the decisive voter do not form a consensus on redistribution. For example, Kenworthy and McCall (2008) found that the median-voter hypothesis was not supported over time in eight nations during the 1980s and 1990s. The model considered here serves as one possible solution with two critical reversal points regarding public opinion about redistribution, rather than one.

eration is formed while shutting down all other possible channels. Within this model, my goals are reduced to (1) show a reasonable set of assumptions that predicts 'the observation,' and (2) examine whether a larger set of parameters predicts 'the dynamics' within such assumptions. This approach is parsimonious in the sense that it doesn't consider exogenous preferences over political parties, nor heterogeneous beliefs about the state of the world and the state of themselves. It also allows better comparative statics.

To capture economic mobility positively associated with the policy changes (Chetty et al., 2014), I assume citizens' productivity is slightly perturbed only if a new policy is implemented.[4] Then, positional concern would play a role to explain both 'the observation' and 'the dynamics.' By positional concern, I mean that citizens care for their relative position of consumption rank.[5] Even if a redistribution policy allows the poor to enjoy a larger amount of resources for consumption in *absolute* terms, some of the poor may have a *relatively* smaller amount of resources compared with others who used to have the same amount under the status quo policy. If the expected marginal disutility by positional concern exceeds the marginal utility from redistribution, they prefer to stay with the status quo. The rich will prefer the status quo because under a new redistribution policy their resources decrease in absolute terms, and for some of them, even in relative terms. The middle income group may prefer the new policy under a reasonable assumption about the utility from the relative rank.

The last-place aversion (LPA) reported by Kuziemko et al. (2014) is one of the key assumptions I rely on. If a last-place-averse citizen concerns for his/her relative position in general, the marginal disutility of moving down from the second bottom to the very bottom must be strictly greater than that of moving down from the third to the second bottom. Thus, the utility function which captures the positional concern should be increasing concave in position.[6]

Another contribution of this paper is to provide a way to find the desirable form of redistribution policy by observing the changes in public opinion about redistribution. I show that if positional concern is the main driving force behind economic conservatism of the poor, then the right skewness of income distribution is positively related to the increased economic conservatism of the low income group, while the increase in the income gap between groups is negatively related to it. The prospect of upward mobility works

[4]Although I assume a minuscule productivity shock for parsimonious representation of the model, it doesn't necessarily be a 'productivity' shock in particular. Any random component that could cause a chance of economic mobility will also work.

[5]In the sense that one's consumption affects the others' utility, positional concern is always associated with (negative) positional externality. In this paper, I interchangeably use 'positional concern' and 'positional externality' in relevant contexts.

[6]This increasing concave function plays an important role as does the increasing concave mobility function considered in Benabou and Ok (2001). I discuss it in greater detail in Section 4.

in the opposite way. If the low income citizens believe that opposing redistribution will be eventually beneficial for themselves in the future, the right skewness of income distribution will negatively affect the economic conservatism of the poor, while the increase in the income gap between groups is positively related to it. Thus, if positional concern is the main driving factor, utilitarian policymakers should focus more on increasing the low income citizens' standard of living to the middle class, while the prospect of upward mobility is main, minimizing income gaps by cutting down the top-income earnings could be of their primary interest.

The rest of this paper is organized as follows: In the following subsection, I review related studies. Section 2 describes economic models and some results from those models, Section 3 shows the dynamics of the model, and Section 4 discusses the relationship between the model and the prospect of upward mobility hypothesis and possibility of conducting empirical/experimental follow-up studies. Section 5 summarizes the lessons from this project. Omitted proofs are in the Appendix.

1.1 Related Literature

Since Thorstein Veblen (1899) addressed the low demand for redistribution by the poor, or the economic conservatism of the poor in a broader sense, a number of possible explanations contributes to the economic conservatism of the poor. The prospect of upward mobility may make the lower income citizens believe that opposing redistribution will bring economic prosperity and eventually it will be beneficial for them in the future (Benabou and Ok, 2001). Biased perceptions in individuals' evaluations of their own relative position in the income distribution drive the low-income citizens (who mistakenly believe that they are middle-income ones) to demand redistribution less (Cruces et al., 2013), and heterogeneous beliefs about intergenerational mobility affect preferences for redistribution (Alesina et al., 2018). The public may be following how the media covers household income inequality and how it relates to the government, as opposed to the inequality itself (Kelly and Enns, 2010). Distrust of the entire political system, doubts about the government's efficiency and cynicism about redistribution may prevent the poor from being liberal (Houtman et al., 2008). The underprivileged who lack self-esteem may prefer to identify themselves as a group (in this context, a state or a country) to which they belong, and this tendency may encourage them to support the conservative political party which advocates economic prosperity rather than economic equality.[7]

[7]This argument is related to the theory of optimal distinctiveness, a social psychological theory asserting that an individual's social identity is determined by the optimal balance between the desire of inclusion and the opposite desire of distinctiveness within and between social groups and situations (Brewer, 1991). However, even if this is the main channel for the low income citizens to identify themselves as members of a larger social group, the nation, we are not sure how this desire of inclusion is maintained when a liberal

Some may look for specific reasons about the lower income group's social/cultural conservatism applied to a specific region (Frank, 2004) or religion (Guiso et al., 2003), but there is no clear linkage between social/cultural conservatism and economic conservatism. It may also be possible that the public have a lexicographical preference for government policies, so public opinion about redistribution may be influenced by other issues. For example, the poor may decide to vote for a political party that offers the most preferred policy about, say, guns or abortion, and the party may happen to be against a redistribution policy. I admit all aforementioned explanations have their merits, and view this study as a complement to the existing arguments.

Veblen (1899) claims that implementing a new redistribution policy may give rise to some unexpected productivity shocks ("surplus of energy"). According to his argument, lower income citizens barely live within their means and they cannot afford the possibility of a negative productivity shock, and therefore they become conservative.[8] Meanwhile, the middle income citizens would appreciate the benefit of redistribution even after taking a productivity shock into account.[9] I am sympathetic to Veblen's argument and believe his observation is still valid, even outside of the United States.[10] At the same time, however, I found that there is little micro-foundation for his argument. Especially in a modern democracy where the voting cost is minimal, we cannot argue that every lower income class lives at the boundary of their constraints; even if there are some, the number should be marginal. Then it is possible for a marginal number of the poor to be conservative, but it does not necessarily mean that a substantial proportion of the poor is conservative. Moreover, if we narrow down his argument to the psychological cost-benefit analysis, there is no reason for the poor to be conservative. Rather, a higher proportion of abstention to the political decisions should have been observed (Rosenstone and Hansen, 1993) or their attitude should be related to social/cultural conservatism, not

political party is in power, and how it leads to the support of economic conservatism.

[8] One way of using this idea with the overlapping generation models could be considering the decisions about the human capital investment of which return is uncertain. It is shown that if people with sufficiently low human capital endowments are concerned about the situation where the return is not as great as they hoped, they may abstain from human capital investment (Blackburn and Chivers, 2015).

