Essays in Political Economy

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Dedication

To my wife Belen, who has supported me every day, and to my children Pedro, Javier, Ignacio and Nicolas, for always reminding me what is trully important.

Abstract

How does the interaction between inequality and social mobility affect the choice of fiscal policy? I analyze this question in a model of democratic politics with imperfect tax enforcement, where the ability of individuals to evade taxes limits the amount of redistribution in the economy. Social mobility creates an insurance motive that increases voluntary compliance, favoring the tax enforcement process. In such an environment, redistributive pressures brought about by an increase in inequality are only implementable in highly mobile societies. On the contrary, when mobility is low, higher inequality reduces tax rates and redistribution. I empirically test this prediction using data on absolute upward mobility for the 50 US states and the District of Columbia, and measuring redistribution as state and local government expenditure per capita. I find a strong, positive and highly significant relation between inequality and redistribution for states with relatively high levels of social mobility: A one Gini-point increase in inequality is associated to roughly $800 higher expenditure per capita. This effect dissipates in states with low levels of mobility. Finally, I embed the politico-economic environment of the paper in a simple endogenous growth model, in order to analyze how inequality directly and indirectly affects the growth process when social mobility and tax evasion are taken into account.

Contents

List of Tables

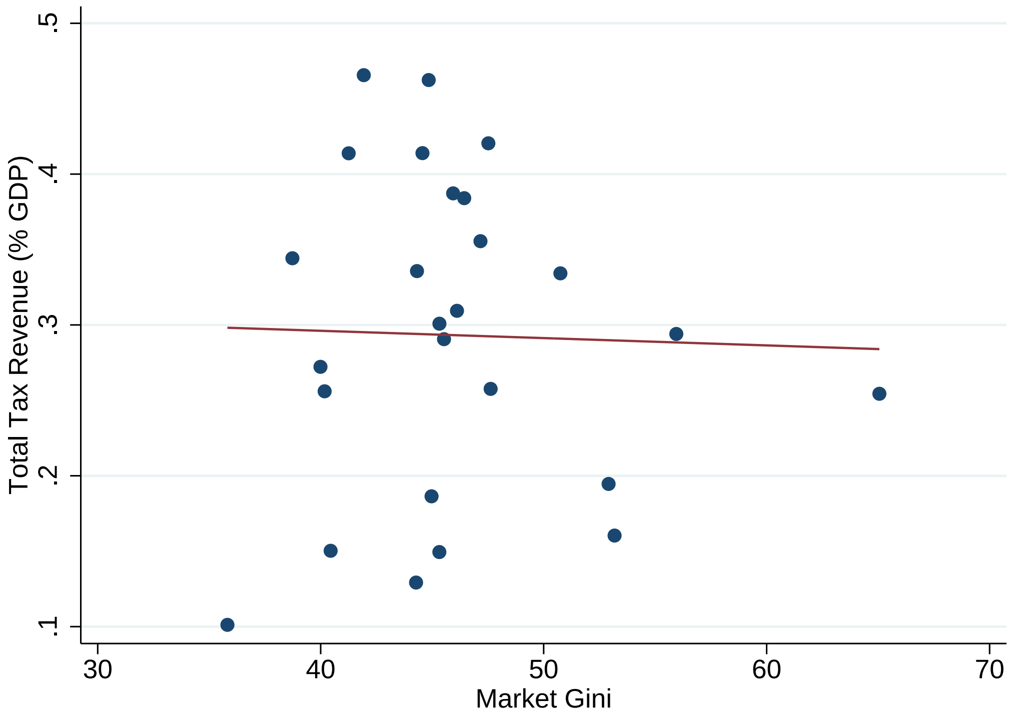
List of Figures

Chapter 1

Introduction

The standard politico-economic theory derives a positive relation between inequality and the level of taxation and redistribution (Romer (1975), Roberts (1977), Meltzer and Richard (1981)). In a democratic political environment, the choice of fiscal policy reflects the preferences over redistributive taxes of the median (pivotal) voter. Higher inequality implies a poorer median voter relative to the country average, which fosters pressures to increase taxes and redistribution. This mechanism is at the heart of many politico-economic models used to explain cross-country differences regarding the size of the welfare system, the level of democratization (Acemoglu and Robinson (2006)) or the effect of inequality on economic growth (Persson and Tabellini (1994)). Nevertheless, this prediction has found little support in cross sectional empirical studies, which have generaly reported an insignificant relation between inequality and different measures of redistribution (Perotti (1996), Rodriguez (1999), Benabou (1996)). Figure 1.1 shows this for a sample of 26 countries. Although based on an appealing economic logic, the Meltzer-Richard effect does not completely explain the relationship between inequality and fiscal policy. It seems thus necessary to include additional factors in the theoretical framework in order to fully understand the effects of inequality on taxation and redistribution.

Figure 1.1: Inequality and Redistribution

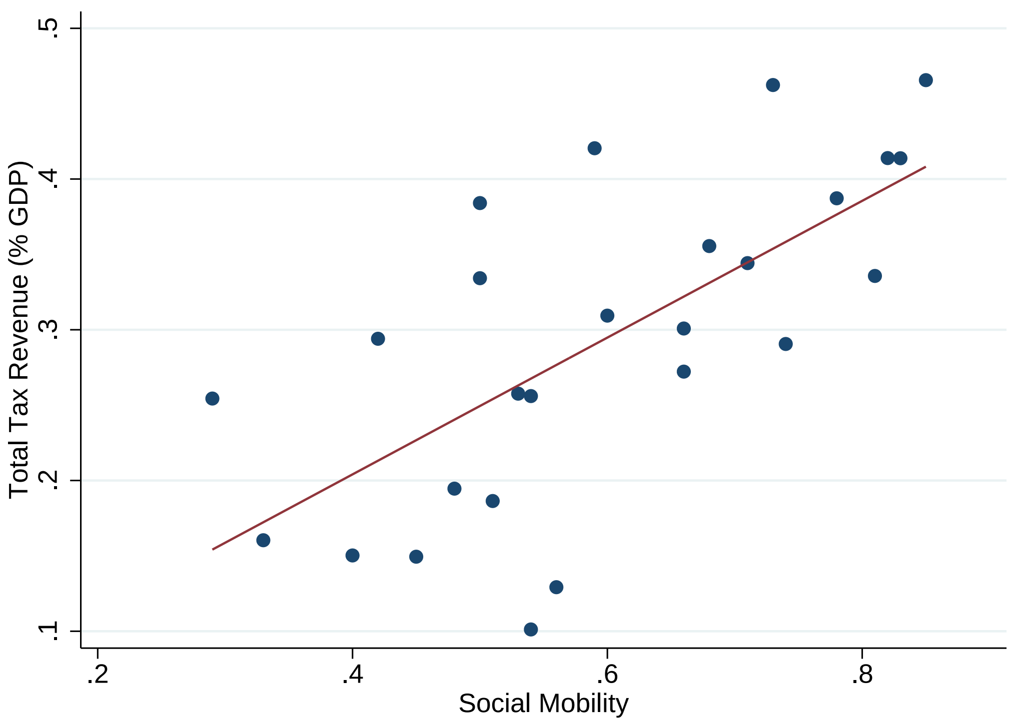


Note: Each point represents a country. Averages for the period 1980-2010. Market Gini coefficients from Solt (2016). Total tax revenue including social contributions from the UN Government Revenue Dataset 2016 (World Bank).

In this paper I introduce two features that, in addition to inequality, can influence the choice of fiscal policy in a political environment: tax evasion and social mobility. Both of them try to capture the idea that the implementation of fiscal policy involves some costs which vary depending on the degree of voluntary cooperation of individuals. On the one hand, tax evasion can be seen as an outside option for relatively rich individuals who expect to be harmed by the redistributive component of fiscal policy. Although tax evasion involves risks and costs, it might be the optimal choice for some individuals when the redistributive burden is sufficiently large. As a result, it limits the amount of resources that a relatively poor majority can extract from those relatively rich individuals through the tax system. A situation of increasing inequality that rises the income of the rich with respect to the country average also increases the redistributive weight on them, and makes more appealing the option for tax evasion. There is some empirical support for the intuition that higher inequality is associated with higher tax evasion and non-compliance (Bloomquist (2003)). The rationale lies in the fact that increasing inequality shifts the composition of income from employment-based sources (matchable) to investment-based ones (non-matchable), and thus facilitates tax evasion. Recent research by Alstadster et al. (2017) reinforce the intuition that individuals at the top end of the income distribution are more likely to make use of tax heavens to avoid the payment of their tax obligations.

On the other hand, I introduce social mobility, which creates uncertainty about future income. In a world with heterogeneity in the income distribution and social mobility, fiscal policy serves two purposes: redistribution from rich to poor, and insurance against income volatility. These two effects determine how individuals value a given fiscal policy, and therefore their incentives to voluntarily participate in the tax and transfer system. Think of an individual who is relatively wealthy today. In a world where there is limited socio-economic mobility, he would be harmed by the redistributive component of fiscal policy, and the insurance benefits would be small. If the tax system is strongly redistributive, he would try to slip away from it by any means. But in a world of high mobility, during his lifetime the redistributive burden would be lower and he would also benefit from the insurance effect of fiscal policy, making more likely his voluntary participation in the tax and transfer system. Therefore, social mobility not only increases the desirability of of a redistributive tax scheme due to insurance motives, but also favors the implementation of fiscal policy as it reduces the incentives for evasion and fosters voluntary tax compliance. If this intuition is correct, we would expect to see a positive relation between social mobility and the level of redistribution. That is, more socially mobile countries should redistribute more. Figure 1.2 shows that this is the case for the same 26 countries as in figure 1.1.

Figure 1.2: Social Mobility and Redistribution



Note: Each point represents a country. Total tax revenue is the average for the period 1980-2010. Social mobility measured as $(1 - \text{IGE})$ where IGE is the intergenerational elasticity of income. Data on IGE is taken from Corak (2006), Corak (2013) and Brunori et al. (2013).

I first formalize these ideas in a simple political economy model with two types of individuals, poor and rich. The poor constitute a majority of the population, and thus are decisive in the choice of fiscal policy in the economy. When making their decision over tax rates, voters take into account the implementability of fiscal policy. Therefore, the joint effects of inequality, mobility and the tax enforcement technology determine the level of taxation and redistribution in the economy. The main result is that the effect of inequality on fiscal policy depends on the level of social mobility. In particular, there is a positive effect of inequality on taxation only in highly mobile societies. If mobility is low, higher inequality decreases tax rates. Consequently, the positive relation between inequality and redistribution is weakened as social mobility decreases, and can eventually become negative. The economic mechanism behind this result parallels the intuition of the previous paragraph. Higher inequality always increases the appetite for redistribution of the relatively poor majority, but they understand that their desires are only effectively implementable if the rich participate in the tax and transfer system, and do not opt for tax evasion. When mobility is relatively high, an increase in income inequality makes fiscal redistribution more beneficial for the rich, as it insures them against the possible downward mobility, and thus reduces their incentives to evade taxes. This opens the door to a more redistributive tax scheme that the majority of poor individuals exploit, increasing tax rates and redistribution. Therefore, with high mobility, the positive relation between inequality and redistribution predicted by the standard theory holds. On the contrary, when social mobility is relatively low, an increase in inequality represents an increasing redistributive burden for the rich, while the insurance benefits of fiscal policy are low due to the small risk of downward social mobility. In this context, incentives for the rich to evade taxes and avoid harmful redistribution increase. As a result, the majority of poor individuals are forced to reduce taxes if they want to keep the rich in the system. Regarding the direct effect of social mobility on redistribution (for a given level of income inequality), the model predicts a positive relation. Higher mobility fosters the insurance benefits of the tax system, again discouraging tax evasion and allowing for the effective implementation of higher redistribution. In a similar fashion, a more efficient tax enforcement technology, modeled as higher audit and penalty rates, is also associated to higher levels of taxation and redistribution.

I generalize the model with a distribution of family types, and obtain similar results to those in the two type model using numerical methods. In particular, inequality has again different efects on tax rates depending on the level of social mobility. The main contribution of such a extension is that with a distribution of types there is in general a positive measure of individuals who evade taxes, which allows for an analysis of the effects of changes in the exogenous variables in the equilibrium level of tax evasion. In accordance with basic intuition, a more efficient tax enforcement process in the form of higher audit or penalty rates discourages tax evasion, both as a fraction of total population and as a fraction of total income. The numerical example shows that the fraction of population who evade taxes is decreasing in the level of social mobility. It also shows that evasion is increasing in the level of inequality, more so in less mobile societies.

I empirically test the main results of the theoretical model with with state level data for the USA. I take advantage of the wotk carried out by Chetty et al. (2014), who estimate measures of social mobility using tax records data on more than 40 million children and their parents. I use their measure of *absolute upward mobility*, the mean rank in the national income distribution of children born to parents at the 25th percentile of the national income distribution, and Gini coefficients before taxes and transfers to measure market inequality. I test whether inequality has different effects on redistribution in states with high average levels of mobility versus less mobile states. Redistribution is measured as total state and local government expenditures per capita. I run OLS regressions splitting the sample between high and low mobility states, and the results confirm the predictions of the theoretical model.

For the subsample of high mobility states, higher inequality significantly increases the level of redistribution. In particular, a 1 Gini point increase in inequality is associated with an increase in expenditure per capita of around $800. On the contrary, for the low mobility states, the coefficient on inequality is non-significant. Higher mobility is associated with higher redistribution in both subsamples, according to the theoretical predictions. I run a similar regression using the whole sample, but introducing an interaction term between inequality and mobility, that captures the differential effects of inequality on redistribution for different levels of mobility. The interpretation of the results is similar, pointing to an increasing positive effect of inequality on redistribution as mobility increases.

Finally, I embed the politico-economic framework described above in a simple endogenous growth model, in order to analyze the effects of inequality on long run economic growth. Even though the model is very simplified, it allows to study direct and indirect effects of inequality on growth that have received attention in the literature. The introduction of social mobility and tax evasion modifies some typical results on the literature. In particular, the indirect political economy mechanism proposed by Persson and Tabellini (1994) that predicts that higher inequality would be detrimental to economic growth because it fosters distortionary taxation and redistribution now only holds when social mobility is relatively high, as only in this case higher inequality increases taxes. When social mobility is low, increasing inequality reduces taxation and is therefore benefitial to economic growth. Regarding the direct mechanisms that link inequality and growth, social mobility does not change the sign of these effects (positive or negative), but changes their magnitude. In settings in which inequality creates a direct negative effect on economic growth, like those proposed by Galor and Zeira (1993) or Aghion et al. (1999b) among others, higher inequality is specially harmful in societies with low social mobility, as growth is further reduced by the decrease in taxation and redistribution. On the contrary, in settings where inequality is good for growth like Kaldor (1957), the benefits of inequality are higher the less mobile is the society. When both direct and indirect channels are in play, the overall effect is ambiguous in some cases.

Related Literature. A variety of papers have studied the political economy of taxation and redistribution, and in particular the role of inequality in democratic environments (see Borck (2005) for a survey). Different theoretical arguments have been proposed in order to rationalize the empirical evidence. This paper is especially related to those that have stressed social mobility as an important factor that drives preferences for redistribution. Moene and Wallerstein (2001) analyze the joint effect of inequality and mobility on the level of redistribution in a political economy setting, focusing on the targeting of transfers. Benabou and Ok (2001) study the "prospects for upward mobility hypothesis", or why the poor might not support higher levels of redistribution if they expect to be relatively rich in the future and thus be harmed by such a fiscal policy as net contributors. Piketty (1995) builds a model in which the past mobility experience of individuals is the source of their preferences for redistribution. Other theoretical arguments have been made to try to explain the lack of empirical support for the positive relation between inequality and redistribution. Papers like Benabou (2000) or Karabarbounis (2011) have studied the differences in political participation among rich and poor as a mechanism that could explain the puzzle. The introduction of individual tax evasion builds on the work of Allingham and Sandmo (1972) and Yitzhaki (1974), and reviewed by Slemrod and Yitzhaki (2002). Regarding tax evasion and its effect on the choice of fiscal policy in a democratic environment, this paper is closely related to that of Borck (2009), Roine (2006) and Traxler

(2006).

The paper is organized as follows. In chapter 2, I set up a two type politico-economic model in which I sequentially introduce inequality, tax evasion and finally social mobility, and derive the theoretical results about the effect of inequality on fiscal policy. Chapter 3 presents a generalization of the model with a distribution of types, and some numerical results. I empirically test the predictions of the model in chapter 4, using US state level data and a small cross-section of countries. In chapter 5 I embed the politico-economic framework of chapter 2 in a simple endogenous growth model. Chapter 6 concludes.

Chapter 2

Two type Model

This section presents a simple theoretical framework to understand how inequality, social mobility and tax evasion interact and affect the choice of fiscal policy in a democratic political environment. First, I lay out a basic politico-economic model that resembles the standard Meltzer and Richard (1981) setting, in which inequality is the only driver of fiscal policy. The standard result of the positive effect of inequality on tax rates is derived. Then I introduce tax evasion, which reverses the previous result: higher inequality decreases tax rates. Finally, the introduction of social mobility yields the main result of the paper: higher inequality leads to increases in taxation *only* in societies with relatively high mobility, while it produces a decrease in taxes when mobility is low.

