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Inequality Of Opportunity And Growth*

by

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Abstract

Theoretical and empirical studies exploring the effects of income inequality upon growth reach a disappointing inconclusive result. This paper postulates that one reason for this ambiguity is that income inequality is actually a composite measure of at least two different sorts of inequality: inequality of opportunity and inequality of effort. These two types of inequality affect growth through opposite channels, so the relationship between income inequality and growth is positive or negative depending on which component is larger. We test this proposal using inequality-of-opportunity measures computed from the PSID database for 23 states of the U.S. in 1980 and 1990. We find robust support for a negative relationship between inequality of opportunity and growth, and a positive relationship between inequality of effort and growth.

JEL Classification: D63, E24, O15, O40.
Key Words: income inequality; inequality of opportunity; economic growth.

Resumen

La literatura existente, tanto empírica como teórica, que estudia la relación entre desigualdad y crecimiento ofrece conclusiones contrapuestas. Este artículo postula que una de las razones de esta ambigüedad es que la medida de desigualdad global usada es en realidad una medida compuesta por dos tipos de desigualdad: desigualdad de oportunidades y desigualdad de esfuerzo. Estos dos tipos de desigualdad afectan al crecimiento a través de canales muy distintos, por lo que la relación entre desigualdad y crecimiento será positiva o negativa dependiendo de qué componente sea más importante. En este trabajo se contrasta esta hipótesis usando estimaciones de la desigualdad de oportunidades calculadas a partir de la base de datos PSID para un conjunto selectivo de regiones de Estados Unidos en la década de los ochenta y los noventa. Encontramos resultados robustos que sustentan la existencia de una relación negativa entre desigualdad de oportunidades y crecimiento y una relación positiva entre el componente de desigualdad de esfuerzo y crecimiento.

Introduction

A surge of literature on income inequality and growth has emerged over the last two decades.[2] On one hand, this literature addresses the causation from growth to inequality, and disputes about the Kuznets (1955) hypothesis, according to which economic development should eventually reduce income inequality. On the other hand, the reverse causation is studied; i.e., the effects of income inequality on growth. We concentrate on this second channel of influence, whose related literature has lead to controversial conclusions.

The analysis of the relationship between inequality and growth suggests many channels through which inequality can affect growth. Accumulation of savings (Galenson and Leibenstein, 1955), unobservable effort (Mirrless, 1971), and the investment project size (Barro, 2000) are some of the main routes through which inequality may enhance growth. On the contrary, inequality can negatively affect growth through the following channels: unproductive investments (Mason, 1988), levels of nutrition and health (Dasgupta and Ray, 1987), demand patterns (Marshall, 1988), capital market imperfections (Galor and Zeira, 1993), fertility (Galor and Zang, 1997), domestic market size (Murphy et al., 1989), political economy (Persson and Tabellini, 1994), and political instability (Alesina and Perotti, 1996). Thus, overall inequality would affect growth positively or negatively depending on the channels that dominate.

However, the existing empirical literature does not indicate that any of these channels has a predominant influence. As a result, the relationship between inequality and growth turns out to be ambiguous. Empirical papers tend to justify this ambiguity through the quality of data (Deininger and Squire, 1996), the inconsistent nature of

[2] Surveys on this issue can be found in Bénabou (1996), Bourguignon (1996), Aghion et al. (1999), Bertola et al. (2005) and Ehrhart (2009).

inequality measures (Knowles, 2001), the type of inequality index (Székely, 2003), the econometric method (Forbes, 2000) or the set of countries considered and their degree of development (Barro, 2000). As a conclusion, Ehrhart (2009) acknowledges that the overall rather inconclusive econometric results suggest that either the data and/or the instruments are not sufficient to estimate the true relationship between inequality and growth or the transmission mechanisms really at work are different from those mentioned in the literature.

In this paper, we defend the idea that this ambiguity can be due to the concept of inequality that has been used in the literature. In particular, we consider that income inequality is actually a composite measure of at least two different sorts of inequality: inequality of opportunity and inequality of effort (Roemer, 1993; Van de Gaer, 1993).[3] Thus, overall inequality can be seen as the result of heterogeneity in social origins and the exerted effort. These two types of inequality may affect growth in an opposite way. Because it may encourage people to invest in education and effort, income inequality among those who exert different effort can stimulate economic growth (Mirrless, 1971). Meanwhile, inequality of opportunity can decrease growth as it favors human capital accumulation by individuals with better social backgrounds or circumstances, rather than by individuals with more talent or skills (Loury, 1981; Chiu, 1998). The greater the inequality of opportunity, the stronger the role that background plays, rather than effort.

Furthermore, inequality of opportunity may increase social instability and raise the demand for redistribution. In sum, the relationship between income inequality and growth can be positive or negative depending on which kind of inequality prevails on the overall measure.

[3] Though not considered in this paper, another possible source of inequality is luck (Lefranc et al., 2006a).

The lesson for economic policy is clear. Policies that equalize income may increase investment across individuals and thus may increase growth, but, more likely, unobservable effort borne by agents will be discouraged. On the contrary, policies that equalize opportunities will improve individual investments without deterring individual effort. Hence, a general redistributive policy does not guarantee any result, and growth may increase or decrease depending on which effect – opportunity or effort – prevails. However, selected distribution policies reducing inequality of opportunity will promote growth-enhancing conditions for the economy.

In sum, this paper combines the growth literature from macroeconomics and the inequality-of-opportunity literature from microeconomics. The main goal is to revisit the relationship between inequality and growth, distinguishing between inequality of opportunity and effort. A discussion on both these literatures is presented in Section 2. In Section 3, we use depurated data of the Panel Survey Income Dynamics (PSID) database to estimate total inequality and inequality of opportunity for a selected set of 23 states in the U.S. in the 1980s and 1990s. Section 4 shows the empirical model and studies the effect on growth of income inequality, inequality of opportunity, inequality of effort and other widely used control variables. We find robust support for a negative relationship between inequality of opportunity and growth, and a positive relationship between inequality of effort and growth. Finally, the paper concludes in Section 5.

2. Inequality of Opportunity and the Inequality–Growth Debate

The last decade has witnessed an intensive debate about the effects of inequality on growth. Using the *Google Academic Search* tool, the term “inequality and growth” appears 608 times between 1990 and 1999 but 3,690 times between 2000 and 2009. Meanwhile, the inequality-of-opportunity literature has also increased in importance during the last decade. The term "inequality of opportunity" is shown 696 times between 1990 and 1999 but 1,460 times between 2000 and 2009. However, the entry "inequality of opportunity and growth" is shown zero times.[4] This section attempts to bring the inequality-of-opportunity issue into the inequality–growth debate.

Two different conceptions of equality of opportunity appear in the literature. The first one is about meritocracy (Lucas, 1995, Arrow et al., 2000). In this approach, individuals are completely responsible for their outcome (income, health, employment status, or utility). The second conception, which has been developed over the last two decades, considers that equal opportunity policies must create a "level playing field", after which individuals are on their own.[5] The "level playing field" principle recognizes that an individual's outcome is a function of variables beyond and within the individual's control, called circumstances (e.g., socioeconomic and cultural background and race) and effort (e.g., investment in human capital, number of hours worked and occupational choice), respectively.[6] Inequality of opportunity refers to those outcome inequalities that are exclusively due to different circumstances. Individuals are, therefore, only responsible for their effort. The meritocracy approach is an extreme case for which circumstances are not considered. In this paper, we adopt the more general second approach, which distinguishes between inequality of opportunity and inequality of effort.

[4] There is one academic document for each of the following entries: "inequality of opportunities and growth", "equality of opportunities and growth" and "equality of opportunity and growth". This search was made on May 26th, 2009.

[5] See Roemer (1993, 1996, 1998 and 2002), Van de Gaer (1993), Fleurbaey (1995), Roemer et al. (2003), Ruiz-Castillo (2003), Peragine (2002 and 2004), Lefranc et al. (2006a and 2006b), Betts and Roemer (2007), Moreno-Ternero (2007), Ooghe et al. (2007), Fleurbaey and Maniquet (2007) and Rodríguez (2009).

[6] Talent could be considered a circumstance, however, this variable is controversial as it might reflect past effort of a person (while being a child) and hence is not obviously something for which a person should not be held accountable.

Two sets of models have been proposed in the inequality–growth literature: models where inequality is beneficial for growth and models where inequality is harmful for growth.

In this literature, we find three main reasons for a positive relationship between inequality and growth. First, income inequality is fundamentally good for the accumulation of a surplus over present consumption regardless of whether the rich have a higher marginal propensity to save than the poor do (Kaldor’s hypothesis). Then, more unequal economies grow faster than economies characterized by a more equitable income distribution if growth is related to the proportion of national income that is saved (Galenson and Leibenstein, 1955, Stiglitz, 1969 and Bourguignon, 1981). Second, following Mirrless (1971), in a moral hazard context where output depends on the unobservable effort borne by agents, rewarding the employees with a constant wage, which is independent from output performance, will discourage them from investing any effort. Third, investment projects often involve large sunk costs. Wealth needs to be sufficiently concentrated in order for an individual to be able to initiate a new industrial activity. Barro (2000) proposes a similar argument for education. Accordingly, investments in physical or human capital have to go beyond a fixed degree to affect growth in a positive manner.

