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INEQUALITY AND GROWTH: UNCOVERING THE MAIN CONCLUSIONS FROM THE EMPIRICS

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Inequality and Growth:
Uncovering the main conclusions from the empirics

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Abstract

The theme of the relationship between inequality and economic growth has gained considerable attention among economists over the last two decades. In this paper, we analyse the effect of inequality on growth, whose related literature has been producing inconclusive results.

After an exhaustive study of the major empirical works in this specific research area, we are able not only to advance with some potential explanations for the apparent lack of consensus on the empirical assessment of the inequality-growth relationship, but also to achieve a better understanding of the nature of this relationship and the forces underlying it.

We conclude that the disparities found in the results of the estimation of the reduced-form relationship are most likely due to three dimensions: differences in the estimation techniques, the countries and the periods included in the sample, and the variable used to measure inequality. The last two aspects have particularly important implications. First, country/region specificities play a crucial role in the relationship between inequality and growth, so more emphasis should be put on the estimation of such a relationship on a national/regional basis, rather than trying to establish universal patterns. Second, the time horizon of the analysis should be carefully chosen, as different transmission channels from inequality to growth tend to operate differently in the short and in the long-run. Third, the fact that inequality in wealth distribution has a stronger negative effect on growth than inequality in income distribution may indicate that the channels through which inequality affects growth are not the same in both distributions. Therefore, we argue that in order to produce an accurate assessment of both the reduced-form relationship and the underlying transmission channels these aspects should be accordingly considered, which has not been the case in most of the empirical literature.

Keywords: inequality, economic growth, transmission channels, income distribution, wealth distribution, taxation

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1. Introduction

The theme of the relationship between inequality and economic growth has gained considerable attention among economists over the last two decades. Since the late 1980s, hundreds of theoretical and empirical papers have been produced.[3] On the one hand, there is a significant strand of the literature addressing the causation from growth to inequality, which has very much focused on the assessment of the well-known inverted-U Kuznets hypothesis (Kuznets, 1955). On the other hand, another research line has focused on the reverse causation, i.e., on the effect of inequality on growth. In this paper we concentrate on this second causality type, whose related literature has led to inconclusive results.

Regarding the theoretical literature, several mechanisms through which inequality affects growth have been presented, the most important being the credit market imperfections channel, the fiscal policy channel, the socio-political instability channel, and the savings channel. Most of the theoretical models produced within these approaches predict a negative effect of inequality on growth (e.g., Galor and Zeira 1993, Banerjee and Newman 1993, Alesina and Rodrik 1994, Persson and Tabellini 1994, Alesina and Perotti 1996).

As for the empirical literature, a considerable number of works have been produced in an attempt to test both the reduced-form relationship between inequality and growth and the underlying mechanisms. They present, however, very different results regarding the signal of the relationship (some studies conclude that inequality is harmful for growth; other studies conclude that it is beneficial; some others find a non-significant relationship) and the validity of each mechanism. Besides, the empirical studies significantly differ according to several methodological issues, such as the way of measuring inequality, the sample, the functional form of the regression, the estimation techniques, and the source, quality and structure of income distribution data. Thus, it is important to examine how these methodological differences influence the final results. This is the first objective of this paper. To do so, we first present a systematization of the key results of major empirical works, as well as of the way they address the abovementioned methodological issues, and then try to derive some

[3] Based on the Econlit, an electronic bibliographic database maintained by The American Economic Association, we have implemented a procedure using in simultaneous two terms as search keywords: 'inequality' and 'economic growth'. The search procedure is encompassing since it covers the keywords in several dimensions: the title, the abstract and the main text of the articles. Despite the limitations associated with the choice of search keywords, we consider that the selected keyword combination - 'inequality' and 'economic growth'- captures the core contributions in the area under analysis. This small bibliometric exercise allows us to confirm with quantitative evidence the boom registered by this line of research since 1990. Since 1969, more than 90% of total records appear from 1990 onwards.

conclusions through a heuristic approach. The second goal of the paper is to investigate some possible causes and implications of these conclusions. By doing so, we will be able not only to advance with some potential explanations for the apparent lack of consensus on the empirical assessment of the inequality-growth relationship, but also to have a better understanding of the nature of this relationship and the forces underlying it.

The paper is structured as follows. After the Introduction, Section 2 presents a brief survey of the main theoretical approaches on the effects of inequality on growth. Section 3 uncovers the main empirical works, testing both the reduced-form relationship and the transmission channels from inequality to growth. An emphasis is put on the systematization of the key results of the selected studies, as well as of the ways they approach some of the methodological issues mentioned above. In Section 4 a critical discussion of these results and methodological issues is produced, with a focus on the ideas mentioned in the previous paragraph. Section 5 concludes.

2. Inequality and Economic Growth: a Brief Survey of the Main Theoretical Approaches

The theoretical literature on the effects of inequality on economic growth has grown enormously over the last two decades. Particularly since the early 1990s, many theories have been constructed to examine the channels through which inequality influences economic growth. As a consequence, there is by now a rich literature on the subject which has been thoroughly surveyed by Perotti (1996), Aghion et al. (1999), Barro (2000), among others. The main purpose of this section is to briefly review this literature in order to better accomplish our research goal.

In general, we can identify four main approaches, each corresponding to a specific transmission channel: the credit market imperfections channel, the fiscal policy channel, the sociopolitical instability channel and the saving channel. The first three approaches predict a negative impact of inequality on growth, whereas the last one predicts a positive impact.

2.1 The credit market imperfections channel

The credit market imperfections channel explores the implications of inequality on investment in human and physical capital in the presence of borrowing constraints. The key idea of this approach is that when there are major restrictions on borrowing, and investment in physical

and human capital is associated with significant fixed costs, inequality is harmful for growth, as it prevents the poor from carrying out these investments.

The origin of this approach can be traced to Galor and Zeira (1993). In this seminal paper, they analyze the theoretical link between income distribution and economic growth through investment in education in an overlapping generations' framework, with individuals living for two periods and with intergenerational altruism. In each period, there is a single good that can be produced with two technologies: one using skilled labor and capital, and the other using unskilled labor only. Individuals live for two periods: in the first period, they may either invest in human capital or work as unskilled; in the second period, they work as skilled or unskilled (according to their education level), consume, and leave bequests. Individuals are assumed to be born with the same potential abilities and preferences; they differ only according to their inherited wealth. Capital market imperfections assume the form of a higher interest rate for borrowers than for lenders, which makes borrowing costly and difficult. Therefore, those who have a poor initial wealth are not willing to invest in education, since they would have to borrow a significant amount. Education is then limited to individuals with sufficiently high initial wealth. Hence, the inheritance of each individual fully determines his/her decisions to invest in education, so initial wealth distribution determines the aggregate level of investment, output, and skilled and unskilled labor in the short-term.

However, wealth distribution also has an effect on these variables in the long-run, as the amount of investment in human capital in a certain time period determines the distribution of inheritances in the following period, which gradually changes the distribution of wealth over time. By analysing the dynamics of the economy, Galor and Zeira (1993) show that the economy converges to a long-run equilibrium with two groups of agents: the rich dynasties, in which all generations invest in human capital, work as skilled and leave a large bequest, and the poor ones, where people inherit less, work as unskilled and leave less to their children. The relative size of these two groups depends on the initial distribution of wealth, as the more individuals with low initial wealth, the more unskilled workers in the long-run. Thus, an economy which is initially poor ends up poor in the long run; an economy which is initially rich and whose wealth is distributed among many, ends up rich; but an economy with a large initial amount of wealth, which is held by a few, ends up poor. Thus, there is path dependency, as economies may converge to different steady-states, depending on their initial conditions. This is possible only if another crucial assumption is added to the model, namely indivisibility in investment in human capital (that is, non-convexity of the production technology).

The subsequent studies that have emerged within this approach maintain the key features of the Galor and Zeira's (1993) model, namely: the assumptions of credit market imperfections and fixed costs associated with investment, the framework based on a model of economic growth with overlapping generations, and the fundamental result that inequality harms growth.