2.1 Basic Meltzer and Richard Setting

There is a continuum of individuals indexed by $i \in [0, 1]$, who live for one period. Each individual receives an exogenous endowment at the beginning of the period, that can be high or low, $y^i \in \{y_H, y_L\}$. I will assume that there is a fraction $\delta < \frac{1}{2}$ of high endowment individuals, so average income in the economy is given by $\bar{y} = \delta y_H + (1-\delta)y_L$. Preferences are common across individuals and given by $U(c) = \frac{c^{1-\sigma}}{1-\sigma}$, where $\sigma \geq 1$.

There is a government that collects proportional taxes on income, and redistributes total tax revenue across individuals in a lump-sum fashion. The tax rate $\tau \in [0,1]$, is determined in a democratic political process that takes place once endowments are known to everyone, in which each individual has one vote.

Given that the low endowment individuals constitute a majority of the population, the equilibrium tax rate (τ^*) will be the most preferred tax for them. In this simple setting with no tax distortions, there are only two possible cases. If income inequality is non-existent ($y_H = y_L$), every individual is indifferent between any pair of tax rates. If income inequality is positive ($y_H > y_L$), the equilibrium tax rate is always 1. Intuitively, the poor individuals are extracting as much resources as possible from the rich ones, given that taxation is frictionless in every sense. The introduction of taxation costs, or elastic labor supply in a production economy, gives rise to an interior solution for the tax rate. In such a setting, we obtain the well known result that the equilibrium tax rate is increasing in the level of income inequality.

2.2 Tax Enforcement Frictions

Assume now that the tax enforcement process is not perfect. Once endowments are realized and the vote on fiscal policy has taken place, each agent decides if he wants to voluntarily comply with his tax obligations, or try to circumvent the tax and transfer system through tax evasion. Let $\rho^i \in \{0, 1\}$ determine the comply-evasion decision of individual i, with $\rho^i = 1$ denoting evasion. The government audits an exogenous fraction of the population, $\theta \in [0,1]$. If an individual decides to evade taxes and is audited, the government imposes an exogenous penalty on his income $\eta \in [0,1]$, and he consumes the rest. In addition, he is excluded from transfers. If a tax evader is not audited, he consumes his initial endowment. In practice, it is as if he was living in autarky, not paying taxes nor receiving transfers. Total tax revenue, voluntarily paid and enforced through audits, is lump-sum redistributed among those individuals who did not evade. This way of modeling tax evasion resembles public programs that condition their benefits to previous participation, like pension systems or unemployment insurance in many developed countries.

Definition 1 (Politico-Economic Equilibrium). *An equilibrium is a tax policy and a set of private economic decisions such that:*

1. *The tax rate (τ^*) cannot be defeated by any alternative in a majority vote.*
2. *The decision of whether to comply or evade taxes (ρ^i) is optimal for every individual.*

Let $\bar{V}(\tau)$ be the utility of an individual with high endowment, and $\underline{V}(\tau)$ of a low endowment individual, when everyone complies with the tax rate τ. Let $\bar{V}^e$ and $\underline{V}^e$ be the utility in case of tax evasion for a high and low endowment individual respectively. Thus:

$$\bar{V}(\tau) = U\left((1-\tau)y_H + \tau\bar{y}\right)$$

$$\underline{V}(\tau) = U\left((1-\tau)y_L + \tau\bar{y}\right)$$

$$\bar{V}^e = \theta U\left((1-\eta)y_H\right) + (1-\theta)U\left(y_H\right)$$

$$\underline{V}^e = \theta U\left((1-\eta)y_L\right) + (1-\theta)U\left(y_L\right)$$

It is obvious that $\underline{V}(\tau) \geq \underline{V}^e$, so a poor individual always voluntarily complies with his tax obligations. For a rich individual, his optimal compliance-evasion decision will depend on the tax rate (τ) and the tax enforcement parameters (θ, η) . Therefore, when voting over tax rates, the poor individuals need to take into account that the rich might opt for tax evasion if taxes are too high. Imperfect tax enforcement limits the ability of poor individuals to extract resources from the rich and, if audit and penalty rates are not too high, makes full redistribution not implementable. The following proposition characterizes the politico-economic equilibrium as the highest tax rate that satisfies that those with high endowment choose to comply with their fiscal obligations.

Proposition 1. *The equilibrium tax rate (τ^*) is the highest tax such that $\bar{V}(\tau) \geq \bar{V}^e$. For $U(c) = \frac{c^{1-\sigma}}{1-\sigma}$, it is given by:*

$$\tau^* = \min\left\{\frac{y_H(1-A)}{y_H - \bar{y}}, 1\right\}$$

Where $A = \left[\theta\left((1-\eta)^{1-\sigma} - 1\right) + 1\right]^{\frac{1}{1-\sigma}}$.

Proof. To show the result, it is necessary to prove first that at τ^*, every individual chooses to comply with the tax system, $\rho^i = 0, \forall i$. Let $\underline{\tau}$ be such that for any $\tau > \underline{\tau}$, the poor individuals prefer the rich ones to comply with taxes. Conversely, for any $\tau < \underline{\tau}$ they prefer the rich to evade. Similarly, let $\bar{\tau}$ be such that for any $\tau > \bar{\tau}$, the rich individuals prefer to evade taxes, while for any $\tau < \bar{\tau}$ they are better off taking part of the tax and transfer system. If $\underline{\tau} \leq \bar{\tau}$, then there is always a tax rate that induces the rich individuals to comply, and makes the poor individuals better off than when the rich evade. We can find $\underline{\tau}$ equalizing the utility of the poor individual when everyone complies to his utility when the rich individuals evade taxes:

$$U(y_L + \tau(\bar{y} - y_L)) = U\left(y_L + \frac{\delta\theta\eta y_H}{1-\delta}\right)$$

Therefore:

$$\underline{\tau} = \frac{y_H}{y_H - y_L}\frac{\theta\eta}{1-\delta}$$

Notice that $\underline{\tau}$ is independent of the utility function. We can find $\bar{\tau}$ in the same way, as the tax rate that satisfies $\bar{V}(\tau) = \bar{V}^e$. In this case, the solution will depend on the function U. It is easy to show that for linear utility, $\bar{\tau} = \frac{y_H}{y_H-y_L}\frac{\theta\eta}{1-\delta} = \underline{\tau}$. Notice that $\bar{V}(\tau)$ is not risky, while $\bar{V}^e$ involves a gamble given by the audit process. Thus an increase in the risk aversion of the individuals would make $\bar{\tau}$ increase. Therefore, for any concave function U, it is always the case that $\underline{\tau} \leq \bar{\tau}$, and the poor will choose a tax rate that implies generalized compliance.

Given that $\bar{V}(\tau)$ is strictly decreasing in τ, and $\underline{V}(\tau)$ strictly increasing in τ, the poor individuals will vote for the highest tax rate that satisfies that the rich participate in the tax and transfer system, that is τ^* such that $\bar{V}(\tau^*) = \bar{V}^e$ for an interior solution, or $\tau^* = 1$ otherwise. For the case of CRRA utility, in case of an interior solution, the equilibrium tax rate solves:

$$\frac{(y_H + \tau(\bar{y} - y_L))^{1-\sigma}}{1-\sigma} = \frac{\theta(1-\eta)^{1-\sigma}y_H^{1-\sigma}}{1-\sigma} + \frac{(1-\theta)y_H^{1-\sigma}}{1-\sigma}$$

With some algebra we can get $\tau^* = \frac{y_H(1-A)}{y_H-\bar{y}}$, where $A \in [0,1]$ is given in the proposition. In the case of a corner solution, the rich are better off complying than evading taxes for any $\tau \in [0,1]$, so the poor would choose an equilibrium tax of $\tau^* = 1$. ■

The characterization of the equilibrium tax rate allows to analyze how it would vary with changes in the rest of exogenous variables of the model. The following propositions establish some comparative static results regarding the effect of changes in the tax enforcement parameters and the level of inequality in initial endowments on the equilibrium tax rate, in the case of an interior solution.

Proposition 2. *The equilibrium tax rate (τ^*) is increasing in the audit rate (θ) and the penalty rate (η).*

Proof. The result can be proved taking the derivative of τ^* with respect to θ and η:

$$\frac{\partial \tau^*}{\partial \theta} = -\frac{y_H}{y_H - \bar{y}} \frac{1}{1-\sigma} \left[\theta((1-\eta)^{1-\sigma} - 1) + 1\right]^{\frac{\sigma}{1-\sigma}} \left((1-\eta)^{1-\sigma} - 1\right) > 0$$

$$\frac{\partial \tau^*}{\partial \eta} = \frac{y_H}{y_H - \bar{y}} \frac{1}{1-\sigma} \left[\theta((1-\eta)^{1-\sigma} - 1) + 1\right]^{\frac{\sigma}{1-\sigma}} \theta(1-\sigma)(1-\eta)^{-\sigma} > 0$$

■

Proposition 3. *Let (y'_H, y'_L) be a mean preserving spread of (y_H, y_L), so that $y'_H > y_H$, $y'_L < y_L$ and $\bar{y}' = \bar{y}$. A mean preserving spread decreases the equilibrium tax rate (τ^*).*

Proof. A mean preserving spread increases y_H while keeping $\bar{y}$ constant, so the sign of its effect on τ^* is determined by:

$$\frac{\partial \tau^*}{\partial y_H} = -\frac{(1-A)\bar{y}}{(y_H - \bar{y})^2} < 0$$

■

The intuition behind proposition 2 is clear. An increase in the probability of being audited (θ) or the penalty when audited (η), discourages evasion for the rich, thus allowing for the implementation of a higher tax rate. When the government is sufficiently efficient enforcing fiscal policy, evasion is too risky and a full redistribution tax scheme is implementable. Proposition 3 shows how the introduction of tax evasion reverses the sign of the relation between inequality and tax rates from the previous section. An increase in inequality increases the utility for the rich under both compliance and evasion, but the increase in the latter is always higher, leading to a necessary decrease in the equilibrium tax rate.

In order to analyze the effect of inequality on the effective level of redistribution, I will define differnet measures of redistribution. A commonly used measure of redistribution is the level of government tax revenue or spending (as a fraction of total output or in per capita terms). In this simple model with no saving and borrowing, government revenue and expenditures per capita are the same, and given by $\tau^* y$. Tax revenue or expenditures as a fraction of total output is just τ^*. Therefore, measuring redistribution in this way, we just need to analyze the changes in the equilibrium tax rate.

Another typical measure of redistribution is obtained as the difference between pre and post tax and transfer Gini coefficients, sometimes referred as absolute redistribution. In this simple setting with only two types of individuals, the Gini coefficient is given by the difference between the share of total income of the high type individuals and their share in the population. Therefore, the market Gini (pre-tax and transfer) and net Gini (post-tax and transfer), and abosolute redistribution in the economy are given by:

$$\text{Market Gini} = \frac{\delta y_H}{\bar{y}} - \delta = \delta\left(\frac{y_H - \bar{y}}{\bar{y}}\right)$$
$$\text{Net Gini} = \frac{\delta(y_H - \tau(y_H - \bar{y})}{\bar{y}} - \delta = \delta\left(\frac{(1-\tau)(y_H - \bar{y})}{\bar{y}}\right)$$
$$\text{Absolute Redistribution} = \text{Market Gini} - \text{Net Gini} = \delta\left(\frac{y_H - \bar{y}}{\bar{y}}\right)\tau$$

Given the expressions above and the result of proposition 3, the effect of an increase in inequality on the level of tax revenue (or government spending) is determined by the change in the equilibrium tax rate. That is, an increase in inequality is associated with higher redistribution. On the contraty, the effect of rising inequality on redistribution measured as the difference between pre and post taxes and tranfers inequality is not clear. On the one hand, higher inequality increases y_H and thus the term in parenthesis. On the other, higher inequality decreases the equilibrium tax. As a result, the total effect on absolute redistribution can be positive or negative.

2.3 Social Mobility

In order to introduce uncertainty, assume that each individual is born to a family that can be of two types, high or low. There is a fraction δ of high type families. The family type of each individual determines the stochastic process that will govern the realization of his endowment. In particular, an individual born to a high type family will have a high endowment with probability π, and a low endowment with probability $(1 - \pi)$. Conversely, an individual born to a low type family will have a low endowment with probability γ and and high endowment with probability $(1 - \gamma)$. In order to keep the fraction of high type families and endowments constant and equal to δ, it must be that $\gamma = 1 - \frac{(1-\pi)\delta}{(1-\delta)}$. This assumption also ensures that average income in the economy is again given by $\bar{y} = \delta y_H + (1 - \delta)y_L$. It will be helpful to assume that $\pi \geq \frac{1}{2}$, so an individual born to a rich family is more likely to turn out rich tan poor. The family to which an individual is born is known at the beginning of the period, but the realization of actual endowments is only known after the vote on fiscal policy has taken place, and the evasion-compliance decision has been made.

The timing of the model with tax enforcement frictions and income mobility is then:

1. Family types are realized.
2. Majority vote on the tax rate τ.
3. Compliance/evasion decision by each individual ρ^i.
4. Uncertainty is resolved and the endowment of each individual is known, y^i.
5. Audit process.
6. Redistribution of total tax revenue (voluntarily paid plus enforced).
7. Consumption takes place, c^i.

Using the same notation as in the previous section, we can define the expected utility of individuals born to a high and low family, when everyone complies with the tax rate τ, as $\bar{V}(\tau)$ and $\underline{V}(\tau)$ respectively. Let $\bar{V}^e$ and $\underline{V}^e$ denote their utilities under evasion. Notice that the position of the bar determines the family type of the individual, not his endowment after all uncertainty has been resolved y^i. Therefore, we can define:

$$
\begin{aligned}
\bar{V}(\tau) =& \pi U\left((1-\tau)y_H + \tau\bar{y}\right) + (1-\pi)U\left((1-\tau)y_L + \tau\bar{y}\right) \\
\underline{V}(\tau) =& \gamma U\left((1-\tau)y_L + \tau\bar{y}\right) + (1-\gamma)U\left((1-\tau)y_H + \tau\bar{y}\right) \\
\bar{V}^e =& \pi\left(\theta U\left((1-\eta)y_H\right) + (1-\theta)U\left(y_H\right)\right) + \\
& (1-\pi)\left(\theta U\left((1-\eta)y_L\right) + (1-\theta)U\left(y_L\right)\right) \\
\underline{V}^e =& \gamma\left(\theta U\left((1-\eta)y_L\right) + (1-\theta)U\left(y_L\right)\right) + \\
& (1-\gamma)\left(\theta U\left((1-\eta)y_H\right) + (1-\theta)U\left(y_H\right)\right)
\end{aligned}
$$

When socio-economic mobility is present, fiscal policy serves two purposes: redistribution and risk sharing. Given the assumptions on π and γ, fiscal policy involves only beneficial effects for individuals born to a poor family, as these individuals always receive a positive net transfer, and taxation reduces their income risk. For this reason, individuals born to poor families always prefer to comply than evade taxes ($\underline{V}(\tau) \geq \underline{V}^e$). For individuals from rich families, the benefits in terms of insurance trade off against the cost in terms of redistribution to the poor. Again, the compliance-evasion decision for these individuals will depend on the tax rate decided in the majority voting, and the rest of exogenous parameters of the model (y_H, y_L, θ, η). For a sufficiently high tax rate, the redistributive costs are greater than the insurance benefits, and higher tax rates are always harmful for them. The following lemma summarizes the previous discussion, and will be helpful to understand the characterization of the equilibrium tax rate in this environment.

Lemma 1. *$\underline{V}(\tau)$ is increasing in the tax rate (τ). Further, there exists $\tau_{max} < 1$ such that $\bar{V}(\tau)$ is decreasing for any tax rate $\tau > \tau_{max}$.*

Proof. Denote by c_H the consumption of an individual with high realized endowment, and c_L the consumption of an individual with low realized endowment, after taxes and transfers have taken place. Then we have:

$$\begin{aligned}\frac{\partial \underline{V}(\tau)}{\partial \tau} &= \gamma U'(c_L)(\bar{y} - y_L) + (1-\gamma)U'(c_H)(\bar{y} - y_H) \\ &= \gamma U'(c_L)(\bar{y} - y_L) - (1-\gamma)U'(c_H)\frac{1-\delta}{\delta}(\bar{y} - y_L) \\ &= \gamma U'(c_L)(\bar{y} - y_L) - (1-\pi)U'(c_H)(\bar{y} - y_L) \\ &= (\bar{y} - y_L)\left(\gamma U'(c_L) - (1-\pi)U'(c_H)\right) > 0\end{aligned}$$

Where the last inequality follows from the fact that $U(\cdot)$ is an increasing and concave function, $\gamma > \frac{1}{2}$ and $\pi > \frac{1}{2}$.

