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# Channels of transmission of inequality to growth: A survey of the theory and evidence from a Portuguese perspective

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## Abstract

We review the theoretical and empirical literature on the relationship between inequality and economic growth from the perspective of the Portuguese economy in order to identify the correct (predicted) sign for the relationship in this particular country and the underlying mechanisms that explain it. Different mechanisms relating inequality and economic growth can be at stake explaining why different countries can experience different outcomes in the same period of time or why the same country experiences different outcomes in different periods of time. It is thus fundamental to correctly identify the channels of transmission of inequality to growth in the Portuguese economy. Ideally, all the mechanisms selected should be tested, but prior judgments should also lead us to produce a ranking of the mechanisms according to its relevance for the economy under analysis. This correct identification and ranking leads to more accurate policy recommendations as far as redistributive policies for the Portuguese economy are concerned.

**Keywords:** inequality, growth, Portugal

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## 1. INTRODUCTION

Why should we care about income (and capital) inequality in the Portuguese economy? Since the 1980's, Portugal has experienced a decrease in income inequality but this decrease has not been uniform across the income distribution, especially towards the end of the 20<sup>th</sup> century and the beginning of the 21<sup>st</sup>. According to recent European Commission reports on the social situation in the EU, Portugal was the EU\_25 member state that presented the most unequal income distribution in 2001 and again in 2004, with a Gini coefficient of 41% and a rate of population at risk of poverty of 20.3% in the last year under analysis.

Income inequality *per se* is only relevant to the well-being of individuals if it is accompanied by a decrease in the rate of economic growth and by an increase in poverty. If inequality in the Portuguese economy is negatively associated to economic growth and positively associated to poverty this implies a reduction in the well-being of the Portuguese citizens. Furthermore, an economy experiencing high levels of income (and capital) inequality at medium levels of poverty will probably become more vulnerable to adverse shocks on economic growth, which in turn can lead to more poverty in the present, and most certainly in the future too if intergenerational mechanisms perpetuating poverty are in action.

The aim of this paper is to review the theoretical and empirical literature on the relationship between inequality and economic growth from the perspective of the Portuguese economy in order to identify the correct (predicted) sign for the relationship in this particular country and the underlying mechanisms that explain that sign. Different mechanisms relating inequality and economic growth can be at stake explaining why different countries can experience different outcomes in the same period of time or why the same country experiences different outcomes in different periods of time. It is thus fundamental to correctly identify the channels of transmission of inequality to growth in the Portuguese economy. Ideally, all the mechanisms selected as crucial for the Portuguese economy should be tested, provided data is available, but even if this is the case some prior judgments should lead us to a ranking of the mechanisms according to its relevance for the economy under research. This correct identification and ranking will enable us to derive more accurate policy recommendations as far as redistributive policies for the Portuguese economy are concerned.

The paper is organized as follows. In section 2 we provide a brief description of the Portuguese economy in terms of inequality and poverty in order to identify the mechanisms relating inequality to economic growth relevant for this particular country. In section 3, we analyze how these mechanisms work based on a survey of the theoretical literature on the subject. Section 4 is devoted to a systematization of the empirical evidence already collected on the theme. Finally, in section 5 we conclude and identify main avenues for future research on the theme applied to the Portuguese economy.

## **2. INEQUALITY AND POVERTY IN THE PORTUGUESE ECONOMY**

In this section we start by characterizing inequality and poverty in the Portuguese economy during the 1990's and then we proceed to its characterization within the context of the 25 member-states of the European Union (EU\_25) in order to identify its major determinants.

### **2.1. THE 1990'S**

Rodrigues (1996; 1999a,b; 2007) analyses at deep extent the main characteristics of inequality and poverty in the Portuguese economy during the 1990's.

1989-2000 was a period of vigorous growth for the Portuguese economy, with growth accelerating in the last five years of the period under analysis<sup>1</sup>. In this period, the increase in real income occurred at all levels of income translating into a decrease in absolute poverty<sup>2</sup>. But the increase in income was uneven, with inequality rising strongly in the first half of the period. Based on the distribution of income by deciles per equivalent adult in the years 1989, 1995 and 2000 the growth rates of equivalent income for the whole distribution, as well as per decile, were 2.64% for the whole period, corresponding to a growth rate of 2.18% in the 1<sup>st</sup> decile, against 3.69% in the 10<sup>th</sup> decile. Within the period income inequality augmented at different speeds: in 1989-1995 the growth rate was 4.3% for the 10<sup>th</sup> decile against 1.41% for the 1<sup>st</sup> decile. This trend was reversed in the second period, 1995-2000: the growth rate for the 10<sup>th</sup> decile decreased to 2.6% and in the 1<sup>st</sup> decile it increased to 3.12%. But this change in trend was not sufficiently strong to determine a trend for the whole period similar to the one

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<sup>1</sup> The real GDP per capita average annual growth rate was 2.8% for the whole period, 2.6% in 1989-1995 and 3.7% in 1995-2000.

<sup>2</sup> The poverty line is 6500 Euros per year.

that characterized the 1980's, when changes in income and inequality benefitted the most those individuals at the bottom or at low levels of the income distribution.

## **2.2. RELATIVE TO THE EU\_25**

Since the setting-up of the Lisbon Agenda, a renewed interest on Social Policies by the European authorities has taken place resulting in four important reports on the social situation in the EU\_25 (see EC (2007; 2008a,b,c). We will rely on these reports to characterize inequality and poverty in the Portuguese economy relative to the EU\_25 since they use comparable data and indicators<sup>3</sup>. The data used in the reports refers to the years 2001 (ECHP) and 2004 (EU\_SILC) and the analysis is conducted at country level as well as for the average EU\_25 economy.

The Portuguese economy was the most unequal economy in 2001 and maintained that place in 2004: it presented a Gini coefficient of 41% and a rate of population at risk of poverty of 20.3%, against 20.6% for Lithuania and Poland and 9.2% for Sweden. For the group of Mediterranean Countries, this rate varies between 19% and 20.6%, with Portugal exhibiting the highest value, which corresponds to 2 135 000 of poor people. By age composition this aggregate rate corresponds to 19% of children, 57% of people at working age and 24% of elderly people, which translates into 405650 poor children, 1216950 poor people at working age and 512400 poor elderly people.

How does the composition of the population at risk of poverty vary according to household type<sup>4</sup> and work intensity? Households with couples with less than 65 years of age without children and work intensity less than unity correspond to 5% of the poor population (in levels, 106750 poor people); households with lone women with more than 65 years of age represent approximately 6% of the poor population (128100 poor people); households with couples without children with 65 years of age or more registered a rate of 14% (298900 poor people); households with couples with 1 or 2 children with work intensity of unity correspond to 12% of the poor population (256200 poor people); for the households with couples with 1 or 2 children with work intensity

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<sup>3</sup> Starting in 1994, for a period of 10 years, the European Community Household Panel Survey (ECHP) produced annual data on social conditions. In 2005 it was replaced by a new instrument, Statistics on Income and Living Conditions (EU-SILC), which is based on larger samples and allows improved characterization of certain households.