[9] *"(t)he process of readjustment of the accepted theory of life involves a degree of mental effort... This process requires a certain expenditure of energy, and so presumes, for its successful accomplishment, some surplus of energy beyond that absorbed in the daily struggle for subsistence... The abjectly poor... are conservative because they cannot afford the effort of taking thought for the day after tomorrow... (and they are) incapable of the effort required for the learning and adoption of new habits of thought."* [Veblen (1899), pp. 203–204.]

[10] Houtman et al. (2008) showed the working class' economic conservatism in Belgium. In South Korea, comparing those who self-reported that they are not in the lower income group to those who self-reported that they are in the lower income group, a smaller proportion of the lower income group felt that (1) income inequality should be dealt with by the government, (2) taxes should be increased to promote a nation's welfare and (3) the mandatory education service should be fully supported by the government (Kang, 2010).

economic conservatism (Lipset, 1959, 1981).

One possible way of completing this project could be to take positional externality into account. A positional good is defined as "one whose utility depends strongly on how it compares with others in the same category" (Frank, 2008). Positional goods do not necessarily mean conspicuous goods but also unwilling expenditures due to the social norm or social pressure (Hirsch, 1995; Chen, 2014), various types of investment in rent seeking (Tullock, 1980), the all-pay auction (Baye et al., 1996), or the rank-order tournament (Lazear and Rosen, 1981), and expenditures as signaling (Ireland, 1994) can also be represented by the form of positional goods. It is well known that when positional goods and non-positional goods coexist, the negative externality of positional goods[11] steers people to reallocate more of their resources to positional goods from non-positional goods (Frank, 1985; Hopkins and Kornienko, 2004). To consider this positional concern, I explicitly include the relative position of consumption in the utility function.[12] The positional externality may also depend on another dimension: social class (Gallice and Grillo, 2018), but to clearly illustrate the role of positional concern, I restrict the model as parsimonious as possible.

I show that if the citizens' utility, and, accordingly, public opinion, depend on positional concern, then the right skewness of income distribution is positively related to the increased economic conservatism of the low income group, while the increase in the income gap between groups is negatively related to it. Lupu and Pontusson (2011) found that redistribution increases in 15 advanced democracies as the dispersion of earnings in the upper half increases relative to the dispersion of earnings in the lower half. My study may serve as a theory that supports their finding.

In the sense that I posit a behavioral assumption to explain the low-income citizens' opposition to the redistribution policy, this paper is closely related to Kuziemko et al. (2014), where they observe the LPA both in the laboratory and in a survey about a minimum wage increase. Those who earn just above the minimum wage level may vote against a policy for a minimum wage increase because it could help the group just beneath them differentially, bringing the lower level group up to their level, which they dislike. It may explain why some of the lower income citizens vote against the redistribution policy. However, this explanation only applies to the group near the margin where the new policy directly affects, and the LPA by itself cannot explain why severer income inequality increases the economic conservatism of the poor. I take into account

[11] If one consumes positional goods more, then the utility of some other consumers decreases even though they do not change their consumption levels. See Luttmer (2005).

[12] See Clark et al. (2008), who claim that the presence of relative position terms in the utility function can play a significant role in economic models of behavior in the domains of consumption, investment, economic growth, savings, taxation, labor supply, wages and migration.

the idea of the LPA in an economy with a linear redistributive tax. The main results in this study are robust in modifications of the utility function representing preferences on relative rank. For example, I did not assume the first-place loving (Gill et al., 2018) as a counterpart of the LPA. If the first-place loving exists, that is, if the marginal utility of the change in rank from second place to first is greater than that from third place to second, we could consider the utility from the relative position as an inverted S-shaped odd function with zero marginal utility at the median. The main results in this study remain unaffected by this modification, and my claims can be more strongly supported by the coexistence of the first-place loving and the last-place averse. Charite et al. (2016) provide another related experimental evidence that emphasizes the importance of reference points to explain why a social planner may limit redistribution from the rich, but they mainly focus on the redistribution decision by a social planner, not on the demand of redistribution by the poor.

It is worth mentioning the probabilistic voting model (Ledyard, 1984; Lindbeck and Weibull, 1987) that predicts an equilibrium such that more inequality could be associated with smaller government. This is mainly because two competing parties consider nonlinear transfers to different groups, and if the low-income and high-income groups have non-pliable preferences over the parties' exogenous differences, political income redistribution should be targeted to groups who are swing voters. In this paper, however, I do not consider Downsian competition between political parties and exogenous differences in policy preferences, because one of the primary goals of this paper is to show the non-monotonic changes in opinion about redistribution without relying on heterogeneity in preferences. For a similar reason, I did not consider heterogeneous beliefs about the fairness of social competition and the value of effort which could lead to completely opposite tax policies in different equilibria (Alesina and Angeletos, 2005).

2 A Model

This section is composed in the following manner: I show that the standard model cannot predict 'the observation,' and then I show that it cannot be predicted even after introducing productivity shocks after implementation of a new tax policy. Finally, I introduce positional concern in the utility function and show that it reasonably predicts 'the observation,' and furthermore, I provide a testable prediction to address 'the dynamics.' For the sake of simplicity, functional forms are specified similar to those in Meltzer and Richard (1981), but my propositions hold in a more general setup.

There are three types of citizens/consumers whose type is indexed by θ_i, $i \in \{H, M, L\}$ with $\theta_H > \theta_M > \theta_L$. The type represents the labor productivity, that is, their output

is $y_i = \theta_i l$, where $l \in [0,1]$ is the amount of the labor supply. There is a unit mass of population. Let P denote the population distribution by type, that is, $P = (p_H, p_M, p_L)$, where p_i is the proportion of the citizens with θ_i and $p_H + p_M + p_L = 1$. Both θ_i and P are public information. For a benchmark, assume each type is equally populated, $P = (1/3, 1/3, 1/3)$.

In a decentralized economy, or in an economy with a non-taxation government, the citizen's preference is represented by the utility function $u_i(c_i, l_i; \theta_i)$, where c_i is the level of consumption and l_i is labor supply of citizen i. Assume that u_i is increasing and concave in c_i, and decreasing and convex in l_i. For now, assume $u_i(c_i, l_i; \theta_i) = \ln(c_i) - l_i^2/2$. The solution for each citizen's utility maximization problem is

$$\begin{aligned} \max\ & u_i(c_i, l_i; \theta_i) = \ln(c_i) - l_i^2/2 \\ \text{s.t. } & c_i \leq \theta_i l_i. \end{aligned} \tag{1}$$

The indirect utility function is:

$$v_i(\theta_i) = \max_{l_i} u_i(\theta_i l_i, l_i; \theta_i). \tag{2}$$

In this setup, $l_i^* = 1$ and $v_i(\theta_i) = \ln \theta_i - 1/2$ for all i. Now suppose that a redistribution policy is proposed. A proposed public policy is $((G_i)_{i=\{L,M,H\}}, t)$, where $G_i \in [0, g]$ is a lump sum transfer to consumer i and $t \in [0,1]$ is a linear tax rate on income.