For an individual from a rich family, we have:

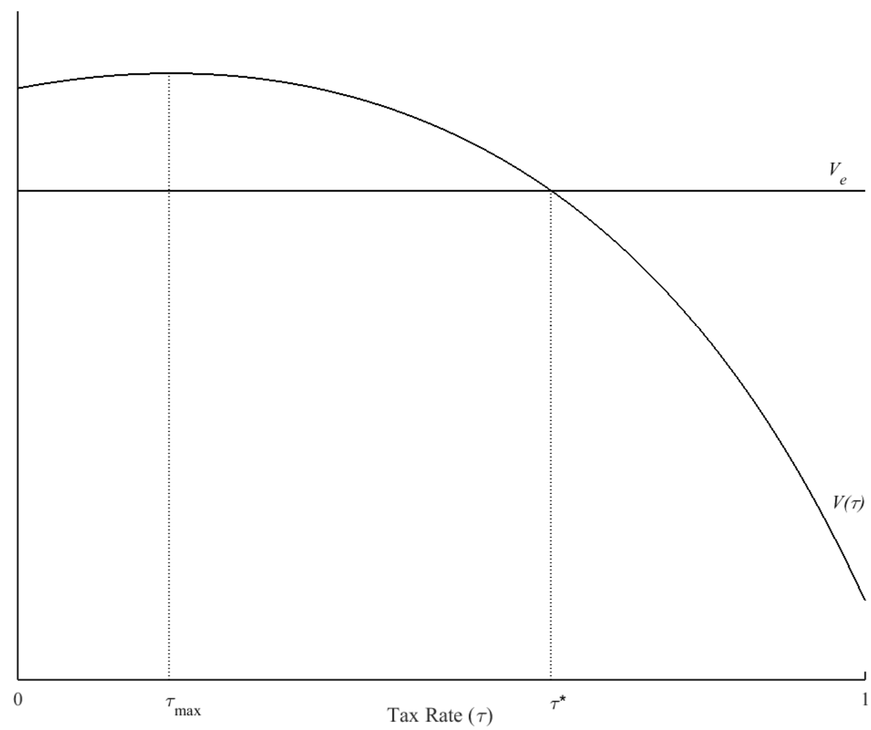
$$\begin{aligned}\frac{\partial \bar{V}(\tau)}{\partial \tau} &= \pi U'(c_H)(\bar{y} - y_H) + (1-\pi)U'(c_L)(\bar{y} - y_L) \\ &= (\bar{y} - y_L)\left[(1-\pi)U'(c_L) - \pi U'(c_H)\frac{1-\delta}{\delta}\right]\end{aligned}$$

The sign of the derivative depends on the second term in the above expression, which is greater than zero when:

$$\frac{U'(c_L)}{U'(c_H)} > \frac{\pi}{(1-\pi)}\frac{1-\delta}{\delta}$$

The left hand side is a monotonically decreasing function that reaches 1 when $\tau = 1$. The right hand side is a constant greater than 1. Thus there exist some $\tau_{max} < 1$ such that $\frac{\partial \bar{V}(\tau)}{\partial \tau} < 0$ for any $\tau > \tau_{max}$. ■

Figure 2.1: Utility Under Compliance and Evasion (Rich Family)



Note: $V(\tau)$ denotes the utility of an individual born to a rich family when everyone in the economy complies with their tax obligations, and V^e denotes his utility when he opts for tax evasion. Figure generated for $\sigma = 2.7$, $\pi = 0.7$, $\theta = 0.1$, $\eta = 0.3$, $y_H = 6$, $y_L = 2.25$, $\delta = 0.2$.

Lemma 1 also implies that there is a political conflict in the setting of fiscal policy, which will be solved through the democratic political process. Individuals from poor families want to set the highest possible tax, while those from rich families support increases in taxes up to a certain point (τ_{max}), but are harmed with any further increase. Again, the equilibrium tax rate will be the highest tax rate that satisfies the participation constraint of those born to rich families. That is, the highest tax rate that ensures that those born to rich families voluntarily participate in the tax and transfer system. The main difference with respect to the previous section is that uncertainty on future endowments favors the tax enforcement process due to the insurance benefit of taxation. As a result, everything else equal, higher mobility (lower π) leads to higher equilibrium tax rates. Figure 2.1 shows graphically the two sides of the participation constraint for an individual born to a rich family, and how the equilibrium tax rate is found at the intersection of these two curves for any interior solution ($0 < \tau^* < 1$). Notice also that τ^* always lays in the downward slopping part of $\bar{V}(\tau)$. This feature will be used in the proofs of the following propositions, which establish some comparative static results with respect to the equilibrium tax rate when tax enforcement frictions and income mobility are present.

Proposition 4. *The equilibrium tax rate* (τ^*) *is increasing in the audit rate* (θ)*, the penalty rate* (η)*, and the level of economic mobility* ($1 - \pi$)*.*

Proof. Assuming an initially interior solution, the participation constraint for an rich family individual would be binding, and thus holding with equality. Given that $U(\cdot)$ is an increasing function, $\bar{V}^e$ decreases as a result of the increase in θ or η, so that the participation constraint is relaxed. Therefore it must be that the equilibrium tax adjusts so that $\bar{V}(\tau)$ also falls. Given that we know that, at τ^*, $\frac{\partial \bar{V}(\tau)}{\partial \tau} < 0$, it must be that τ^* increases.

For the last part of the proposition, regarding income mobility, notice that an increase in π increases both the right and left hand sides of the participation constraint for the individual born to a rich family. Given that, in equilibrium, $\bar{V}(\tau)$ is decreasing in τ, in order to prove the result it suffices to show that $\frac{\partial \bar{V}(\tau)}{\partial \pi} < \frac{\partial \bar{V}^e}{\partial \pi}$, that is:

$$U(c_H) - U(c_L) < \theta(U((1-\eta)y_H) - U((1-\eta)y_L)) + (1-\theta)(U(y_H) - U(y_L))$$

$$U(c_H) - U(y_H) + U(y_L) - U(c_L) < \theta(U((1-\eta)y_H) - U(y_H) + U(y_L) - U((1-\eta)y_L))$$

For any $\tau > 0$, $c_H < y_H$ and $y_L < c_L$, so the left hand side of the expression above is always negative. For the case of logarithmic utility ($\sigma = 1$), we can easily verify that the right hand side is non-negative:

$$\theta(\log((1-\eta)y_H) - \log(y_H) + \log(y_L) - \log((1-\eta)y_L)) = \theta \log \frac{(1-\eta)y_H y_L}{y_H(1-\eta)y_L} = 0$$

For the case of $\sigma > 1$, we can again show that the right hand side is non-negative:

$$\begin{aligned}
&\frac{\theta}{1-\sigma}\left(((1-\eta)y_H)^{1-\sigma} - y_H^{1-\sigma} + y_L^{1-\sigma} - ((1-\eta)y_L)^{1-\sigma}\right) = \\
&\frac{\theta}{1-\sigma}\left(y_H^{1-\sigma}\left((1-\eta)^{1-\sigma} - 1\right) - y_L^{1-\sigma}\left((1-\eta)^{1-\sigma} - 1\right)\right) = \\
&\frac{\theta\left((1-\eta)^{1-\sigma} - 1\right)}{1-\sigma}(y_H^{1-\sigma} - y_L^{1-\sigma}) > 0
\end{aligned}$$

Where the last inequality follows from the fact that $\sigma > 1$. ■

The intuition regarding the relation between the audit rate (θ) and the penalty rate (η) and the equilibirum tax rate (τ^*) is similar to that in proposition 2. Increases in those variables imply a more efficient tax enforcement process, that discourages evasion for those individuals born to rich families, allowing for the implementation of higher taxes. With respect to social mobility, the proposition implies that more mobile societies should have higher taxes, everything else being constant. This is again intuitive, as higher uncertainty about future income increases the expected benefits of the tax and transfer system for the individuals from rich families, making them more reluctant to evade taxes and permitting the implementation of a higher tax rate. The next proposition characterizes the relationship between inequality and tax rates, and shows how this relation is mediated by the level of social mobility.

Proposition 5. *Let (y'_H, y'_L) be a mean preserving spread of (y_H, y_L), so that $y'_H > y_H$, $y'_L < y_L$ and $\bar{y}' = \bar{y}$. Then there exists π^* such that :*

(i) For any $\pi < \pi^*$, an increase in inequality increases the equilibrium tax (τ^*).

(ii) For any $\pi > \pi^*$, an increase in inequality decreases the equilibrium tax (τ^*).

(iii) For $\pi = \pi^*$, an increase in inequality does not change the equilibrium tax (τ^*).

Proof. Using the fact that $\bar{y} = \delta y_H + (1-\delta)y_L$, we can write the participation constraint for the individual born to a rich family as:

$$\begin{aligned}\pi U\left(y_H - \tau(y_H - \bar{y})\right) + (1-\pi)U\left(\frac{\bar{y} - \delta y_H}{1-\delta} + \tau\frac{\delta}{1-\delta}(y_H - \bar{y})\right) \geq \\ \pi\left(\theta U\left((1-\eta)y_H\right) + (1-\theta)U\left(y_H\right)\right) \\ + (1-\pi)\left[\theta U\left((1-\eta)\frac{\bar{y} - \delta y_H}{1-\delta}\right) + (1-\theta)U\left(\frac{\bar{y} - \delta y_H}{1-\delta})\right)\right]\end{aligned}$$

To determine the effect of a mean preserving spread on the equilibrium tax rate, we need to check whether the participation constraint is relaxed and thus τ^* would increase, or vice versa. Notice that a mean preserving spread would increase y_H and leave $\bar{y}$ unchanged, so we can see if the participation constraint is relaxed or not taking the derivative with respect to y_H:

$$\begin{aligned}\frac{\partial \bar{V}(\tau) - \bar{V}^e}{\partial y_H} =& \pi U'(c_H)(1-\tau) - (1-\pi)U'(c_L)(1-\tau)\frac{\delta}{1-\delta} \\ &- \theta\pi U'((1-\eta)y_H)(1-\eta) + \theta(1-\pi)U'((1-\eta)y_L)(1-\eta)\frac{\delta}{1-\delta} \\ &- (1-\theta)\pi U'(y_H) + (1-\theta)(1-\pi)U'(y_L)\frac{\delta}{1-\delta}\end{aligned}$$

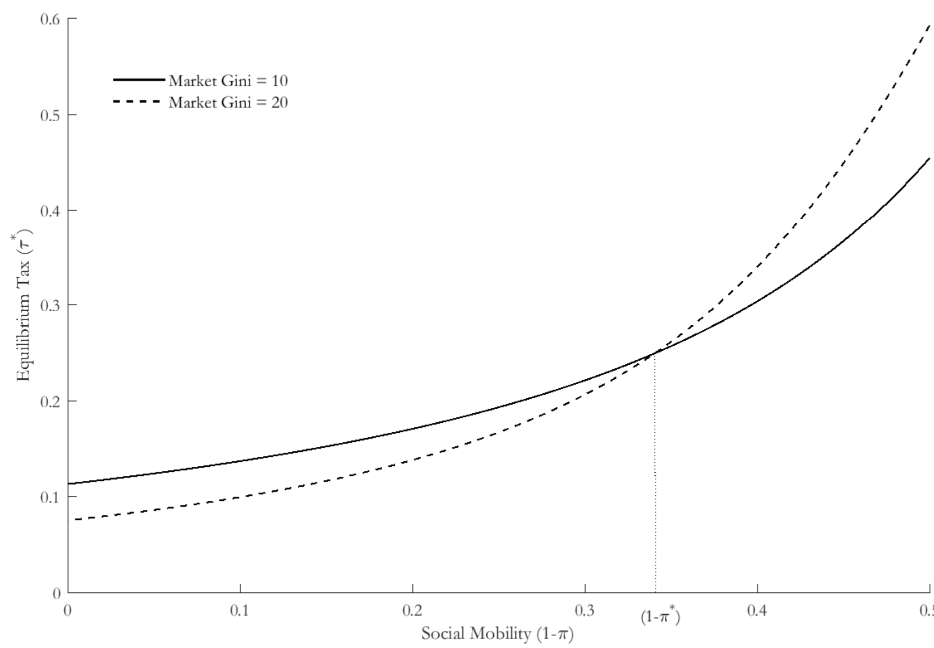
The participation constraint will be relaxed whenever $\frac{\partial \bar{V}(\tau) - \bar{V}^e}{\partial y_H} > 0$, which is the case if:

$$\pi < \frac{1}{1 + \frac{1-\delta}{\delta}\frac{\theta(1-\eta)U'((1-\eta)y_H) + (1-\theta)U'(y_H) - (1-\tau)U'(c_H)}{\theta(1-\eta)U'((1-\eta)y_L) + (1-\theta)U'(y_L) - (1-\tau)U'(c_L)}} = \pi^*$$

Thus for any $\pi < \pi^*$, an increase in inequality relaxes the participation constraint, so the equilibrium tax rate must increase to make it hold with equality again. Conversely, for any $\pi > \pi^*$, higher inequality leads to a decrease in the equilibrium tax rate. When $\pi = \pi^*$, the increase in inequality does not change the equilibrium tax rate. ■

Proposition 5 is the main result of the paper. It shows how the relationship between inequality and taxation is not always positive, and depends on the level of socio-economic mobility. Intuitively, when mobility is relatively high, the risk sharing benefits of fiscal policy more than offset its redistributive costs for the rich, favoring the tax enforcement process and allowing for an increase in taxation as a response to higher inequality. When mobility is relatively low, the increase in the redistributive burden of fiscal policy for the rich due to the rise in inequality is big enough to make them prefer tax evasion unless tax rates are lowered. Notice that proposition 5 does not necessarily imply that π^* is always in the interval $(\frac{1}{2}, 1)$. For some combinations of parameters, it could be that $\pi^* < \frac{1}{2}$, so that higher inequality decreases the equilibrium tax for any level of mobility; or $\pi^* > 1$, and higher inequality increases the equilibrium tax for any level of mobility.

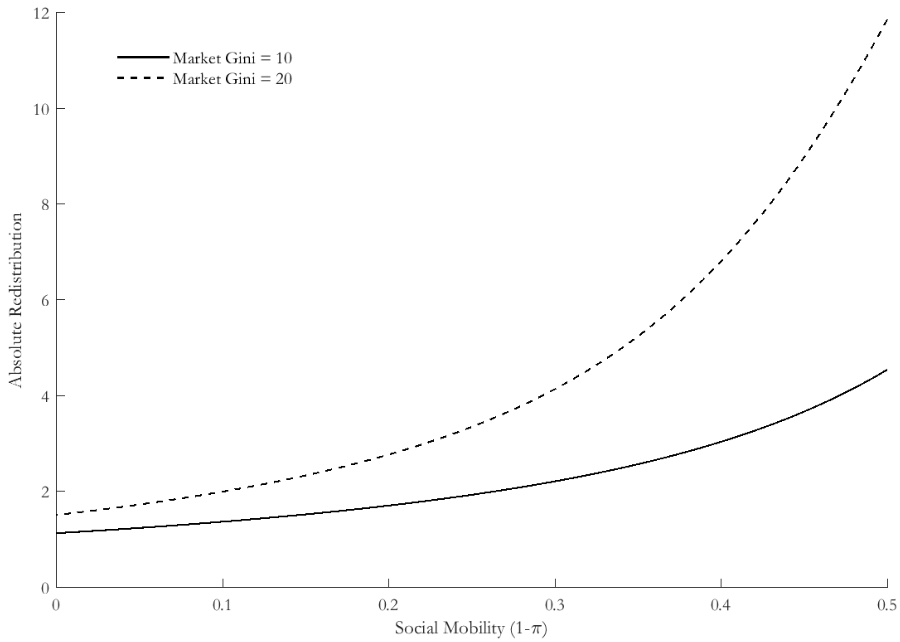
Figure 2.2: Increasing Inequality and Equilibirum Tax



Note: Figure generated for $\sigma = 1.5$, $\theta = 0.1$, $\eta = 0.3$, $\delta = 0.2$.

Figure 2.2 shows an example in which $\pi^* \in (\frac{1}{2}, 1)$, and an increase in the level of economic inequality (mean preserving spread) has different effects depending on the level of economic mobility in the economy. Specifically, the figure shows the effect on the equilibrium tax rate when market inequality increases from a Gini of 10 to a Gini of 20, for different levels of socioeconomic mobility. The cut-off level of mobility $(1 - \pi)$ is close to 0.34 in this case. A society with higher mobility would experience an increase in tax rates, while a society with less mobility would see a fall in taxation. As was explained above, the effect on redistribution as measured by tax revenue or expenditure is analogous to that of the effect on tax rates.

Figure 2.3: Increasing Inequality and Absolute Redistribution



Note: Figure generated for $\sigma = 1.5$, $\theta = 0.1$, $\eta = 0.3$, $\delta = 0.2$.