<sup>4</sup> See EC (2007), Chapter 2.

less than unity and at least equal to 0.5, the rate was 18% (384300 poor people); and for other household types the rate was 45% (960750 poor people)<sup>5</sup>.

The age composition of the Portuguese population classified as poor shows that a huge percentage are at working age, which means that in most cases their work is not productive enough to ensure decent living standards, due most certainly to their low levels of educational attainment and/or training. Additionally, this situation has strong negative consequences upon children that live in households whose parents are at working age since it makes them more exposed to the risk of poverty. It is thus not surprising that the percentage of poor children in the total poor population amounts to 19%. Analyzing the percentage of the poor population by household type, we can conclude that 30% of the Portuguese considered poor live in households with couples with 1 or 2 children and work intensity between 0.5 and 1. This is an impressive number because a large number of poor children are raised in these types of households and their parents' work is not sufficiently productive to enable them to overcome the poverty threshold.

According to household type and the rate of children at risk of poverty, the Portuguese economy belongs, along with Spain and Italy, to the group of EU countries for which the prevalent household types are: i) households with couples with 2 children and; ii) complex households, for which the rate of children at risk of poverty is less or equal to 22% and not higher than 29%.

According to the national and EU rates of poverty among children and the overall national rate of poverty, Portugal belongs to the group of countries for which the rate of poverty of children is above (or equal to) to the EU average and the national rate of children at risk of poverty is higher than the national rate of risk of poverty for the overall population, but doesn't exceed the latter in more than 5 p.p.. For the Portuguese economy the rates are, respectively, 24% and 19%, a difference of exactly 5 p.p., so the Portuguese economy is not very far from the countries that belong to the worst group, those that present a differential between the two rates that exceeds 5 p.p..

How is inequality related to age, education and employment status<sup>6</sup>? Based on a static decomposition of the Mean Log Deviation (MLD) index it is possible to identify five groups of countries within the EU\_25: the Anglo-Saxon, the Baltic, the Central European Countries, the Continental, the Nordic and the Mediterranean groups.

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<sup>5</sup> See EC (2007), table 3 p.52 and first pie chart on p. 67.

<sup>6</sup> See EC (2007), pp. 19 -27 and pp.34-42.

Portugal belongs to the last group, for which the percentage of inequality explained by the different factors was, in 2004, 18% due to education, 4% attributable to employment status and 3% to age, that is, in the Portuguese economy education is the major factor explaining the observed inequality<sup>7</sup>. Compared to the other country groups, the Mediterranean group registered the highest percentage of inequality explained by education, while the Nordic group experienced the lowest value. The employment status has the highest influence on inequality in the Anglo-Saxon group, 19%, while the lowest value is registered in the Mediterranean group, 4%. Age accounts as the major factor determining inequality in the Nordic group, exhibiting the highest value, 8%, against only 2% for the Central European Countries group.

As for the dynamic decomposition of the MLD index, since the period under analysis is very short the differences between the country groups due to the three factors mentioned above are expected to be negligible. For the Portuguese economy, in the period 2001-2004 the increase in income dispersion within groups explains the increase in inequality, while age, education and employment status are relatively unimportant in the explanation of the increase in inequality in Portugal in this period.

Let us now focus on the characterization of households according to work intensity, since work is the most important (proximate) factor in preventing individuals at working age and their dependents from the risk of poverty, as it is the most important source of income to the household budget. Labour services should be productive enough in order to allow for earnings levels sufficiently high that, when translated into units of equalized income, should surpass, at least to some extent, the income poverty threshold. For the EU\_25, in households with work intensity higher or equal to 0.5, 13% of children are at risk of poverty, while in the Portuguese economy that rate is 21%. In households with parents with full time work the rate is 7% for the EU\_25 and 14% for Portugal. As for households with couples with 1 or more children, the rate of children at risk of poverty differs according to the respective work intensities. Comparing the EU\_25 and the Portuguese rates these are, respectively: for the jobless, 68% against 47%; for part-time only, 32% and 59%; for one full time work, 21% and 44%; for one full time work plus one part-time work, 6% and 26%; and for two full time work, 5% and 10%. Except for the jobless, the rates are higher for Portugal than for the EU\_25. Additionally, the rates for Portugal in the cases of one full time work and one full time

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<sup>7</sup> In fact, the share of between group inequality in total inequality by education of the household head is 24%, while by age is 1% and by employment status is 2%.

work plus part-time work are the highest among the EU\_25 and for the two full time works it is the second highest and the double of the EU\_25 rate. It is thus possible to conclude that educational levels of the Portuguese working population are a very important (ultimate) factor in explaining child poverty, since low levels of education are associated with lower labour productivity and lower wages<sup>8</sup>.

As predicted by human capital theories (see e.g. Simões (2006)), employment rates are positively associated with educational attainment of individuals aged 15-64<sup>9</sup> (see European (2008b), chart 7.4, p. 152). For the EU\_27, the employment rate of individuals with low educational attainment is less than 50% and for the majority of the EU member states for the individuals with high educational attainment the employment rate is more than 85%, although important differences within countries can be observed. For example, Portugal has the highest employment rate for individuals with low educational attainment, 66%, similar to the employment rate for individuals with medium educational attainment, and the employment rate for individuals with high educational attainment is approximately 85%. Unemployment rates by levels of educational attainment for the EU\_27 over the period 2000-2007, seem to confirm the results above since for all member states, with the exception of Greece, the unemployment rate is higher the lower the educational attainment of individuals.

The educational levels of the Portuguese population aged 15-64<sup>10</sup>, are lagging from the EU\_27 values. The percentage of the population with low, medium and high educational attainment in the EU-27 for the years 2000 and 2007 were, respectively, 38%, 45% and 17%, and 32,7%, 46,7% and 20,6%, against 79%, 13,4% and 7,6%, and 71,3%, 16,7% and 12% in the Portuguese economy for the same years<sup>11</sup>.

Analyzing the educational outcomes of children it is possible to understand if the intergenerational mechanism of transmission of disadvantages/inequality acts through the influence of the parents' educational background upon the children educational attainment. According to the educational level of the father, the probability of attaining high school for women and men aged 25-65 in the EU\_25 and Portugal is, 0.18 and 0.11 when the father has a low level of education; 0.33 and 0.58 when the father has a medium level of education, and 0.63 and 0.65 when the father has high level of education, respectively. For the Portuguese economy, the influence of the father's

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<sup>8</sup> See EC (2008a), pp.34 and 35, table A13.c on p. 165 and tables A14 bis on p. 169.

<sup>9</sup> See also EC (2008b), chart 7.5, p. 153.

<sup>10</sup> Low level, ll; medium level, ml; and high level, hl.