Banerjee and Newman (1993) examine the effect of inequality on a different type of choice, the choice between becoming an entrepreneur or a worker (rather than the choice between becoming a skilled or an unskilled worker). The key idea is that, if lenders refuse to make loans available to those with a low wealth, poor people will not have the necessary amount to invest in an entrepreneurship activity, thereby opting to work. Thus, in a certain period, the institutional structure of the economy, represented by the pattern of occupations, depends on wealth distribution. This pattern, in turn, determines both the wage equilibrium and the saving rate in the following period, thereby generating a new distribution of wealth and a new pattern of occupational choice. We will have then a dynamical system, in which the evolution of wages, savings, income distribution, occupational patterns and output are endogenously determined. The authors show that a highly unequal initial distribution of wealth may result in an under-investment in the entrepreneurial activity and may therefore be harmful for growth.

Aghion and Bolton (1997) and Piketty (1997) introduce a new element in the analysis, as they endogeneize the interest rate. By explicitly modeling the supply side of the credit market, they explore the interplay between the capital market equilibrium (and the interest rate equilibrium) and the distribution of wealth. Whereas Aghion and Bolton (1997) focus on finding conditions under which there is a non-monotonic evolution of income inequality towards a unique-steady state, Piketty (1997) shows that economies may converge to different steady-states, depending on their initial conditions. In particular, he shows that the higher the initial inequality in wealth distribution, the higher the demand for credit and therefore the higher the interest rate in the future. Higher interest rates, in turn, prevent the poor from accumulating and investing in physical capital (credit rationing increases), thereby harming growth.

Owen and Weil (1998), and Maoz and Moav (1999), in turn, focus on the effect of inequality on the degree of intergenerational mobility and on the efficiency in the allocation of talents across occupations. Contrarily to the previous studies, they consider that the decision of investing in education is positively influenced not only by individuals' inheritance but also by their differentiate ability. Due to the complementarity between educated and non-educated workers, a developed economy with high levels of human capital will have higher relative wages for uneducated workers, making it more likely that the children of such workers will be

able to afford an education and the children of educated workers will have fewer incentives to become educated. Thus, richer economies tend to experience a high degree of upward and downward mobility, as well as low levels of wage gaps and inequality. A high degree of mobility, in turn, has a positive impact on long-term growth, as it leads to a high correlation between ability and human capital, thereby improving the efficiency in which education is provided. Therefore, as they prevent high-ability poor people from getting an education, credit constraints hinder wage inequality reduction and harm human capital accumulation, upward mobility, education efficiency and long-term growth.

2.2 The fiscal policy channel

The fiscal policy approach further advanced the idea that inequality has a negative impact on economic growth. According to this approach, whose major proponents are Bertola (1993) Alesina and Rodrik (1994), and Persson and Tabellini (1994), income distribution affects growth via its effects on government expenditure and taxation.

The theoretical models presented by the three abovementioned studies combine elements of two important strands in the economics literature – the endogenous growth theory and the political economy approach. Typically, output depends on capital, labor and on a public good, the latter being financed by a proportional tax on capital (capital is meant to capture all-growth producing assets, including physical capital, human capital, and proprietary technology, so the tax on capital must be interpreted as a metaphor for any kind of redistributive policy that transfers income to unskilled labor and reduces incentive to accumulate). Since tax revenues are redistributed lump-sum to all individuals and they differ in their endowment of capital and labor, each one will have a different view on what the common tax rate should be. In particular, those with a low share of capital income will prefer a higher tax rate.

Since fiscal policy is decided by majority voting, one can use the median voter theorem to investigate the relationship between inequality and growth: the more equitable the distribution in the economy, the better endowed the median voter with capital, and consequently, the lower the equilibrium level of taxation. Thus, taxation and redistributive government expenditure increase as inequality increases. This mechanism, which Perotti (1996) calls a "political mechanism", constitutes the first link of this approach. The second link – the "economic mechanism" – is based on the idea that taxation and redistribution, in turn, are

harmful for growth because of their distortionary effects on savings and investment. Combining these two links, we should expect a negative effect of inequality on growth.

2.3 The sociopolitical instability channel

Inequality and its association with sociopolitical instability have been identified as an additional barrier to economic growth. Alesina and Perotti (1996), Gupta (1990) and others argue that a highly unequal distribution of resources increases sociopolitical instability, as it makes individuals more prone to engage in rent-seeking activities, as well as in violent protests, revolutions, and coups. Socio-political instability, in turn, has a negative impact on investment, because it increases uncertainty and causes disruptions of productive activities, and therefore a fall in the productivity of labor and capital. Thus, as in the case of the fiscal policy channel, this approach is composed of two links – inequality raises sociopolitical instability (first link), and sociopolitical instability harms investment and growth (second link).

2.4 The saving channel

Contrarily to the three channels presented above, the saving channel supports the classical view that inequality has a positive impact on growth (Kaldor, 1956). The key idea underlying this channel is Kaldor's hypothesis that the marginal propensity to save of the rich is higher than that of the poor. Consequently, as it channels resources towards individuals whose marginal propensity to save is higher, inequality increases aggregate savings, thereby fostering investment and growth. To our knowledge, there are no theoretical models addressing specifically this channel within the theoretical literature on the effects of inequality on growth. However, we mention this channel, since, according to Barro (2000) and Knowles (2001), some economists still believe that it plays an important role in the relationship between inequality and growth.

3. The Empirical Literature

Following the explosion of the theoretical literature on the inequality-growth relationship in the 1990s, a significant branch of empirical work has been developed, in an attempt to test the main theoretical predictions. Over the last two decades, hundreds of empirical papers have been produced, some of them confirming the results of the main theoretical models, others rejecting them. The purpose of this section is to uncover the main works within this empirical

literature. We will divide the analysis in two parts: the first part uncovers those studies testing the reduced form relationship between inequality and growth, while the second part focuses on those studies testing the transmission channels sustained by the theoretical literature.[4]

3.1. Testing the reduced-form relationship

3.1.1. The early consensus on the negative impact of inequality on growth

A first set of studies – Alesina and Rodrik (1994), Persson and Tabellini (1994), Clarke (1995), and Perotti (1996) – aimed at testing the reduced-form relationship between inequality and growth. To do so, they all used cross-section data and estimated a linear equation in which the dependent variable – the output growth rate – was regressed on a measure of inequality and on a set of other variables that were found relevant in the explanation of cross-country growth performance in the highly influential Barro's (1991) econometric work. These variables include initial output, some measure of human capital, physical capital investment ratio, and regional dummies, among others. The aim was to identify the sign and to investigate the statistic significance of the variable associated with inequality, which, in all studies, was measured using data on income distribution. In order to avoid reverse causation from growth to the explanatory variables, in particular inequality, the former was measured as the average of annual growth rates for a relatively long period (20-30 years), whereas the latter were measured in the beginning of the time horizon for growth.

The studies differ primarily on three aspects: the source of income distribution data, the measure of inequality and the sample. Alesina and Rodrik (1994) use income data from Jain (1975) and Fields (1989); Persson and Tabellini (1994) from Paukert (1973); Perotti (1996) from Jain (1975) and Lecaillon (1975); and Clarke (1975) from the United Nations Social Indicators. Regarding the measurement of inequality, 5 different measures are used: the Gini coefficient (by Alesina and Rodrik, 1994, and Clarke, 1995); the share of the fourth quintile (by Persson and Tabellini, 1994, and Clarke, 1995), the share of the third and fourth quintiles (by Perotti, 1996, and Clarke); the coefficient of variation (by Clarke, 1995); and the Theil's index (by Clarke, 1995). As for the samples, with the exception of Clarke (1995), all the studies use average annual growth on the period 1960-1985 period, and a sample of several countries (whose dimension ranges from 40 to 80), selected on the basis of data availability.

[4] In both parts, we consider only those works that were produced from the early 1990s onwards, as this was the period in which the empirical literature on the effect of inequality on growth exploded. However, there were studies produced before 1990, some of them examined in Benabou (1996).