Recall from the previous subsection that in this setting, absolute redistribution is given by $\delta\left(\frac{y_H - \bar{y}}{\bar{y}}\right)\tau$. Therefore, the effect of an increase in inequality on the amount of redistribution depends on the change in the tax rate. Higher inequality produces a change in the term in parenthesis that is always positive, but the change in τ depends on the level of mobility, as shown in proposition 5. Only when $\pi \leq \pi^*$, higher inequality produces and unequivocal increase in absolute redistribution. If $\pi > \pi^*$, the effect of inequality on redistribution can be positive, zero, or negative. What is certain is that the strength of the positive effect of inequality on redistribution is decreasing on the level of economic immobility. This can be observed in figure 2.3, which plots the level of absolute redistribution for different levels of mobility, for an equal increase in the market Gini coefficient as in figure 4 (10 Gini points). The increase in redistribution is bigger the higher the level of mobility. In particular, when the probability of an individual born to a rich family to become poor is 50%, absolute redistribution increases by more than 7 Gini points, which implies that the increase in taxation and redistribution offsets around 70% of the increase in inequality. For societies where the probability of an individual born to a rich family to become poor is 10% or lower, an increase in market inequality of 10 Gini points produces an increase in absolute redistribution of less than 1 point.

Both figures 2.2 and 2.3 show that the relation of social mobility with taxation and redistribution is always positive, for a given level of market inequality, as was established in proposition 4. This is shown by the solid lines of each figure, that are increasing in $(1 - \pi)$. That is, for a given market Gini coefficient, societies with higher social mobility have higher tax rates and higher levels of redistribution.

Chapter 3

Model with General Distribution of Family Types

In this chapter, I extend the model introducing a distribution of family types. The comparative static results stated in the propositions above are obtained using numerical methods. With just two types, there was no evasion in equilibrium, as the low type individuals were making sure that the high type ones were participating in the tax and transfer system when voting for the tax rate. Once we have a distribution of types, there is in general a positive measure of individuals who evade taxes. This feature allows for an analysis of the effects of different levels of mobility and inequality on the amount of tax evasion in the economy.

3.1 Tax Enforcement Frictions

Suppose now that endowments are distributed according to a lognormal distribution Y, so that $\log Y \sim N(\mu_Y, \sigma_Y^2)$, with density function $f_Y(y)$. Abstract from uncertainty, so each individual knowns his endowment before he votes on tax rates and makes the compliance-evasion decision. In this scenario, the individual with median endowment is the decisive voter, and the equilibrium tax rate will be the most benefitial tax for him. Anyhow, he needs to take into account the fact that some individuals will evade taxes, reducing total tax revenue and thus the amount of the transfer. For a given tax rate τ, there will be a cut-off endowment $\tilde{y}$ such that every individual with $y^i > \tilde{y}$ will opt for evasion, while individuals with $y^i \leq \tilde{y}$ will decide to comply. For a given tax, $\tilde{y}$ will solve the participation constraint with strict equality, $V(\tilde{y}, \tau) = V^e(\tilde{y})$, where:

$$V(\tilde{y}, \tau) = U\left((1-\tau)\tilde{y} + T(\tilde{y})\right)$$

$$T(\tilde{y}) = \frac{\displaystyle\int_0^{\tilde{y}} \tau y f_Y(y) dy + \int_{\tilde{y}}^{\infty} \theta \eta y f_Y(y) dy}{\displaystyle\int_0^{\tilde{y}} f_Y(y) dy}$$

$$V^e(\tilde{y}) = \theta U((1-\eta)\tilde{y}) + (1-\theta)U(\tilde{y})$$

Notice that in this case, the lump-sum transfer $T(\tilde{y})$ is the sum of the taxes voluntarily paid and the revenue collected through audits, divided by the fraction of the population who did not avoid taxes. A politico-economic equilibrium in this environment is defined as:

Definition 2 (Politico-Economic Equilibrium). *An equilibrium is a function $\tilde{y}(\tau)$, a set of private economic decisions $\rho^i \forall i$, and a tax policy τ^*, such that:*

1. *The function $\tilde{y}(\tau)$ solves $V(\tilde{y}, \tau) = V^e(\tilde{y})$.*
2. *The decision of whether to comply or evade taxes (ρ^i) is optimal for every*

individual.

3. *The tax rate (τ^*) cannot be defeated by any alternative in a majority vote.*

In order to characterize the equilibrium, we first need to obtain the function $\tilde{y}(\tau)$. This function implicitly gives the compliance-evasion decision for each individual as, for a given τ, every i with endowment $y^i > \tilde{y}$ will choose $\rho^i = 1$, while every i with endowment $y^i < \tilde{y}$ will choose $\rho^i = 0$. Finally, we can use the median voter theorem to determine the equilibrium tax rate τ^* as the solution to the median voter's problem:

$$\tau^* = \arg\max_{\tau} U\left((1-\tau)y^m + T(\tilde{y}(\tau))\right)$$

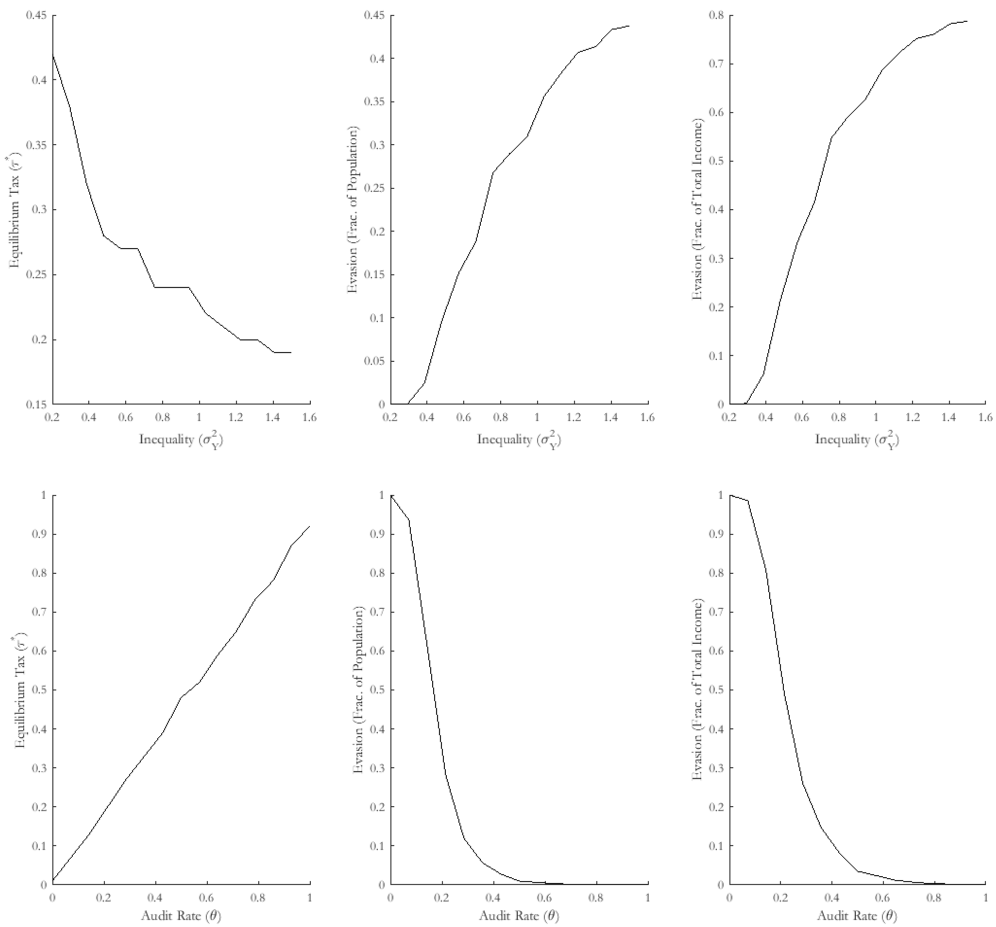
Where y^m is the median income in the economy.

Similar results to those in propositions 2 and 3 above can be obtained numerically. That is, the equilibrium tax rate (τ^*) is increasing in the audit and penalty rates (θ, η), and decreasing in the degree of inequality in the distribution of family types, measured by the variance of the endowment distribution σ_Y^2. This is shown in figure 3.1, which provides the results of a numerical example. The top left graph in the figure shows how the equilibrium tax rate (τ^*) is decreasing in the level of inequality, and the bottom left graph that it is decreasing in the audit rate (θ).[1]

With a distribution of types there is in general a positive measure of individuals who evade taxes, so it is possible to analyze the effect of changes in the exogenous parameters in the level of tax evasion in the economy. Center and right graphs of figure 3.1 show the results of this exercise. Intuitively, higher audit and penalty rates reduce incentives for evasion. This is clear from the

[1] The results for a change in the penalty rate (η) are similar to those for a change in the audit rate (θ), and therefore are not shown.

Figure 3.1: EQUILIBRIUM TAX RATES AND EVASION



Note: Figure generated for $\sigma = 1$, $\theta = 0.3$, $\eta = 0.4$, $\sigma_Y^2 = 0.5$, $\mu_Y = \log 15$.

bottom center and right graphs of figure 3.1, which depict how the fraction of the total population who evades taxes and the fraction of total income evaded decrease as the audit rate increases. This is because higher audit (or penalty) rates make evasion more risky, shifting out the function $\tilde{y}(\tau)$. For each tax rate, the fraction of individuals who find it optimal to evade taxes diminishes, which allows for increases in tax rates. When inequality increases, equilibirum taxes and redistribution fall, as those relatively rich now face a higher redistributive burden, which increases their incentives for evasion as can be seen in the top center and right graphs of figure 3.1. In this case, the function $\tilde{y}(\tau)$ shifts down, reflecting the fact that those individuals who were initially indifferent between compliance and evasion (had income equal to $\tilde{y}$) prefer to evade after the increase in inquality. This situation forces the decisive voter to reduce taxes and redistribution to limit the increase in tax evasion.

3.2 Social Mobility

In order to introduce income mobility, think of a lognormal distribution of family types Y_0, so that $\log Y_0 \sim N(\mu_{Y_0}, \sigma^2_{Y_0})$. Let $f_{Y_0}(y_0)$ denote the density function of Y_0. One individual is born into each family. The actual endowment of each individual is determined by his family type (y_0^i) and an idiosyncratic shock (z^i), which also follows a lognormal distribution Z such that $\log Z \sim N(\mu_z, \sigma_z^2)$. Let $f_Z(z)$ denote the density function of Z. Thus, the ex-post endowment distribution $Y = Y_0 + Z$ satisfies $\log Y \sim N(\mu_{Y_0} + \mu_z, \sigma^2_{Y_0} + \sigma^2_z)$. The position in the family distribution is known to the individual at the beginning of time, but the specific shock is only known after the vote on tax rates and the compliance-evasion decision have taken place. Therefore, each individual knows his endowment only imperfectly when he has to make his decisions.

We can use $m = \frac{\sigma_z^2}{\sigma_Y^2}$ as a measure of mobility. Notice that when $m = 0$ mobility is non-existent, as every individual knows perfectly his endowment before the voting process. We are in the environment of the previous section. Instead, when $m = 1$ no individual has any ex-ante information about his future endowment and mobility is the highest.

The definition and characterization of the equilibrium are equivalent to those in the previous section. The cut-off rule for evasion $\tilde{y_0}(\tau)$ will now solve:

$$\int U\left((1-\tau)(\tilde{y_0}+z)+T(\tilde{y_0})\right)f_Z(z)dz = \int \theta U((1-\eta)(\tilde{y_0}+z))+(1-\theta)U(\tilde{y}+z)f_Z(z)dz$$

Where:

$$T(\tilde{y_0}) = \frac{\displaystyle\int_0^{\tilde{y_0}} \tau y_0 f_{Y_0}(y_0+z)dy_0 + \int_{\tilde{y_0}}^{\infty} \theta\eta y f_{Y_0}(y_0+z)dy_0}{\displaystyle\int_0^{\tilde{y_0}} f_{Y_0}(y_0)dy_0}$$

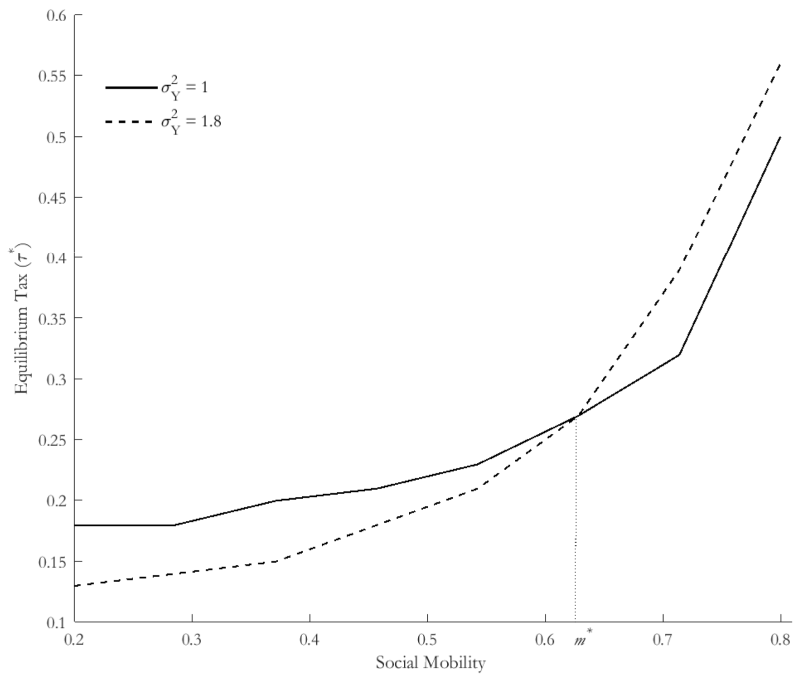
Again, once the function $\tilde{y_0}(\tau)$ has been obtained, the equilibrium tax rate solves the problem of the individual with median income (y_0^m):

$$\tau^* = \arg\max_{\tau} \int U\left((1-\tau)(y_0^m+z)+T(\tilde{y_0}(\tau))\right)f_Z(z)dz$$

In this case, we can analyze the effects of changes in social mobility on equilibrium tax rates and redistribution. In a similar fashion as in the two type model, social mobility favours the tax enforcement process, making evasion less desirable and participation in the tax and transfer system more atractive, as it provides valuable risk insurance. Therefore, the equilibrium tax rate (τ^*) is increasing in the level of social mobility (m) for a given level of inequality. This can be observed in the solid line of figure 3.2, which shows how the equilibrium tax is an increasing function of mobility.

The result in proposition 5, namely, that the effect of inequality on equilibrium tax rates depends on the level of social mobility, is also clear from figure 3.2. The solid line depicts the equilibirum tax rates for different levels of social mobility, for a given level of inequality. The dotted line shows the results when inequality increases. If social mobility is lower than the cutoff level m^*, the increase in inequality leads to a decrease in equilibrium taxes, while for relatively high levels of mobility (above m^*), higher inequality produces an

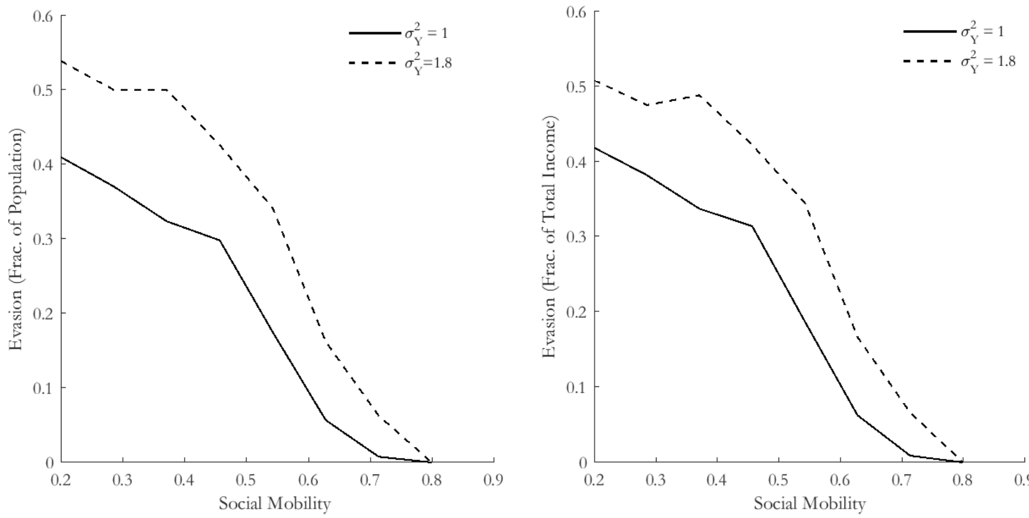
Figure 3.2: Increasing Inequality and Equilibrium Tax



Note: Figure generated for $\sigma = 1$, $\theta = 0.2$, $\eta = 0.4$, $\mu_Y = \mu_{Y_0} = \log 15$, $\sigma_Y^2 = 1$, $\mu_z = 1$.

increase in taxation. The intuition is the same as in the case of just two types. When social mobility is low, taxation imposes a redistributive burden on those relatively rich, that is exacerbated by the increase in inequality, increasing the incentives for tax evasion. The relatively poor majority is forced then to lower taxes in order to reduce as much as possible the increase in tax evasion. On the contrary, when social mobility is high, the tax system provides a risk insurance benefit that even those with high chances of turning out rich want to take advantage of. Therefore, higher inequality makes insurance more valuable reducing incentives for evasion. This opens the door to increase equilibrium taxes. Figure 3.3 shows how tax evasion is affected by the change in inequality, for different levels of social mobility. As expected, evasion is a decreasing

Figure 3.3: Increasing Inequality and Tax Evasion



Note: Figure generated for $\sigma = 1$, $\theta = 0.2$, $\eta = 0.4$, $\mu_Y = \mu_{Y_0} = \log 15$, $\sigma_Y^2 = 1$, $\mu_z = 1$.

function of social mobility for a given level of inequality, both measured as the fraction of the population who evades as well as total income evaded (solid lines in both graphs of figure 3.3). When inequality increases, so does evasion for every level of mobility, while it is worth noting that the increase is reduced as mobility increases. This is in line with the intuition presented above. In highly mobile societies, higher inequality does not push a lot of individuals into tax evasion, allowing for the implementation of higher fiscal pressure. On the contrary, when social mobility is low, higher inequality has important effects on the incentives for evasion.