A consumer's budget balance condition is:

$$c_i = G_i + (1-t)\theta_i l_i$$

Given t and G_i, we can find the indirect utility function as:

$$v_i(t, G_i; \theta_i) = \max_{l_i} \{u_i(G_i + (1-t)\theta_i l_i, l_i; \theta_i)\}$$

The government's budget condition given $((G_i), t)$ is $t \sum p_i y_i \geq \sum p_i G_i$. To make the problem simpler, assume that transfers are uniform, i.e., $G_i = G$ for all i.

Consider that a community holds a referendum. The citizens are divided into supporters and opposers of the referendum. If the number of votes in favor of the referendum is at least as big as the number against, the proposed change is approved. To shun additional complexity of voter turnout, assume that there is no abstention. Then the citizens' decision rule, $V_i \in \{S, O\}$, where S or O means that consumer i becomes, respectively, a

supporter or opposer, is straightforward:

$$V_i = \begin{cases} S & \text{if } v_i(t,G;\theta_i) \geq v_i(\theta_i), \\ O & \text{otherwise.} \end{cases} \tag{3}$$

To exclude the trivial case, consider $t > 0$ because when $t = 0$, $v_i(t,G;\theta_i) = v_i(\theta_i)$ for all i. For any redistribution policy, the poor will vote for the referendum, while the rich will vote against it.

Proposition 1. *For any $t \in (0,1)$, $V_L = S$ while $V_H = O$.*

Proof: See Appendix.

Proposition 1 is intuitive: The poor will favor any redistribution policy, while the rich will not. The upshot I want to convey here is that the opinion of the poor regarding redistribution is opposite to that of the rich. I neither consider the optimal policy nor pose the objective of the government. Indeed, Proposition 1 is stronger in a sense that it holds for any t. Moreover, the status quo condition specified, $t = 0$, is not necessary.

Corollary 1. *For any t, t' with $0 \leq t < t' \leq t_L^*$, $v_L(t',G',\theta_L) \geq v_L(t,G,\theta_L)$ and $v_H(t,G,\theta_H) > v_H(t',G',\theta_H)$, where $t_L^* = \arg\max_{t \geq 0} G(t) + (1-t)\theta_L l_L^* - l_L^{*2}/2$.*

Proof: See Appendix.

Next, following Veblen's (1899) argument, I take "some surplus of energy" into account. If a new policy is not accepted, consumer i's productivity remains at θ_i. If a new policy is accepted, then in the course of implementation, each consumer's new productivity becomes $\theta_i^n = \theta_i + \varepsilon$, where ε is a random variable whose mean is zero and variance, σ_ε^2, is finite. This random adjustment can be understood as a productivity shock. Also, it may capture a heterogeneous ability of adaptation. Unless the consumers are extremely risk-averse, this random adjustment would not drastically change the result of Proposition 1.

Redefine the indirect utility function as:

$$v_i(t,G;\theta_i^n,\epsilon) = \max_{l_i} E_{\theta_i^n}\left[u_i(G + (1-t)\theta_i^n l_i, l_i; \theta_i^n)\right].$$

The citizen's decision rule is still the same. Then, for any $t > 0$, we can find a sufficiently small σ_ε such that 'the observation' cannot be predicted.

Corollary 2. *For any $t \in (0, t_L^*]$, there is $\bar{\sigma}_\varepsilon(t) > 0$ such that for any $\sigma \leq \bar{\sigma}\varepsilon(t)$ $V_H = O$ and $V_L = S$.*

Proof: See Appendix.

Proposition 1 and Corollaries 1 and 2 reiterate our commonsense: Any redistribution policy, even if it may bring some uncertainty after implementing it, will be supported by the poor and opposed by the rich. Another property we can obtain from this setup is that if the productivity shock is large enough to make the poor vote against the referendum, the middle and the rich will also vote against it.

Proposition 2. *For a sufficiently large $\sigma_\varepsilon > 0$ such that $V_L = O$, $V_M = V_H = O$.*

Proof: See Appendix.

That is, if the poor do not prefer a redistribution policy due to the high productivity shock associated with the policy implementation, the middle and above, who will be less benefited than the poor, will also have the same opinion. Though we can create some extreme situations to meet Veblen's (1899) argument, this can only mean that all income classes vote against a proposed policy. There is evidence that a high tax rate is positively associated with a higher chance of economic mobility (Chetty et al. (2014)), so it makes sense to introduce a way to disturb an existing relative rank. However, the massive productivity shock by itself can hardly be supported as a reason for the low demand of the poor for redistribution. Throughout this paper, I will assume that productivity shock exists but it is substantially small.

Now, consider a positional concern by replacing the utility function $u_i(c_i, l_i; \theta_i)$ with:

$$u_i(c_i, l_i, F(c_i); \theta_i, \alpha),$$

where $F(c)$ is a cumulative distribution function of population mass at consumption level c, and $\alpha \in [0,1]$ is a weighting parameter that captures the degree of positional concern. Assume the utility function is given as:

$$u_i(c_i, l_i, F(c_i); \theta_i, \alpha) = (1-\alpha)\left(\ln(c_i) - l_i^2/2\right) + \alpha\psi(F(c_i)),$$

where $c_i = \theta_i l_i$ and $\psi : [0,1] \to \mathbb{R}$ is an increasing concave function with $\psi(1/2) = 0$. Note that α captures how seriously consumers are concerned for the relative rank of their consumption. The previous model is a special case of this model when $\alpha = 0$. If $\alpha = 1$, all citizens' utility is governed by the relative rank of their consumption and they will simply oppose any redistribution policy due to the concavity of the utility.

It is worth separating this positional utility with the Keeping-up-with-the-Joneses (KUJ) utility, one of the frequently used reference-dependent utility functions. Although

the KUJ utility function may be understood as a special variation of this function, which can be shown as:

$$u_i(c_i, l_i, R(c_i); \theta_i, \alpha) = (1-\alpha)\left(\ln(c_i) - l_i^2/2\right) - \alpha(c_i - R(c_i))^2,$$

where $R(c_i)$ is a comparison point, often described as a mean or median of the consumption distribution, the KUJ utility is *not* a special case of the positional utility functions as it lacks one important feature of positional concern—positional competition. Even at the highest income level, people are comparing their positions with the others in the same category, and a very small positive deviation from the cohort will make one better off, and at the same time make the others worse off, that is, the models with the positional utility predicts a sort of "deviations" from the consumption level of the comparable group. However, the KUJ utility decreases as their decision deviates from the comparison point, all the models with the KUJ utility predict a sort of "reversion" to the comparable consumption level. This limits the possibility of incorporating the feature of positional competition.

Note also that utility from the relative rank is represented by an increasing concave function with zero utility at the median. This captures the findings that the marginal disutility of the change in rank from the second bottom to the bottom is greater than that from third place to second, that is, it shows the last-place aversion (Kuziemko et al., 2014). We may also assume for the first-place loving that the marginal utility of the change in rank from second place to first place is greater than that from third place to second (Gill et al., 2018), by considering an inverted S-shaped odd function with zero marginal utility at the median. When we modify the utility function in this manner, the main results in this study remain unaffected or are more strongly supported.