Despite these differences, the estimation of the regressions using Ordinary Least Squares (OLS) shows in all studies that inequality has a negative, significant impact on subsequent growth, thereby confirming the predictions of most of the theoretical approaches mentioned in the previous section. With the exception of Persson and Tabellini (1994) and Perotti (1996) – in which the inclusion of regional dummies as explanatory variables weakens considerably the effect of inequality on growth – this result is robust to different sensitivity analyses, such as different inequality measures, samples, time periods, explanatory variables, and estimation techniques, measurement errors, reverse causation, and heteroskedasticity. Most studies tested the inequality-growth relationship splitting their samples in sub-samples according to the countries' political regime (democracy or non-democracy) or to the development level (poor or rich countries). While Persson and Tabellini (1994) found a significant difference between democracies and non-democracies – the relationship is statistically significant only in democracies – the other authors did not. Perotti (1996), in turn, found that the negative inequality-growth correlation is statistically significant only in rich countries.

3.1.2. Challenging the results and the methodology of the early empirical works

By the late 1990s, the general consensus on the negative impact of inequality on growth began to be challenged. Several papers emerged criticizing the data quality and some of the methodological procedures used in the previous empirical studies. In most cases the result was an invalidation of the negative relationship between inequality and economic growth.

From the analysis of this more recent literature, we identify, in general, five major criticisms: the doubtful quality of income distribution data; the lack of comparable data on income distribution; the use of income distribution to measure inequality; the use of cross-section data; and the estimation of a linear growth regression.

❖ *The doubtful quality of income distribution data*

Deininger and Squire (1996) argue that in order to provide a basis for inferences on issues of inequality and growth, data on inequality should: i) be based on household surveys, rather than estimates drawn from national accounts statistics; ii) have comprehensive coverage of all sources of income or uses of expenditure, rather than covering only wages; iii) be representative of the population at the national level, rather than dealing with, for example, only the rural urban population or with taxpayers.

Based on these criteria, Deininger and Squire (1996) assembled a high-quality data set which was subsequently used by several empirical studies. In one of these studies, Deininger and Squire (1998) show that the data used in previous works was of doubtful quality, as the application of these criteria led to a considerable reduction in the size of the sample that was used to estimate the inequality-growth relationship. Moreover, using a sample composed by the 87 countries whose data satisfy their criteria, Deininger and Squire (1998) test the reduced-form relationship and find that the effect of income inequality on subsequent growth is not very robust, as the coefficient of inequality is not statistically different from zero once regional dummy variables are introduced in the Barro-type regression. This suggests that region-specific characteristics which may include income inequality could be at the root of the relationship observed in the previous empirical literature.

❖ *Stressing the role of land and human capital inequality*

Deininger and Squire (1998) also criticize the previous works in the way inequality was measured. They argue that inequality should be measured using land distribution (as a proxy of wealth distribution) instead of income distribution, since: i) it is associated with far less measurement errors; ii) its coverage is more equal both geographically and over time; iii) the relevant distribution in explaining the relationship between inequality and growth in many theoretical analyses is that of wealth, not of income.

Using initial distribution of land as a measure of inequality, Deininger and Squire (1998) find a negative, significant effect of inequality on growth, even when regional dummy variables are included, which indicates that the initial distribution of assets may capture economic characteristics that are only imperfectly reflected in standard measures of income inequality. However, when the sample is split according to the countries' development level or political regime, the data shows that the significant, negative effect exists only in non-democracies and primarily in poor countries.

Using panel data instead of cross-section data, Deininger and Olinto (2000) also find that initial land distribution, but not initial income distribution, has a significant growth-reducing impact. When including both variables simultaneously, the former maintains its negative sign, but the latter does not, which suggests that both types of distributions affect growth through different channels. A similar result is found by Alesina and Rodrik (1994).

Castelló and Domenech (2002) test the impact of inequality on growth using human capital instead of income or land inequality. They argue that income and land inequality may be insufficient measures of wealth inequality, since other variables such as human capital are also important determinants of wealth. Besides, in some theoretical models analyzing the relationship between inequality and growth, the role played by human capital endowment is very important if not crucial, as it shapes the distribution of income and wealth. The results found by Castelló and Domenech are basically the same as those obtained by the authors that use land inequality: i) income distribution is not statistically significant to explain growth, once regional variables are added; ii) human capital distribution has a strong, negative effect on subsequent growth; iii) when both variables are included simultaneously, the coefficient associated with human capital inequality remains negative, but that of income inequality becomes positive.

- *The lack of comparable data on income distribution*

Knowles (2001) produced a very accurate and comprehensive analysis of the way income inequality data had been used in previous works. His main point is that nearly all of them use inequality data that was not consistently measured, that is, data in which distribution is measured using different criteria across countries. In particular, some countries typically collect information on gross income, whereas other countries more often collect information on expenditures. This creates a problem because, as expenditures tend to be more equally distributed than income, the mixing of both indicators introduces a bias in the results.

The author shows that it does make a difference how income distribution is measured. Using a sample of 84 countries, where expenditure and income inequality are both used, Knowles obtains, consistently with the earlier works, a negative and significant relationship between inequality and growth. However, when the sample is reduced to those countries for which gross income data is used (primarily developed countries), such a relationship becomes insignificant. Thus, the first major conclusion of Knowles' study is that the previous empirical works should be interpreted with some caution, as they measure inequality inconsistently and this may make a difference in the final results.

Yet, Knowles argues that it is not appropriate to use gross income data, since most of the channels presented in the literature relate to distribution of income after redistribution, which can be measured by expenditure. Therefore, he estimates another equation with those countries for which expenditure data is available (mainly developed countries) and finds that inequality

has a significant, negative effect on growth. Thus, the second conclusion of this study is that there is a negative correlation between inequality and growth, but only when the focus is on inequality after redistribution.

❖ *The use of panel data instead of cross-section data*

Following the release of the Deininger and Squire inequality dataset that assembled more reliable data with time series information for a larger group of countries, several studies estimated the inequality-growth relationship using panel data techniques. These studies include Forbes (2000), Barro (2000), Deininger and Olinto (2000), Banerjee and Duflo (2003), and others.

According to Forbes (2000), the use of panel data is desirable for two reasons. First, it allows controlling for differences in time-invariant, unobservable country characteristics, thereby removing any bias resulting from the correlation of these characteristics with the explanatory variables. On the other hand, cross-country data do not directly address the important policy question of how a change in a country's level of inequality will affect growth within that country; panel techniques can specifically estimate such an impact.

The panel data evidence on the correlation between income inequality and growth is quite diverse. Forbes (2000) finds a positive relationship for high and mid-income countries that persists across different samples, variable definitions and model specifications, but not through all the time period under consideration. Barro (2000) obtains a negative relationship for poor countries, a positive relationship for developed countries, and an insignificant one when considering both groups of countries. Banerjje and Duflo (2003) find that it is a change in the direction, not the initial level of inequality, that leads to slower future growth. Deininger and Olinto (2000), in turn, find a negative correlation between land inequality and growth.

With the exception of Barro (2000), that considers 10-year growth episodes, these studies assess the impact of inequality on growth over 5-year periods, all taking the Gini coefficient as the reference inequality measure and estimating the relationship using different panel data techniques (fixed effects, random effects, General Method of Moments (GMM), Kernel regression, series estimator). All of them also include some form of sensitivity analysis, such as the consideration of different inequality measures, control variables, samples of countries, and estimation techniques.

❖ *Questioning the linear regression structure*

As we have seen, the vast majority of the empirical literature has examined the growth-inequality relationship by estimating a growth Barro-type linear equation with inequality as an additional explanatory variable. Banerjee and Duflo (2003) question this econometric methodology. First, using non-parametric methods, they show that there are strong *a priori* reasons to believe that the linear regression structure imposed in the previous studies is inconsistent with the predictions of the theoretic models. In particular, taking into account the characteristics of some of these models, it is demonstrated that the growth rate is expected to be an inverted U-shaped function of inequality, that is, changes in inequality in any direction are associated with reduced growth in the next period. Second, the authors test this hypothesis using a panel of 70 countries. The data show that the hypothesis is confirmed: there is strong evidence that the inequality-growth relationship is best described by an inverted U-shaped function, rather than by a linear one. This result is robust to changes in control variables and estimation techniques. According to the authors, this non-linearity is sufficient to explain why previous estimates of the growth-inequality relationship have led to so different conclusions.