On the other hand, we find three main sets of models in which inequality can discourage growth. The first set refers to models of economic development where three general arguments can be found (Todaro, 1994): unproductive investment by the rich (Mason, 1988); lower levels of human capital, nutrition and health by the poor (Dasgupta and Ray, 1987); and biased demand pattern of the poor towards local goods (Marshall, 1988). The second set groups models of imperfect capital markets, fertility and domestic market size. Wealth and human capital heterogeneity across individuals produces a negative relationship between income inequality and growth whether or not capital markets are imperfect and investment indivisibilities exist.[7] According to the endogenous fertility approach, income inequality reduces per capita growth because of the positive effect that inequality exerts on the rate of fertility.[8] Moreover, the production of manufactures is only profitable if domestic sales cover at least the fixed setup costs of plants. Consequently, redistribution of income may increase future growth by inducing higher demand of manufactures.[9] Finally, the third set of models refers to the political economy literature, where two arguments can be found. First, in a median-voter framework, a more unequal distribution of income leads to a larger redistributive policy and thus to more tax distortion that deters private investment and growth.[10] Second, strong inequality may result in political instability.[11]

As a conclusion from the last two paragraphs, inequality may affect growth through a large variety of opposite routes. Therefore, from a theoretical perspective, the prevalence of a positive or negative relationship between overall inequality and growth depends on which channel predominates. This fact is clearly reflected by the empirical evidence linking income inequality to economic growth: cross-sectional and panel data studies are generally inconclusive. Cross-sectional analysis showing a negative relationship between both dimensions include, among others, Alesina and Rodrik (1994), Persson and Tabellini (1994), Clarke (1995), Perotti (1996), Alesina and Perotti

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[7] See Banerjee and Newman (1991), Galor and Zeira (1993), Bénabou (1996), Aghion and Bolton (1997) and Piketty (1997).
[8] See Galor and Zang (1997), Dahan and Tsiddon (1998), Morand (1998), Khoo and Dennis (1999) and Kremer and Chen (2002).
[9] See the contributions of Murphy et al. (1989), Falkinger and Zweimüller (1997), Zweimüller (2000) and Mani (2001).
[10] See Perotti (1992 and 1993), Alesina and Rodrik (1994), Alesina and Perotti (1994) and Persson and Tabellini (1994).
[11] See Gupta (1990), Tornell and Velasco (1992), Alesina and Perotti (1996), Alesina et al. (1996), Svensson (1998) and Keefer and Knack (2002).

(1996) and Alesina et al. (1996). However, other authors find a positive relationship between growth and income inequality, such as Partridge (1997) and Zou and Li (1998). Barro (2000) shows a very slight relationship between both variables when using panel data, while Forbes (2000) finds a positive relationship.

Given these different findings in the literature, we propose to analyze the inequality and growth relationship using the distinction between inequality of opportunity and inequality of effort. In particular, models *à la* Mirrless, where a positive relationship between inequality and growth is found, have to do with incentives to merits and effort, so they can be associated with the inequality-of-effort term. On the other hand, models where inequality is harmful for growth have to do with the negative impact that certain adverse circumstances may have on growth. In this case, these models are closed related to the inequality-of-opportunity concept. Consequently, by decomposing total inequality into inequality-of-opportunity and inequality-of-effort components, we can discriminate between some positive and negative influences upon growth.

In the rest of the paper, we test our proposal with an inequality–growth empirical analysis for the U.S. economy.

3. **Inequality of Opportunity in the U.S.**

In this section, we estimate the inequality of opportunity in the U.S. by using depurated data of the Panel Survey Income Dynamics (PSID) database for 23 states of the U.S. in the 1980s and 1990s. First, we present the method; next, we describe the database; and finally, we show the main results.

3.1. The estimation approach

There are two main proposals in the literature on inequality of opportunity; namely, Roemer's approach (Roemer, 1993) and Van de Gaer's approach (Van de Gaer, 1993). Because of the limited size of our samples, as discussed below, we adopt the second method because it is much less restrictive in terms of data requirements.[12]

The population is partitioned into a set of types $m=\{1, \ldots, M\}$, where all individuals in each type m share the same set of circumstances or social origins. As is standard in this literature, the individual income, u, is assumed to be a function of the amount of effort, e, that is expendsed and the set of circumstances, m, that the individual faces, which is denoted by $u^m(e)$. The set of incomes available to the members of each group is the opportunity set of each type.

Assume that the distribution of effort exerted by individuals of type m is F^m and that $e^m(\pi)$ is the level of effort exerted by the individual at the π^{th} quantile of that effort distribution. Given the type m, we may, hence, define the level of income obtained by the individual at the π^{th} quantile as follows:

$$v^m(\pi) = u^m(e^m(\pi)). \tag{1}$$

Let $\pi \in [0,1]$, and consider:

$$\bar{v} = \left(\int_0^1 v^1(\pi)\, d\pi, \ldots, \int_0^1 v^M(\pi)\, d\pi \right), \tag{2}$$

[12] Roemer's approach requires measuring income differences by quantiles, while Van de Gaer's method only meassures income differences at the mean. Nevertheless, both mechanisms produce the same rankings when the transition matrices between origins and income quantiles are "Shorrocks monotonic". See Van de Gaer et al. (2001) for more details on this point.

the M-dimensional vector of average incomes. We can interpret each element of the vector $\bar{v}$ as the expected income of each type or category of origin.

According to Van de Gaer's approach, there is equality of opportunity when the distribution of expected incomes is independent of circumstances or social origins. For this task, Van de Gaer (1993) proposed to maximize the minimum average income:

$$Min\,(\bar{v}) = \min_{m \in M} \left\{ \int_0^1 v^m(\pi)\, d\pi \right\}. \tag{3}$$

Instead of using a traditional inequality index like the Theil 0 or Gini indices, Van de Gaer favored the minimum function to keep with the *Rawlsian* maximin principle. However, his proposal is exposed to extreme values because it focuses only on the minimum average income. To reduce this problem, we adopt the Gini index, G, and the Theil 0 index (mean logarithmic deviation), T, which consider the whole vector $\bar{v}$ of average incomes.[13] More importantly, these indices will allow us to decompose the overall inequality into inequality-of-opportunity and inequality-of-effort components.

For every population partition, the Theil 0 index can be expressed as the sum of two terms: a weighted sum of within-group inequalities, plus a between-group inequality component (Bourguignon, 1979 and Shorrocks, 1980 and 1984). Given a particular set of circumstances, consider any partition of income v into M groups, $v = \left(v^1, ..., v^M\right)$, then overall inequality according to the Theil 0 index, $T(v)$, can be decomposed as follows:

[13] The use of an inequality index instead of the minimum function was proposed in Moreno-Ternero (2007), though he justified his proposal on pure equity grounds. The Gini index has a value between 0 and 1, while the Theil 0 index has a value between 0 and ln(N), where N is the sample size. Both indices are positively related to total inequality.

$$T(v) = T(\bar{v}) + \sum_{m=1}^{M} p_m T(v^m) \,, \tag{4}$$

where p_m is the frequency of type m in the population. The first term is a between-group index, which captures the income inequality due to different circumstances. This component is calculated by applying the Theil 0 index to an income vector in which each individual in a given group receives the corresponding group's mean income. Thus, this component is, by construction, an inequality-of-opportunity index. Its accuracy is conditioned by the set of circumstances being selected, which, in practice, depends on the available data. The second component is a within-group term, which captures the income inequality within each type *m*, weighted by the demographic importance of the corresponding type.[14] Because income is a function of effort and circumstances, the within-group component then can be considered as an inequality-of-effort index.

We also provide the Gini index decomposition. We are aware that the Gini index generally fails to decompose additively into between- and within-group components. For this reason, we mainly focus on the Theil 0 decomposition in the rest of the paper, showing the Gini results just for illustrative purposes. The Gini decomposition is (Lambert and Aronson, 1993):

$$G(v) = G(\bar{v}) + \sum_{m=1}^{M} p_m q_m G(v^m) + R \,, \tag{5}$$

[14] The rest of the inequality indices that belong to the General Entropy class use weights that are given not only by the groups' population shares but also by the groups' income shares.

where q_m is the income share for type *m*. The first term is the between-groups Gini coefficient, the second term is the within-group component, and *R* is a residual.[15] In this case, the effort and opportunity components can somehow be obtained if inequality of effort is associated with the within-group term plus the residual.

3.2. The data

Data requirements for comparing inequality of income across states or countries are severe (Deininger and Squire, 1996), but comparisons of inequality of opportunity are even more stringent (Lefranc et al., 2006b). Empirical analysis of inequality of opportunity requires not only comparable measures of individual disposable income but also individual background measured in a comparable and homogeneous way.

Unfortunately, there are only a few databases with information on individual circumstances or social origins.[16] Furthermore, the number of circumstances is usually small. In addition, to test for long-term effects on growth, we also need the value of inequality of opportunity for at least two distant periods of time, generally 10 years (Barro, 2000). This last requirement limits even more the availability of databases.

As far as we are aware, the PSID database is the only exception that satisfies both requirements and is rich enough in terms of cross-sectional heterogeneity, variables and observations.[17] It provides data for the U.S. during the period 1968–2007.