<sup>11</sup> See EC (2008b), table Ann B.7.1, p.218.



educational background is weaker for women aged 25-65 than for men<sup>12</sup>. In younger cohorts that dependency is also lower when the father's educational attainment is low. The probability of attaining higher education for men and women by age (25-34, 35-44 and 45-54) when the father's level of education is low are: for the EU\_25, 0.25, 0.19 and 0.15, respectively, and for Portugal 0.17, 0.09 and 0.09. Although the EU\_25 has experienced improvements in educational attainment levels, the fact is that, in 2006, 15% of the population between 18 and 24 years old dropped out the education or training systems before completing the higher level of secondary schooling. In Portugal the situation is even worst with drop-out rates of more than 30%<sup>13</sup>. The European benchmark for the year 2010 of no more than 10% of the population aged 18-24 with less than upper secondary schooling not attending the education or the training systems seems thus difficult to be reached within a year.

The numbers presented above seem to confirm that the intergenerational mechanism of transmission of disadvantages/inequality acts primarily through the influence of the parents' educational background upon the educational attainment of children in the whole EU\_25. Furthermore, they suggest that this is a very powerful mechanism in Portugal, with related detrimental effects upon the current and future well being of children, as well as upon economic growth (Carneiro (2007)).

Budria (2007) uses data from the ECHP to study economic inequality in Portugal for the period 1994-2001. He is the first to study the wealth distribution for the Portuguese households, namely its capital income distribution, characterizing it for the period under analysis as well as describing its evolution over time<sup>14</sup>. Budria (2007) shows that the distribution of capital is very uneven and that this situation increased over the whole period, contrary to income inequality and earnings inequality that registered a decrease over the same period. These findings suggest that we must also consider seriously the fiscal approach as a possible candidate to the explanation of the relationship between inequality and economic growth in the Portuguese economy. In fact, the capital distribution suggests the existence of a political mechanism dictated by the median voter that prefers more redistribution than the average owner of capital, which in turn entails a tax policy that benefits the median voter and decreases the after-tax marginal product of capital of the Cardoso and Cunha (2005) average owner of capital, hindering

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<sup>12</sup> For women the probabilities are 0.14(ll), 0.64(ml) and 0.67(hl), against 0.08(ll), 0.52(ml) and 0.62(hl) for men.

<sup>13</sup> See EC (2008a), p. 99.

<sup>14</sup> On this topic, it is also worth mentioning a previous study by Cardoso and Cunha (2005) since it constitutes an attempt to estimate capital assets of the Portuguese households. However the authors do not analyze the wealth distribution of the Portuguese households in the period under analysis, 1980-2004.

investment and thus economic growth. However, we have to carefully consider possible obstacles to the application of this approach to the Portuguese economy on the tax policy side, since in Portugal capital income at the top 1% or 5% of the distribution is not heavily taxed.

The previous picture on inequality and poverty for the Portuguese households suggests that the uneven distribution of human capital is a decisive factor in explaining inequality in the Portuguese economy. This uneven distribution of human capital is in turn the result of past investment decisions on human capital. Thus the borrowing constraints on human capital investment is a serious candidate approach to the explanation of the relationship between inequality and economic growth for the Portuguese economy.

The findings that the distribution of capital income in Portugal is very uneven and has increased over time also suggest that we must consider the fiscal approach as another serious candidate to the explanation of the relationship between inequality and economic growth in the Portuguese economy.

### **3. CHANNELS OF TRANSMISSION OF INEQUALITY TO GROWTH IN THE PORTUGUESE ECONOMY: A SELECTIVE SURVEY OF THE THEORETICAL LITERATURE**

There is by now an extensive and rich literature on the relationship between inequality and economic growth that has been carefully and thoroughly surveyed by Aghion, Caroli and García-Penalosa (1999), Perotti (1994), Alesina and Perotti (1994), Benabou (1996), and Deininger and Squire (1996), among others. In the nineties of the 20<sup>th</sup> century a renewed interest on the subject took place that lead mostly to the development of theoretical models on the subject. Due to the scarcity of reliable and comparable data on inequality and due to the existence of poor measures of equality (inequality), empirical literature on the subject lagged behind. The theoretical literature relies on common sources despite the different approaches within it. Endogenous growth theory, theory of political economy, microeconomics of information are key sources for this literature, allowing it to explore, in the framework of optimal growth models or overlapping-generations models, for instance, stationary solutions in models with distribution effects, or richer dynamics beyond steady state equilibrium solutions. This literature has also challenged key predictions from a former literature on the subject,

namely those derived from the Kuznets inverted-U curve relating economic growth to income inequality.

Our main purpose in this section is to briefly survey the theoretical literature that highlights the mechanisms relating inequality to economic growth that we have considered relevant for the Portuguese economy. We will consider in this paper only two approaches from which those mechanisms can be derived. The first approach we deal with, sometimes called borrowing constraints in human capital investment, explains the relationship through investments in human capital under imperfect capital markets. The second approach that we will survey is the fiscal policy approach emerging from the political links that relate income distribution to economic growth. Both approaches predict a positive relationship between equality in the distribution of human capital and economic growth.

[Insert Table 1 here]

### **3.1. BORROWING CONSTRAINTS TO INVESTMENTS IN HUMAN CAPITAL**

In a seminal paper, Galor and Zeira (1993) analysed the theoretical link between income distribution and economic growth through human capital investments in the framework of an overlapping generations with individuals living for two periods and with intergenerational altruism. In the model, the economy produces a single good using skilled or unskilled labor. Individuals have identical potential skills and preferences; the only difference concerns their inherited wealth. In the first period they work as unskilled or invest in human capital. In the second period they work as unskilled or skilled workers depending on their level of education, they consume and leave bequests to the younger generation. The initial wealth distribution determines the short run equilibrium due to the existence of capital market imperfections to the borrowers. Only those individuals that have an initial level of wealth high enough are able to invest in human capital, those who have a poor initial wealth endowment are not able to invest in human capital because borrowing is costly and difficult.

But the initial level of wealth distribution will determine also the long-run equilibrium due to the indivisibility of individual investments in human capital. This last equilibrium is characterized by the existence of two groups of individuals, unskilled and skilled, whose relative size is determined by the initial wealth distribution. The level of income and wealth is positively related to the number of individuals that invest more

than the critical point below which a skilled dynasty cannot be sustained<sup>15</sup>. The long-run equilibrium is path dependent: multiple equilibriums exist and the economy will approach one of the possible equilibriums depending on the initial wealth distribution. The main prediction of the model is: *“If we would like to describe these results in more popular terms, we could say that a country has better growth prospects, if it has a relatively larger middle class”*<sup>16</sup>. So an economy with a more equal wealth distribution will be growth enhancing because it invests more in human capital.