In Table 1 we present a systematization of the main features of the studies analyzed in this subsection, focusing on the results they obtain and on the abovementioned methodological issues.

Table 1: The empirical literature on the reduced-form relationship

	Sample	Data structure	Distribution	Measure of inequality	Income inequality data set	Estimation method	Effect of inequality on growth
Alesina and Rodrik (1994)	46/70 countries 1960-1985	Cross-section	Income Land	Gini coefficient	Jain (1975) Fields (1989)	OLS 2SLS	*Income* Negative for the whole sample Negative in democracies and non-democracies Insignificant when income and land inequality are considered simultaneously *Land* Negative for the whole sample
Persson and Tabellini (1994)	56 countries 1960-1985	Cross-section	Income	Share of the fourth quintile	Paukert (1973)	OLS 2SLS	Negative for the whole sample Negative in democracies and insignificant in non-democracies
Clarke (1995)	74/81 countries 1970-1978	Cross-section	Income	Gini coef. Coef. var. Theil index Share of the fourth quintile	United Nations Social Indicators	OLS WLS 2SLS	Negative for the whole sample Negative in democracies and non-democracies
Perotti (1996)	67 countries 1960-1985	Cross-section	Income	Share of the third and fourth quintiles	Jain (1975) Lecaillon (1984)	OLS WLS	Negative for the whole sample Insignificant when regional dummies are added Negative in democracies and non-democracies Negative in rich and insignificant in poor countries
Deininger	66/87	Cross-	Income	Gini	Deininger	OLS	*Income*

and Squire (1998)	countries 1960-1992	section	Land	coefficient	and Squire (1996)		Negative for the whole sample Insignificant when regional dummies are added *Land* Negative for the whole sample Insignificant in democracies and negative in non-democracies Insignificant in rich and negative in poor countries
Deininge and Olinto (2000)	31/60 countries 1966-1990	Panel	Income Land	Gini coefficient	Deininger and Squire (1996)	GMM	*Income* Positive when income and land inequality are considered simultaneously *Land* Negative for the whole sample
Forbes (2000)	45 countries 1966-1995	Panel	Income	Gini coefficient	Deininger and Squire (1996)	GMM	Positive in high and mid-income countries
Barro (2000)	84 countries 1965-1995	Panel	Income	Gini coefficient	Deininger and Squire (1996)	Random effects	Insignificant for the whole sample Positive in rich countries Negative in poor countries
Knowles (2001)	40 countries 1960-1990	Cross-section	Income	Gini coefficient	Deininger and Squire (1996)	OLS	Negative for the whole sample Insignificant for high/mid-income countries and negative for low-income countries Insignificant for gross-income and negative for expenditures
Castelló and Domenéch (2002)	67/83 countries 1960-1990	Cross-section	Income Human capital	Gini coefficient	Barro and Lee (2001)	OLS	*Income* Negative for the whole sample Insignificant when regional dummies are added Positive when income and human capital inequality are considered simultaneously *Human capital* Negative for the whole sample
Banerjee and Duflo (2003)	45 countries 1965-1995	Panel	Income	Gini coefficient	Deininger and Squire (1996)	Kernel regression Series estimator	Inverted-U for the whole sample

3.2 Testing the Transmission Channels

Alongside the examination of the reduced-form relationship between inequality and growth, a number of empirical studies have tried to estimate the importance of the channels through which such a relationship operates (Persson and Tabellini (1994), Alesina and Perotti (1996), Perotti (1996), Deininger and Squire (1998), Deininger and Olinto (2000), Sylwester (2000)). In this subsection we analyze the contribution of the main empirical studies for the assessment of each of the four channels identified in section 2: the sociopolitical instability channel, the fiscal policy channel, the credit market imperfections channel, and the saving channel.

3.2.1 The sociopolitical instability channel

This channel was explicitly addressed by two empirical studies: Alesina and Perotti (1996) and Perotti (1996). In both studies, two equations are estimated using cross-section data from developed and developing countries: one to test the hypothesis that income inequality increases

sociopolitical instability, and the other to test the hypothesis that sociopolitical instability in turn reduces investment and growth. In the first equation, an index of socio political instability (which aggregates four proxies of social unrest: political assassinations, violent deaths, successful coups, and unsuccessful coups) is regressed as a function of income distribution and other variables, whereas in the second equation the average GDP growth rate in the period 1960-1985 is regressed as a function of the initial levels of the sociopolitical instability index, as well as other variables. In both papers, the two hypotheses are confirmed at a 5% level, these results being robust to an extensive battery of sensitivity tests, which confirms that the sociopolitical instability channel is strongly supported by the empirical evidence.

3.2.2 The fiscal policy channel

As he did in the case of the sociopolitical instability channel, Perotti (1996) tests the fiscal policy channel by running two regressions, one for each of its underlying mechanisms. The political mechanism is tested by regressing the fiscal policy variable (the average marginal tax rate between 1970 and 1985) on income distribution and other variables; the economic mechanism, in turn, is tested by regressing the growth rate on the fiscal policy variable and other regressors. Perotti (1996) does not find support for the fiscal policy channel, as the economic mechanism is rejected by the data. Although in the first equation income inequality has a strong and positive effect on the average marginal tax rate in democracies (thereby lending support to the political mechanism), in the second equation taxation has a positive (rather negative, as predicted by the economic mechanism) impact on growth. These results remain when other fiscal policy variables are used.

A similar result is obtained by Persson and Tabellini (1994). Using cross-section data for 43 countries, they test, first, the effect of income inequality on investment, second, the effect of inequality on redistribution (measured by transfers as a fraction of GDP), and third, the effect of redistribution on growth. They find that, in accordance with the theory, the first effect is negative, statistically significant and is present only in democracies, but the second and third effects, despite having expected coefficient signs, are not statistically significant.

Sylwester (2000), in turn, analyses the fiscal channel in a sample of developed and developing countries between 1970 and 1985, concentrating on the influence of public expenditures on education. He finds that income inequality has a significant positive impact on expenditures for public education (the reason being that highly unequal societies are likely to develop a dual system of schools, which increases the fixed costs of rising and supporting the public system of schools), and these expenditures in turn influence growth in two opposite

directions. On one hand, they have a negative effect on short-term growth (because of the distortionary taxation effect); on the other hand, they contribute positively to long-term growth (because they increase the stock of human capital in the future). Thus, this paper confirms the conclusion of Perotti (1996) and Persson and Tabellini (1994) that there is no empirical support for the fiscal policy channel in the long-run. However, it introduces the idea that such a support may exist in the short-run.

It should be noted that some of the studies examining the reduced-form relationship between inequality and growth test whether this relationship is different in democratic and non-democratic countries. The aim of this procedure is to check whether inequality influences growth through a political mechanism, as, according to the fiscal policy approach, one would expect such an influence to be higher in democracies. The results are quite diverse: a significant negative impact of inequality on growth is found only in democracies by Persson and Tabellini (1994), only in non-democracies by Deininger and Squire (1998), and in both regimes by Alesina and Rodrik (1994), Clarke (1995), and Perotti (1996).

Thus, in conclusion, there is no strong empirical support for the fiscal policy channel.

3.2.3 The credit market imperfections channel

Besides testing the socio-political instability and the fiscal policy channels, Perotti (1996) also tests the validity of the credit market imperfections channel. This mechanism was investigated considering only its action through investment in education and associated endogenous fertility decisions. Using data on female and male secondary school and fertility rates, Perotti concludes that inequality influences human capital investment negatively and fertility rates positively and, these, in turn, have a negative impact on growth. However, more accurate tests of this approach using measures of the degree of credit market imperfections (the loan-to-value ratio and the ratio of the domestic credit to GDP) interacted with the income distribution variable in the equation where education is the dependent variable lead to inconclusive results.