Equilibrium can be described in the manner of a symmetric Bayesian Nash Equilibrium. Each citizen, with a belief of consumption distribution, makes a decision on labor supply, and then the equilibrium allocation is consistent with the belief. It is reasonable to start with the belief that the consumption distribution is also described by $P = (p_H, p_M, p_L)$, and indeed it constructs an equilibrium. They do the same exercise to calculate the equilibrium labor supply for the case when the redistribution policy is implemented. Then they vote for or against the policy if accepting it makes them better or worse off, respectively.

Proposition 3. *There exists a pair* $(t, \alpha) \in [0,1]^2$ *such that* $V_H = V_L = O$ *and* $V_M = S$ *with a sufficiently small productivity shock.*

Proof: See Appendix.

The basis of Proposition 3 is as follows: Instead of continuous productivity shock, consider that ε has two possible values, ϵ and $-\epsilon$, with equal probability. Assume that ϵ is small enough that it does not raise economic mobility across initial types, that is, $\theta_L + \epsilon < \theta_M - \epsilon$. For either the rich or the poor, new productivity shocks, no matter how small they are, give them the possibility of losing their current position with a 50 percent chance. Of course, a positive shock will give them a chance to keep the current consumption rank, but the marginal disutility of losing a current rank is greater than the marginal utility of keeping a current rank, which is zero. As for the poor, for example, the current relative rank of consumption is p_L, but after a new policy is implemented, half of the poor will have the relative rank of $p_L/2$ and the other half will have the relative rank of p_L. Even though the marginal gain of accepting the redistribution policy is positive for the poor, it is possible for them to vote against the policy when the expected marginal disutility of losing the current rank from p_L to $p_L/2$ is greater than the marginal gain. Meanwhile, the citizens with θ_M will be less affected by productivity shock because they will be, by and large, in the middle even after the new policy is implemented. Specifically, their current relative rank is $p_L + p_M$, but after a new policy is implemented, the half of the consumers with θ_M will have the relative rank of $p_L + p_M/2$. Though this brings some disutility, its magnitude is much smaller than that of the lower income citizens due to the concavity of $\psi(F(c))$.

Table 1: An Example of 'the Observation'

t	0.12	0.13	0.14	0.15	0.16	0.17	0.18	0.19	0.2	0.21	0.22	0.23	0.24	0.25	0.26
V_L	O	O	O	O	O	O	O	O	O	O	O	O	O	S	S
V_M	O	O	S	S	S	S	S	S	S	S	S	S	S	S	S
V_H	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O

Under a specific tax rate shown in the first row, $V_i = O$ when citizens with θ_i oppose a proposed redistribution in equilibrium, and $V_i = S$ when they support it, $i \in \{H, M, L\}$. $\{P, \Theta, \epsilon, \alpha\}$ are assumed to be $\{(1/3, 1/3, 1/3), (0.9, 1, 2), 0.01, 0.2\}$. When the income tax rate varies from 0.14 to 0.24, the low income citizens do not want redistribution, while the middle income citizens do.

Table 1 exemplifies a set of parameters that supports 'the observation' under the above simplified setup with $P = (1/3, 1/3, 1/3)$, $\Theta = (0.9, 1, 2)$, $\epsilon = 0.01$ and $\alpha = 0.2$. I also set $\psi(F(c)) = \log(F(c))$. When the tax rate varies from 0.14 to 0.24, the low income citizens oppose a proposed redistribution policy, but the middle income citizens support it in equilibrium.

Note that the magnitude of productivity shock, or ability of adaptation, is not a main driving force yielding the desirable prediction because the relative rank can be proportional to the size of the population even when a productivity shock is sufficiently small. We cannot explain 'the observation' by simply adding a small productivity shock in a standard model (Corollary 2). With a sufficiently large productivity shock, the model

without consideration of positional concern unilaterally predicts that there would be no demand for redistribution (Proposition 2). In the example shown in Table 1, I set $\epsilon = 0.01$, but any positive number below 0.1 will yield the same results.

3 Explaining 'The Dynamics'

Another beauty of this model is that it also helps us to understand why the lower income citizens exhibit economic conservatism more as income inequality gets severer. In particular, this model can provide a testable prediction of economic conservatism regarding how income inequality gets severer. Although income inequality arises in a more complex way in real-life situations, in the model are basically two orthogonal cases where income inequality gets severer, when the income gap between groups gets larger or when the proportion of the lower income citizens gets larger while that of the higher income citizens gets smaller.[13] In my model the former can be captured by the mean-preserving spread of $(\theta_L, \theta_M, \theta_H)$ and the latter by the skew of (p_H, p_M, p_L). The Gini coefficient is a well-known measure used to capture income inequality, but it is silent about how the changes in income inequality arose. For example, see Figure 1. The blue lines in both graphs show the Lorenz curves with $P = (1/3, 1/3, 1/3)$ and $\Theta = (0.6, 1, 1.8)$ and the red lines show changes in the Lorenz curve due to different parameters. On the left, Θ is changed from $(0.6, 1, 1.8)$ to $(0.43, 1, 2.14)$, while on the right P is changed from $(1/3, 1/3, 1/3)$ to $(6/15, 5/15, 4/15)$. Even though those two changes in income inequality yield almost similar Gini coefficients, a larger set of parameters supports 'the dynamics' with the type of changes on the right if positional concern is the main cause of economic conservatism of the poor. Let P' denote (p'_H, p_M, p'_L), where $p'_H \leq p_H$ and $p'_L \geq p_L$. That is, the proportion of the high (low) income citizens decreased (increased) in P'. On the other hand, let $\Theta' = (\theta'_L, \theta_M, \theta'_H)$, where $\theta'_L = \theta_L - \delta$ and $\theta'_H = \theta_H + \delta$ for some $\delta \in (0, \theta_L)$.

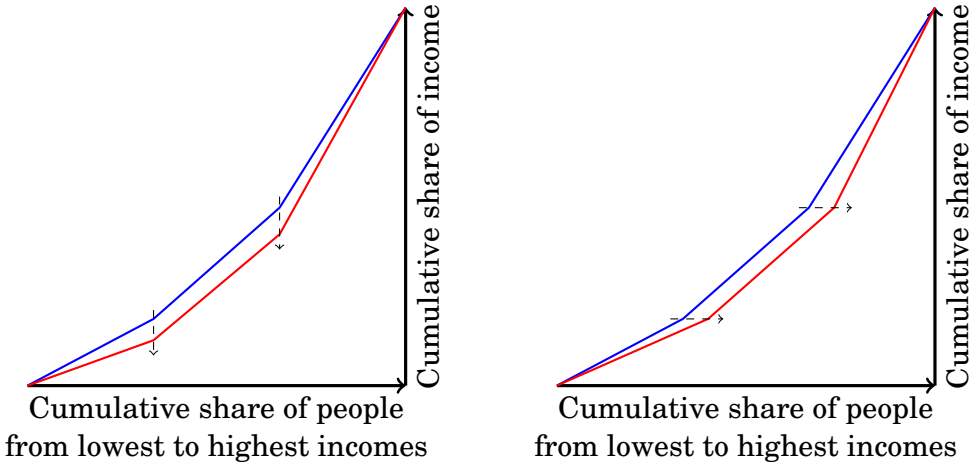
Proposition 4. *Define* $A_{P,\Theta} = \{(t, \alpha) \in [0,1]^2 | V_H = V_L = O\}$ *for a given* P, Θ, *and a sufficiently small* ϵ. *For any* P' *and* Θ', $A_{P,\Theta'} \subset A_{P,\Theta} \subset A_{P',\Theta}$.