Chapter 4

Empirical Evidence

In this chapter I present empirical evidence in support of the predictions of the model. In particular, I test that:

1. The level of redistribution is positively related to social mobility.
2. The level of redistribution is non-linearly related to inequality, increasing when mobility if high, and decreasing (or increasing less) with inequality when mobility is low.
3. The level of redistribution is negatively related to the efficiency of the tax enforcement process.

In the following subsections, I first explain in detail the sources of the data used in the empirical work. Then, I present summary statistics and correlation tables that allow to already foresee the main results. Finally, I explain the construction of the OLS regressions that yield the main empirical results.

4.1 State-level Data for the USA

4.1.1 Social Mobility

There exist a variety of theoretical ways in which we can measure social mobility, that is, how social status changes from one generation to another [1]. From an empirical point of view, any of them entail a challenge in terms of data availability, due to the fact that they require reliable data on the variable studied, in this case lifetime income, for at least two generations. For countries where such a long panels are available, research has focused on the estimation of the inter-generational elasticity of income (IGE), which assesses the relation between a father's income and his descendants. Specifically, it measures the percentage difference in earnings in the child's generation associated with the percentage difference in the parental generation. This literature has provided estimates of the IGE for a small sample of countries, but the comparability of these results is in many cases problematic due to differences in the underlying data and methodology used (Corak (2006)).

More recently, the availability of tax records has made possible to obtain much more reliable measures of social mobility. In this paper I make use of the work of Chetty et al. (2014), who use US federal income tax records on more than 40 million children and their parents for the period 1996-2012, and analyze social mobility for 741 commuting zones (CZ) in the USA. Chetty et al. (2014) calculate a variety of measures of social mobility, differentiating between relative and absolute mobility. Among relative measures of mobility, they calculate

[1] See Fields and Ok (1999) and Jantti and Jenkins (2013) for a comprehensive analysis of the different measures of income mobility, which is the focus of this paper. Other variables used in the literature to try to capture the social mobility include educational attainment, job characteristics or social class, which all have an important positive correlation with income mobility across generations.

the IGE and also the rank-rank slope, defined as the correlation between the parents' rank in the income distribution and the rank of their children. They find that IGE estimates have important stability problems, mainly due to their sensitivity to the treatment of observations with very small income. For this reason, in the empirical exercise of this paper I will rely on other measures of mobility when possible. In terms of absolute mobility, they define *absolute upward mobility* as the mean rank (in the national income distribution) of children whose parents are at he 25th percentile of the national income distribution[2]. Another measure analyzed is the probability that a child born in the bottom quintile of the national income distribution moves to the top quintile, that has also been used in international comparisons.

In this paper I have translated the CZ-level measures of social mobility made available by Chetty et al. (2014) to state-level, by calculating a population weighted average for all the CZ within a given state. In the regression analysis below I use the measure of absolute upward mobility because of its good properties[3]. Therefore, I have a cross section of the 50 states of the USA plus the District of Columbia.

4.1.2 Inequality

I use Gini coefficients before taxes and transfers in order to measure inequality at the state level. Given the question I am trying to answer in this paper, namely, what is the effect of inequality on the level of redistribution, the choice of a pre-taxes and transfers measure of inequality is clearly adecuate. I

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[2] As they explain, at a national level this variable is equivalent of the rank-rank slope, but when measured for small areas like CZ, it is effectively a measure of absolute mobility because the effect of incomes in a given area are negligible for the national income distribution.

[3] The correlation among the different measures of social mobility is very high, both at a CZ and state levels.

obtain the data from the 2007 American Community Survey, specifically I use the 3-year average estimation of the Gini coefficient for each state in the USA and the District of Columbia.

4.1.3 Redistribution

I use data on state and local government tax revenue and spending to measure redistribution at the state level, from the Census of Governments 2012, and calculate per capita variables using data on population from the 2010 Census. From the revenue side, I compute Government Revenue per capita and Government Revenue from Own Sources per capita, where the latter excludes intra-government transfers mainly from the Federal Government. From the spending side, I obtain Expenditures per capita and Social Expenditures per capita. The latter is the sum of expenditures on education, welfare programmes, hospitals and health, employment security administration, veterans' services, and housing and community development. For the regression analysis shown below I use Expenditures per capita as the dependent variable, but the results are very similar when I use any of the other measures, again due to the really high correlation between all of them.

4.1.4 Tax Evasion

Measuring tax evasion is not an easy task, for obvious reasons. Even though the IRS runs different programmes to asses the extent of non-compliance like the National Research Porgram (NRP), only aggregate data on total estimates of non-campliance are available. Nevertheless, previous research on tax evasion with access to such data has documented some regularities in the non-compliance behaviour in the USA, that can be used to calculate some proxie variables for the extent of tax evasion. In particular, Johns and Slemrod (2010) have shown how net misreporting is specially relevant at the top of the income distribution. Namely, around 70% of total net misreporting is concentrated in the top quintile of the income distribution, and more than 60% on the top decile. Johns and Slemrod (2010) also analyze how misreporting is distributed among different income categories, finding that income reported as business and profesional or capital gains accumulate around 90% of total misreporting. As some research has suggested (Bloomquist (2003)), these two facts are clearly related due to the fact that business and profesional or capital gains income are specially relevant for top earners, and are not subject to third party reporting, making evasion easier. Another argument has been made in order to rationalize the fact that evasion is more prevalent among top earners, which is the idea that only relatively rich individuals have access to the financial and legal services needed for tax evasion (Alstadster et al. (2017)).

I make use of these results to calculate two variables that try to capture the efficiency of the tax enforcement process across states in the USA. The IRS Statistics On Income (SOI) provide data (at a state level) for total Adjusted Gross Income (AGI) for different income groups and different sources of income. On the one hand, I calculate a first measure of tax evasion by obatining the fraction of total AGI in a given state that is reported by individuals with income above $100,000. On the other hand, I calculate a second variable which indicates the fraction of total AGI in a state that is reported as Business and Professional Income and Capital Gains Income. I use the SOI for the Tax Year 2001 because the results from Johns and Slemrod (2010) mentioned before are based on NRP data for that fiscal year.

4.1.5 Political Participation

Given that the core of the mechanism in the paper relies on a political economy argument and the median voter theorem, it seems reasonable to control for some measure of political participation. Moreover, it has been widely documented that individuals in the lower end of the income distribution are less politicaly involved. Therefore, I obtain data from the 2016 Current Population Report of the US Census on voting turnout by state in the presidential elections of the years 2008 and 2012. The regressions below use the 2012 data, but the results do not change with the 2008 data or a mean of both elections.

4.2 Summary Statistics and Conditional Correlations

Table 4.1 shows summary statistics of the different variables described above for the 50 US states and the District of Columbia, which will be uselful when analysing the regression results below.

Table 4.2 shows simple and conditional correlations between inequality and two different measures of redistribution, total revenue per capita and total expenditure per capita. Both of them follow a similar pattern, showing a relatively low positive correlation between inequality and redistribution when using the whole sample, specially when redistribution is measured by total revenue per capita. This resembles the typical result in the literature, which has found it difficult to document a strong positive relation between inequality and redistribution in cross section studies, besides the clear prediction of the standard theory. Nevertheless, this fact conceals the clearly different results

Table 4.1: Summary Statistics

Variable	Mean	Median	Max.	Min.	Standard Dev.
Mobility	42.448	43.133	53.742	36.246	3.658
Market Inequality	44.951	44.9	54.3	41	2.333
Revenue	10,249	9,200	25,652	7,379	3.312
Revenue Own Sources	6,809	6,127	19,777	4,720	2,457
Expenditure	10,408	9,780	22,959	7,247	2,864
Social Expenditure	5,503	5,294	10,815	3,566	1,247
Tax Evasion 1	0.283	0.275	0.410	0.193	0.052
Tax Evasion 2	0.082	0.074	0.149	0.054	0.020
Voting Turnout 2008	0.607	0.624	0.708	0.468	0.058
Voting Turnout 2012	0.592	0.591	0.733	0.464	0.065

Note: Mobility measured as absolute upward mobility and obtained from Chetty et al. (2014). Market inequality measured as average pre-tax and tranfer Gini coefficient for 2005-2007 obtained from American Community Survey. Revenue and expenditure variables obtained from the 2012 Census of Governments. Revenue denotes total state and local government revenue per capita. Revenue own sources denotes total state and local government revenue per capita excluding intra-government transfers. Expenditure denotes total state and local government expenditures per capita. Social expenditure denotes total state and local government expenditure per capita in selected social programmes. Tax evasion 1 denotes the fraction of total AGI declared for individuals who declare AGI $\geq$ \$100,000. Tax evasion 2 denotes de fraction of total AGI reported as Business and Professional income and Capital Gains income. AGI data comes from the SOI reported by the IRS for the Tax Year 2001. Voting turnout comes from the 2016 Current Population Report of the US Census. Total of 51 observation which include the 50 states in the USA and the District of Columbia.

obtained when dividing the sample by the level of mobility in each state, specially pronounced when measuring redistribution as expenditure per capita. Using the median level of absolute upward mobility as the splitting point, we observe that the positive correlation between inequality and redistribution is clear for those states with high mobility (0.508), while is close to zero for low mobility states (0.022).

Table 4.2: Conditional Correlations

Variable	Conditioning Statement	Correlation w/ Revenue	Correlation w/ Expenditure
Market Ineq.	None	0.1519	0.296
Market Ineq.	Mobility $\geq$ Median	0.317	0.508
Market Ineq.	Mobility $<$ Median	0.030	0.022

Note: Mobility measured as absolute upward mobility and obtained from Chetty et al. (2014). Market inequality measured as average pre-tax and tranfer Gini coefficient for 2005-2007 obtained from American Community Survey. Revenue and expenditure per capita obtained from the 2012 Census of Governments. Revenue denotes total state and local government revenue per capita. Expenditure denotes total state and local government expenditures per capita. Total of 51 observation which include the 50 states in the USA and the District of Columbia.

This basic correlation results give suggestive support for the hypothesis and theoretical results presented in the previous sections. Namely, that the positive relation between inequality and redistribution derived in the canonical political economy models only holds in relatively mobile societies.

4.3 OLS Results

In order to further test the hypothesis of the paper, I present OLS regression results following two different strategies. On the one hand, I divide the sample into high and low mobility states, and regress redistribution on inequality (and other independent variables) for each subsample. The goal is to evaluate if the effect of inequality on redistribution is significantly different for these two groups, as suggested by the conditional correlations discussed above. On the other hand, I use the whole sample to regress redistribution on inequality, mobility, and an interaction term that captures how the effect of inequality varies with the level of mobility.

Table 4.3: OLS Results

Dep. Variable: Redistribution	High Mobility (Mobility $\geq$ median)	Low Mobility (Mobility < median)	Whole Sample
Inequality	797.6***	94.6	-4464.5**
	(194.8)	(144.6)	(1823.3)
Mobility	406.1**	272.9***	-4959.2**
	(167.2)	(80.8)	(1977.1)
Tax Evasion	22728.3	2353.8	16152.5
	(15131.9)	(11301.4)	(17122.5)
Voting Turnout	3460.9	10561.2 ***	10117.4*
	(3634.3)	(2913.0)	(5049.3)
Inequality * Mobility	-	-	118.8***
			(44.3)
Constant	-46831.8***	-12318.5	187514.4**
	(15381.9)	(9046.2)	(80530.6)
Observations	26	25	51
R^2	0.638	0.372	0.600

Note: Robust statdard errors in parentheses. *, **, *** indicate statistical significance at 0.1, 0.05 and 0.01 respectively. Mobility measured as absolute upward mobility and obtained from Chetty et al. (2014). Market inequality measured as average pre-tax and tranfer Gini coefficient for 2005-2007 obtained from American Community Survey. Redistribution measured as total state and local government expenditures per capita obtained from the 2012 Census of Governments. Tax evasion denotes de fraction of total AGI reported as Business and Professional income and Capital Gains income. AGI data comes from the SOI reported by the IRS for the Tax Year 2001. Voting turnout in the 2012 presidential election, comes from the 2016 Current Population Report of the US Census. Total of 51 observation which include the 50 states in the USA and the District of Columbia. Regression calculated weightening each observation by total population, obtained from the 2010 Census.

Table 4.3 presents the results for the three OLS regressions, where the dependent variable is redistribution measured by expenditure per capita, and the independent variables are inequality, mobility, tax evasion and political participation, measured by the Gini coefficient, absolute upward mobility, the fraction of income from business and professional activities and capital gains, and voting turnout int the 2012 presidential election, respectively. All regressions are calculated weightening each observation by the total population of the state, obtained from the 2010 Census.

The first two columns of table 4.3 present the results for the first strategy, that is, dividing the sample in high and low mobility states with the median level of mobility (43.133) as the splitting point. For the high mobility subsample, the coefficient of inequality is 797.6, and is highly significant. A 1 point increase in the pre-tax and transfer Gini coefficient translates into an increase of $797.6 in expenditure per capita. On the other hand, for the low mobility subsample the coefficient on market inequality is not significant. The results of these regressions clearly support the hypothesis of a different effect of inequality on redistribution for the two subsamples. The coefficients on Mobility are significant in both cases and have the expected sign. Higher levels of social mobility are associated with higher redistribution. Regarding Tax Evasion, the coefficients are non-significant in any of the regressions. This might reflect that the constructed variable is not a good proxy for tax evasion, or the fact that some of the effect of tax evasion on redistribution is already picked up by the inequality variable. Voting turnout is not significant in the high mobility subsample, but it is very significant for the low mobility states. In both cases the political participation variable has the expected sign, pointing to the idea that more politically involved societies are able to implement higher levels of redistribution.

The last column of table 4.3 presents the results of the regression for the whole sample, introducing an interaction term between inequality and mobility. The coefficients on inequality, mobility and the interaction term are highly significant and have the sign predicted by the theory. The effect of inequality on redistribution is captured now by the coefficient on market inequality plus the coefficient on the interaction term multiplied by the level of mobility. That is, for a state with median mobility, the effect of a 1 Gini-point increase in market inequality is an increase of $659.7 in redistribution per capita. For any country with mobility above the median, the effect of inequality would be larger, and vice versa. For example, for the state with the lowest level of mobility, the same increase in inequality produces an decrease in redistribution per capita of $158.5, while for the state with the highest level of mobility, it increases expenditure per capita in $1915.1. We can find the empirical counterpart of the cutoff level of mobility (m^*), which for this specification would be 37.58. The effect of mobility on redistribution can be interpreted in a similar way, now being the sum of the coefficient on mobility and the coefficient on the interaction term multiplied by the level of market inequality. Recall from table 4.1 that the minimum level of market inequality in the sample is 41, so for that observation the effect of mobility on redistribution is very close to zero (-$88.4). For any observation with a higher level of mobility, the effect is always positive, and increasing as the level of market inequality increases. The tax evasion coefficient is again non significant, while the turnout coefficient is significant only at a 90% level.

Overall, the results of the OLS regressions support the theoretical prediction that the effect of inequality on redistribution is mediated by the level of social mobility. Namely, that higher inequality is associated with higher levels of redistribution only if social mobility is sufficiently high. The empirical evidence also supports the prediction that social mobility favors redistribution, for a given level of inequality. The prediction on the effect of tax evasion on redistribution are not conclusive, most likely due to the difficulties of measuring adecuately how easy (or likely) evasion might be.