Galor and Moav (2004) aim at reconciling the classical view on inequality and growth with the modern view within the framework of a growth model with different accumulation *regimes*. At earlier stages of capitalism, the engine of growth is the accumulation of physical capital and a more unequal wealth distribution is more conducive to economic growth because the owners of capital have a higher propensity to save. At later stages of capitalism the engine of growth is human capital accumulation. There are borrowing constraints on individual’s human capital investment due to the existence of capital market imperfections to the borrowers. So at later stages of capitalism, a more equal wealth distribution enhances economic growth because individuals decide to invest more in human capital. Finally, the influence of inequality on economic growth will depend on the relative return to physical and human capital. These predictions are obtained in the framework of an overlapping-generations model with two periods. The economy produces a single good and accumulates physical and human capital. As in the Galor and Zeira (1993) model, individual decisions about their investment in human capital depend on their inherited wealth because they face borrowing constraints.

Chiu (1998) builds an overlapping-generations model with income and talent heterogeneity and intergenerational altruism. Individuals face liquidity constraints but, contrary to Galor and Zeira (1993), they cannot save nor borrow against future income. Individuals live for two periods and in the first period they receive from their parents a bequest and decide whether to work or attend school. In the second period they work and receive an income that is proportional to their investment in human capital. Individuals with talent above the average will receive only in accordance to that rule if they have invested in human capital. The main predictions of the model are: the higher the initial income equality for one generation, the higher will be the aggregate human

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<sup>15</sup> Galor and Zeira (1993), p. 42, equation (26).

<sup>16</sup> Galor and Zeira (1993), p. 42.

capital that is accumulated by that generation and the higher will be the initial income distribution of future generations. The steady state growth rate is independent from initial conditions, namely, from initial income distribution; it depends on the aggregate level of human capital. The convergence result for the growth rate implied by the model however has different implications in terms of output levels which depend always on the initial income distribution.

The important contributions derived from the borrowing constraints to investments in human capital approach shortly reviewed above all imply the same main prediction: a higher initial income (wealth) distribution implies higher economic growth through higher investment in human capital. This prediction also applies to a growth model with different regimes of economic development if human capital accumulation is the main engine of economic growth.

### **3.2. THE FISCAL POLICY APPROACH**

The fiscal policy approach is anchored on two recent strands of economic literature, models of political economy and endogenous growth models. This literature was extensively reviewed by Alesina and Perotti (1996), Perotti (1996) and Aghion, Caroli and García-Penalosa (1999), among others.

The fiscal policy approach results from the political links between income distribution and economic growth. The median voter's preference for income distribution determines income redistribution through voting, which in turn translates into government expenditures and taxation. The higher is the preference of the median voter for income redistribution relative to the average voter, the higher the level of taxation he will vote for. This in turn will discourage private investment, hindering in this way economic growth. The fiscal approach thus predicts a positive relationship between equality and economic growth, no matter the specific redistribution mechanisms that might be used to achieve that redistribution.

The fiscal approach literature is based on the interplay of two mechanisms, the political mechanism and the economic mechanism. The former determines income redistribution and government's expenditures and taxes, while the latter determines the influence of taxation on economic growth. Seminal references on the fiscal approach are Alesina and Rodrik (1991; 1994), Bertola (1993) and Persson and Tabellini (1991; 1994). As far as the political mechanism is concerned these three contributions consider different types

of government expenditures in order to achieve the desired income redistribution: public investment in Alesina and Rodrik (1994), redistribution from capital to labour in Bertola (1993) and pure redistribution transfers in Alesina and Rodrik (1991; 1994) and Persson and Tabellini (1991; 1994). In what concerns the political mechanism they all share the conclusion that no matter the type of government's expenditures these imply a higher level of capital taxation that decreases the after-tax marginal revenue to capital thus harming private investment and consequently economic growth.

Alesina and Rodrik (1994) develop two endogenous growth models with wealth distribution effects. The first model considers the distribution conflict between two classes, workers and capitalists, that derive their revenues from different sources, labor and capital, respectively. It is an one sector AK optimal growth model with a production function *à la* Barro (Barro (1990)), with the government's budget constraint indicating that redistribution of income to workers has its source exclusively on capital income taxes. The model is completed by adding intertemporal utility functions for each class and for the government, with the associated budget constraints. Several important predictions are derived from the model. From the solution of the dynamic problem faced by the capitalists, the respective consumption growth rate is maximized if the share of government revenues transferred to workers is zero and the capital tax is associated with the growth maximizing level.

The problem faced by the government is thus to choose taxes by solving the dynamic problem of maximizing its utility function, which is a combination of the utilities functions of both classes and whose weights are exogenously determined and subject to the usual constraints. The main prediction is that if the government attributes importance to workers' consumption through income redistribution, the capital tax level chosen will surpass the level associated to the growth maximizing level and in consequence the growth rate will be inferior to the maximum growth rate. Considering that the time preference parameter is the same for both classes, the solutions are time invariant. Two regions for the solutions can be considered depending on the value of the parameter that measures the weight of the workers' welfare function in the social welfare function: a region of low values for the parameter and a region of high values. It is proven that growth is inversely related to that parameter. In the former region, there are possible solutions without income transfers to workers if their time preference is low.

Considering that the workers' time preference is higher than the capitalist's time preference, the solutions to the government's dynamic problem are no longer time invariant, which leads to a problem of time inconsistency. The solution to the problem mentioned above under an optimal policy with commitment leads to a growth rate that increases over time. Correcting for the problem of time inconsistency implies that governments' parameters are time invariant and so will be the growth rate. The authors simulate the time consistent solutions and the optimal solutions (at time zero and at time= $\infty$ ) for this version of the model and arrive to several important conclusions. For all values of the parameter that measures the weight of workers' welfare in the social welfare function, the solutions for both policies are associated with no redistribution of income to workers. This means that public expenditures are productive enough and workers will be in a better situation without income redistribution. Comparing the time consistent solutions with the optimal solutions (at time zero), for the same parameters, the latter ones lead to a higher capital income tax and a lower growth rate. Assuming that optimal policies with commitment are possible, under these policies at time zero government rewards more workers' preference for present consumption through public expenditures at the expense of higher taxes in capital income. The fundamental predictions of this two class model are restated in a new model where individuals are not split into workers and capitalists but instead differ by their initial relative capital endowment. Additionally, individuals will vote by majority rule only for the level of capital tax, so pure income transfers from the government to individuals are not considered. The main prediction of the model is: "in a democracy the more unequal is the distribution of wealth, (...), the lower is the rate of growth of the economy"<sup>17</sup>.

Bertola (1993) develops an optimal one sector AK growth model with distributional effects derived from individuals' heterogeneity due to differences in initial endowment shares of accumulated to non-accumulated factors (capital to labor, respectively). Under the political mechanism of redistribution of income from capital to labor, a median voter will vote for a tax on capital that is inversely related to its capital-labor ratio. The economic mechanism will act through a lower after tax capital income appropriated by the private investor, which discourages private investment, jeopardizing economic growth.