Proof: See Appendix.

In the sense that the model with positional concern can explain 'the observation' only under a specific set of parameters, the prediction from Proposition 3 is, at best, describing one snapshot of the phenomenon. Though some of the low income citizens do not want redistribution, others of them still want it. Since each citizen may have a different α and

[13] Of course any linear combination of the two scenarios could increase income inequality, which is indeed more likely in real-life situations.

Figure 1: Changes in Income Inequality: Two Lorenz Curves



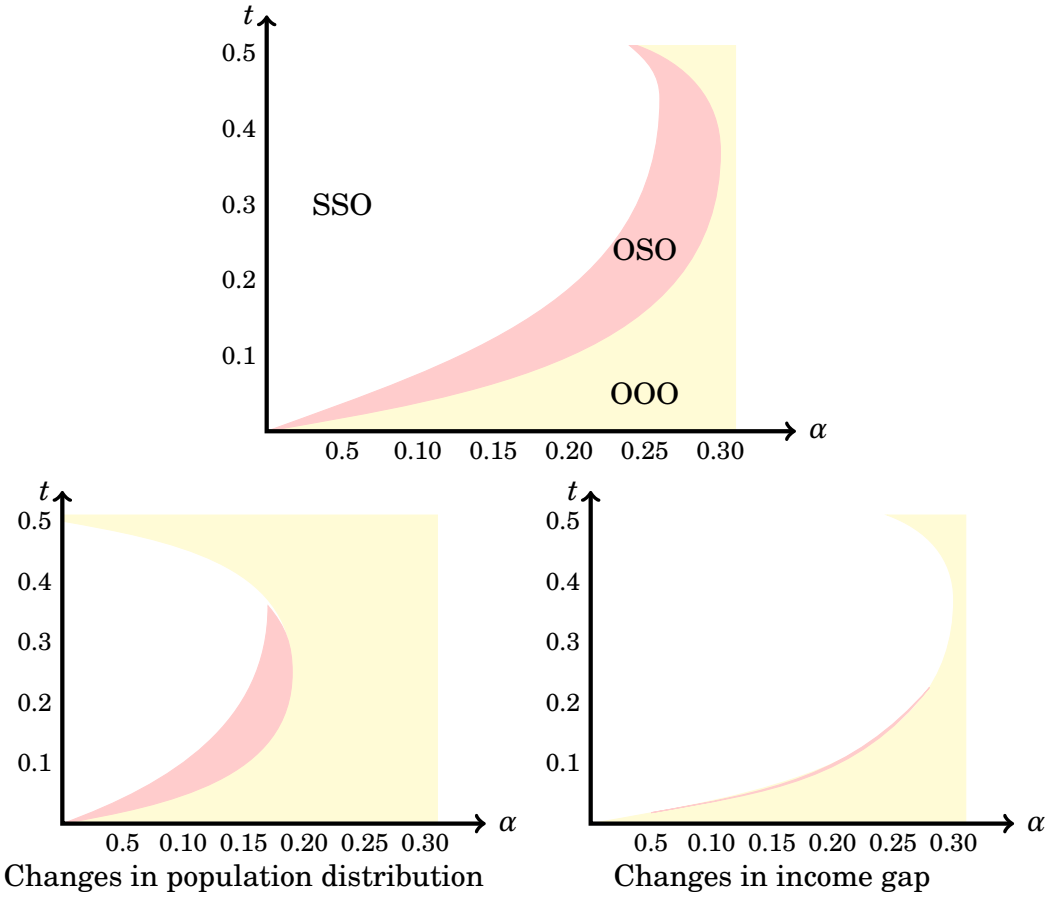
Blue lines in both graphs show Lorenz curves with $P = (1/3, 1/3, 1/3)$ and $\Theta = (0.6, 1, 1.8)$. The red line on the left is a Lorenz curve with $P = (1/3, 1/3, 1/3)$ and $\Theta = (0.43, 1, 2.14)$, while the red line on the right is with $P = (6/15, 5/15, 4/15)$ and $\Theta = (0.6, 1, 1.8)$. (Left) Income inequality gets severer as the income gaps between types get larger. (Right) Income inequality gets severer as the proportion of the low (high) type gets larger (smaller). Even though those two changes in income inequality look similar, hence yield similar Gini coefficients, a larger set of parameters supports 'the dynamics' with the changes in proportions.

risk preferences, even if positional concern were to be the main cause of the observation, I can only interpret that some citizens' α coincides within the $A_{P,\Theta}$. Therefore, it is important for us to know whether the model fits with a larger set of parameters when income inequality grows without changing the functional form of utilities. I claim in Proposition 4 that if the changes in right-skewness yield more of the low income citizen's economic conservatism but the mean-preserving spread of the income distribution yields less of it, then positional concern could be the driving force behind 'the dynamics.'

The intuition behind Proposition 4 is fairly straightforward. Even if the income, or income-generating productivity, gaps across types get larger, the expected utility changes from the relative rank would remain the same. At the same time, the lower income citizens could expect more marginal utility gain from redistribution because they would pay less taxes and the high income citizens would pay more. That is, the lower income citizens may enjoy a larger redistribution in absolute terms with the same expected marginal disutility of losing the current relative position. It implies that a smaller set of parameters will support 'the dynamics.' It is the opposite with changes in proportion of the population distribution. When the income distribution is more concentrated at the lower income level, the lower income citizens would more likely vote against the redistribution policy. The marginal benefit of redistribution in absolute terms is getting smaller because the lump sum transfer is evenly distributed to the citizens with θ_L, while the

government's revenue for the transfer comes from the smaller proportion of the population with θ_H. The marginal cost of implementing the new policy is getting larger for the low income group because the expected marginal disutility of receiving $-\epsilon$ is larger.