Deininger and Squire (1998), on the other hand, test the impact of credit market imperfections that lead to borrowing constraints impending over physical and human capital investment. They advance with the conjecture that lenders are generally more willing to accept physical capital as collateral for a loan than to lend against a future stream of earnings associated with the acquisition of human capital. Therefore, effects of initial inequality that are transmitted

through credit markets are expected to have a more important effect on the stock of human capital than on the stock of physical capital. By regressing the proxies of human and physical capital on inequality the authors confirm this hypothesis: inequality strongly harms investment in human capital, but it has an insignificant impact on investment in physical capital. Hence, the main channel through which it appears to affect growth is schooling.

Deininger and Olinto (2000) reach a different conclusion. Using panel data for 60 countries, they show that land inequality has a significant impact on growth but, once a proxy for investment in physical capital is included as explanatory variable, this impact becomes less strong. On the other hand, such an investment is significantly correlated to land inequality. Therefore, the conclusion is that land inequality influences growth not only directly, but also indirectly, via its impact on investment. The credit market imperfections channel, considering its action through investment in physical capital, is thus supported by the results of this study.

3.2.4 The saving channel

Very little attention has been paid to test the saving channel, perhaps because over the past decades there has been limited interest in exploring this link in the theoretical literature. Still, Barro (2000) slightly addresses this channel by checking how highly correlated income inequality is with investment ratios. Using panel data for several countries he shows that such a correlation is not statistically significant, both for developed and for underdeveloped countries. Thus, there is no evidence that the aggregate saving rate, which tends to influence the investment ratio, depends on the degree of income inequality.

The table below summarizes the main conclusions and features of the studies mentioned in this subsection for each transmission channel.

Table 2: The empirical literature on the transmission channels

	Channel	**Sample**	**Data structure**	**Distribution**	**Measure of inequality**	**Income inequality data set**	**Estimation method**	**Result** (acceptance or rejection of the channel)
Persson and Tabellini (1994)	Fiscal policy	13/43 countries 1960-1985	Cross-section	Income	Share of the fourth quintile	Paukert (1973)	OLS 2SLS	Rejection

Alesina and Perotti (1996)	Sociopolitical instability	71 countries 1960-1985	Cross-section	Income	Share of the third and fourth quintiles	Jain (1975) Lecaillon (1984)	2SLS	Acceptance
Perotti (1996)	Sociopolitical instability	64 countries 1960-1985	Cross-section	Income	Share of the third and fourth quintiles	Jain (1975) Lecaillon (1984)	OLS 2SLS	Acceptance
Perotti (1996)	Fiscal policy	49/27 countries 1960-1985	Cross-section	Income	Share of the third and fourth quintiles	Jain (1975) Lecaillon (1984)	OLS 2SLS	Rejection
Perotti (1996)	Credit market imperfections	62 countries 1960-1985	Cross-section	Income	Share of the third and fourth quintiles	Jain (1975) Lecaillon (1984)	OLS 2SLS	Ambiguous result
Deininger and Squire (1998)	Credit market imperfections	52/81 countries 1960-1992	Cross-section	Land	Gini coefficient	Deininger and Squire (1996)	OLS	Acceptance
Deininger and Olinto (2000)	Credit market imperfections	31/60 countries 1966-1990	Panel	Land	Gini coefficient	Deininger and Squire (1996)	GMM	Acceptance
Sylwester (2000)	Fiscal policy	52 countries 1960-1992	Cross-section	Income	Gini coefficient	Deininger and Squire (1996)	3SLS	Acceptance (short-run) Rejection (long-run)
Barro (2000)	Saving	84 countries 1965-1995	Panel	Income	Gini coefficient	Deininger and Squire (1996)	OLS	Rejection

4. The Empirical Literature: a Critical Discussion of the Main Methodological Issues and Results

The previous section provided a review of the main empirical works testing the effect of inequality on growth. One of its main insights is that the estimation of this effect is subject to a number of methodological issues and difficulties. In fact, the studies differ significantly according to several aspects, such as the way of measuring inequality, the sample, the functional form of the regression, the estimation techniques, and the source, quality and structure of income distribution data. Another important insight is that the results regarding the estimation of both the reduced-form relationship and the transmission channels seem to be quite diverse. Concerning the reduced form relationship, whereas some studies predict a negative impact of inequality on growth, others predict an insignificant or even positive

impact. As for the transmission channels, the results are far from being consensual too. Hence, there seems to be a lack of consensus regarding the empirical assessment of the links between inequality and growth. Since the analyzed studies present significant differences in the way they approach the methodological issues stated above, these differences must contribute significantly to the disparities in the final results.

One of the fundamental objectives of this section is to investigate how the methodological issues influence the final results of this empirical literature. Based on the systematization effort developed in Section 3, we will draw some conclusions concerning the potential relations between some particular treatment given to a certain methodological issue and the final results that are obtained. This is a difficult task, as these empirical studies deal with different methodological issues in different ways, so it is not easy to test and prove if the disparities in the results between two or more papers are the consequence of approaching differently methodological issue A, B, or C. However, if a considerable number of papers dealing with a certain methodological issue in the same way obtain similar results, then it is reasonable to assume that there is a causal relation between these results and the way that specific methodological issue is addressed, even if the other methodological issues are treated in a distinct way. Faced with the constraints associated with the intrinsic complexity of the subject in study, we will follow a heuristic approach throughout this section: any causal link between the use of a certain methodological technique and the estimation results will be considered relevant only if it is supported by most of the papers that deal with it.

The other objective of this section is to discuss the possible causes and implications of these relevant links. By doing so, we will be able not only to advance with some potential explanations for the apparent lack of consensus on the empirical assessment of the inequality-growth relationship, but also to have a better understanding of the nature of this relationship and the forces underlying it.

As in the previous section, the reduced-form relationship and the transmission channels will be analyzed separately in two different subsections.

4.1 The empirical literature on the reduced-form relationship

Taking into account the above considerations and the information provided in Subsection 3.1, we can identify four main conclusions:

i) the results of cross-section studies are not strongly affected by differences in estimation techniques, inequality measures, and explanatory variables included in the regressions;

in panel data studies, however, differences in estimation techniques lead to differences in the final results.

ii) the effect of inequality on growth is considerably weakened when regional dummies are introduced in cross-section studies;

iii) the results are sensitive to the type of countries included in the sample;

iv) the effect of land and human capital inequality on growth is stronger than that of income inequality.

Next we discuss these four conclusions in detail.

4.1.1 Estimation techniques, inequality measures, and explanatory variables

As mentioned in 3.1, most empirical studies examining the reduced-form relationship develop some type of sensitivity test in order to assess the robustness of the estimation results. One of the most common sensitivity analyses procedures consists of changing the explanatory variables included in the growth regression. Different studies estimate the inequality-growth impact using different control variables, but almost all of them examine whether changing these variables affects significantly the final results. With the exception of the regional variables – whose effect will be subsequently analyzed in more detail – almost all studies find that the estimation of the coefficient associated with inequality is not strongly affected by changes in the control variables.

Another commonly used sensitivity test consists in changing the estimation technique. As we have seen in Subsection 3.1, cross-section studies estimate the reduced-form relationship by OLS. In order to avoid reverse causation from growth to inequality, all of them use values for the inequality proxies measured in the beginning of the time period for growth. Some studies examine whether changing the way of dealing with reverse causation has a significant impact in the final results. In particular, they estimate the growth regression using an alternative procedure, which consists of running two-stage least squares regressions and instrumenting for the inequality measure. All of them come to the conclusion that the main results are the same in both procedures.