Persson and Tabellini (1994) build an overlapping-generations model with non altruistic individuals living for two periods and constant population. Individual preferences are

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<sup>17</sup> See Alesina and Rodrik (1994), p.23.

the same and the income of the young generation depends on an average endowment of basic skills and an endowment of individual-specific basic skills, as well as on the capital stock accumulated by the older generation. A pure redistributive income policy takes the form of taxes on profits: profit income from those individuals that invested above the average are transferred to those that have invested below the average through lump-sum transfers, while intergenerational redistribution is excluded. The redistributive income policy is politically determined by the median voter. If the individual skills of the median voter are lower (higher) he will prefer a tax (subsidy) on investment if he is poorer (richer) than the average investor. Two main predictions can be derived from the model in the context of a stationary solution: a more equal distribution of income increases growth and a higher level of basic skills is growth enhancing.

Persson and Tabellini (1991), discuss at full length more complex dynamics for the growth rate and inequality that can be path dependent and allow to reconcile, under certain conditions, their findings with the Kuznets curve. The same is true for Perotti (1993) that in the framework of an overlapping-generations model and of an infinite-horizon model analyses the relationship between income distribution and economic growth in a political model where individuals vote for income redistribution and invest in human capital. Multiple equilibria are allowed, the initial income distribution along with the political equilibrium determine the growth rate. One of the main predictions of the model is the existence of an inverted U-shaped relationship between inequality and income levels in cross-section analyses, which does not necessarily stand for time series analyses. In a different framework of analysis, Aghion and Bolton (1997) use also an overlapping-generations model with capital market imperfections due to moral hazard, and they analyze the relationship between wealth distribution and economic growth in an economy where individuals invest in physical capital. Like Perotti (1993), the authors consider also a trickle down growth mechanism. The existence of an inverted U-shaped relationship, similar to the Kuznets curve, is one of their main predictions.

The main results that follow from the contributions shortly reviewed above and that stem from the fiscal approach to the relationship between income distribution and economic growth allow us to conclude that, in spite of the different assumptions adopted in the underlying models, a common prediction is obtained: initial higher equality in income (wealth) distribution is growth enhancing no matter the political and



the economic mechanisms at stake. Models that allow for multiple equilibrium solutions are able to predict an inverted U-shaped relationship between inequality and growth similar to the Kuznets curve and are also able to predict that permanent redistribution policies can foster economic growth.

#### 4. EMPIRICAL EVIDENCE

The aim of this section is to offer a summary and a critical discussion of the empirical evidence on the impact of inequality on economic growth with a focus on the evidence concerning the mechanisms identified as potentially more important for the Portuguese economy.

##### 4.1. MAIN EMPIRICAL FINDINGS

In this review we focus on a number of empirical studies that try to shed some light on the impact of inequality on economic growth. We start our empirical literature review with studies from the 1990's<sup>18</sup>. After analysing the main conclusions associated with the estimation of reduced-form equations we then proceed to the analysis of the main results concerning the clarification of the mechanism through which inequality influences growth.

###### 4.1.1. REDUCED-FORM EQUATION

The studies reviewed in this section share a common regression specification of the general form:

$$GR_{it} = f(INEQ_{it}) + \beta_i X_{it} + \mu_{it}$$

where a measure of output growth,  $GR_{it}$ , is regressed on a measure of (initial) inequality/equality,  $INEQ_{it}$ , where the function  $f$  might be non-linear; and a set of other explanatory variables,  $X$ , that include initial output, some measure of human capital, physical capital investment ratio, and regional dummies, among others. This equation can thus also be classified as a “Barro” or *ad hoc* growth regression that includes

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<sup>18</sup> Benabou (1996) presents a summary of the results of 23 previous cross-country studies, some prior to 1990, that reveal that inequality is unambiguously detrimental to growth.

inequality as a regressor along another set of independent variables that are believed to influence economic growth<sup>19</sup>.

The aim of these regressions is to identify the sign of the relationship between inequality and growth in order to determine whether redistributive policies enhance growth. Until the late 1990's the identification of the sign of this relationship was based on the exploitation of cross-country variation of the series under analysis, but recent studies have been using pooled cross-country time series data<sup>20</sup>.

A first set of studies (see Persson and Tabellini (1994), Alesina and Rodrik (1994), Alesina and Perotti (1996), Clarke (1995), Perotti (1996), Birdsall and Londono (1997), Deininger and Squire (1998), Castelló-Climent and Doménech (2002), Chen (2003), Balisacan and Fuwa (2003), Bleaney and Nishiyama (2004)) tries to assess the contribution of inequality to cross-country variation in growth rates, after controlling for a number of variables that have been found relevant in the explanation of cross-country growth performance in a large number of empirical growth studies aimed at identifying the importance of some other factor for growth.

The estimates of the impact of inequality on economic performance of the various cross-country studies reviewed here reveal a negative long-run relationship between the two variables<sup>21</sup>, a result that is usually robust to different sensitivity analyses such as controlling for different inequality measures, different samples and time periods, the presence of outliers, model uncertainty, measurement error, reverse causation, and heteroscedasticity. In what follows we identify the main differences in the methodology used and results achieved by these cross-country studies and aspects that hinder their comparability and robustness of the results.

[Insert Table 2 here]

All the studies focus on clarifying the importance of some measure of inequality in explaining cross-country differences in real per capita GDP growth rates averaged for 20-25 years periods, although this measure comes from different sources (e.g. Summers and Heston (1991) and the World Bank) and none tests the robustness of the results to the use of other proxies of macroeconomic performance, such as real GDP per worker or per hour worked, probably due to limited data availability at the time or for comparability reasons with previous studies.

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<sup>19</sup> See for instance Barro and Sala-i-Martin (2004).

<sup>20</sup> This was made possible to a great extent by the work of Deininger and Squire (1996) that assembled a more reliable inequality dataset with time series information for a large enough group of countries. See section 4.2.

<sup>21</sup> See also Benabou (1996).

A more fundamental issue, dealt with in several of the reviewed studies, concerns the sensitivity of the results to the use of different proxies of inequality. When the studies measure inequality solely as income inequality they tend to use different statistical measures of this indicator with a prevalence for the Gini coefficient of income, but also some measure of equality in the distribution of income aimed at capturing the size of the middle class, such as the share of income of the middle quintile(s) of the population or inequality measures based on the ratios between different income percentiles<sup>22</sup>.