Figure 2: Opposite Predictions from Changes in Income Inequality



The x-axis and the y-axis in each graph represent the degree of positional concern, α, and the income tax rate, t, respectively. The shaded areas (in both yellow and red) represent $A_{P,\Theta}$, where $P = (1/3, 1/3, 1/3)$ and $\Theta = (0.9, 1, 2)$ (Top), $A_{P',\Theta}$, where $P' = (0.2333, 0.3333, 0.4334)$ (Bottom Left), and $A_{P,\Theta'}$, where $\Theta' = (0.8, 1, 2.1)$ (Bottom Right), respectively. The shaded areas in red represent parameter pairs that yield $V_L = O, V_M = S, V_H = O$. Each entity consists of three letters and each of them represents each type's opinion on redistribution. For example, 'SSO' means $V_L = S, V_M = S, V_H = O$, which is trivially predicted by the model without positional concern.

Figure 2 illustrates how the parameter set changes with two different causes of severer economic inequality. Each graph in Figure 2 shows a set of parameter pairs (t, α) that yields public opinion which could not be captured in previous studies. The x-axis of each graph represents the degree of positional concern, α, and the y-axis represents the income tax rate t. The value for ϵ is set at 0.01. The shaded areas in red and yellow represent $A_{P,\Theta}$, that is, when parameter coordinates are in the shaded area the low income citizens would vote against a proposed redistribution. Shaded areas in red represent

parameter pairs where only the middle income citizens support the proposed redistribution. The graph on the top is generated with $P = (1/3, 1/3, 1/3)$ and $\Theta = (0.9, 1, 2)$. The bottom left graph is with Θ and $P' = (1/3 + 0.1, 1/3, 1/3 - 0.1)$, and the bottom right one is with P and $\Theta' = (0.9 - 0.1, 1, 2 + 0.1)$. As we can see, $A_{P,\Theta'} \subset A_{P,\Theta} \subset A_{P',\Theta}$.

This clear distinction brings us a testable prediction about the relationship between the changes in income inequality and the economic conservatism of the lower income citizens. Changes in the income gap will not generate more economic conservatism of the low income citizens, but when a higher proportion of the population is at the low income level they become more conservative.

4 Discussions

4.1 A comparison with the prospect of upward mobility

Positional concern with a small productivity shock may not be the only possible way of explaining the poor citizens' low demand for redistribution. Benabou and Ok (2001) show that the prospect of upward mobility can rationally drag down the social demand for redistribution, though the prospect of upward mobility hypothesis cannot directly explain why some of the poor demand redistribution less than the middle income citizens do, because it always predicts that citizens whose expected income is below that of the decisive voter (in this context, the median income citizen) will support the redistribution policy. The underlying factor that drives low demand for redistribution is the strict concavity in the mobility process: If the lower income citizens believe they, or their offspring, may move upward on the income ladder more sharply than the higher income citizens move downward, then they might not want redistribution. If the prospect of upward mobility is the main driving force behind the low demand for redistribution it will yield the opposite predictions to those in Proposition 4, that is, severe income inequality due to an increase in the income gap will lessen demand for redistribution while severe income inequality due to changes in right skewness of the income distribution will increase demand.

For illustration, I provide a simplified example from Benabou and Ok (2001). Suppose that risk-neutral agents decide today between a laissez-faire scheme and complete sharing with respect to the next period's income, and that the latter is a sum of a deterministic function of current income and some shocks: $y' = \sqrt{y} + \varepsilon$ for all y in an interval $[0.5, 1.5]$, where $\varepsilon \sim N(0, \sigma^2)$. Assume further that the agents are equally populated in terms of their current income, that is $y \sim U[0.5, 1.5]$ so that the average and median income is $\mu = \int_{0.5}^{1.5} y dy = 1$. Note that the transition function is normalized so that

someone with income equal to the average, $\mu = 1$, maintains the same expected income level tomorrow ($\mu' = E[y'] = \sqrt{1} = 1$). Everyone will expect that complete sharing gives $\int_{0.5}^{1.5} \sqrt{y} dy = 0.9890$ in expectation. It means that everyone whose income is initially less than 0.9781 (=0.9890^2) will see their expected income rise under complete sharing, and conversely, all those who are initially richer will experience a decline. Since the probability mass of losers is bigger than that of winners under the complete sharing scheme, or in other words, an agent with median initial income can rationally expect to be richer in the laissez-faire scheme, the median voter will oppose the complete redistribution of future income.

Considering the example above as a benchmark, I do two comparative analyses: one with the mean-preserving spread of income distribution, which is analogous to the changes from Θ to Θ', and the other one with the skewness change of the distribution, analogous to the changes from P to P'.[14] If the initial income is uniformly distributed on the interval $[0,2]$ instead of $[0.5,1.5]$, $\mu = \mu' = 1$ still holds. Everyone will expect that complete sharing gives $\int_0^2 \frac{1}{2}\sqrt{y} dy = 0.9428$. It means that everyone whose income is initially less than 0.8889 (=0.9428^2) will see their expected income rise, and, conversely, all those who are initially richer will experience a decline. In the benchmark case the decisive income was 0.9781 while now it is 0.8889. It means that, even after considering some degree of risk-averseness, the likelihood that the median voter will demand future redistributions is smaller than that in the benchmark example case. Now suppose that the initial income is distributed on $[0.5,1.5]$, with a probability distribution function of $f(y) = 3-2y$ instead of $f(y) = 1$, that is, the proportion of agents decreases with respect to y. The average income is $\mu = \int_{0.5}^{1.5}(3-2y)y dy = 0.8333$. Normalize the transition function by scaling with μ, so that someone with income equal to the average maintains the same expected level tomorrow, that is, $y' = \sqrt{\mu y} + \varepsilon$. Everyone will expect that complete sharing gives $\int_{0.5}^{1.5}(3-2y)\sqrt{\mu y} dy = 0.8252$, which is greater than the median voter's expected income, 0.8129.[15] Thus, the median voter, when being asked to choose either no taxation or complete sharing, will choose complete sharing. It suggests that the likelihood that the median voter will demand future redistributions is higher for a given tax rate than that in the benchmark example.

This illustration is not a back-to-back comparison with the model that I propose because the model in Benabou and Ok (2001) considered only two extreme cases, $t \in \{0,1\}$, for analytical simplicity, but it at least sheds some light on the crucial differences in predicting 'the dynamics' of public opinion on redistribution. Properly explaining economic

[14] It should be noted that here we consider the skewness of the initial income distribution, not that of idiosyncratic income shock as Benabou and Ok (2001) considered.

[15] The median income is 0.7929 because $\int_{0.5}^{0.7929}(3-2y)dy = 1/2$. The median income citizen's expected income is $\sqrt{0.7929\mu} = 0.8129$.

phenomena, though they are seemingly puzzling, may not be of policymakers' interests, but they should be concerned for the fundamental aspects that lead to the phenomena. If positional concern matters, utilitarian policymakers should consider ways to minimize the proportion of people crowed at the poverty level, while if an individual's prospect of upward mobility was the key, they should think about ways to reduce income gaps. Both ways policymakers can attain a smaller income inequality, typically measured as a Gini coefficient, but as we learned, how the income distribution is shaped is as important as the level of income inequality.