As for panel data studies, the situation is slightly different. First, a wider variety of estimators is used. Barro (2000) uses a random effects estimator, Banerjee and Duflo (2003) use Kernel regressions and series estimators, and Forbes (2000) and Deininger and Olinto (2000) use the

Arellano and Bover's GMM estimator.[5] The sensitivity analysis conducted by some of these studies shows that different methods lead to substantial differences in the estimated value of the inequality coefficient. Thus, in contrast with cross section studies, in panel data analyses the results seem to vary considerably with the estimation techniques. This may provide a first explanation for the diversity of results found by this type of studies.

Finally, the results do not seem to be significantly affected by the measure of inequality that is used. Most studies use the Gini coefficient as the indicator of inequality; the exception is Persson and Tabellini (1994), which uses the share of the fourth quintile. Alesina and Perotti (1996) argue that the choice between these two types of indicator is not relevant for the estimation of the effect of inequality on growth, as they are highly correlated. On the other hand, Clarke (1995) addresses explicitly this issue by estimating four regressions, each using a different measure for income distribution – the Gini coefficient, the share of the fourth quintile, the coefficient of variation, and the Theil's index. In the four models, the estimation of the inequality coefficient does not change significantly, which strongly reinforces the idea that the way of measuring inequality does not affect the final results.

4.1.2 Introduction of regional dummies in cross-section studies

A crucial result that can be derived from the analysis of the empirical literature is that the inclusion of regional dummies as explanatory variables in a cross-section regression weakens the magnitude of the coefficient associated with inequality. This occurs in all the studies in which this procedure is implemented. Persson and Tabellini (1994), Perotti (1996), Deininger and Squire (1998), and Castelló and Doménech (2002) find that income inequality has a significant, negative impact on growth, but once regional variables are added such an impact becomes insignificant. On the other hand, Deininger and Squire (1998) and Castelló and Doménech (2002) find that when income inequality is replaced by land or human capital inequality, the inclusion of regional dummies also weakens the inequality-growth relationship, although it still remains significant. Thus, it is clear that intercontinental variation in inequality, particularly in income inequality, accounts for a substantial part of the negative impact of inequality on growth that is found in several cross-section studies. This suggests that country and region specificities play a crucial role in explaining such an impact.

[5] This estimator first-differences each variable so as to eliminate the country-specific effects and then uses all possible lagged values of each of the variables as instruments, thereby correcting the problem of simultaneity.

It is worth noting that the results obtained by panel data studies corroborate this idea. Panel data estimation controls for differences in time-invariant, unobservable country characteristics, thereby removing any bias resulting from the correlation of these characteristics with the explanatory variables. As a result, it gives a more accurate indication of how a change in a country's level of inequality predicts a change in that country's growth rate. Thus, the fact that panel data studies lead to so diverse results may be the consequence not only of the use of different estimation techniques but also of the idea advanced in the previous paragraph, that the relationship between income inequality and growth differs across countries.

4.1.3 Estimation for different groups of countries

Another important conclusion that can be derived from the empirical studies is that the results are quite sensitive to the type of countries included in the sample. As mentioned in Subsection 3.1, several authors examining the reduced-form relationship split the original sample in sub-samples according to the countries' political regime or development level. In some cases, they obtain significant differences in the results for each sub-sample. Let's consider, first, the division between democratic and non-democratic countries. While Alesina and Rodrik (1994), Clarke (1995), and Perotti (1996) do not find considerable differences between democratic and non-democratic countries, Persson and Tabellini (1994) and Deininger and Squire (1998) do: the former find a significant negative impact of inequality on growth only in democracies and the latter only in non-democracies. Regarding the division between rich and poor countries, the results are very diverse too. Deininger and Squire (1998) and Knowles (2001) find a negative relationship for poor countries and an insignificant one for high/mid-income countries. Barro (2000) also finds a negative relationship for poor countries, but a positive one for rich countries. Forbes (2000), in turn, detects a positive effect for both high and mid income countries. By contrast, Perotti (1996) finds that inequality has a negative impact on growth only in rich countries.

Hence, we can conclude that the results are sensitive to the type of countries included in the sample, since the estimation of the effect of inequality on growth is significantly different for the different groups of countries considered in the studies. Technically speaking, there is no parameter stability when using a sample composed by countries with different political regimes and/or different development levels. This confirms the key idea previously advanced that the inequality-growth relationship is strongly influenced by the specific characteristics of

each country (or group of countries). Therefore, these characteristics should not be ignored in the estimation of this relationship.

We can also conclude that, despite the differences between poor and rich, and democratic and non-democratic countries, there is no compelling evidence for the direction of the income inequality effect on growth within each group of countries, when income distribution is used as a proxy of inequality. In fact, taking into account the results highlighted above, it is possible to find, for each of the four groups of countries that were considered, at least one study predicting a positive relationship between inequality and growth, and another study predicting a negative one. There is, therefore, no consensus about the magnitude and sign of this relationship, even within each group of countries, when inequality in income distribution is used.

4.1.4 Land and human capital inequality *vs*. income inequality

It has been already mentioned that some authors suggest that inequality should be measured using the distribution of land – Deininger and Squire (1998), Deininger and Olinto (2000) – or of human capital – Castelló and Domenéch (2002) – instead of income distribution. They argue that the relevant distribution in explaining the relationship between inequality and growth in many theoretical analyses is that of wealth, which is best described by land or human capital, rather than by income.

The results obtained in all these studies show that inequality in land and in human capital distribution has a stronger negative effect on growth than inequality in income distribution. On the one hand, Deininger and Squire (1998) find that, when land inequality and income inequality are included in separate cross-section regressions and these do not include regional dummy variables, the coefficients of both variables have negative signs, but that of the former has a stronger magnitude than that of the latter. On the other hand, when regional dummies are included as explanatory variables, only the coefficient of land inequality remains significant. Castelló and Domenéch (2002) find exactly the same results for inequality in human capital distribution. Moreover, Alesina and Rodrik (1994), Deininger and Olinto (2000), and Castelló and Domenéch (2002) find that when both proxies of inequality (income and land/human capital) are included simultaneously in the same regression, the coefficient associated with land/human capital remains negative, but that of income becomes either positive or insignificant. Thus, there is some evidence that the negative effect of wealth inequality on growth is stronger than that of income inequality.

Before advancing with some possible explanations and discussing the implications of this phenomenon, we should note that it does not necessarily contradict the previous conclusion that the inequality-growth relationship is strongly influenced by the specific characteristics of each country. Indeed, the inclusion of regional variables in cross-section regressions weakens the impact of inequality on growth, but in the case of land and human capital inequality this impact still remains negative and significant. This suggests that both components – the specific characteristics of each country and the channels through which land and human capital inequality systematically affect growth – play an important role in the explanation of the inequality-growth relationship.

Let's move now to the discussion of the possible reasons for the fact that land and human capital inequality have a stronger impact on growth than income inequality. We focus on two lines of arguments: first, the estimation result of the effect of income inequality on growth may be influenced by several problems surrounding data on income distribution; second, the fact that the impact of land and human capital distribution is stronger than that of income distribution may occur simply because, as stated by Deininger and Squire (1998), the relevant distribution in explaining the relationship between inequality and growth in many theoretical analyses is that of wealth, not of income.