But a preliminary problem arises when deciding which measure of inequality to use in empirical studies since the relevant distribution in explaining the relationship between inequality and growth in many theoretical analyses is that of wealth, not income. Due to limited data availability on the distribution of wealth and to the fact that both distributions are often highly correlated, only a limited number of cross-country studies deals with this issue. The exceptions are Alesina and Rodrik (1994), Alesina and Perotti (1996), and Deininger and Squire (1998) that proxy wealth inequality with the Gini coefficient of land distribution and get more robust results with this inequality measure than with income inequality measures. For instance, in Alesina and Rodrik (1994), when the Gini coefficient of income and the Gini coefficient of land distribution are introduced simultaneously in the regressions the former loses statistical significance, while in Deininger and Squire (1998) the estimated coefficient on initial Gini coefficient of land distribution does not lose significance when regional dummies are introduced, contrary to what happens to the estimated coefficient on initial Gini coefficient of income.

Another interesting strand of the empirical literature defends that in important theoretical models that analyze the relationship between inequality and growth the distribution of education/human capital shapes the distribution of income and wealth and thus the relevant inequality measure refers to human capital inequality. At the cross-country level, Birdsall and Londono (1997) and Castelló-Climent and Doménech (2002) reach more robust results when using a human capital inequality measure than an income inequality measure.

The samples used in most studies integrate developing and developed countries and some split their samples into sub-samples according to the countries' political regime (democratic or non-democratic) or level of development (poor and rich countries) to test

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<sup>22</sup> For instance, Clarke (1995) analyses the sensitivity of the results to the use of four different income inequality measures: the coefficient of variation, the Theil's index, the Gini coefficient, and the share of income earned by the 40 percent poorest relative to the richest 20 percent of the population.

the robustness of the results. For instance, Alesina and Perotti (1996), Clarke (1995), and Perotti (1996) do not find any significant difference between democratic and non-democratic countries but when the sample is split according to the countries' level of development the same conclusion does not apply. Perotti (1996) estimates reveal a high (negative) and statistically significant coefficient in the sample of rich countries and a low (negative) and statistically insignificant coefficient in the sample of poor countries. Chen (2003) identifies an inverted-U relationship between initial income inequality and long-run growth in a sample of 43 countries between 1970 and 1992, while Bleaney and Nishiyama (2004) detect no differences between rich and poor countries in two out of three estimated models, but significant differences in the sign and statistical significance of the estimated coefficient on inequality between models.

Despite the differences we have just highlighted between the reviewed cross-country studies, the broad picture is that: a) there is a significant negative correlation between inequality and growth; b) this relationship remains significant and of the same sign when using slightly different inequality measures, samples, data, sets of regressors and estimators (OLS, WLS, 2SLS); c) in most studies the relative impact of inequality is lower than that of other growth determinants.

Following the release of the Deininger and Squire inequality dataset that assembled more reliable data<sup>23</sup> with time series information for a large enough group of countries, a number of studies estimated the inequality and growth relationship using panel data techniques (see Persson and Tabellini (1994), Partridge (1997), Li and Zou (1998), López, Thomas and Wang (1998), Forbes (2000), Barro (2000), Panizza (2002), Banerjee and Duflo (2003), Voitchovsky (2005)), trying to uncover in this way a short to medium-term relationship. Contrary to the common message conveyed by most cross-country studies, the panel data evidence is quite diverse, finding either a positive, negative or non-existent correlation between inequality and growth.

[Insert Table 3 here]

Starting with the studies that consider wider samples of countries with both developing and developed countries, Li and Zou (1998) find that inequality is not necessarily harmful for growth, i.e. the sign of the relationship is ambiguous and positive in some cases; Forbes (2000) detects a positive relationship that persists across different samples, variables definitions, and model specifications but not the length of period under consideration; Barro (2000) uncovers a negative relationship for poor countries, a

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<sup>23</sup> See section 4.2.1.

positive relationship for rich countries, and an insignificant one for the whole sample; and Banerjee and Duflo (2003) present evidence that it is a change in any direction, not the initial level of inequality that leads to slower future growth and also that there is no reason to impose a linear relationship between 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 take the Gini coefficient of income as the reference inequality measure and estimate the relationship using different panel data techniques (pooled OLS, fixed and random effects, GMM, 3SLS, Kernel regression, series estimator). All of them also include some form of sensitivity analysis of the results such as the consideration of different inequality measures, control variables, or samples of countries. Forbes (2000) suggests that her results are not incompatible with the results from the cross-country studies since the former explore within-country information variation in a short period of time identifying the sign of the relationship between changes in inequality and changes in growth performance, while the latter explore between-countries information variation in a longer period of time between the initial level of inequality and the growth rate.

Considering a more restricted sample that includes only U.S. states, Partridge (1997) and Panizza (2002) also explore the panel structure of the data to uncover the sign of the relationship between inequality and growth. The first study considers ten-years growth episodes during the period 1960-90, finding a positive correlation between the Gini coefficient of income and growth, indicating a positive relationship between inequality and growth, but also a positive correlation between the income share of the middle quintile and growth, indicating a positive relationship between equality, not inequality, and growth. The second study uses state data from different sources covering a wider period (1940-80), Gini coefficients of income and the income share of the middle quintile, analyzes ten and twenty-years growth episodes, and uses different panel data techniques (pooled OLS, fixed effects, GMM), reaching the conclusion that the sign and significance of the estimated relationship changes when different measures of inequality are used and that controlling for outliers, serial correlation and structural breaks substantially changes the results.

In face of the ambiguous results from the panel data studies, Voitchovsky (2005) explores the idea that aggregate measures of income distribution such as the Gini coefficient of income are not appropriate to test the importance of inequality for economic growth since the relationship might depend on the whole shape of the income

distribution, i.e. may hide movements in the incomes of different groups. For instance, overall inequality may remain relatively stable over time but there can be considerable change in the shares of total income received by individual groups. Using comparable cross-country time series data on inequality for twenty-one industrialized countries surveyed by the Luxembourg Income Study (LIS) between 1975 and the year 2000, she constructs measures of inequality in the bottom and top ends of the income distribution to assess whether top and bottom end inequality have different implications for growth. The results reveal that top end inequality positively influences growth while the influence of bottom end inequality is negative. These results are robust to the use of different estimators (pooled OLS, within-groups, first-differenced GMM and system GMM).

#### 4.1.2. TRANSMISSION MECHANISMS SPECIFICATIONS

The inconsistency of the results provided by the estimation of reduced-form equations may just be the consequence of the complexity of the effects of inequality on growth predicted by the theoretical literature that does not necessarily imply that more inequality decreases growth, as initially put forwarded by new growth theories. Since the reduced form analysis is not very informative regarding the different channels through which inequality might affect growth it is not surprising that a number of empirical studies has tried to examine in more detail the importance of some mechanism in the explanation of the inequality-growth relationship.