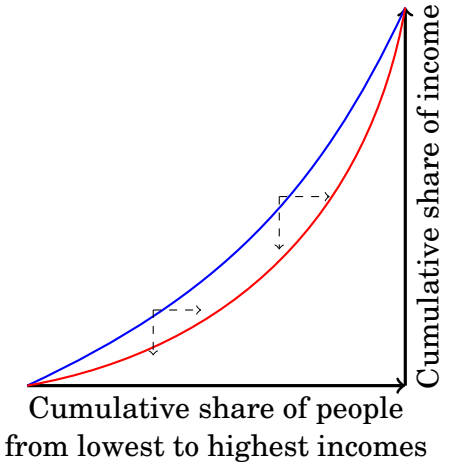
4.2 Empirical/Experimental Studies

A naturally followed attempt is to seek empirical evidence to test the theoretical predictions of the model. An increase in inequality due to an increase in the right-skewness of the income distribution will make it more likely to observe economic conservatism of the poor, while an increase in inequality due to an increase in the income gap between the bottom and the top of the distribution will make it less likely to observe economic conservatism of the poor. Thus it would be ideal to find some country-level evidence on these, using data from a panel of countries on both redistribution policies and changes in income inequality. However, it is easier said than done. The main challenge is to decompose the changes in skewness with the spread of the income gap, because both happen *simultaneously* in reality. Figure 3 illustrates this issue on decomposition. Suppose income inequalities of one country are collected for two time periods. Unlike the model where we easily distinguish the changes in the right-skewness from the changes in the income gap by examining kinked points of Lorenz curves, changes in income inequality can be solely explained by the right-skewness or by the income gap. Of course any combination of these two can also explain the changes in income inequality. Unless a policymaker is willing to forcefully shut down one channel of inequality changes, empirical data would be exposed to the issues of underidentification.

Controlled lab experiments are a plausible alternative. What I propose is a mixture of the many-player divide-the-dollar game[16] with random states and rank-based payments: In each round, subjects in the laboratory are randomly given their type (a constant number randomly drawn from $\{0.9, 1, 2\}$), and one randomly recognized player proposes the allocation of a unit of budget. If the proposal is rejected by majority then they will have an equally divided budget whose payoff is a multiplication of the type and share of the

[16] Since Baron and Ferejohn (1989) introduce a structural form of legislative bargaining, many-player divide-the-dollar game has been a workhorse for many experimental studies. The proposed design of experiments is similar to the design of Agranov and Palfrey (2015) who experimentally test the Meltzer–Richard model.

Figure 3: Decomposing Changes in Income Inequality?



The blue line shows a (hypothetical) Lorenz curve measured in year t, and the red one is a Lorenz curve in year t'. Although it is clear to tell that income inequality gets severer, changes in income inequality can be solely explained by the right-skewness (horizontal arrows), solely explained by the income gap (vertical arrows), or explained by any combination of these two.

budget. If it is supported by majority, then the proposed allocation is implemented, with the new type either increased or decreased by 0.05 with equal probability from the initial type. At the end of the game, they additionally get paid based on their relative rank. If the results of this experiment fit with the theoretical prediction about 'the observation,' one could consider two treatment sessions where each treatment modifies the values of type and the probability of each type, respectively. These treatments will tell us whether positional concern is the main driving force behind 'the dynamics.'

5 Concluding Remarks

I showed that positional externality and a small productivity shock associated with the new policy implementation can successfully explain why some of the low income citizens demand redistribution less than the middle income citizens and under which conditions the proportion of low income citizens opposing redistribution increases with increased income inequality. If the marginal gain from redistribution in absolute terms is smaller than the expected marginal loss from a relative position, the low income citizens may not demand redistribution. The spread of the income gap by itself does not predict such observations, but the changes in right skewness of the income distribution do.

To the best of my knowledge, this is the first trial in the literature of political economy to incorporate positional externality, though positional concern is hard to be ignored,

and to some degree, is essential to our daily lives. The model that I consider in this paper poses lots of assumptions for simplification, which could be relaxed. Especially, I assume that the labor productivity (type) is publicly observable, but as Mirrlees (1971) argues, the types are more likely to be unobservable from the perspective of government. I realize that it is challenging to find the optimal taxation when households have private information about their labor productivity and positional concerns on certain goods, but it will be worth investigating the effect of positional concern on the optimal taxation. I also specified the shape of the utility function for positional concern, and the implicit assumption by the specification is that citizens are concerned for their relative rank of consumption over the entire population, which may not be necessarily true in general. Though it has been empirically and experimentally supported that individuals care for their relative rank more when they are in the lower rank than the middle, one may be worried if it could be applied to cases with a larger population. Besides the theoretical improvement, laboratory experiments could be conducted to test the idea of positional concern.

Appendix

Proof of Proposition 1: Our goal is to show that $y_L^* < y_M^* < y_H^*$. If $y_L^* < y_M^* < y_H^*$, then $y_H^* > (y_L^* + y_M^* + y_H^*)/3 > y_L^*$, and therefore the consumers with θ_H pay a tax more than what they receive, while ones with θ_L pay less than what they receive. The first order condition of the maximization problem is

$$\frac{(1-t)\theta_i}{G + (1-t)\theta_i l_i^*} = l_i^*$$

Solving for l_i^*, we have $l_i^* = \frac{\sqrt{G^2+4(1-t)^2\theta_i^2}-G}{2(1-t)\theta_i}$ or $y_i^* = \theta_i l_i^* = \frac{\sqrt{G^2+4(1-t)^2\theta_i^2}-G}{2(1-t)}$. Since $\theta_H > \theta_M > \theta_L$, it immediately follows that $y_H^* > y_M^* > y_L^*$. Next, we show that $v_H(t,G;\theta_H) < v_H(\theta_H)$. From the government's budget condition, $G(t) = t(p_H y_H^* + p_M y_M^* + p_L y_L^*) = \frac{t}{3}(y_H^* + y_M^* + y_L^*)$ Since $G(t) + (1-t)\theta_H l_H^* = \frac{t}{3}(\theta_H l_H^* + \theta_M l_M^* + \theta_L l_L^*) + (1-t)\theta_H l_H^* < \theta_H l_H^*$, $\ln(\theta_H l_H^*) - {l_H^*}^2/2 > \ln(G + (1-t)\theta_H l_H^*) - {l_H^*}^2/2 = v_H(t,G;\theta_H)$. Therefore $\max_{l_H}\{\ln(\theta_H l_H) - l_H^2/2\} \geq \ln(G + (1-t)\theta_H l_H^*) - {l_H^*}^2/2$ for any l_H^*, $v_H(\theta_H) > v_H(t,G;\theta_H)$. $v_L(t,G;\theta_H) \geq v_L(\theta_H)$ can be shown similarly. □

Proof of Corollary 1: t_L^* is the optimal tax level from the perspective of the low income group. We know $t_L^* > 0$ by Proposition 1, so the statement is well defined. We want to show that citizens with θ_H want zero taxes. By the Envelope Theorem,

$\frac{\partial v_H(t,G;\theta_H)}{\partial t} = \frac{-\theta_H l_H^*}{G+(1-t)\theta_H l_H^*} < 0$, that is, their indirect utility is decreasing in t. □