4.4 International Cross-Section Analysis

As mentioned before, the availability of data on social mobility for international comparison is very limited, usually focused on the estimation of the intergenerational elasticity of income. Anyhow, it is worthwhile to test the hypothesis of the theoretical model for those countries for which reliable and comparable estimations of social mobility are available. In this section, I carry out a similar analysis as the one for the USA for a sample of 22 countries for which, according to Corak (2006), Corak (2013) and Brunori et al. (2013), comparable IGE estimates are available[4].

4.4.1 International Data

As explained above, social mobility will be measured by the IGE, which ranges from 0 to 1. Higher IGE values denote lower mobility, as they imply a higher persistence of income differences between generations. IGE estimates are taken from Corak (2013), except for Netherlands, Cyprus and South Africa, which come from Brunori et al. (2013), and are calculated for generations of children born around 1960s and measuring their income in the mid to late 1990s. I use data on income inequality from the the Standardized World Income Inequality Database (version 5.1), gathered by Solt (2016), which provides comparable Gini coefficients for a large number of countries and years. Furthermore, this database clearly differentiates between pre (market) and post (net) taxes and transfers inequality, allowing to measure absolute redistribution following Ostry et al. (2014) as the difference between market and net inequality. Absolute redistribution is highly correlated to other measures of aggregate taxation and

[4]The countries of the sample are Denmark, Norway, Finland, Canada, Australia, Sweden, New Zealand, Germany, Japan, Spain, France, Switzerland, United States, Argentina, Italy, United Kingdom, Chile, Brazil, Peru, Netherlands, Cyprus and South Africa.

redistribution, as is shown by Ostry et al. (2014) for a large sample of countries. As is standard in the literature, I control for real GDP per capita in order to take into account that richer countries redistribute more, and for an index of democratic institutions as more democratic countries also tend to have higher levels of redistribution. The data on real GDP comes from the World Development Indicators Database (World Bank). The democracy index used has been obtained from the Polity IV Project, which assesses the authority characteristics of different regimes in a scale from 10 to -10, where a value of 10 denotes to the most democratic regime, and a value of -10 to the most autocratic. Market inequality, net inequality, absolute redistribution, real GDP per capita and the democracy variable are calculated as the average for the period 2000-2010.

4.4.2 Conditional Correlations and OLS Results

If we calculate the unconditional correlation of market inequality and absolute redistribution for the 22 countries, we obtain a value of -.0291. That is, for the whole sample, the relation between inequality and redistribution is negative. If we condition by the level of social mobility (using the median IGE value), we again find that the correlation changes dramatically. For the high mobility countries, the correlation between inequality and redistribution is 0.629, while for the low mobility countries is -.260. Therefore, we observe again that the positive relation between inequality and redistribution predicted by the standard theory is only clear when mobility is relatively high.

Table 4.4 shows the result of running similar regressions to those in the previous sections, for the sample of 22 countries. The coefficients lack significance in many cases, due to the small sample used, but the results point in the same direction as before.

Table 4.4: OLS Results (International Sample)

Dep. Variable: Redistribution	High Mobility (IGE < median)	Low Mobility (IGE $\geq$ median)	Whole Sample
Inequality	1.519***	0.662*	1.602*
	(0.401)	(0.317)	(0.886)
IGE	-14.491	-16.461	48.329
	(21.433)	(29.927)	(80.089)
Real GDP per capita	11.689*	9.495**	9.917***
	(5.691)	(3.386)	(2.676)
Democracy index	-	0.194	-.069
		(0.504)	(0.792)
Inequality * IGE	-	-	-1.463
			(1.746)
Constant	-172.5**	-111.8*	-155.8***
	(61.924)	(49.158)	(48.961)
Observations	11	11	22
R^2	0.695	0.756	0.787

Note: Robust statdard errors in parentheses. *, **, *** indicate statistical significance at 0.1, 0.05 and 0.01 respectively. All variables are annual averages for the period 2000-2010. Inequality measured as Gini coefficient before taxes and transfers, and redistribution as the difference between the Gini coefficient before and after taxes and transfers, all taken from Solt (2016). Real GDP per capita (in logs) comes from the World Development Indicators Database (World Bank). Democracy index is the Polity IV score, and is omitted for the high mobility subsample because every obvervation has the highest score.

When splitting the sample by the median level of IGE, we observe very similar results as those obtained for the USA. The coefficient on inequality for the high mobility sample (IGE< median) is positive and highly significant, while the significance level is much lower for countries with relatively high levels of IGE. Furthermore, the magnitude of the effect of inequality on redistribution is much higher for more mobile societies. A similar picture is given by the regression with the interaction term between inequality and IGE, but the coefficient on the interaction term is not significant. Regarding IGE, it is not a significant variable in any of the regressions, even though the sign of the coefficients is the expected one (remember that IGE measures immobility, so a negative coefficient implies higher mobility favours redistribution). It is worth noting the importance of real GDP per capita, corroborating the well known result that richer countries redistribute more.

Chapter 5

An Application: Inequality and Economic Growth

In this chapter, I embeed the politico-economic environment of the previous sections in a stylized endogenous growth model in order to obtain theoretical results to the question of how inequality might affect the growth process. I will first review the theoretical and empirical literature on the channels through which the shape of the income distribution can affect economic development and growth. I focus on direct channels of inequality on growth, and also on indirect channels which usually are based on political economy arguments. Second, I set up a simple model which can account for a variety of these transmission mechanisms using different parameter values. Finally, I obtain qualitative theoretical results using numerical examples, that show how different levels of social mobility produce differentiated effects of inequality on economic growth.

5.1 Literature Review

Theoretical Literature

How does inequality in the distribution of resources affect (if at all) subsequent economic developement is a question that has received great attention by economists at least since the work of Kaldor (1956) and Kaldor (1957), which propposed a channel through which inequality would favour economic growth. Kaldor shows that if economic growth is based on the accumulation of capital, and assuming that richer individuals have a higher propensity to save, then a more unequal society would have a higher aggregate saving rate and therefore grow faster. Stiglitz (1969) and Bourguignon (1981) formalized this idea in a Solow growth model. Another two mechanisms were put forward in the early days of the discussion, again predicting a positive relation between inequality and growth. On the one hand, the existence of investment indivisibilities would imply that only individuals with a sufficiently high level of income (or assets) could afford the initial fixed costs needed to carried out socially benefitial investments. Therefore, higher inequality would favor that a larger fraction of the population has access to investment opportunities, increasing the rate of growth of the economy. On the other hand, inequality of outcomes provides incentives to individuals to invest and accumulate physical and/or human capital, or to exert the optimal level of effort, and would therefore be a necessary ingredient in the growth process [1].

The generalized use of representative agent models in the neoclassical tradition abstracted from the effects of the income (or wealth) distribution on economic growth, until Galor and Zeira (1993) reintroduced resource heterogeneity as an important factor for economic development. In particular, they showed how in

[1] See Aghion et al. (1999b) for a discussion of these channels.

an environment of imperfect credit market and fixed costs in the acquisition of human capital, inequality has a negative and long lasting effect on economic growth. Different papers followed this line, keeping the main two ingredients (market incompletness and some kind of minimum investment level), reaching similar conclusions, i.e. that higher levels of inequality would produce under-investment and therefore harm economic growth. Usually the missing markets are the credit or insurance markets, due to limmited commitment or moral hazard problems (Ferreira (1995), Aghion and Bolton (1997), Piketty (1997) or Banerjee and Newman (1991). Aghion et al. (1999b) survey this literature and present simple versions of these models. All these papers share an important approach: they propose a direct negative effect of inequality on growth, due to the specifics of the economic environment. For this reason, most of them call for ex-ante redistributive policies that reduce inequality of resources before production takes place, and therefore have a positive impact on economic growth. Intuitively, redistributive fiscal policy would be a substitute for the missing market, and thus growth-enhancing.

A different set of papers have proposed an indirect effect of inequality on economic growth, based on the idea that the distribution of resources has important political implications, which then feed to the economic system to affect economic development. The sometimes called political economy channel was introduced by papers like Persson and Tabellini (1994), Alesina and Rodrik (1994) or Perotti (1993). These papers are based on the application of the median voter theorem to the political determination of fiscal policy, in the spirit of Meltzer and Richard (1981). Higher inequality makes the median (decisive) voter poorer with respect to the mean income, and therefore increases taxes and redistribution in equilibrium. If taxation involves some kind of distortions, due for example to disincentives to work or invest, then more unequal societies would have higher levels of taxation and redistribution and therefore a higher level of negative distortions which would lower the rate of economic growth. These theories predict a negative relation between inequality and growth, through a indirect political channel. The main problem was that, even though empirical evidence at the time seemed to support the overall negative effect of inequality on growth, the data clearly contradicted the transmission mechanism proposed (see below). Cross-section analyses on the relation of inequality and redistribution found negative coefficients, that is, more unequal countries redistribute less than countries with lower distributional disparities. Furthermore, empirical evidence showed an insignificant relationship between redistribution and economic growth, or even positive. Papers like Paul and Verdier (1996), Benabou (2000) or Benabou (2002) tried to rationalize these empirical findings with the political channel theories proposing a different mechanism. Rich individuals have lobbying power to prevent redistributive policies from being implemented, and therefore higher inequality would increase the lobbying pressures producing a lower level of redistribution, which would then reduce economic growth.

Other papers have proposed other indirect channels based on political arguments, like Acemoglu and Robinson (2000), who talk about the revolution risk produced by high levels of social inequality. High levels of inequality would be associated with violent revolutions and regime changes, as the poor majority might not find a way through the non-violent political process to implement redistributive policies. Is this social unrest that creates political and eventually economic instability and negatively affects long run growth. If the ruling elite does not have the power to repress these demands, it might be forced to voluntarily implement such a redistributive policies, initiating a democratization process. Others have followed this line of research and proposed ways in which inequality can increase political and economic instability, and harm economic growth in the process. Papers like Alesina and Perotti (1996) or

Aghion et al. (1999a) are some early examples.

Empirical Literature

The early empirical studies in the decade of the 1990's on the effect of inequality on growth were based on reduced form cross-country OLS regressions of a measure of initial inequality (usually Gini indeces or the income share of the middle quintiles) on average economic growth for the subsequent 20-30 years[2]. Typical controls include the initial level of real GDP per capita, average human capital, or regional dummies. Prominent examples of these kind of studies include Persson and Tabellini (1994), Perotti (1993), Perotti (1996), Deininger and Squire (1998) or Clarke (1995), which all found a significant negative relation between inequality and economic development. It is worth noting that Persson and Tabellini (1994) and Perotti (1996) report that the effect of inequality becomes insignificant when regional dummies are included in the model.

In the following years, a set of papers posed different caveats to this result, using panel data to include within country variation effects. Forbes (2000) found a positive effect of inequality on short term growth. Barro (2000) claimed that the sign of the effect of inequality depended on the level of the country's development, being positive for developed countries and negative for developing countries, and reporting an insignificant relation when all countries were pooled together. Castell-Climent (2010) and Knowles (2005) found similar results, with the latter reporting an insiginificant relation between inequality and growth for mid-rich countries. Banerjee and Duflo (2003) find that

[2]See Benabou (1996) for an early revision of the literature, and Cingano (2014), Ostry et al. (2014) or Castells-Quintana and Royuela (2017) for more recent ones.

changes in inequality, in any direction, are associated with lower growth, casting doubts on the linear OLS specifications used in most of the empirical studies. Voitchovsky (2005) found that inequality affects growth differently depending of the source of inequality, having a positive effect when it is the rich who pull away and a negative effect when the poor fall behind. Recently, Cingano (2014) found supporting evidence for this result for OECD countries. Ostry et al. (2014) is one of the few papers that have recently found a clear negative relation between inequality and growth. Furthermore, they document that inequality not only produces lower average long run growth, but also reduces the duration of growth spells.

Some papers have tried to go beyond the direct evidence on the effect of inequality on economic growth, to try to test the main mechanisms proposed to explain such a relationship. Regarding the political economy explanation that claims that higher inequality would lead to higher taxation and economic distortions, does not seem to be supported by empirical evidence. Perotti (1996) and Persson and Tabellini (1994) find an insignificant relationship between inequality and the level of redistribution, or even slightly negative [3]. Furthermore, most of the studies that have analyzed how the level of redistribution affects economic growth have found a positive relation. The political and economic stability channel has found general support in the data, as reported by Alesina and Perotti (1996), Perotti (1996), Svensson (1998) or Keefer and Knack (2002). The credit market incompleteness channel was accepted empirically by Deininger and Squire (1998), but Perotti (1996) obatined inconclusive results. Finally, the saving channel proposed early by Kaldor (1957) was rejected empirically by Barro (2000).

[3] See the discussion in the introduction of this paper.

Overall, the lack of consensus among empirical studies about the effects of inequality on economic development, and the different transmission mechanisms through which this relation may work, is clear. This is most likely due to disparities in the apporach taken and the techniques used as well as the lack of comparability in the data sets used[4]. The recent surge in the interest on the study of inequality will most likely help to provide more adequate data with which to obtain better answers to this classic question.

5.2 A Model of Inequality and Growth

In this section, I set up a simple model which can account for a variety of the transmission mechanisms detailed above on the effects of inequality on economic growth. Furthermore, I include the politico-economic environment of this paper to analyze how this relationship is affected when social mobility and tax evasion are included in the theoretical framework. I use the simple endogenous economic growth setting of Aghion et al. (1999b), including a source of tax exogenous distortions in the spirit of Persson and Tabellini (1994). The political environment is equivalent to the one in the previous sections of this paper, so that the results proven above carry forward to this section. This simple framework can account for direct (positive or negative) effects of inequality on growth arising from the economic environment, as well as indirect effects of inequality brought about by the determination of fiscal policy in a democratic political process. For simplicity pourposes I will use the two type version of section 2, so that closed formed solutions can be easily found and propositions can be proved.

[4]See Neves et al. (2016) and Cingano (2014) for a detailed discussion on the econometric methods and data constraints of the literature.

5.2.1 Model Set-up

Economic Environmnet. Think of a continuum of overlapping generation families indexed by $i \in [0,1]$. Each family is composed of one individual who lives for one period, and can be of two types $i = \{H, L\}$. A measure δ of them will be high type, and a measure $(1-\delta)$ low. As before, the type of the family determines the probability of having a high endowment, π and $1-\gamma$ respectively[5]. Each individual born in period t uses his after-tax endowment $(\hat{y}_t^i)$ to invest in the production of the consumption good according to the following individual production function:

$$F(\hat{y}_t^i) = A_t \left(\hat{y}_t^i\right)^\alpha$$

The value of α determines the marginal returns with respect to individual investments. Total output is the sum of all individual outputs. When $\alpha = 1$, there are constant returns to scale with respect to individual endowments, and inequality in after-tax endowments does not affect aggreagate output. If $0 < \alpha < 1$, higher dispersion of individual investments reduces total output, while when $\alpha > 1$ higher inequality increases total production. The level of technological knowledge in period t is given by A_t, and is common to all individuals. The economy features learning by doing and knowledge spillovers, so technology in period t depends on the amount of aggregate production in the previous periods:

$$A_t = \int A_{t-1} \left(\hat{y}_{t-1}^i\right)^\alpha di$$

[5] The way individual family types are assigned is irrelevant. Assuming that family types are randomly assigned at the beginning of the period, that each individual inherits the initial family type of his father, or his end of period type, is equivalent as long as the fraction of high type individuals is δ in every period.

Denote aggregate output in period t as Y_t, then economic growth between periods $t-1$ and t is given by:

$$g_t = \ln \frac{Y_t}{Y_{t-1}} = \ln \frac{\int A_t \left(y_t^i\right)^\alpha di}{A_t} = \ln \int \left(y_t^i\right)^\alpha di$$

In the simple two-type version of this model, the level of knowledge and the growth rate of output is given by:

$$\begin{aligned} A_t &= A_{t-1} \left[\delta \left(\hat{y}_{t-1}^H\right)^\alpha + (1-\delta) \left(\hat{y}_{t-1}^L\right)^\alpha\right] \\ g_t &= \ln \left[\delta \left(\hat{y}_{t-1}^H\right)^\alpha + (1-\delta) \left(\hat{y}_{t-1}^L\right)^\alpha\right] \end{aligned}$$

Think of a situation in which $\alpha \in (0,1)$, so that inequality has a direct negative effect on growth, in the spirit of the incomplete markets approach. If initial endowments can be traded without frictions, all individuals would invest the same amount in equilibrium and economic growth would be maximized. If capital markets are imperfect, initial endowment disparities cannot be completely eliminated and therefore output growth will be reduced. Assume the extreme case of no capital markets, so each individual is constrained by his initial endowment. As Aghion et al. (1999b) and others propose, a redistributive fiscal policy that taxes those with high endowments and subsidizes those with low endowments is growth enhancing. Furthermore, the highest rate of economic growth is attained with full redistribution, when all endowments are equalized. Following the notation of the previous sections, a tax rate $\tau = 1$ implies that every individual has a post-tax endowment of $\bar{y}$ and output growth is given by $\alpha \ln \bar{y}$. But as we have seen, when taxes are the outcome of a political process, full redistribution is not in general an equilibrium. Furthermore, if taxation involves some costs, then the potential efficiency benefits of redistribution trade off against its distortive costs. In what follows, I study the effects of inequality on growth in a political environment with tax enforcement frictions and income mobility.