This approach to the empirical study of the relationship between inequality and growth is designated by the transmission mechanisms specifications and usually consists in estimating a system of equations with two dependent variables, output growth,  $GR$ , and a proxy for the mechanisms under analysis,  $MECH$ , where the former depends on the latter, and in turn  $MECH$  depends on a measure of inequality/equality,  $INEQ_{it}$ , such as the system described below:

$$GR_{it} = aMECH_{it} + \alpha_i W_{it} + \mu_{it}$$

$$MECH_{it} = bINEQ_{it} + \beta_i Z_{it} + \varepsilon_{it}$$

where  $W$  and  $Z$  are vectors of additional explanatory variables. There is evidence supporting the influence of inequality on economic growth through the mechanism under analysis when both  $a$  and  $b$  are statistically different from zero. In face of the different theoretical predictions on the channel through which inequality influences

growth (see section 3) ideally the different mechanisms and their potential interactions should be tested simultaneously but this is not possible due to the limited inequality and other growth variables data availability.

[Insert Table 4 here]

Perhaps the most often analysed mechanism of transmission is the fiscal channel. Testing the fiscal channel (see Perotti (1996), Partridge (1997), Sylwester (2000)) involves choosing the appropriate fiscal variable, that can range from public expenditures that have an explicit redistributive nature (e.g. public expenditure on education and health, social security) to taxation needed to finance the redistributive expenses<sup>24</sup>. Perotti (1996) considers cross-section information from developed and developing countries during the period 1960-85 and uses the average marginal tax rate (MTAX) as the reference fiscal policy variable, obtaining a positive rather than a negative, as expected, estimated coefficient on MTAX in the growth equation, while income distribution plays no role in determining MTAX, except in the sample of democratic countries. These results survive a number of sensitivity checks, namely the consideration of different fiscal policy variables such as the average share of labour taxation in GDP, the average share of personal income taxes in personal income, average share of government expenditure in social security and welfare in GDP, average share of government expenditure in health and housing in GDP and average share of government expenditure on education in GDP. Partridge (1997) focus in panel data for a sample of U.S. states and tests this channel using a slightly different approach. First, he regresses growth on inequality and equality measures and government intervention variables (percent state and local taxes, percent public welfare expenditures, and the government employment share), obtaining positive estimated coefficients for both income distribution variables and negative but usually insignificant ones for the government intervention variables. Afterwards, the author estimates the impact of the income distribution variables on the different government intervention variables finding weak evidence that the former influence the latter. Sylwester (2000) 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. From the results,

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<sup>24</sup> An alternative way that has been followed to test the fiscal channel, justified in most cases by data availability constraints, consists in estimating a reduced-form equation for samples of democratic and non-democratic countries separately or introducing an interaction term between the inequality proxy and a dummy variable for democratic regimes. Support for this transmission mechanism implies a negative statistically significant coefficient for the inequality proxy for the sample of democratic countries but not necessarily for the sample of non-democratic countries or the interaction term for the whole sample (see e.g. Alesina and Rodrik (1994), Alesina and Perotti (1994), Clarke (1995), Perotti (1996), Deininger and Squire (1998)). The evidence from these studies is mixed but in most studies the results point to no significant differences between samples of democratic and non-democratic countries.

the author concludes that the influence of contemporaneous expenditures on growth is negative, probably due to the necessity to increase distortionary taxation to finance these expenditures, but that past education expenditures have a positive impact because of the associated rise in human capital. Additionally, there is evidence that this is a relatively important channel since controlling for the influence of public education expenditures on growth renders the independent impact of income inequality insignificant. Also, the influence of this fiscal policy variable is quantitatively more important than that of other government policy variables (average government transfers as a fraction of GDP, average public investment as a fraction of GDP, the average of defence expenditures as a fraction of GDP, and the average of the government share of GDP minus education expenditures).

Perotti (1996) and Deininger and Squire (1998) test the validity of the credit market imperfections that lead to borrowing constraints channel. In Perotti (1996) the mechanism is tested considering only its action through investments in education and associated endogenous fertility decisions. Using data on female and male secondary school and fertility rates, the author concludes that there is evidence supporting that borrowing constraints limit investments in education by poor people. However, more direct tests of this approach using measures of the degree of credit market imperfections (e.g. the loan-to-value ratio and the ratio of 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 through credit market imperfections that lead to borrowing constraints impending over both physical and human capital investment under the assumption that the effects over human capital investment will be greater due to the greater reluctance of lenders to accept the future higher stream of earnings as collateral. After estimating a reduced-form equation for high and low-income countries separately and confirming that inequality is only relevant in poor countries and thus for a tentative support of the credit markets imperfections channel, the authors then regress proxies of human and physical on inequality and confirm that this is a relevant variable in explaining investments in human capital but not investment in physical capital, concluding that the main channel through which inequality affects growth is schooling.



## **4.2. METHODOLOGICAL ISSUES**

In this section we pay particular attention to some of the most important empirical difficulties surrounding the estimation of the inequality and growth relationship in order to try to understand some of the possible causes for the lack of consensus on the empirical assessment of the sign of the relationship patent in the literature review from the previous section.

### **4.2.1. ALTERNATIVE MEASURES OF DISTRIBUTION**

The empirical assessment of the importance of inequality for economic growth implies the use of inequality measures suitable on theoretical grounds for the estimation of reduced-form equations or transmission mechanisms specifications. The most widely used measures of inequality relate to the income distribution but most theoretical studies explain the relationship between inequality and growth based on the distribution of wealth. However, few empirical studies use wealth inequality as an explanatory variable due to data constraints. Despite the fact that the shape of wealth and income distributions usually vary together in cross-sections of countries, Alesina and Rodrik (1994), Alesina and Perotti (1994) and Deininger and Squire (1998) use the Gini coefficient of land distribution as a proxy for wealth inequality in their empirical studies and present better results with this measure than with the income distribution measure<sup>25</sup>. Human capital inequality measures have also been shown to provide more robust results than income inequality measures in the estimation of standard growth and investment equations (see Castelló-Climent and Doménech (2002)), a result attributed to the importance of human capital in the explanation of the distribution of wealth present in many theoretical models.

The analysis of the impact of inequality on economic growth also implies the availability of comparable inequality measures for a relatively large cross section of countries, ideally over time<sup>26</sup>. Comparability of the data on inequality is usually hindered by: (i) differences in construction methods, e.g. it is not always based on nationally representative surveys but inferred from national accounts data by making assumptions that should not be imposed but tested in the empirical analysis; (ii)

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<sup>25</sup> Deininger and Squire (1997) call our attention to the fact that, in general, the Gini coefficient of land distribution presents higher cross-section variability than the Gini coefficient of income which can lead to different estimated coefficients (in sign and importance).

<sup>26</sup> Deininger and Squire (1998), p.260: "the inequality data used are deficient with respect to their quality, their comparability over time and across countries, and their geographical and temporal coverage."

differences in data coverage, i.e. it does not cover the entire population but only a subset (e.g. urban population); and (iii) differences in income definitions, e.g. it does not encompass all types of income such as nonwage income and income from household production. By collecting data from primary survey data, official statistical publications and research papers, Deininger and Squire (1996) overcame the previous problems for a large enough group of countries, constructing a new and readily available data set of higher quality income distribution data that has also the advantage of providing information over time for a sub-sample of countries, thus allowing to perform panel data studies. However, Atkinson and Brandolini (2001) show, for a sample of OECD countries, that major issues concerning data quality and data consistency<sup>27</sup> (across countries and across time) remain<sup>28</sup>, which advises caution and sensitivity analysis of the results to measurement error even when using this much improved data set.