Proof of Corollary 2: By Proposition 1, $v_H(\theta_H) > v_H(t,G;\theta_H^n,0)$. By continuity, there exists a sufficiently small ϵ such that $v_H(\theta_H) > v_H(t,G;\theta_H^n,\epsilon)$. □

Proof of Proposition 2: By Jensen's inequality, for any ε and ε' with $\sigma_\varepsilon > \sigma_{\varepsilon'}$, $v_i(t,G;\theta_i^n,\varepsilon) < v_i(t,G;\theta,\varepsilon')$. Thus we can find a sufficiently large productivity shock such that $v_L(t,G;\theta_L^n,\varepsilon) < v_L(\theta_L)$. Since $u_{c\theta} = 0$, by the single-crossing property, $c_M^* \geq c_L^*$, which leads $v_M(\theta_M) - v_M(t,G;\theta_M^n,\epsilon) \geq v_L(\theta_L) - v_L(t,G;\theta_L^n,\epsilon)$. Since σ_ε is large enough to have $v_L(\theta_L) - v_L(t,G;\theta_L^n,\varepsilon) > 0$, $V_M = O$. $V_H = O$ is analogous. □

Proof of Proposition 3: For a sufficiently small shock, $V_H = O, V_L = S$ when $\alpha = 0$ by Proposition 1. We also know that if θ_M is equal to or smaller than the mean productivity, $V_M = S$. See Meltzer and Richard (1981). Therefore when $\alpha = 0$, $(V_L,V_M,V_H) = (S,S,O)$. For any $\alpha > 0$, redefine the indirect utility function at the status quo as: $v_i(\theta_i,\alpha) = \max_{l_i}(1-\alpha)(\ln(\theta_i l_i) - l_i^2/2) + \alpha\psi(F(\theta_i l_i))$. First I show that Bayesian Nash equilibrium exists and $v_i(\theta_i,\alpha) = (1-\alpha)(\ln\theta_i - \theta_i^2/2) + \alpha\psi(\sum_{j:\theta_j\leq\theta_i} p_j)$. Under the initial belief that all other's consumption remain unchanged, any one citizen makes the consumption-labor decision. Then the marginal benefit of labor supply is $(1-\alpha)/l_i + \alpha\psi'(F(\theta_i l_i))F'(\theta_i l_i)\theta_i$ and the marginal cost of labor supply is $(1-\alpha)l_i$. In this quasilinear setup the labor supply is not distorted, that is, $l_i^* = 1$ because without considering the second term of the marginal benefit, $\alpha\psi'(F(\theta_i l_i))F'(\theta_i l_i)\theta_i$ which is positive, the optimal labor supply decision is already binding in the support of labor supply. With considering that $l_i^* = 1$ for all i, it is straightforward to attain the indirect utility $v_i(\theta_i,\alpha) = (1-\alpha)(\ln\theta_i - \theta_i^2/2) + \alpha\psi(\sum_{j:\theta_j\leq\theta_i} p_j)$, which is consistent with the initial belief we posed. Now suppose that a redistribution policy is proposed. $v_i(t,G;\theta_i^n,\alpha,\epsilon) = \max_{l_i} E_\epsilon[(1-\alpha)(\ln(G+(1-t)\theta_i^n l_i) - l_i^2/2) + \alpha\psi(F(G+(1-t)\theta_i^n l_i))]$. Initially guess that $G+(1-t)\theta_i l_i^*$ is weakly monotone increasing so the relative rank of consumption for θ_L is p_L, for θ_M is p_L+p_M, and for θ_H is 1, respectively. Then the expected utility for positional concern would be determined by ϵ, productivity shock, so it doesn't affect individual's optimization problem. Because the cross-partial derivative of the objective function with respect to c and θ is zero, we find that c^* is weakly monotone increasing in type by Topkis' theorem, and therefore, we verify our guess. When $\alpha = 1$, it is straightforward to have $(V_L,V_M,V_H) = (O,O,O)$ unless $\epsilon = 0$ due to the concavity of $\psi(\cdot)$. Since $(V_L,V_M,V_H) = (S,S,O)$ when $\alpha = 0$, but $(V_L,V_M,V_H) = (O,O,O)$ when $\alpha = 1$, by continuity, we can find (at least locally) $a_M^* \in (0,1)$ such that $V_M = O$ if $a > a_M^*$, and $V_M = S$ if $a < a_M^*$. We can find $a_L^* \in (0,1)$ similarly. This proof can be done by considering θ_L sufficiently close to θ_M. First note that if $\theta_M = \theta_L$, then $a_M^* = a_L^*$. When θ_L changes

from from θ_M to $\theta_M - \delta$ for a small positive δ, $a_M^* > a_L^*$ because $\psi(\cdot)$ is increasing and concave, $\psi'(F(c_L^*)) > \psi'(F(c_M^*))$, and it is fixed regardless of the difference between θ_L and θ_M. Therefore, we can pick $\delta > 0$ such that the differences in marginal utilities from redistribution of both types is smaller than $\psi'(F(c_L^*)) - \psi'(F(c_M^*))$, which is strictly positive. Under such δ, $(V_L, V_M, V_H) = (O, S, O)$ in equilibrium. □

Proof of Proposition 4: Our first goal is to show that for any $(t,\alpha) \in A_{P,\Theta}$, it belongs to $A_{P',\Theta}$. $(t,\alpha) \in A_{P,\Theta}$ implies that $v_L(\theta_L,\alpha,P) > v_L(t,G;\theta_L,\alpha,P)$, where $G = t(p_L y_L^* + p_M y_M^* + p_H y_H^*)$. Since $y_H^* > y_L^*$, $p_L' > p_L$, and $p_H' < p_H$, $\tilde{G} = t(p_L' y_L^* + p_M y_M^* + p_H' y_H^*) < G$. That leads a decrease in G in equilibrium. Since $v_L(t,G;\theta_L,\alpha,P) \geq v_L(t,G;\theta_L,\alpha,P')$, $(t,\alpha) \in A_{P',\Theta}$. Our second goal is to show that for any $(t,\alpha) \in A_{P,\Theta'}$, it belongs to $A_{P,\Theta}$. $(t,\alpha) \in A_{P,\Theta'}$ implies that $v_L(\theta_L,\alpha,\Theta') > v_L(t,G;\theta_L,\alpha,\Theta')$, where $G = t(p_L \theta_L' l_L^* + p_M \theta_M l_M^* + p_H \theta_H' l_H^*)$. Since $\theta_L > \theta_L'$, and $\theta_H' > \theta_H$, $\tilde{G} = t(p_L \theta_L l_L^* + p_M \theta_M l_M^* + p_H \theta_H l_H^*) < G$. That leads a decrease in G in equilibrium. Since $v_L(t,G;\theta_L,\alpha,\Theta') \geq v_L(t,G;\theta_L,\alpha,\Theta)$, $(t,\alpha) \in A_{P,\Theta}$. □

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