The first line of arguments is based on the idea that data on income distribution are often associated with problems of measurement and comparability across countries. According to Deininger and Squire (1996), comparability of the data on income inequality may be hindered by several problems, such as differences in construction methods (data is not always based on household surveys, as sometimes estimates drawn from national accounts statistics are used), income definitions (in several countries, nonwage income and income from household production account for a significant share of the total income and, therefore, they should not be ignored), and data coverage (income data may not cover the entire population, but only a subset, e.g. urban population). By collecting data primarily from surveys, official statistical publications and research papers, Deininger and Squire (1996) overcame some of these problems for a large enough group of countries, constructing a new available data set of higher quality income distribution data, which, as already mentioned in Subsection 3.1, was used in most of the subsequent empirical works testing the inequality-growth relationship. One way to check if these problems associated with income inequality data do affect the estimates of the effect of inequality on growth is to examine if the use of the Deininger and Squire data set resulted in significant changes in these estimates. However, this is not an easy

task, as some studies that were produced after the publication of the dataset differ from the previous studies not only because they use the new dataset, but also because they use panel data instead of cross-section data (Deininger and Olinto, 2000; Forbes, 2000; Barro, 2000; Banerjee and Duflo, 2003). Therefore, one cannot say that the differences between the results of these studies and those of the previous studies are due to the introduction of higher quality income data or to the use of a different data structure. Nevertheless, there are two studies – Deininger and Squire (1998) and Knowles (2001) – that make use of the high quality data set and maintain the cross-section structure of the data. They both estimate a growth Barro-type equation with income inequality as an additional explanatory variable and, similarly to the earlier studies, obtain a negative, significant coefficient for inequality. This may indicate that the estimation of the effect of income inequality on growth is not affected by the use of high quality data; put differently, these two studies suggest that deficiencies related to income distribution data, such as construction methods, data coverage, and income definitions, do not significantly affect the key estimates, and therefore, do not explain why the effect of income distribution on growth is less stronger than that of land or human capital distribution.

Nevertheless, some authors suggest that major issues concerning data quality and consistency remain, even in the Deininger and Squire data set. Perotti (1996) had already noted that when income quintile shares and Gini coefficients are typically computed from surveys (which is the case in Deininger and Squire data set), two potential problems arise. First, and for obvious reasons, in any given survey the raw figures may be subject to very large measurement errors. Second, it is still difficult to establish consistent comparisons across countries, as the surveys they are derived from can vary remarkably with the definition of the recipient unit (households *vs*. individuals), and the income concept (gross income *vs*. expenditures). With respect to the recipient unit, Perotti (1996) argues that there are good reasons to believe that data organized by individuals understate the income share of the third and fourth quintiles of the distribution, relative to data organized by incomes and, therefore, using both in the same sample may not be appropriate. As for the income concept, Knowles (2001) and Milanovic (2005) also argue that mixing gross income and expenditure data introduces a bias in the results because expenditures tend to be more equally distributed than income. Whether or not this bias is sufficiently strong to affect the estimate of the impact of inequality on growth is a question that should be answered. According to Knowles (2001), it is, since, as we have seen in Subsection 3.1, the results that he finds differ when he considers a sample composed only by countries that use data on gross income (sample 1) and another sample only with countries

that use data on expenditures (sample 2). However, this conclusion should be interpreted very cautiously. Typically, European countries, the United States and most of Latin America collect household income information, whereas African and Asian countries more often collect information on expenditures. This is the reason why Knowles' sample 1 is mainly composed by mid/high-income countries and sample 2 by low-income countries. Therefore, the differences obtained between the two estimations may be due to sample selection, rather than data comparability issues. Hence, Knowles' results do not point necessarily to the idea that it does make a difference to estimate the inequality-growth relationship using inequality based on gross income or expenditures.

In conclusion, there is no compelling evidence to support the idea that reasons related to problems of quality and comparability of income distribution data are behind the weaker relationship between income inequality and growth. On the one hand, the use of Deininger and Squire high quality data set does not seem to induce a significant change in the results; on the other hand, there are reasons to doubt that the divergences found by Knowles (2001) are due to inconsistencies in income measurement.

We now move our attention to the second possible reason sustaining the fact that land and human capital inequality have a stronger effect on growth than income inequality. This reason has to do with the nature of the forces underlying the inequality-growth relationship, rather than with methodological issues. It is related with the idea advanced by Deininger and Squire (1998), Deininger and Olinto (2000), and Castelló and Domenéch (2002) that the relevant distribution in explaining the relationship between inequality and growth in many theoretical analyses is that of wealth, which is best described by land or human capital, rather than by income. In fact, as will be discussed in more detail in Subsection 4.2.2, the argumentation line of the three theoretical approaches predicting a negative impact of inequality on growth suggests that wealth distribution is more relevant than income distribution for the explanation of the underlying transmission channels. As a consequence, one would expect a negative coefficient of inequality by those empirical studies using proxies of wealth inequality, but not necessarily by those using income inequality. Moreover, the fact that several studies find a negative effect for land/human capital inequality and a positive one for income inequality when both are included simultaneously may be an additional reason to suspect that both types of distribution affect growth through different channels. These and other subjects will be discussed in more detail in the next subsection.

4.2 The empirical literature on the transmission channels

This subsection focuses on the empirical assessment of the transmission channels from inequality to growth. In contrast with the reduced-form relationship, the empirical literature has not paid due attention to the testing of the transmission channels. On the one hand, the number of studies addressing certain channels is clearly scarce, which makes it impossible to draw any credible conclusion about their validity; on the other hand, most studies do not test the transmission channels in the most appropriate way, as they neglect some aspects that are crucial to the production of a reliable analysis of the mechanisms through which inequality affects growth. Therefore, after systematizing the main conclusions that can be derived from the empirical works presented in Subsection 3.2, we will mention some of the main aspects that should be considered by this literature and discuss how important they are for a better understanding of the channels underlying the inequality-growth relationship.

4.2.1 Key conclusions about the empirical assessment of the transmission channels from inequality to growth

Taking into account the information presented in Subsection 3.2, we can identify three main conclusions with respect to the empirical literature on the transmission channels from inequality to growth:

i) The empirical evidence does not support the fiscal policy channel;
ii) There seems to be some support for the credit market imperfections channel, although the results are far from being conclusive;
iii) The works on the political instability channel and on the saving channel are very scarce, which prevents us from drawing any credible conclusion about their validity.

The first conclusion is clear from the analysis of the information contained in Table 2. Nearly all the studies testing specifically the fiscal policy channel find no evidence for it. Persson and Tabellini (1994), Perotti (1996) and Sylwester (2000) find evidence supporting the political mechanism but not the economic mechanism. This means that the theoretical prediction that inequality leads to an increase in taxation and redistributive expenditure is correct, but the prediction that taxation and redistribution are harmful for subsequent growth because of their distortionary effects is not. Besides, the fact that the results on the distinct effects of inequality on growth between democracies and non-democracies are far from being

consensual may be another indication that the fiscal policy mechanism is not relevant to explain these effects.

Regarding the credit market imperfections channel, there seems to be some evidence supporting it. Perotti (1996) and Deininger and Squire (1998) find that inequality has a negative influence in human capital investment, while Deininger and Olinto (2000) find that it harms primarily investment in physical capital. According to these authors, these results show that the credit market imperfections channel is strong. We argue, however, that this association is rather abusive, as the negative effect of inequality on investment in both physical and human capital may not be due to the existence of credit market imperfections. Thus, it would be more appropriate to test this channel using a variable that measures specifically the degree of credit market imperfections and test how this variable is associated with inequality and investment in physical and human capital. Perotti (1996) did so by interacting the loan-to-value ratio for home mortgages and the ratio of domestic credit to GDP with the income distribution variable. He obtained inconclusive results, as these variables turned to be insignificant. However, as Perotti himself states, this is an imperfect way of testing the credit market imperfections channel, as the variables he used are a very crude approximation to the concept of borrowing constraints. Hence, we can say that there may be some evidence that supports this channel, but the results should be interpreted very cautiously.

As for the saving and the sociopolitical instability channels, the empirical works attempting to test their validity are very scarce. Barro (2000) finds that aggregate saving rates do not depend on the degree of inequality, and Alesina and Perotti (1996) and Perotti (1996) conclude that there is evidence to support the sociopolitical instability channel. However, these works are clearly insufficient to draw any reliable conclusion about the way these two channels operate.

4.2.2 Key aspects to be considered when testing the transmission channels

In this subsection we look at some methodological aspects that we think are of prime importance in order to produce an accurate assessment of the validity of each transmission channel, but that have been clearly neglected by the existing empirical literature.

We have already mentioned the inadequate procedure that has been used to test the credit market imperfections channel. Most studies have failed to include in the regressions a variable measuring specifically the degree of credit market imperfections and thus to examine its relationship with inequality and investment. This type of analysis is necessary if we want to properly test this mechanism, as it allows examining if the relationship between inequality

and investment in physical and human capital found in the existing literature is indeed due to the existence of credit market imperfections.