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[15] This residual is zero only in the case that group income ranges do not overlap (Lambert and Aronson, 1993), which does not occur in our case.

[16] The data used in Roemer et al. (2003) and Lefranc et al. (2006b) contain information on 11 developed countries: Belgium (1992), Denmark (1993), France (1994), Great Britain (1991), Italy (1993), the Netherlands (1995), Norway (1995), Spain (1991), Sweden (1991), the United States (1991) and West Germany (1994). Rodríguez (2008) also uses that information and a dataset for Spain (2005). Moreover, Cogneau and Mesplé-Somps (2009) consider the following African countries: Ivory Cost (1985 and 1988), Ghana (1988 and 1998), Guinea (1994), Madagascar (1993) and Uganda (1992).

[17] The *European Statistics on Income and Living Conditions* (EU-SILC) is a novel and homogeneous database with information on social origins for most EU countries. However, this database starts at 2004, which prevents us from using it for our purposes.

This database contains information not only on individual income and circumstances but also on the state of residence. However, there is still a problem: data are representative at the national level, but they do not have to be necessarily at the state level. To minimize this problem, we have made a reasonable selection of data, states and decades.

Samples refer to individuals who are male heads of household, 25–50 years old. This sample selection rule is applied for avoiding the so-called composition effect (individuals with different ages are in different phases of the wage-earning time series). Another advantage of this rule is that individual earnings will be more representative of the individual's lifetime income (Grawe, 2005). Income is calculated as the individual's labor income plus the household capital income divided by the number of adults in the household.

As is usual in the inequality-of-opportunity literature, we consider the father's education as the individual's circumstance, and for this circumstance, the sample is partitioned into three types (i.e., M=3): less than twelfth grade, twelfth grade and more than twelfth grade.[18] In this case, the estimated inequality-of-opportunity component is called the "*3-groups*" index. Furthermore, for the sake of robustness, we also consider race (white and others) as an additional circumstance (i.e., M=6). In this manner, we also have a "*6-group*s" inequality-of-opportunity index.

To have enough degrees of freedom for our estimations, we disregard the computation of inequality-of-opportunity indices for those states with less than 50 observations. Using this criterion, there are only 17 states in 1970 with at least 50 observations. Moreover, there were 2,116 observations for the U.S. as a whole in 1970,

[18] Information on mother's education is not available for the whole period.

whereas the numbers of observations were 3,096 and 3,843 in 1980 and 1990, respectively. Hence, to assure a large enough sample size for each state, we disregard the 1970s and focus on the 1980s and 1990s. For these two decades, our final sample reduces to the following 23 states: Arkansas, California, Florida, Georgia, Illinois, Indiana, Iowa, Kentucky, Louisiana, Maryland, Massachusetts, Michigan, Mississippi, Missouri, New Jersey, New York, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, Texas, and Virginia.

3.3. Inequality of income and opportunity in the U.S. states

Tables 1 and 2 show the indices of income inequality and inequality of opportunity for our selected U.S. states in 1980 and 1990, respectively.[19] They show results for the Theil 0 and Gini indices and for the 3- and 6-groups estimates. We also provide the standard error estimates calculated by bootstrapping according to the formula (Davison and Hinkley, 2005):

$$\hat{\sigma}(\hat{I}) = \sqrt{\frac{1}{R-1}\sum_{r=1}^{R}\left(I^{*} - \bar{I}^{*}\right)^{2}} \ , \qquad (6)$$

where I is the corresponding index and R is the number of replications.[20] The estimated standard errors for the income inequality indices are rather good. Moreover, bearing in mind the limited size of our samples, the standard errors estimates of the inequality-of-opportunity indices are also reasonably precise.

INSERT TABLES 1 AND 2 ABOUT HERE

[19] Note that we work with truncated samples of male heads of household, so direct comparisons of our estimations with the published inequality indices by states are not possible.

[20] In our calculations, we have assumed R=1000. Cowell and Flachaire (2007) find that bootstrap tests usually improve numerical performance. Moreover, with small sample sizes it could be better to use a bootstrap approach that guarantees a better level of approximation to the nominal confidence intervals (Davison and Hinkley, 2005).

For the 3-groups case, we observe that inequality of opportunity represents a small percentage of the total inequality. The existence of additional and more representative circumstances capturing differences in opportunity, other than parents' education, could explain this result. In fact, the inclusion of a second circumstance, such as race, increases significantly the inequality of opportunity estimates, as it is shown when comparing the 3- and the 6-groups cases. To appreciate the important role that race has in inequality of opportunity estimates, we consider the cases of Maryland, New York and Missouri. For the two former states, inequality of opportunity increased between 1980 and 1990 when using the 3-groups estimates, while it fell during the same period when race was included as an additional circumstance. The opposite happened for Missouri.

This section ends with a brief descriptive analysis of the inequality-of-opportunity results. For the reasons discussed above, we focus on the Theil 0 index for the 6-groups case. Figures 1a and 1b rank the U.S. states in 1990 according to total inequality and inequality of opportunity, respectively. Comparing the two figures, we observe substantial differences between both rankings. In particular, there exists a group of states with high total inequality and rather low inequality of opportunity, such as Michigan, Louisiana, Ohio, Texas and Pennsylvania; the opposite happens in states like Georgia, Virginia and North Carolina. However, there exist some states whose relative position remains. For example, Mississippi has about the national average level in both rankings, and New York and Iowa are at the lowest levels of both dimensions, while New Jersey and Tennessee are at the top of the two rankings.

INSERT FIGURES 1a AND 1b ABOUT HERE

Figure 2 shows the relationship between the 1980–1990 variation of total inequality and inequality of opportunity. The cases of New York and Arkansas are remarkable, in that they have reduced both measures. The opposite is found in the states of Tennessee and Illinois. Besides, Louisiana and Mississippi maintained constant income inequality, whereas their inequality-of-opportunity indices decreased notably. Georgia experienced an increase in inequality of opportunity while showing little change in total dispersion. Lastly, Maryland, South Carolina, Texas and Ohio are among those states that increased their inequality most, without displaying a significant change in their inequality-of-opportunity measures.

INSERT FIGURE 2 ABOUT HERE

Finally, we emphasize the little significance of the relationship between total inequality and inequality of opportunity. This result points out that those factors affecting the evolution of these two dimensions must be different. As a consequence, the impact on growth of each variable should be distinct, as is discussed in more detail in the next section.

4. Inequality of Opportunity and Growth: An Empirical Analysis

In this section, we carry out the main task of this paper, which is to characterize the effects of inequality of opportunity on growth. We assume two consecutive decades, from 1980 to 1990 (the 80s) and from 1990 to 2000 (the 90s), and our analysis is limited to the selected set of 23 U.S. states. An advantage of this panel is that heterogeneity within states is not coming from the political process because, for the most part, it is similar across the different states. More importantly, institutional, cultural, religious and other differences are less intensive for U.S. states than for different countries.

4.1. The empirical model

Our dependent variable is the growth rate in the ensuing 10 years of real personal income (adjusted by CPI) divided by total midyear population. Inequality indices and other explanatory variables are all measured at the beginning of each decade (1980 and 1990). This strategy saves us from endogeneity and measurement errors; in this manner, we can apply standard pooling regressions techniques (Barro and Sala-i-Martin, 1991 and Partridge, 1997).

Although we focus on the Theil 0 index (6-groups), we also show results for the 3-groups case and the Gini index. To estimate the relationship between inequality and growth properly, we must include additional variables that also affect growth. Basically, we use the controls that were significant in Partridge (1997). Roughly speaking, they are a convergence term, time and regional dummies, the average skills of the labor force, sectoral composition and past labor growth. Population and personal income data come from the Regional Economic Accounts of the Bureau of Economic Analysis,[21] while CPI data come from the U.S. Department of Labor;[22] employment data (total and by type of industry) come from the Current Employment Statistics of the Bureau of Labor Statistics.[23]

As is the norm in the convergence literature, an implicit assumption is that economic growth is converging to an equilibrium growth path that is a function of initial conditions (Barro and Sala-i-Martin, 1991). Correspondingly, the lagged level of

[21] U.S. Department of Commerce: http://www.bea.gov/regional/spi/drill.cfm.
[22] All Urban Consumers CPI series: http://www.bls.gov/data/#prices.
[23] U.S. Department of Labor: http://www.bls.gov/data/#employment.

real per capita income is included in the model to control for conditional convergence across states. In addition, we consider a time dummy for the 80s, and we omit the dummy for the 90s. We also use a standard and broad classification for regional variables: *West*, *Midwest*, *South* and *Northeast*.[24] The omitted regional dummy is the Northeast region. We consider three categories to measure the average skills of the labor force: the percentage of the population over 24 years old who have graduated from high school but do not have a four-year college degree (*high school*); the percentage who have graduated from a four-year college (*college*); and the omitted category, which is the percentage of individuals who have not graduated from high school (*nongraduated*).[25] To control for the initial industrial mix of each state, the shares of nonagricultural employment are included for *mining*, *construction*, *manufacturing*, *transportation and public utilities*, *finance*, *insurance and real estate*, and *government*. *Traded goods and services* are the omitted sector, and thus the employment share coefficients should be interpreted as being relative to this sector. The percentage of the population who worked on a farm (*farm*) is included to account for the different importance of agriculture across states. Finally, in order to account for the possibility that growth in the previous decade could, in turn, influence growth in the following decade and be correlated with past inequality, we include the percentage change in nonagricultural employment in the preceding decade (e.g., employment growth in the 80s is used to explain per capita income growth in the 90s).