Political Environment. The government collects proportional taxes on initial endowments, and lump-sum redistributes total tax revenue. The tax rate is determined in a democratic political process that takes place after family types are realized, but before actual endowments are realized, where each individual has one vote. As before, each individual can decide whether he wants to voluntarily comply with his tax obligations or to try to evade taxes. This decision is denotes by $\rho_t^i \in \{0,1\}$ where 1 denotes evasion, and takes place after the vote on tax rates, but before the realization of actual endowments. The government runs a tax enforcement process, auditing a fraction θ of the population. If an individual evades taxes and is audited, the government imposes a proportional penalty on his endowment (η), and excludes him from transfers. If an individual evades taxes and is not audited, he keeps his whole endowment, but does not recieve transfers. Notice that total tax revenue is the sum of taxes voluntarily paid by those who comply and the penalties collected from audited tax evaders, and is only redistributed to those who complied in the first place.

I introduce exogenous taxation costs, to capture the idea that taxation involves some distortions. These costs have a quadratic form $\phi\frac{\tau_t^2}{2}$, where $\phi \geq 0$ captures the magnitude of these costs. As was proved before, in the two family type setting there is no tax evasion in equilibirum, so the government budget constraint is given by:

$$\tau_t\left[\delta y_t^H + (1-\delta)y_t^L\right] = \tau_t\bar{y}_t - \phi\frac{\tau_t^2}{2}$$

Timing. The timing within each period is the same as in section 2.3, but instead of directly consuming his after-tax endowment ($\hat{y}_t^i$), now individuals use it to invest in the production of the consumption good. Therefore the timing is:

1. Family types are realized.
2. Majority vote on the tax rate τ_t.
3. Compliance/evasion decision by each individual ρ_t^i.
4. Uncertainty is resolved and the pre-tax endowment of each individual is known, y_t^i.
5. Audit process.
6. Redistribution of total tax revenue (voluntarily paid plus enforced).
7. Investment of after-tax and transfer income ($\hat{y}_t^i$) in the production technology.
8. Consumption takes place, c_t^i.

As in section 2.3, the crucial assumption about this timing is that the voting on tax rates and the compliance-evasion decision take place when individuals only know their family type, but not their actual endowment. They have therefore imperfect information about how fiscal policy will affect them. Again, taxes and transfers serve two pourposes, redistribution and insurance, and the degree of social mobility will play a crucial role in determining the relative importance of each of them. Notice as well that I assume no capital markets, an extreme form of market incompleteness that prevents individuals from trading their endowments to those with higher marginal productivities. Thus, after-tax endowments determine the production capacity of each individual, and his level of consumption.

5.2.2 Comparative Static Results

Recall from section 2.3 that with only two family types, the equilibirum tax rate is given by the maximum tax which ensures that the high family type individuals decide to comply with their tax obligations. The results proven in the propositions above with respect to the equilibrium tax rate carry forward to this section without change. In particular, as proposition 5 shows, the effect of an increase in the level of inequality (mean preserving spread) on the equilibrium tax rate depends on the level of social mobility $(1 - \pi)$. With this results in mind, we can now prove some propositions regarding the effect of inequality on economic growth, when different transmission mechanisms are in play.

Two parameters capture the different channels through which inequality can affect economic growth, α and ϕ. On the one hand, α determines the direct effect of inequality on growth. When $\alpha \in (0, 1)$, higher inequality implies lower aggregate production and therefore lower technology and economic growth. This case would be a reduced form equivalent to the investment indivisibilities or fixed costs mechanisms explained above, proposed by papers like Galor and Zeira (1993) or Banerjee and Newman (1991). If $\alpha = 1$, inequality does not cause a direct effect on growth, neither positive nor negative. Usually, the political economy mechanisms would have this feature, as the effect of inequality on growth in these settings operates only through the political process, not directly from the economic environment. Finally, if $\alpha > 1$, higher inequality would procude a higher rate of economic growth, resembling mechanisms like the saving channel proposed by Kaldor (1957). On the other hand, ϕ captures the distortions created by taxation. When $\phi = 0$ there are no tax distortions and we are left with the direct mecahnisms described above. Instead, when $\phi > 0$ taxation creates costs that reduce economic growth and, to the extent that inequality affects the determination of tax rates, creates an indirect channel through which inequality affects economic growth. These costs are equivalent to the negative labor supply effects of taxation in models with elastic labor, or the investment desincentives in dinamic models like Persson and Tabellini (1994). In what follows, I show comparative static results on the effect of inequality on economic growth for different combinations of α and ϕ, and how the mechanisms captured by different values of these parameters are affected by social mobility.

Abstract from tax distortions for now ($\phi = 0$). I will drop time subscripts t for notational simplicity. The following proposition shows how inequality affects economic growth for different values of α.

Proposition 6. *Let (y'_H, y'_L) be a mean preserving spread of (y_H, y_L), so that $y'_H > y_H$, $y'_L < y_L$ and $\bar{y}' = \bar{y}$. Let $\phi = 0$. Then:*

(i) For $\alpha \in (0,1)$, an increase in inequality decreases economic growth.

(ii) For $\alpha = 1$, an increase in inequality does not change economic growth.

(iii) For $\alpha > 1$, an increase in inequality increases economic growth.

Furthermore, the magnitude of the effect of inequality on economic growth (positive or negative) is increasing in social immobility (π).

Proof. Remember that the rate of economic growth is given by:

$$g = \ln\left[\delta\left(\hat{y}^H\right)^\alpha + (1-\delta)\left(\hat{y}^L\right)^\alpha\right]$$

Given that $\phi = 0$ and that we know that there is no evasion in equilibrium, g can be expressed in terms of y^H as:

$$g = \ln\left[\delta\left((1-\tau^*)y^H + \tau^*\bar{y}\right)^\alpha + (1-\delta)\left((1-\tau^*)\frac{\bar{y}-\delta y^H}{1-\delta} + \tau^*\bar{y}\right)^\alpha\right]$$

Taking the derivative of the term inside the bracket (equal to e^g) with respect to y^H we can sign the effect of a mean preserving spread on economic growth, given that $\bar{y}$ does not change, and the logarithmic function is a monotone transformation. Such a derivative yields:

$$\begin{aligned}\frac{\partial e^g}{\partial y^H} =&\delta\alpha\left(\hat{y}^H\right)^{\alpha-1}\cdot\left[(1-\tau^*)+\frac{\partial\tau^*}{\partial y^H}(\bar{y}-y^H)\right]+\\ &+(1-\delta)\alpha\left(\hat{y}^L\right)^{\alpha-1}\cdot\left[\frac{\delta}{1-\delta}(1-\tau^*)+\frac{\partial\tau^*}{\partial y^H}(\bar{y}-y^L)\right]\\ =&\delta\alpha\left[\left(\hat{y}^H\right)^{\alpha-1}-\left(\hat{y}^L\right)^{\alpha-1}\right]\cdot\left[(1-\tau^*)+\frac{\partial\tau^*}{\partial y^H}(\bar{y}-y^H)\right]\end{aligned}$$

Think of the case when $\alpha \in (0,1)$. The first term in brackets is always negative as long as there is no full redistribution ($\tau^* < 1$), because $\hat{y}^H > \hat{y}^L$. The sign of the second term in bracket depends on the derivative of the equilibirum tax rate with respect to the level of inequality. Recall from proposition 5 that there is a cutoff level of immobility (π^*) that determines this effect. When $\pi \geq \pi^*$, so relatively low levels of mobility, $\frac{\partial\tau^*}{\partial y^H} \leq 0$ and therefore the second term is always positive. When $\pi < \pi^*$ (high mobility), $\frac{\partial\tau^*}{\partial y^H} > 0$ and the last term in the second bracket is negative. Anyhow, for interior equilibrium tax rates, this term is sufficiently small so that the second bracket is again positive. Thus, an increase in inequality always decreases economic growth when $\alpha \in (0,1)$, as part (i) in the proposition claims.

Proving part (ii) of the proposition is straightforward. Notice that, for $\alpha = 1$, the first bracket is equal to 0, so that $\frac{\partial e^g}{\partial y^H} = 0$ as well. In order to prove part (iii), observe that the first bracket is now always positive. According to the analysis of the second bracket above, $\frac{\partial e^g}{\partial y^H}$ is therefore always positive.

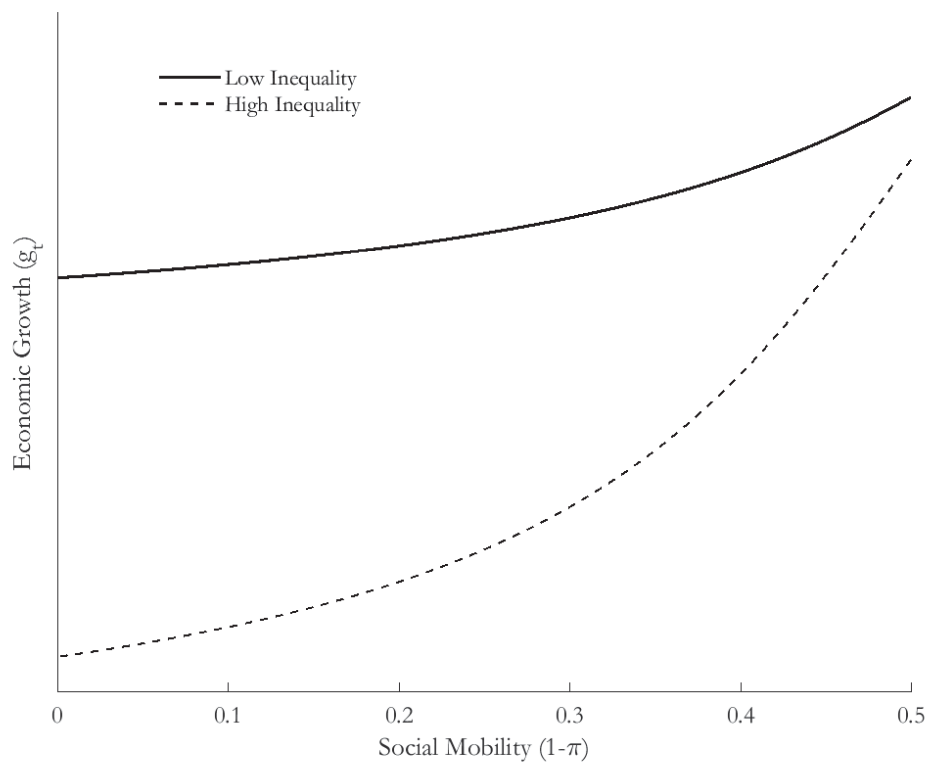
Finally, to prove the last part of the proposition that states that the effect of inequality on growth is increasing in π, it suffices to take the derivative of the last expression with respect to π:

$$\frac{\partial^2 e^g}{\partial y^H \partial \pi} = \delta\alpha \left[(\alpha-1)\left(\hat{y}^H\right)^{\alpha-2} \cdot - \frac{\partial \tau^*}{\partial \pi} y^H + \frac{\partial \tau^*}{\partial \pi}\bar{y} \right] \cdot \left[(1-\tau^*) + \frac{\partial \tau^*}{\partial y^H}(\bar{y} - y^H) \right] + \delta\alpha \left[\frac{\partial \tau^*}{\partial \pi} + \frac{\partial^2 \tau^*}{\partial y^H \partial \pi}(\bar{y} - y^H) \right] \cdot \left[\left(\hat{y}^H\right)^{\alpha-1} - \left(\hat{y}^L\right)^{\alpha-1} \right]$$

When $\alpha \in (0,1)$, the expression is negative, which implies that the magnitude of the negative effect of inequality on growth is larger as π increases (less mobility). On the contrary, when $\alpha > 1$ the expression is always positive which means that the positive effect of inequality on growth is larger as π increases. ■

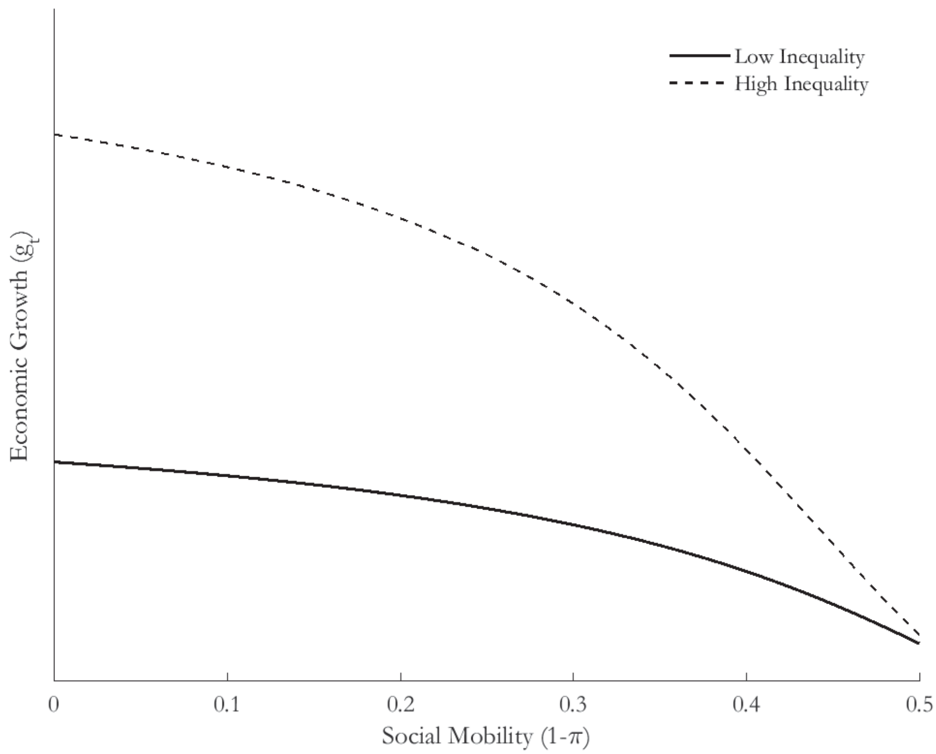
Proposition 6 shows how, when only direct effects of inequality on growth are present, the sign of the effect depends on the specific economic environment proposed. When inequality reduces growth due to diminishing marginal returns with respect to individual investments ($\alpha \in (0,1)$), taxation plays a role in amiliorating/exacerbating the effect of inequality on growth, but is never sufficient to change the negative sign of the effect. For economies with relatively high mobility, an increase in pre-tax inequality is compensated with an increase in redistribution, so that the effect on post-tax inequality is small, and thus also on growth. Instead, for economies with low economic mobility, higher pre-tax inequality is followed by a decrease in taxes which further reduces the rate of economic growth. So the result is similar to those in papers like Aghion et al. (1999b) or Galor and Zeira (1993), but now the introduction of social mobility implies that higher inequality is specially harmful for growth in societies with low social mobility. When $\alpha > 1$, higher inequality has always a positive effect on growth, in the spirit of Kaldor (1957). This effect is stronger when social mobility is low, because the increase in growth is reinforced by the lower level of redistribution, while is partially compensated with higher taxes and redistribution when social mobility is relatively high. This can be observed in figures 5.1 and 5.2, which plot the rate of economic growth for different levels of social mobility when $\alpha \in (0, 1)$ and $\alpha > 1$ respectively. The solid lines depict the rate of economic growth for an initial level of inequality, while the dashed lines show the growth rate after an equal increase in inequality. In the first case, higher inequality always reduces growth, and specially so the lower the level of social mobility. On the contrary, in the second case higher inequality always fosters growth, and this effect decreases with social mobility.

Figure 5.1: Inequality and Economic Growth ($\phi = 0, 0 \leq \alpha \leq 1$)



Note: Figure generated for $\sigma = 1.5$, $\theta = 0.1$, $\eta = 0.3$, $\delta = 0.2$, $y_H = 5$, $y'_H = 6$, $\bar{y} = 3$, $\alpha = 0.8$, $\phi = 0$.

Figure 5.2: Inequality and Economic Growth ($\phi = 0, \alpha > 1$)



Note: Figure generated for $\sigma = 1.5$, $\theta = 0.1$, $\eta = 0.3$, $\delta = 0.2$, $y_H = 5$, $y'_H = 6$, $\bar{y} = 3$, $\alpha = 1.2$, $\phi = 0$.

Figures 5.1 and 5.2 also show how economic growth is affected by social mobility, for a given level of pre-tax inequality. The solid line is increasing in figure 5.1, when $\alpha \in (0, 1)$, showing that higher mobility favours economic growth; while it is decreasing in figure 5.2 ($\alpha > 1$), implying that mobility reduces growth in this case. As we saw, higher social mobility benefits the tax enforcement process and increases equilibirum taxes and redistribution. With diminishing returns to individual investments, redistribution helps reduce post-tax inequality and therefore fosters growth, while with increasing returns to individual investment redistribution reduces the rate of economic growth. In a similar way, higher audit and penalty rates have the same effects as higher social mobility, as these exogenous changes also produce an increase in taxation and redistribution. Proposition 7 formally proves these results.