As for the fiscal policy channel, more attention should be paid to the fiscal variable that is used. First, it is very important to choose the appropriate variable, that is, a variable that captures accurately the nature of the mechanisms presented by the theoretical models. As mentioned in Section 2, the link between income distribution and growth in this approach is the pressure for redistribution that arises in highly unequal societies; on the other hand, what matters for growth are the distortions caused by the taxation that accompanies the redistributive expenditures. Hence, as Perotti (1996) argues, the appropriate fiscal variable should be related to either public expenditures that have an explicit redistributive nature (e.g., social security and welfare, health and housing, and public expenditure of education) or to measures of taxation (such as the average marginal rate, the average tax on labor, and the average personal income tax). Second, it is also important to investigate how sensitive the results are to the choice of the fiscal policy variable, given the differences in the nature of some of the mentioned variables.

Another aspect that should not be ignored in the estimation of all the transmission channels is the consideration of country/region specificities. One of the most important conclusions resulting from the analysis of the empirical works on the reduced-form relationship is that these specificities play a crucial role in the inequality-growth relationship. Hence, they should be also considered in the empirical studies of the transmission channels. This can be done by including regional dummies in cross section regressions, using panel data (which is something that has not been explored yet), or testing the channels using small samples composed by countries with similar characteristics.

Another idea of crucial importance is the fact that the transmission channels should be tested in a way that is consistent with the assumptions on which the theoretical models are based. In particular, we call attention for three features that should be kept in mind: whether the mechanism operates primarily in the short-run or in the long-run; whether the relevant distribution to explain the transmission channel is that of wealth or income; whether pre-tax income or post-tax income should be used. The consideration of these aspects is relevant not only because it allows testing the transmission channels more accurately but also because it may give important insights on some of the questions that were discussed in the analysis of the reduced-form relationship estimation.

Starting with the short-run *vs*. long-run issue, the key idea is that the four channels are likely to operate in different temporal horizons. According to Knowles (2001), the fiscal policy and the sociopolitical instability channels tend to be more relevant in the medium/long-term because, in the first case, there is a considerable time lag between an increase in inequality, mounting pressure for more income distribution, and for redistribution to then take place, and, in the second case, it takes some time for inequality to lead to sociopolitical instability. By contrast, the saving channel tends to be more relevant in the short/medium-term, as it may not take long for inequality to affect incentives and savings behavior. The credit market imperfections channel, in turn, is likely to operate in both short and long-terms, since the repercussions on growth of poor investment in physical capital are immediate, but those of poor investment in human capital are not. Hence, when the first two channels are tested empirically, a significant time lag between growth and the inequality variable should be considered; on the other hand, if the aim is to test the saving channel, the time lag should be short. This insight may provide further explanations for some of the results found by the empirical literature testing the reduced-form relationship. Since these studies regress the average of annual growth rates for a period of 20-30 years on the initial level of inequality, most cross-section studies examine the inequality-growth relationship in the long-run. Panel data studies, in turn, have examined this relationship in the short-medium run, as they usually assess the impact of inequality on growth over 5-year periods. This may pose another explanation for the fact that the panel data evidence on the correlation between income inequality and growth is so diverse. Indeed, we have some studies predicting a negative correlation and others predicting a positive one, and this may be a consequence of the fact that these studies test the effect of inequality on growth in the short/medium term, in which two channels – the saving channel and the credit market imperfections channel – operate in opposite directions. By contrast, in the cross-section studies there is more evidence for the existence of a negative relationship, which may occur because all the three channels that are more relevant in the long-run – sociopolitical instability, fiscal policy, and credit market imperfections channels – imply a negative impact of inequality on growth.

The four transmission channels also differ with respect to the relevant type of distribution. While in the saving channel the income distribution is the one that matters (because the saving rates are determined as a fraction of income), in the credit market imperfections channel wealth distribution is more relevant (since wealth is more important than income in determining investment decisions). In the other two channels, in turn, both types of

distributions are relevant. This is a strong argument to support the results obtained by those studies that estimated the reduced-form relationship using wealth/asset distribution. As it was emphasized in Subsection 4.1.4, the negative effect of land and human capital inequality on growth tends to be stronger than that of income inequality. We advanced with the possible explanation that the relevant distribution in explaining the relationship between inequality and growth in many theoretical analyses might be that of wealth, which is best described by land or human capital inequality, not that of income. We have just seen that there are strong reasons to believe that this is the case, as wealth distribution is relevant in the three channels predicting a negative effect of inequality on growth, whereas income distribution is relevant not only in two of these channels, but also in the saving channel. Thus, the fact that wealth and income distributions affect the inequality-growth relationship through different channels can explain some of the differences found in the estimates of the coefficient associated with inequality when both types of distributions are used.

Finally, there are also differences among the four channels regarding the type of income that should be considered. While the sociopolitical instability, the credit market imperfections, and the saving channels refer to income inequality after redistribution has taken place, the fiscal policy channel refers to inequality of pre-redistribution income. Hence, if this channel is to be tested empirically, data on gross income should be used, whereas data on net income or expenditure are most appropriate for the first three channels. We can relate this idea with the results of Knowles' (2001) work. As mentioned before, Knowles finds that, for those countries that use gross income distribution, inequality has an insignificant impact on growth, whereas for those countries that use expenditure the impact is significant and negative. In Subsection 4.1.4, we argued that this divergence could arise because of either differences in the way of measuring income distribution or issues related to sample selection. Now we advance with a third possible explanation. Since the use of expenditure captures primarily the fiscal policy channel and the use of gross income captures the other three channels, then one would expect to find a negative effect of inequality on growth in the first case and an effect of any direction in the second case. Thus, Knowles' findings may also arise because of differences in the relative importance of the transmission channels underlying each of the two estimations.

5. Conclusion

The estimation of the effect of inequality on growth is subject to a number of methodological issues and difficulties, which in part may be responsible for the apparent lack of consensus

about the way inequality influences growth. Although it is not easy to systematize and compare the results of so many studies, especially when a large array of different methodological techniques is employed, some conclusions can be derived.

First, it is evident from our analysis that country and region specific characteristics play a crucial role in the determination of the effect of inequality on growth. This conclusion has two important implications. On the one hand, it implies that more emphasis should be put on the estimation of the inequality-growth relationship on a national/regional basis. It is perhaps more appropriate to study how this relationship operates within a country or a group of countries with similar characteristics, rather than trying to establish a universal pattern. Such an approach provides a better understanding of the inequality-growth process and may also present a possible way of overcoming data constraints and empirical methodological issues. On the other hand, since it is risky to make inferences on the impact of inequality in a particular country using coefficient estimates from a wide sample of countries, policy recommendations should not be based on these estimates, but on those of country studies.

Secondly, we also conclude that inequality in wealth distribution, proxied by land or human capital distribution, seems to have a stronger negative effect on growth than inequality in income distribution. This may occur because the channels through which inequality affects growth are not the same in both distributions, regardless of problems related to measurement errors and comparability across countries that arise when income is used. In particular, wealth distribution is likely to be more relevant in the three channels predicting a negative correlation between inequality and growth. Exploring in more depth the channels through which wealth and income inequality could differentially affect growth might be an interesting question for future research.

Thirdly, the divergences found in the estimation of the reduced form relationship are more pronounced in panel data studies. We suggest that these divergences are due to three reasons: i) differences in estimation techniques; ii) country/region specificities, which are captured in panel data; iii) the effect of opposing transmission mechanisms in the short/medium-run, which is the time horizon considered in most panel data studies.

Finally, the empirical studies specifically addressing the transmission channels from inequality to growth have been scarce. Besides, they have neglected some important aspects, such as the time horizon, the type of distribution, and the definition of income that should be used to test each mechanism. We believe that the consideration of these aspects is crucial to

produce an accurate assessment of the empirical validity of each mechanism. Therefore, this area of research has a vast potential to be yet explored.

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