The benchmark analysis is based on regressions between growth, lagged income, an overall inequality index and a set of control variables:

[24] Regional dummies consider those fixed factors that are time invariant and inherent to each area but are not observed or not included in the model, such as geographical, social or local policy regional aspects or initial technology efficiency.

[25] Historical Census Statistics on Education Attained in the U.S., 1940 to 2000 (U.S. Census Bureau): http://www.census.gov/population/www/socdemo/education/introphct41.html.

$$GY_{it} = \beta \cdot y_{it-s} + \phi \cdot I_{it-s} + \alpha' T_t + \delta' R_i + \lambda' X_{it-s} + \varepsilon_{it} \ , \qquad (7)$$

where GY_{it} is real per capita income growth in the decade, y_{it-s} is the real per capita income of state *i* at the beginning of the decade, I_{it-s} is the overall inequality index at the beginning of the decade, T_t is the time dummy corresponding to the 80s, R_i is a set of regional dummies, X_{it-s} groups the rest of control variables measured at the beginning of the decade, and finally ε_{it} encompasses effects of a random nature that are not considered in the model and is assumed to have the standard error component structure.

Bearing in mind the above regression, we distinguish between inequality of opportunity (*IO*) and inequality of effort (*IE*), as discussed in the previous section. Accordingly, we estimate the following models:

$$GY_{it} = \beta \cdot y_{it-s} + \phi_1 \cdot IO_{it-s} + \alpha' T_t + \delta' R_i + \lambda' X_{it-s} + \varepsilon_{it} \ , \qquad (8)$$

$$GY_{it} = \beta \cdot y_{it-s} + \phi_2 \cdot IE_{it-s} + \alpha' T_t + \delta' R_i + \lambda' X_{it-s} + \varepsilon_{it} \ , \qquad (9)$$

$$GY_{it} = \beta \cdot y_{it-s} + \phi_1 \cdot IO_{it-s} + \phi_2 \cdot IE_{it-s} + \alpha' T_t + \delta' R_i + \lambda' X_{it-s} + \varepsilon_{it} \ . \qquad (10)$$

Equation (8) includes only the *IO* index, equation (9) considers only the *IE* index, and equation (10) includes both terms.

4.2. Results

Tables 3 and 4 show results for the *Theil 0* and *Gini* decompositions, respectively. Results are based on standard OLS pooling regression and White cross-sectional standard errors and covariance matrix. For each table, the first column shows the results using the overall inequality (equation 7). For the 3- and 6-groups estimates, the second set of columns shows results for the *IO* index (equation 8), the third panel considers results for the *IE* index (equation 9), and finally the fourth set of columns shows results for the *IO* and *IE* indices together (equation 10).

Regardless of the inequality measure being considered, the results for the control variables are robust and are in line with Partridge (1997) and the related literature. The negative coefficient for real per capita income reflects conditional convergence, and its magnitude is in accordance with Barro and Sala-i-Martin (1991). Future economic growth is expected to be positively correlated with the labor force's human capital. As is commonly found in growth models augmented for human capital, the relevant variable of education is *college*, which is highly positive and significant with respect to the omitted category (*nongraduated*). However, we find that the effect of *high school* on growth is negative, but small, with respect to *nongraduated*.

The coefficients on most of the initial industrial mix variables are negative and significant (*construction*, *transportation and public utilities* and *government* for most models) or nonsignificant (*mining* and *finance, insurance and real estate*). The exception is *manufacturing*, whose coefficient is positive and significant, in most cases. These findings suggest that states with greater initial shares in *services and traded goods* (the omitted category) and the manufacturing sector experienced higher economic growth. The estimates for the *farm* variable are negative and nonsignificant in most models. Finally, the coefficient associated with labor growth in the preceding year is positive and significant, which corroborates the idea that growth in the previous decade influences growth in the following decade. Regarding the cross-regional dummies, *South* tends to be positive and significant, and *West* is negative and significant, while *Midwest* is nonsignificant. Finally, the dummy for the 80s tends to be positive and significant, though it depends on the specified model.

INSERT TABLES 3 AND 4 ABOUT HERE

Regarding the income inequality indices, we first notice that Partridge found a positive relationship between overall inequality and per capita income growth. However, we find that the initial *Theil 0* and *Gini* coefficients are nonsignificant.[26] Based on the latter result, a poor conclusion would be that distributive policies do not have effects on growth. However, if we distinguish between inequality-of-opportunity and inequality-of-effort components, our policy message changes dramatically.

Focusing on the Theil 0 decomposition (Table 3), we notice that the *IE* coefficients are positive and significant (equations 9 and 10 for 3- and 6-groups), meanwhile the *IO* coefficients are also significant but negative (equations 8 and 10 for 3- and 6-groups).[27] All these coefficients are significant at the 1% level of significance. Bearing in mind that the Gini decomposition is inexact and only considered for illustrative purposes (see Section 3), we obtain that their *IE* coefficients are positive and significant, as for the Theil 0 case. However, their *IO* coefficients are negative but only significant for 3-groups at the 10% level of significance. These results support the thesis that inequality of opportunity and inequality of effort have opposite effects on growth. Inequality is good for growth when that comes from differences in effort, while it is harmful for growth when that comes from differences in opportunity. Accordingly, policies that equalize opportunity and promote individual effort will enhance growth.

[26] Note that our results are not directly comparable with Partridge's; because we use the PSID database, our samples refer to male heads of households 25 to 50 years old, and we focus on the 80s and 90s and 23 selected states.

[27] The level of the IE and IO coefficients for 3- and 6-groups are not comparable with each other, because they are not elasticities and depend on the magnitude of the indices.

5. **Concluding Remarks**

Models exploring the incidence of income inequality upon economic growth do not reach a clear-cut conclusion. We postulate in this paper that one possible reason for this inconclusiveness is that income inequality indices are indeed measuring at least two different sorts of inequality: inequality of opportunity and inequality of effort. Though this issue has already been emphasized in the inequality-of-opportunity literature, this distinction has not yet been considered in the growth literature.

Using depurated data of the PSID database for 23 U.S. states in 1980 and 1990, we followed Van de Gaer's approach to compute inequality-of-opportunity and inequality-of-effort indices. We ran standard OLS pooling regressions, finding robust support for a negative relationship between inequality of opportunity and growth, finding a positive relationship for the other sort of inequality. Hence, these two types of inequalities are affecting growth through opposite channels. On one hand, inequality of effort increases growth because it may encourage people to invest in education and to exert effort. On the other hand, inequality of opportunity decreases growth because it may not favor human capital accumulation of the more talented individuals. In fact, Van de Gaer et al. (2001) have pointed out that inequality of opportunity reduces the role that talent plays in competing for a position by worsening intergenerational mobility. Moreover, social instability and the demand for redistribution are other possible channels through which inequality of opportunity may be decreasing growth.

A consequence of the previous discussion is that the relationship between overall inequality and growth may be positive or negative depending on the kind of inequality that is dominant. This relative relevance can vary across countries, with the degree of development and with the time period considered. For our sample, we have found a null influence of overall inequality on growth. Therefore, the negative effect of inequality of opportunity on growth seems to be compensating for the positive influence of inequality of effort.

We believe that making a distinction between inequality of income and inequality of opportunity can throw some light upon several intriguing empirical facts in the growth literature. Two examples are pointed out.

Barro (2000) shows a positive relationship between growth and inequality within most developed countries, while this relationship is negative when looking at the poorest countries. He proposes, as a tentative explanation, the different role of capital markets. In particular, he considers that problems of information (moral-hazard and repayment enforcement problems) are larger in poor countries because they have less-developed credit markets. However, he does not find empirical evidence for this different role of capital markets. An alternative explanation that would arise from the present paper is that inequality of opportunity is more important within less-developed countries, whereas inequality of effort is more important in richer countries.

Secondly, some empirical studies have found that the effect of income inequality on growth is sensitive to the inclusion of some variables like regional dummy variables (Birdall et al., 1995). However, the relationship between initial land inequality and growth is negative and robust to the introduction of regional dummies and other explicative variables (Deininger and Squire, 1998). Our proposal offers an easy explanation for this empirical fact. Income inequality comes not only from unequal opportunities but also from different levels of effort. As a result, the effect of income inequality upon growth can have a different sign depending on the kind of controls that are introduced in the regressions. However, initial land inequality comes unambiguously from unequal opportunities (i.e., the socioeconomic conditions of parents) and has a clear-cut negative effect upon growth.

Further research concerning these issues is clearly needed. However, we believe that a complete understanding of the relationship between inequality and growth requires more effort in constructing appropriated databases that properly represent social origins.

REFERENCES

Aghion, P. and Bolton P. (1997), “A trickle-down theory of growth and development with debt overhang”, *Review of Economic Studies*, 64, 151-162.

Aghion, P. Caroli, E. and García-Peñalosa, C. (1999), “Inequality and economic growth: the perspective of the new growth theories”, *Journal of Economic Literature*, 37, 1615-1660.