Proposition 7. *Let $\phi = 0$. Then:*

(i) For $\alpha \in (0,1)$, economic growth is increasing in social mobility $(1-\pi)$, the audit rate (θ) and the penalty rate (η).

(ii) For $\alpha = 1$, economic growth is independent of social mobility $(1-\pi)$, the audit rate (θ) and the penalty rate (η).

(iii) For $\alpha > 1$, economic growth is decreasing in social mobility $(1-\pi)$, the audit rate (θ) and the penalty rate (η).

Proof. The result can be proved by taking the derivative of e^g with respecto to $(1-\pi), \theta$ and η:

$$\frac{\partial e^g}{\partial(1-\pi)} = \delta\alpha\left[\left(\hat{y}^H\right)^{\alpha-1} - \left(\hat{y}^L\right)^{\alpha-1}\right] \cdot \left[\frac{\partial \tau^*}{\partial(1-\pi)}(\bar{y} - y^H)\right]$$

$$\frac{\partial e^g}{\partial \theta} = \delta\alpha\left[\left(\hat{y}^H\right)^{\alpha-1} - \left(\hat{y}^L\right)^{\alpha-1}\right] \cdot \left[\frac{\partial \tau^*}{\partial \theta}(\bar{y} - y^H)\right]$$

$$\frac{\partial e^g}{\partial \eta} = \delta\alpha\left[\left(\hat{y}^H\right)^{\alpha-1} - \left(\hat{y}^L\right)^{\alpha-1}\right] \cdot \left[\frac{\partial \tau^*}{\partial \eta}(\bar{y} - y^H)\right]$$

The sign of the second term in brackets is always negative, given than $\frac{\partial \tau^*}{\partial(1-\pi)}$, $\frac{\partial \tau^*}{\partial \theta}$ and $\frac{\partial \tau^*}{\partial \eta}$ are all positive (proposition 4), and $y^H > \bar{y}$. The first term in brackets is negative when $\alpha \in (0,1)$, and positive when $\alpha > 1$, which proves the result. ■

Now let's introduce distortionary costs of taxation, so $\phi > 0$. These costs create an additional (indirect) mechanism through which inequality affects growth, as inequality will also change the level of redistribution and therefore the level of distortions in the economy. Proposition 8 shows how economic growth is affected by inequality for different values of α, ϕ and π.

Proposition 8. *Let (y'_H, y'_L) be a mean preserving spread of (y_H, y_L), so that $y'_H > y_H$, $y'_L < y_L$ and $\bar{y}' = \bar{y}$. Let $\phi > 0$. Then:*

(i) For $\alpha \in (0,1)$, economic growth is decreasing in inequality when $\pi \leq \pi^*$, and can be increasing or decreasing in inequality when $\pi > \pi^*$.

(ii) For $\alpha = 1$, economic growth is increasing in inequality when $\pi > \pi^*$, decreasing in inequality when $\pi < \pi^*$, and independent of inequality when $\pi = \pi^*$.

(iii) For $\alpha > 1$, economic growth is increasing in inequality when $\pi \geq \pi^*$, and can be increasing or decreasing in inequality when $\pi < \pi^*$.

Proof. Including the costs of taxation in the calculation of the growth rate, we get:

$$g = \ln\left[\delta\left((1-\tau^*)y^H + \tau^*\bar{y} - \phi\frac{\tau_t^2}{2}\right)^\alpha + (1-\delta)\left((1-\tau^*)y^L + \tau^*\bar{y} - \phi\frac{\tau_t^2}{2}\right)^\alpha\right]$$

The result can be obtained by taking the derivative of e^g with respecto to y^H:

$$\begin{aligned}\frac{\partial e^g}{\partial y^H} =& \delta\alpha\left[\left(\hat{y}^H\right)^{\alpha-1} - \left(\hat{y}^L\right)^{\alpha-1}\right]\cdot\left[(1-\tau^*) + \frac{\partial\tau^*}{\partial y^H}(\bar{y} - y^H)\right] \\ &- \alpha\left(\phi\tau^*\frac{\partial\tau^*}{\partial y^H}\right)\left(\delta y\left(y^H\right)^{\alpha-1} + (1-\delta)y\left(y^L\right)^{\alpha-1}\right)\end{aligned}$$

Notice that the first term (first line) is the same that we obtained when $\phi = 0$. So we know that it is positive when $\alpha > 1$, negative when $\alpha \in (0,1)$, and equal to zero when $\alpha = 1$. This term captures the direct effect of inequality on growth due to the type of returns with respect to individual investments. The second term captures the distortions created by taxation, and its sign depends on the sign of $\frac{\partial\tau^*}{\partial y^H}$, which depends on π as is established in proposition 5. Let's evaluate each case.

When $\alpha \in (0,1)$, for $\pi \leq \pi^*$ both terms in the derivative are negative, so inequality is always harmful for growth. When $\pi > \pi^*$, the first term is negative but the second is positive, so the effect of inequality can be positive or negative.

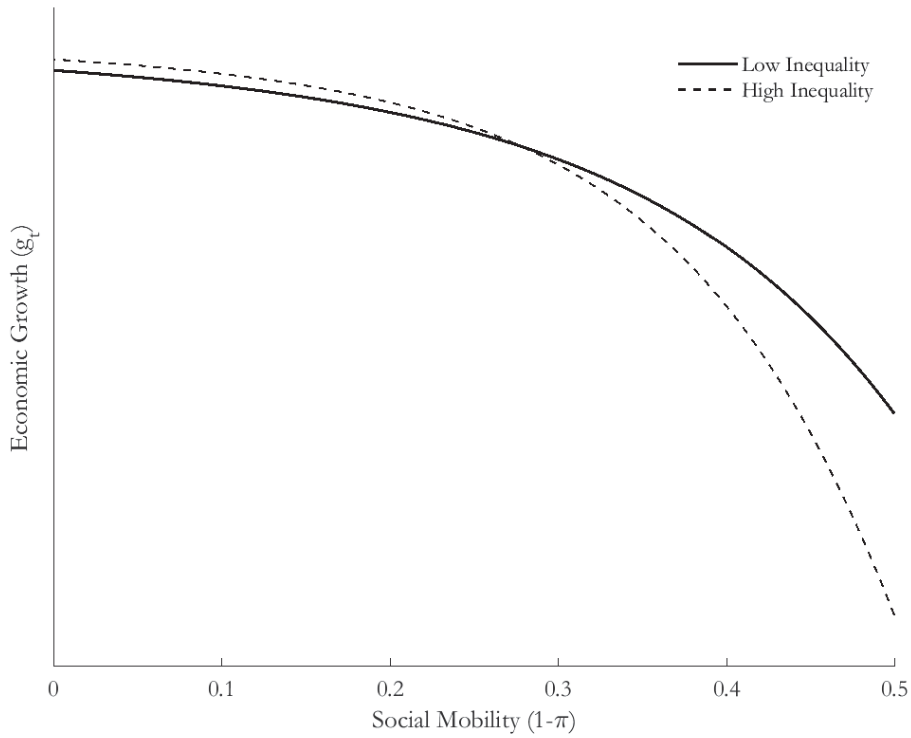
When $\alpha = 1$, the first term is equal to zero, so the effect of inequality on growth only depends on the indirect effect of the second term. For $\pi > \pi^*$, higher inequality increases economic growth. For $\pi = \pi^*$, growth is independent of inequality. For $\pi < \pi^*$, economic growth is decreasing in inequality.

When $\alpha > 1$, or $\pi \geq \pi^*$ both terms in the derivative are positive, so inequality is always good for growth. When $\pi < \pi^*$, the first term is positive but the second is negative, so the effect of inequality can be positive or negative. ■

The case of $\alpha = 1$ is equivalent to the setting of Persson and Tabellini (1994), where the only channel between inequality and economic growth is through the distortionary effects of taxation. In this case, higher taxation increases distortions and lowers economic growth. But inequality affects taxation differently depending on the level of social mobility. For this reason, inequality is harmful for growth only when social mobility is relatively high, as only in this case higher inequality increases tax rates and therefore the distortions in the economy. When social mobility is low, inequality is actually good for growth, as it produces a reduction in taxes that diminish the distortionary costs. Figure 5.3 shows this situation, where π^* is the splitting point in the effect of inequality on growth.

When $\alpha > 1$, inequality always produces a direct positive effect on economic growth, which can be reinforced or compensated depending on the sign of distortionary costs of taxation. For low levels of mobility, inequality is unambiguously good for growth, as the positive direct effect is further complemented with a decrease in economic distortions due to lower taxation. For high levels of mobility, the direct effect of inequality trades off with an increase in the

Figure 5.3: INEQUALITY AND ECONOMIC GROWTH ($\phi = 1, \alpha = 1$)

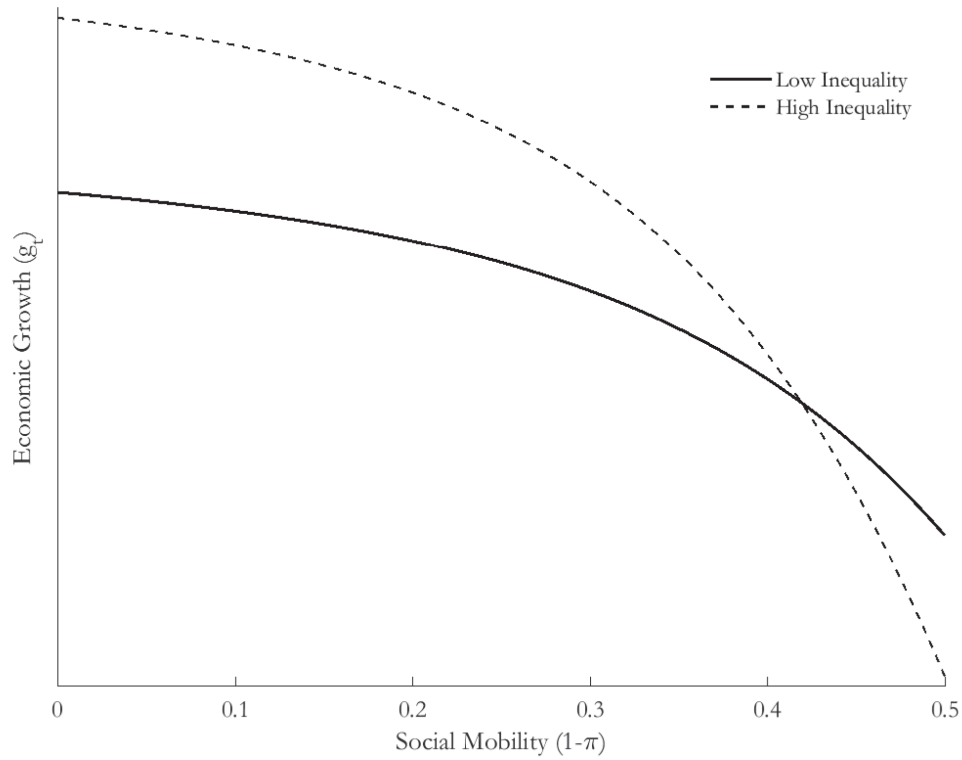


Note: Figure generated for $\sigma = 1.5$, $\theta = 0.1$, $\eta = 0.3$, $\delta = 0.2$, $y_H = 5$, $y'_H = 6$, $\bar{y} = 3$, $\alpha = 1$, $\phi = 1$.

distortionary costs of taxation brought about by the increase in taxes, so the overall effect might be positive or negative. Numerical examples as the one in figure 5.4 show that only with very high levels of mobility the effect of inequality on growth turns negative.

Finally, for $\alpha \in (0, 1)$, the direct effect is always negative: inequality reduces growth. But again, the changes in the distortionary costs might reinforce or change the sign of the overall effect. When $\pi \leq \pi^*$ inequality is always bad for growth, as the the increase in taxation fosters the distortionary costs, which furhter reduce the economic growth rate of the economy. When $\pi > \pi^*$, taxes

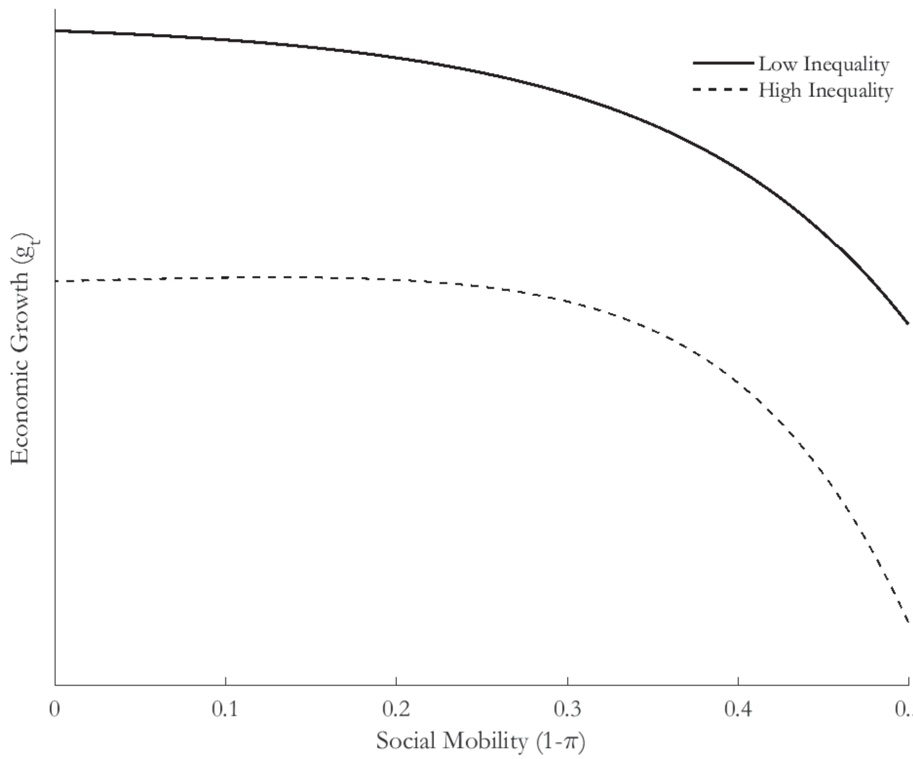
Figure 5.4: Inequality and Economic Growth ($\phi = 1, \alpha > 1$)



Note: Figure generated for $\sigma = 1.5$, $\theta = 0.1$, $\eta = 0.3$, $\delta = 0.2$, $y_H = 5$, $y'_H = 6$, $\bar{y} = 3$, $\alpha = 1.2$, $\phi = 1$.

fall and thus also the distortionary costs, and this effect will compensate the direct negative effect of inequality on growth. The total effect could be positive or negative, depending on the magnitude of the two channels. However, numerical examples point to the idea that the direct effect dominates the reduction in distortions, making inequality bad for growth. Figure 5.5 shows an example of this situation.

Figure 5.5: Inequality and Economic Growth ($\phi = 1, \alpha < 1$)



Note: Figure generated for $\sigma = 1.5$, $\theta = 0.1$, $\eta = 0.3$, $\delta = 0.2$, $y_H = 5$, $y'_H = 6$, $\bar{y} = 3$, $\alpha = 0.8$, $\phi = 1$.

Chapter 6

Conclusions

In this paper, I propose a politico-economic theoretical model in which inequality, social mobility and tax enforcement imperfections interact in the democratic choice of fiscal policy. When tax evasion is possible, voters need to take into account the implementability of the tax policy. In particular, the decisive voter needs to make sure that the relatively rich individuals will participate in the tax and transfer system and will not decide to evade taxes. In this sense, tax evasion puts a limit to the amount of redistribution in the economy. Social mobility plays an important role in this setting, as it favors the tax enforcement process by reducing the incentives for evasion for the relatively rich individuals. High mobility societies can therefore implement higher levels of taxation and redistribution. Moreover, the positive relation between inequality and taxation derived by canonical politico-economic models does not generally hold once tax evasion and social mobility are introduced. In this paper I show how higher inequality leads to higher tax rates only in relatively mobile societies. When social mobility is low, higher inequality leads to a decrease in taxation. This is because only when mobility is relatively high, rich individuals benefit from the insurance component of fiscal policy and therefore do not opt for tax evasion. Instead, if mobility is low, higher inequality increases the redistributive burden for rich individuals and thus their incentives for tax evasion. In order to keep them in the system, the relatively poor majority finds it optimal to reduce tax rates. I empirically test the main predictions of the theoretical model using data on social mobility for the 50 US states and the District of Columbia, finding overall support for the predictions of the model. Finally, I embed the politico-economic framework described above in a simple endogenous economic growth model, in order to analyze the effects of inequality on long run economic growth. Once social mobility and tax evasion are introduced in the model, a variety of classic results on the relationship between inequality and economic growth are modified.

Chapter 7

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