Alesina, A. and Rodrik, D. (1994), “Distributive politics and economic growth”, *Quaterly Journal of Economics*, 109, 465-490.

Alesina, A. and Perotti, R. (1994), “The political economy of growth: a critical survey of the recent literature”, *The World Bank Economic Review*, 8, 350-371.

Alesina, A. and Perotti, R. (1996), “Income distribution, political instability and investment”, *European Economic Review*, 40, 1203-1228.

Alesina, A., Ozler, S., Roubini, N. and Swagel, P. (1996), “Political instability and economic growth”, *Journal of Economic Growth*, 1, 189-211.

Arrow, K., Bowles, S. and Durlauf, S. (2000), *Meritocracy and economic inequality*. Princeton University Press.

Banerjee, A. and Newman, A.F. (1991), “Risk-bearing and the theory of income distribution”, *Review of Economic Studies*, 58, 211-235.

Barro, R. J. (2000), “Inequality and growth in a panel of countries”, *Journal of Economic Growth*, 5, 5-32.

Barro, R. J. and Sala-i-Martin, X. (1991), “Convergence across states and regions”, *Brookings Papers on Economic Activity*, 1, 107-182.

Bertola, G., Foellmi, R. and Zweimüller, J. (2005), *Income distribution in macroeconomic models*. Princeton: Princeton University Press.

Betts, J. and Roemer, J. E. (2007), “Equalizing opportunity for racial and socioeconomic groups in the United States through educational finance reform”, in *Schools and the Equal Opportunity Problem*, P. Peterson (ed.), Cambridge, M.A.: The MIT Press.

Birdsall, N., Ross, D. and Sabot, R. (1995), “Inequality and growth reconsidered: lessons from East Asia”, *World Bank Economic Review*, 9, 477-508.

Bourguignon, F. (1979), “Decomposable income inequality measures”, *Econometrica*, 47, 901-920.

Bourguignon, F. (1981), “Pareto-superiority of unegalitarian equilibria in Stiglitz' model of wealth distribution with convex savings function”, *Econometrica*, 49, 1469-1475.

Bourguignon, F. (1996), “Equity and economic growth: permanent questions and changing answers?”, *Working Paper 96-15*, DELTA Paris.

Chiu, W. H. (1998), “Income inequality, human capital accumulation and economic performance”, *Economic Journal*, 108, 44-59.

Clarke, G.R.C. (1995), “More evidence on income distribution and growth”, *Journal of Development Economics*, 47, 403-427.

Cogneau, D. and Mesplé-Somps, S. (2009), “Inequality of Opportunity for Income in Five Countries of Africa”, *Research on Economic Inequality*, 16, 99-128.

Cowell, F. A. and E. Flachaire (2007): “Income Distribution and Inequality Measurement: The Problem of Extreme Values", *Journal of Econometrics*, 141, 1044-1072.

Dahan, M. and Tsiddon, D. (1998), “Demographic transition, income distribution and economic growth”, *Journal of Economic Growth*, 3, 29-52.

Dasgupta, P. and Ray, D. (1987), "Inequality as a Determinant of Malnutrition and Unemployment Policy", *Economic Journal*, 97, 177-188.

Davison, A. C. and D. V. Hinkley (2005), *Bootstrap methods and their application*. Cambridge University Press, New York.

Deininger, K. and Squire, L. (1996), "A new data set measuring income inequality", *World Bank Economic Review*, 10, 565-591.

Deininger, K. and Squire, L. (1998), "New ways of looking at old issues: inequality and growth", *Journal of Development Economics*, 57, 259-287.

Ehrhart, C. (2009), "The effects of inequality on growth: a survey of the theoretical and empirical literature", *ECINEQ WP* 2009-107.

Falkinger, J. and Zweimüller, J. (1997), "The impact of income inequality on product diversity and economic growth", *Metroeconomica*, 48, 211-237.

Fleurbaey, M. (1995), "Equal opportunity or equal social outcome", *Economics and Philosophy*, 11, 25-56.

Fleurbaey M. and F. Maniquet (2007), "Compensation and responsibility", in *The Handbook for Social Choice and Welfare*, Arrow, K., Sen, A. and Suzumura, K. (eds.), Amsterdan: North Holland.

Forbes, K. (2000), "A reassessment of the relationship between inequality and growth", *American Economic Review*, 90, 869-887.

Galenson, W. and Leibenstein, H. (1955), "Investment criteria, productivity and economic development", *Quaterly Journal of Economics*, 69, 343-370.

Galor, O. and Zeira, J. (1993), "Income distribution and macroeconomics", *Review of Economic Studies*, 60, 35-52.

Galor, O. and Zang, H. (1997), “Fertility, income distribution and economic growth: theory and cross-country race obviousness”, *Japan and the world economy,* 9, 197-229.

Grawe, N. (2005), “Lifecycle bias in estimates of intergenerational earnings persistence”, *Labour Economics*, 13, 551-570.

Gupta, D. K. (1990), *The economics of political violence. The effect of political instability on economic growth*. New York: Praeger Publishers.

Keefer, P. and Knack, S. (2002), “Polarization, politics and property rights: links between inequality and growth”, *Public Choice*, 111, 127-154.

Khoo, L. and Dennis, B. (1999), “Income inequality, fertility choice, and economic growth: theory and evidence”, *Harvard Institute for International Development* (*HIID*), *Development Discussion Paper 687*.

Knowles, S. (2001), “Inequality and economic growth: the empirical relationship reconsidered in the light of comparable data”. *Discussion Paper 105*, Department of Economics, University of Otago (Dunedin), New Zealand.

Kremer, M. and Chen, D. (2002), ”Income distribution dynamics with endogenous fertility”, *Journal of Economic Growth*, 7, 227-258.

Kuznets, S. (1955), “Economic growth and income inequality”, *American Economic Review*, 45, 1-28.

Lambert, P. J. and Aronson, J. R. (1993), “Inequality decomposition analysis and the Gini coefficient revisited”, *Economic Journal*, 103, 1221-1227.

Lefranc, A., Pistolesi, N. and Trannoy A. (2006a), “Equality of opportunity: Definitions and testable conditions, with an application to income in France”, *ECINEQ working paper* 2006-53.

Lefranc, A., Pistolesi, N. and Trannoy A. (2006b), “Inequality of opportunities vs. inequality of outcomes: Are Western societies all alike?”, *ECINEQ working paper* 2006-54.

Loury, G. C. (1981), “Intergenerational transfers and the distribution of earnings”, *Econometrica*, 49, 843-867.

Lucas, J. R. (1995), *Responsibility*. Oxford: Clarendon Press.

Mani, A. (2001), “Income distribution and the demand constraint”, *Journal of Economic Growth*, 6, 107-133.

Mason, A. (1988), “Savings, economic growth and demographic change”, *Population and Development Review*, 14, 113-144.

Marshall, A. (1988), “Income distribution, the domestic market and growth in Argentina”, *Labour and Society*, 13 (1), 79-103.

Mirrless, J. (1971), “An exploration in the theory of optimum income taxation”, *Review of Economic Studies*, 38, 175-208.

Morand, O. F. (1998), “Endogenous fertility, income distribution, and growth”, *Journal of Economic Growth*, 4, 331-349.

Moreno-Ternero, J. D. (2007), “On the design of equal-opportunity policies”, *Investigaciones Económicas*, 31, 351-374.

Murphy, K. M., Schleifer, A. and Vishny, R. (1989), “Income distribution, market size, and industrialization”, *Quaterly Journal of Economics*, 104, 537-564.

Ooghe, E., Schokkaert E. and D. Van de gaer (2007), “Equality of opportunity versus equality of opportunity sets”, *Social Choice and Welfare*, 28, 209-230.

Partridge, M. D. (1997), “Is Inequality Harmful for Growth? Comment”, *American Economic Review*, 87, 5, 1019-1032.

Peragine, V. (2002), “Opportunity egalitarianism and income inequality”, *Mathematical Social Sciences*, 44, 45-60.

Peragine, V. (2004), “Ranking of income distributions according to equality of opportunity”, *Journal of Income Inequality*, 2, 11-30.

Perottti, R. (1992), “Income distribution, politics and growth”, *American Economic Review* 82, 311-316.

Perottti, R. (1996), “Growth, income distribution and democracy: what the data say”, *Journal of Economic Growth*, 1, 149-187.

Persson, T. and Tabellini, G. (1994), “Is inequality harmful for growth?: theory and evidence”, *American Economic Review*, 84, 600-621.

Piketty, T. (1997), “The dynamics of the wealth distribution and the interest rate with credit rationing”, *Review of Economic Studies*, 64, 173-189.

Roemer, J. E. (1993), “A pragmatic approach to responsibility for the egalitarian planner”, *Philosophy & Public Affairs*, 10, pp. 146-166.

Roemer, J.E. (1996), *Theories of Distributive Justice*. Harvard University Press, Cambridge, M.A.

Roemer, J.E. (1998), *Equality of Opportunity*. Harvard University Press, Cambridge, M.A.

Roemer, J.E. (2002), “Equality of opportunity: a progress report”, *Social Choice and Welfare*, 19, 455-471.

Roemer, J.E., Aaberge, R., Colombino, U., Fritzell, J., Jenkins, S., Marx, I., Page, M., Pommer, E., Ruiz-Castillo, J., San Segundo, M. J., Tranaes, T., Wagner, G. and Zubiri, I. (2003), “To what extent do fiscal regimes equalize opportunities for income acquisition among citizens?”, *Journal of Public Economics*, 87, 539-565.

Rodríguez, J. G. (2008), “Partial equality-of-opportunity orderings”, *Social Choice and Welfare*, 31, 435-456.

Ruiz-Castillo, J. (2003), “The measurement of the inequality of opportunities”, *Research on Economic Inequality*, 9, 1-34.

Shorrocks, A. F. (1980), “The class of additively decomposable inequality measures”, *Econometrica*, 48, 613-625.

Shorrocks, A. F. (1984), “Inequality Decomposition by population subgroups”, *Econometrica*, 52, 1369-1388.

Stiglitz, J.E. (1969), “The distribution of income and wealth among individuals”, *Econometrica*, 37, 382-397.

Svensson, J. (1998), “Investment, property rights and political instability: theory and evidence”, *European Economic Review*, 42, 1317-1341.

Székeli, M. (2003), “The 1990s in Latin America: Another decade of persistent inequality, but with somewhat lower poverty”, *Journal of Applied Economics*, VI, 317-339.

Todaro, M.P. (1994), *Economic development*. New York, London: Longman.

Tornell, A. and Velasco, A. (1992), “The tragedy of the commons and economic growth: why does capital flows from poor to rich countries?”, *Journal of Political Economy*, 100, 1208-1231.

Van de Gaer, D. (1993), “Equality of opportunity and investment in human capital”, *Catholic University of Leuven*, Faculty of Economics, no. 92.

Van de Gaer D., E. Schokkaert and M. Martinez, (2001), “Three meanings of intergenerational mobility”, *Economica*, 68, 519-538.

U.S. Census Bureau, Department of Commerce. Decennial census of population: Characteristics of the population. Washington, DC: U.S. Government Printing Office, various years.

U.S. Bureau of Economic Analysis, Department of Commerce. Regional Economic Accounts. Washington, DC: U.S. Government Printing Office, various years.

U.S. Department of Agriculture. Agricultural statistics. Washington, DC: U.S. Government Printing Office, various years.

U.S. Department of Labour. *Employment, hours and earnings.* Washington, DC: U.S. Government Printing Office, various issues.

U.S. Department of Labour. Geographic profile of employment and unemployment. Washington, DC: U.S. Government Printing Office, various years.

Zweimüller, J. (2000), "Schumpeterian entrepreneurs meet Engel´s law: the impact of inequality on innovation-driven growth", *Journal of Economic Growth*, 5, 185-206.

Zou, H. and Li, H. (1998), "Income inequality is not harmful for growth: theory and evidence", *Journal of Development Economics*, 2, 318-334.

TABLES

Table 1. Inequality of income and opportunity in 1980

		I. of Income		I. of Opportunity (3)[a]		I. of Opportunity (6)[b]	
State	**Obs.**	**Gini**	**Theil 0**	**Gini**	**Theil 0**	**Gini**	**Theil 0**
Arkansas	62	0.33424	0.22890	0.05217	0.02447	0.07880	0.02714
		0.00792	0.01075	0.00739	0.00126	0.00670	0.00236
California	288	0.32272	0.21533	0.01955	0.00105	0.05460	0.00894
		0.00382	0.00602	0.00451	0.00049	0.00482	0.00134
Florida	91	0.42466	0.33766	0.05620	0.01162	0.09431	0.01892
		0.00801	0.01293	0.01191	0.00445	0.01069	0.00532
Georgia	96	0.27988	0.23834	0.06035	0.00837	0.07663	0.01129
		0.00724	0.02882	0.01018	0.00336	0.00990	0.00466
Illinois	96	0.31883	0.19999	0.03264	0.00405	0.07842	0.01238
		0.00557	0.00733	0.00657	0.00098	0.00607	0.00185
Indiana	87	0.32770	0.21875	0.00683	0.00044	0.04530	0.00429
		0.00797	0.01040	0.00587	0.00167	0.00605	0.00259
Iowa	57	0.33646	0.20843	0.08543	0.03182	0.10528	0.03451
		0.00705	0.00840	0.00826	0.00081	0.00849	0.00087
Kentucky	53	0.26658	0.12608	0.08316	0.02915	0.08648	0.02976
		0.00479	0.00481	0.00712	0.00283	0.00672	0.00296
Luisiana	83	0.39985	0.44742	0.09522	0.11200	0.12499	0.11509
		0.01128	0.02907	0.01338	0.00792	0.01408	0.01158
Maryland	126	0.30568	0.21192	0.03672	0.00489	0.11454	0.02453
		0.01258	0.02000	0.01423	0.00588	0.01501	0.00722
Massachusetts	60	0.31730	0.17690	0.07375	0.02887	0.09462	0.03101
		0.00478	0.00578	0.00825	0.00196	0.00883	0.00228
Michigan	147	0.34835	0.36653	0.03818	0.00410	0.12068	0.02528
		0.00598	0.01553	0.00722	0.00227	0.00671	0.00240
Mississippi	122	0.38898	0.29497	0.16660	0.07019	0.19528	0.10805
		0.01821	0.02564	0.02441	0.01609	0.02220	0.01970
Missouri	95	0.33638	0.27555	0.05990	0.01270	0.07344	0.01592
		0.00689	0.01305	0.00783	0.00107	0.00684	0.00252
New Jersey	79	0.37963	0.31529	0.06341	0.04782	0.08379	0.04922
		0.00661	0.01435	0.00707	0.00049	0.00705	0.00469
New York	144	0.34521	0.23178	0.01040	0.00034	0.07082	0.01116
		0.00423	0.00623	0.00477	0.00092	0.00580	0.00247
N. Carolina	142	0.36258	0.24823	0.05377	0.01199	0.11002	0.03811
		0.00826	0.01188	0.01207	0.00736	0.01118	0.00761
Ohio	136	0.29474	0.17561	0.01725	0.00127	0.03391	0.00480
		0.00372	0.00638	0.00563	0.00051	0.00549	0.00134
Pennsylvania	162	0.36375	0.35750	0.03235	0.00356	0.10740	0.02160
		0.00663	0.01534	0.00725	0.00210	0.00742	0.00252
S. Carolina	152	0.34084	0.22259	0.01944	0.00139	0.05549	0.01089
		0.00711	0.01091	0.00470	0.00036	0.00877	0.00403
Tennessee	53	0.27433	0.16526	0.06274	0.01927	0.07677	0.02047
		0.00597	0.00902	0.00599	0.00193	0.00568	0.00189
Texas	187	0.30064	0.18843	0.00945	0.00038	0.04066	0.00690
		0.00426	0.00774	0.00473	0.00025	0.00631	0.00065
Virginia	116	0.28231	0.22889	0.00805	0.00035	0.03769	0.00532
		0.00452	0.01668	0.00551	0.00149	0.00570	0.00202
USA	**3091**	**0.34084**	**0.25252**	**0.02987**	**0.00179**	**0.05645**	**0.00909**
		0.00543	0.01036	0.00667	0.00156	0.00630	0.00268

[a] Inequality of opportunity according to parent's education (*3-groups*).
[b] Inequality of opportunity according to parent's education and race (*6-groups*).

Table 2. Inequality of income and opportunity in 1990

		I. of Income		I. of Opportunity (3)[a]		I. of Opportunity (6)[b]	
State	**Obs.**	**Gini**	**Theil 0**	**Gini**	**Theil 0**	**Gini**	**Theil 0**
Arkansas	67	0.29706	0.16818	0.04990	0.00631	0.08444	0.01754
		0.00629	0.00934	0.00823	0.00185	0.00789	0.00222
California	332	0.38229	0.29217	0.01847	0.00085	0.04412	0.00380
		0.00486	0.00831	0.00565	0.00122	0.00544	0.00182
Florida	129	0.42208	0.35338	0.07434	0.01538	0.09991	0.02012
		0.00645	0.01165	0.00937	0.00154	0.00759	0.00422
Georgia	112	0.35784	0.26191	0.09089	0.01891	0.14782	0.04542
		0.00725	0.01292	0.01072	0.00403	0.01001	0.00415
Illinois	115	0.34540	0.34581	0.05836	0.00767	0.10280	0.03129
		0.00661	0.01626	0.00753	0.00090	0.00782	0.01431
Indiana	89	0.33431	0.22422	0.06433	0.01268	0.10863	0.02352
		0.00798	0.01160	0.00693	0.00305	0.00728	0.00414
Iowa	72	0.32327	0.20573	0.02769	0.00201	0.07077	0.01174
		0.00672	0.00943	0.01006	0.00337	0.00990	0.00350
Kentucky	69	0.32882	0.22694	0.05614	0.01003	0.09519	0.02047
		0.00606	0.01171	0.00837	0.00243	0.00778	0.00305
Luisiana	78	0.38272	0.46783	0.02394	0.00203	0.09032	0.01596
		0.01027	0.03272	0.01231	0.00635	0.01263	0.01093
Maryland	155	0.49677	0.47258	0.04735	0.00955	0.10607	0.02375
		0.02059	0.03707	0.02261	0.01078	0.02323	0.02344
Massachusetts	89	0.33443	0.20076	0.07286	0.01554	0.10484	0.02152
		0.00575	0.00663	0.00762	0.00144	0.00711	0.00139
Michigan	177	0.42317	0.43608	0.02571	0.00205	0.06044	0.00982
		0.00771	0.01571	0.01007	0.00569	0.00948	0.00693
Mississippi	162	0.37041	0.33277	0.05999	0.01015	0.09637	0.02258
		0.00857	0.01695	0.01082	0.00368	0.01075	0.00529
Missouri	113	0.33655	0.23957	0.04331	0.00525	0.10744	0.02228
		0.00567	0.01008	0.00914	0.00295	0.00852	0.00336
New Jersey	101	0.47989	0.46021	0.09108	0.02703	0.12374	0.03597
		0.01661	0.02897	0.01946	0.00932	0.01953	0.01362
New York	160	0.30540	0.18871	0.01377	0.00130	0.03339	0.00240
		0.00425	0.00535	0.00367	0.00012	0.00500	0.00130
N. Carolina	214	0.37127	0.28901	0.01882	0.00295	0.11202	0.02467
		0.00716	0.01244	0.01080	0.00495	0.00968	0.00611
Ohio	150	0.35475	0.35219	0.01183	0.00039	0.03024	0.00255
		0.00524	0.01312	0.00573	0.00147	0.00579	0.00195
Pennsylvania	205	0.36963	0.34179	0.02655	0.00207	0.05934	0.00700
		0.00441	0.00967	0.00444	0.00126	0.00526	0.00188
S. Carolina	225	0.35308	0.45366	0.02613	0.01089	0.04978	0.01248
		0.00555	0.02604	0.00669	0.00173	0.00589	0.00289
Tennessee	69	0.43795	0.38964	0.11518	0.03290	0.14801	0.05691
		0.01340	0.02403	0.01702	0.01141	0.01684	0.01197
Texas	235	0.39419	0.35183	0.05256	0.00643	0.07348	0.00984
		0.00520	0.01028	0.00727	0.00060	0.00694	0.00357
Virginia	134	0.35629	0.27648	0.08089	0.02070	0.10345	0.02421
		0.00548	0.01039	0.00835	0.00377	0.00765	0.00397
USA	**3843**	**0.38469**	**0.32666**	**0.07659**	**0.01003**	**0.10531**	**0.02323**
		0.00718	0.01305	0.00807	0.00295	0.00709	0.00357

[a] Inequality of opportunity according to parent's education (*3-groups*).
[b] Inequality of opportunity according to parent's education and race (*6-groups*).

Table 3. Inequality of opportunity and growth: Theil 0 decomposition

	Total inequality	Inequality of Opportunity		Inequality of Effort		Inequality of Opportunity and Effort	
		3-groups	*6-groups*	*3-groups*	*6-groups*	*3-groups*	*6-groups*
Lagged per capita income	-0.0018 (0.0000)	-0.0019 (0.0000)	-0.0017 (0.0000)	-0.0018 (0.0000)	-0.0018 (0.0000)	-0.0019 (0.0000)	-0.0018 (0.0000)
Theil 0	2.7926 (0.1826)	--	--	--	--	--	--
IO index	--	-42.5481 (0.0004)	-17.9023 (0.0001)	--	--	-42.7725 (0.0003)	-22.3163 (0.0000)
IE index	--	--	--	4.9211 (0.0032)	4.6278 (0.0054)	5.0105 (0.0011)	5.8657 (0.0057)
High school	-0.1634 (0.0000)	-0.2043 (0.0001)	-0.1851 (0.0002)	-0.1667 (0.0000)	-0.1675 (0.0000)	-0.2062 (0.0000)	-0.1932 (0.0000)
College	1.0676 (0.0001)	1.1737 (0.0000)	1.1082 (0.0000)	1.1006 (0.0000)	1.0997 (0.0000)	1.2319 (0.0000)	1.1945 (0.0000)
Dum 80	0.8255 (0.0289)	1.3888 (0.0000)	1.0348 (0.0000)	0.9768 (0.0007)	0.9694 (0.0004)	1.6463 (0.0000)	1.4174 (0.0000)
South	2.4009 (0.0000)	2.1320 (0.0001)	2.4360 (0.0000)	2.4201 (0.0000)	2.4624 (0.0000)	2.2086 (0.0000)	2.6092 (0.0000)
Midwest	-1.0987 (0.5348)	-1.0166 (0.5958)	-1.0242 (0.5997)	-1.1118 (0.5065)	-1.1029 (0.5170)	-1.0558 (0.5261)	-1.0502 (0.5360)
West	-6.1018 (0.0985)	-6.2134 (0.0598)	-6.1299 (0.0838)	-6.1439 (0.0874)	-6.1395 (0.0871)	-6.2910 (0.0437)	-6.2351 (0.0536)
Mining	-0.5972 (0.4065)	-0.7655 (0.3079)	-0.7318 (0.3312)	-0.5872 (0.4002)	-0.6013 (0.3852)	-0.7220 (0.3227)	-0.7197 (0.3018)
Construction	-1.8897 (0.0579)	-1.4244 (0.0996)	-1.5947 (0.0956)	-1.9688 (0.0426)	-1.9521 (0.0452)	-1.6576 (0.0819)	-1.8304 (0.0819)
Manufacturing	0.2369 (0.0420)	0.1428 (0.1228)	0.2112 (0.0431)	0.2372 (0.0433)	0.2419 (0.0387)	0.1556 (0.0705)	0.2303 (0.0163)
Transportation and public utilities	-0.3631 (0.2391)	0.0629 (0.6698)	-0.0157 (0.9250)	-0.3285 (0.3470)	-0.2886 (0.4427)	0.0833 (0.7261)	0.1391 (0.7316)
Finance, insurance and real estate	0.4246 (0.5992)	0.0988 (0.8968)	0.2599 (0.7288)	0.4092 (0.6185)	0.4052 (0.6244)	0.1073 (0.8894)	0.2332 (0.7713)
Government	-0.2018 (0.3465)	-0.3569 (0.0735)	-0.2659 (0.1318)	-0.2221 (0.2885)	-0.2209 (0.2922)	-0.3812 (0.0451)	-0.3099 (0.0083)
Farm/population	-0.1121 (0.2644)	-0.1415 (0.3889)	-0.1472 (0.4695)	-0.0285 (0.7785)	-0.0304 (0.7620)	0.0449 (0.5758)	0.0978 (0.1784)
Lag change in employment	0.0426 (0.0235)	0.0324 (0.1566)	0.0324 (0.0873)	0.0472 (0.0349)	0.0460 (0.0395)	0.0438 (0.2178)	0.0442 (0.2226)
Constant	37.0799 (0.0050)	42.6688 (0.0010)	38.2106 (0.0051)	36.7472 (0.0059)	36.3509 (0.0065)	41.2181 (0.0009)	35.8768 (0.0051)
R2	0.6480	0.6636	0.6506	0.6513	0.6502	0.6687	0.6566
F-stat	3.3371 (0.0023)	3.5752 (0.0014)	3.3754 (0.0022)	3.3853 (0.0021)	3.3695 (0.0022)	3.3245 (0.0024)	3.1492 (0.0035)

OLS pooling regression; White cross-section standard errors and covariance estimates. Cross-sections included: 23; Total pool (balanced): 46
P-values of the significance test in parenthesis. For the Theil 0 decomposition, we use male heads of households from 25 to 50 years old.

Table 4. Inequality of opportunity, effort and growth: Gini decomposition.

	Total inequality	Inequality of Opportunity		Inequality of Effort		Inequality of Opportunity and Effort	
		3-groups	*6-groups*	*3-groups*	*6-groups*	*3-groups*	*6-groups*
Lagged per capita income	-0.0018 (0.0000)	-0.0019 (0.0000)	-0.0018 (0.0000)	-0.0020 (0.0000)	-0.0019 (0.0000)	-0.0022 (0.0000)	-0.0019 (0.0000)
Gini	6.6134 (0.1695)	--	--	--	--	--	--
IO index	--	-27.8808 (0.0919)	-7.4829 (0.5177)	--	--	-26.3124 (0.0758)	-4.5939 (0.6503)
IE index	--	--	--	21.0755 (0.0007)	13.4258 (0.0007)	20.1923 (0.0000)	12.789 (0.0000)
High school	-0.1557 (0.0000)	-0.2808 (0.0000)	-0.1783 (0.0000)	-0.2227 (0.0000)	-0.1697 (0.0000)	-0.32956 (0.0000)	-0.1776 (0.0000)
College	1.0489 (0.0000)	1.2769 (0.0000)	1.0893 (0.0000)	1.2355 (0.0000)	1.1352 (0.0000)	1.4473 (0.0000)	1.1587 (0.0000)
Dum 80	0.7797 (0.0021)	0.3449 (0.6156)	0.7684 (0.0480)	0.6051 (0.0002)	0.9073 (0.0000)	0.2493 (0.0838)	0.9240 (0.0000)
South	2.4225 (0.0000)	1.3258 (0.4113)	2.2484 (0.0188)	1.8254 (0.0000)	2.3328 (0.0000)	0.8865 (0.2146)	2.2748 (0.0000)
Midwest	-1.0173 (0.5671)	-0.9433 (0.6402)	-1.0575 (0.5927)	-0.7977 (0.5666)	-0.9324 (0.5726)	-0.6869 (0.6530)	-0.9295 (0.5872)
West	-6.0303 (0.1014)	-7.4096 (0.0929)	-6.3735 (0.1336)	-6.9605 (0.0477)	-6.5381 (0.0742)	-8.1888 (0.0422)	-6.7031 (0.0953)
Mining	-0.5372 (0.4725)	-0.9483 (0.3191)	-0.7249 (0.4012)	-0.5729 (0.3575)	-0.6101 (0.3396)	-0.8751 (0.2986)	-0.6689 (0.3867)
Construction	-1.8892 (0.0445)	-2.2822 (0.0000)	-1.8222 (0.0139)	-2.6306 (0.0000)	-2.1954 (0.0008)	-3.1065 (0.0000)	-2.2253 (0.0003)
Manufacturing	0.2495 (0.0176)	0.0313 (0.6061)	0.1866 (0.0001)	0.1589 (0.0012)	0.2080 (0.0108)	-0.0204 (0.8558)	0.1857 (0.0000)
Transportation and public utilities	-0.3438 (0.2701)	0.0168 (0.8552)	-0.2294 (0.1312)	-0.0635 (0.8686)	-0.1312 (0.7654)	0.2674 (0.3006)	-0.0695 (0.8415)
Finance, insurance and real estate	0.4606 (0.5397)	-0.2866 (0.3795)	0.2200 (0.6769)	0.0762 (0.8998)	0.2021 (0.7773)	-0.5575 (0.0083)	0.1013 (0.8392)
Government	-0.1624 (0.3773)	-0.3780 (0.0000)	-0.2336 (0.1547)	-0.2172 (0.1546)	-0.1863 (0.3636)	-0.3852 (0.0000)	-0.2081 (0.1870)
Farm/population	-0.1375 (0.2607)	-0.2646 (0.0233)	-0.2417 (0.0443)	-0.0165 (0.9150)	-0.1161 (0.3895)	-0.0749 (0.2928)	-0.1393 (0.0432)
Lag change in employment	0.0384 (0.0101)	0.0878 (0.0011)	0.0437 (0.0000)	0.0829 (0.0000)	0.0549 (0.0000)	0.1298 (0.0000)	0.0587 (0.0000)
Constant	34.5748 (0.0028)	56.5682 (0.0000)	41.5665 (0.0000)	40.5461 (0.0001)	36.8942 (0.0016)	57.7871 (0.0000)	39.0256 (0.0000)
R2	0.6495	0.6644	0.6482	0.6702	0.6562	0.6862	0.6569
F-stat	3.3596 (0.0022)	3.5879 (0.0014)	3.3402 (0.0023)	3.6830 (0.0011)	3.460042 (0.0018)	3.6015 (0.00133)	3.1538 (0.0035)

OLS pooling regression; White cross-section standard errors and covariance estimates. Cross-sections included: 23; Total pool (balanced): 46
P-values of the significance test in parenthesis. For the Gini decomposition, we use male heads of households from 25 to 50 years old.

FIGURES

Figure 1a. Income Inequality in U.S. (1990): Theil 0 index

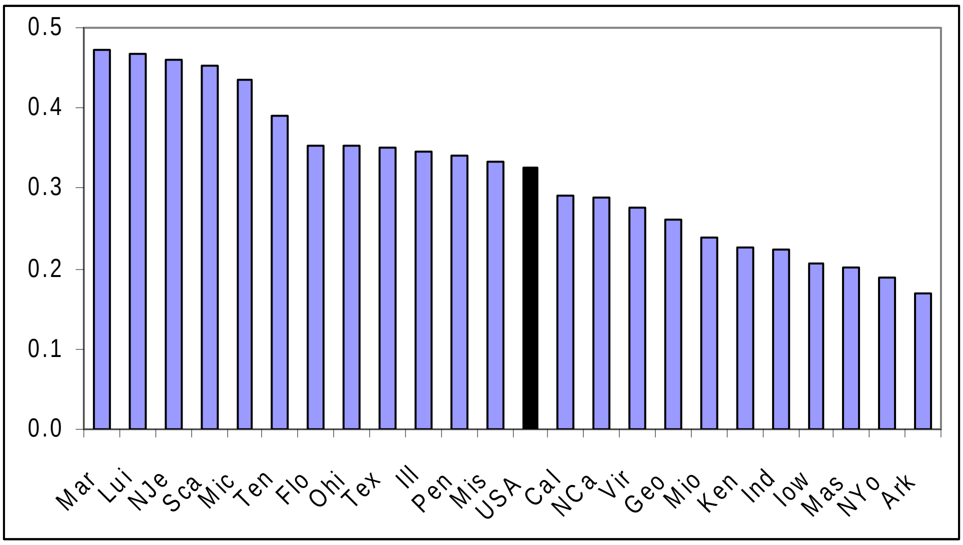


Figure 1b. Inequality of Opportuny in U.S. (1990): Theil 0 (*6-groups*)

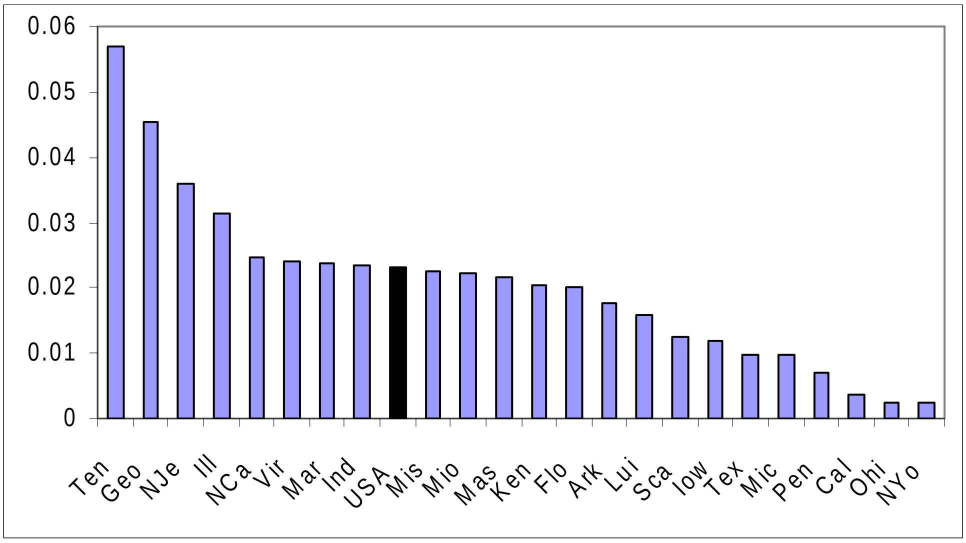
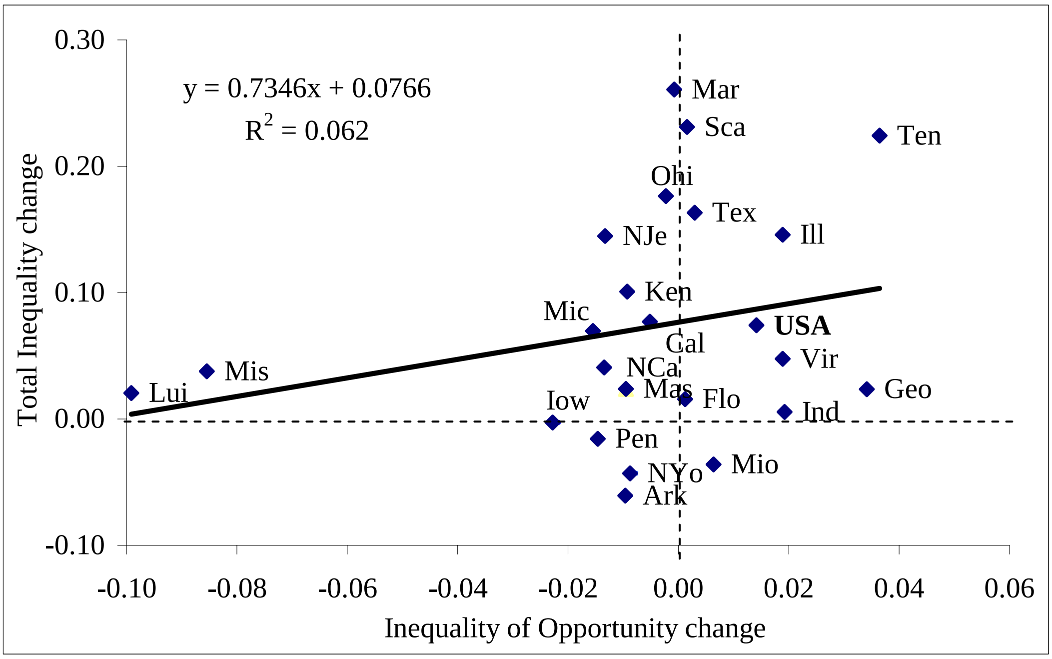


Figure 2. Variation of total inequality and inequality of opportunity in U.S. (1980-90):

Theil 0 decomposition (*6-groups*)



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