A final problem comes from the fact that the aggregate measures of distribution, such as the Gini coefficient, are not appropriate to test the importance of inequality for economic growth since the relationship might depend on the whole shape of the distribution, i.e. may hide movements in the incomes/wealth/human capital of different groups. This issue has been addressed in empirical studies by using alternative measures of inequality, e.g. the share or ratios of certain quintiles or percentiles, and comparing the results with the ones from the estimations that consider the aggregate measure, arriving at some important differences in some cases (see Barro (2000), Panizza (2002), Voitchovsky (2005)).

#### **4.2.2. SPECIFICATION AND FUNCTIONAL FORM**

The evidence on the inequality and growth relationship comes from the estimation of reduced-form equations or more structural models that try to investigate the mechanism through which the influence is transmitted by adding inequality variables to an otherwise standard growth regression with a set of other control variables commonly found in empirical growth studies, such as initial income, and measures of human

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<sup>27</sup> In the definition of income and in the unit of account. For instance, Knowles (2005) argues that the results from existing cross-country studies on inequality and growth have to be interpreted with great caution since the majority does not use consistent data in the sense that the inequality data for some countries is based on gross income, while for others is based on net income or expenditure. Also there are differences concerning the unit of measurement: in some cases it is the individual and in others the household. Using inequality data from the World Development Indicators the author shows that when the sample is restricted to countries with consistent data in the sense described above (in this case using only gross individual income distribution data which reduces the sample to 27 countries) the usual negative cross-country relationship between inequality and growth does not hold. However, he still finds a negative relationship between inequality of expenditure and growth for a sample of developing countries.

<sup>28</sup> For instance, Atkinson and Brandolini (2001) show that the ranking of OECD countries according to the Gini coefficient of income is quite different using the Deininger and Squire (1996) data or the alternative Gottschalk and Smeeding (1997) data.

capital, financial development, openness, or physical capital investment ratios. For instance, Perotti (1996) considers a relatively parsimonious number of control variables, four, while Barro (2000) introduces around ten control variables. This raises the question of which growth determinants should be included in the model since different empirical models have been shown to lead to different conclusions concerning the significance of the different independent variables<sup>29</sup>.

Another empirical problem with studies on inequality and growth is that, with the exception of a few examples in the literature, most studies do not consider whether the way in which the proxy for inequality enters the empirical model, linear or non-linear, has any substantial impact on the estimated inequality coefficient. Using non-parametric methods, Banerjee and Duflo (2003) show that the growth rate is an inverted-U function of net changes in inequality, while Chen (2003), based on the more heterodox cross-section estimation of reduced-form equations, also finds evidence that there is an inverted-U relationship between initial income inequality and long-run economic growth.

#### **4.2.3. STRUCTURE OF THE DATA AND ESTIMATION PROCEDURES**

The methodology followed by the studies under review in this paper to examine the importance of inequality for macroeconomic performance is that of multivariate regression analysis to derive meaningful estimates of the effect on growth of several factors, in particular inequality.

Empirical studies on inequality and growth are often constrained by the available data. Early studies until the late 1990's applied cross-section estimation procedures to a sample of countries, averaging growth over 20-25 years and estimating the impact of initial levels of inequality, due mainly to the lack of availability of inequality data across time. The results from these studies should thus be interpreted as the long-run impact of inequality on economic growth across countries but can not explain how a change in a given country inequality level may affect growth within that country. The release of the Deininger and Squire (1996) data set represented a major improvement with respect to, among other things, the structure of the inequality data, providing a reasonable number of observations for a large enough group of countries across time, i.e. with a panel data structure. By exploring the information across countries and across

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<sup>29</sup> See e.g. Levine and Renelt (1992) and Sala-i-Martin (1997). This problem is also referred to as model uncertainty.

time, panel data techniques not only increase the efficiency of the estimators since they allow for more degrees of freedom, but are also more able to deal with some of the econometric problems that confront the estimation of the inequality-growth relationship, namely the omitted variable bias problem that occurs when a variable that is relevant in explaining growth is correlated with any of the regressors but is not included in the regression, thus biasing the coefficient estimates and respective standard errors<sup>30</sup>. For instance, fixed effects panel data techniques control for this bias in respect to unobservable country characteristics that remain constant over time. The interpretation of the coefficient estimates from panel data studies is thus different from that concerning cross-section studies: they represent the impact of inequality on growth within a country over the short to medium term and not over the long-run across countries. It is thus not surprising that some panel data studies show that the sign and significance of the relationship changes as the length of the period under analysis changes (e.g. from 5-year to 10-year periods; see Forbes (2000)).

Since the work of Kuznets (1955) that postulated an inverted-U relationship between growth and inequality, it is consensual that there is a two-way relation between inequality and macroeconomic performance and that growth and inequality evolve simultaneously, which means that endogeneity bias is present in the estimation of the relationship between inequality and growth, implying that the inequality variables in the growth regressions are correlated with the error term. This correlation might be due to reverse causation (growth determines the evolution of inequality) or to the omission of variables that jointly determine both growth and inequality. One way to overcome this problem is to use initial values of the inequality proxies in the regressions but this might not be sufficient especially in panel data studies that analyse growth over short periods of time and since there might be other factors that jointly determine growth and initial inequality. A second solution is to use instrumental variables estimators such as the 2SLS or the 3SLS but these imply selecting appropriate outside instruments that are usually not readily available or easy to select. Panel studies can also make use of GMM techniques that have the advantage of using lagged values of the endogenous variables as instruments.

Empirical studies on the importance of inequality for growth are based on information from a cross-section of countries at very different stages of development and often

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<sup>30</sup> Evidence of this problem in cross-section studies is patent for instance in the fact that in some of them the consideration of regional dummies renders the coefficient estimates of the inequality variables not significant (see e.g. Deininger and Squire (1998)).

constrain the impact of inequality to be the same across countries. This raises another important empirical problem, that of parameter heterogeneity: if the latter applies then policy implications derived from empirical models that impose restrictions about the equality of parameters that do not apply are invalid. Especially, it is quite risky to make inferences on the impact of inequality in Portugal using coefficient estimates from such wide samples of countries. In fact, splitting the sample according to the level of development, Perotti (1996) concludes, by exploring cross-country information, that higher equality leads to faster future growth in rich countries but not in poor countries. A similar conclusion is reached by Barro (2000) using data with a panel structure: the effect is negative for low levels of development and becomes positive for higher levels. Bleaney and Nishiyama (2004), on the other hand, find no significant differences between rich and poor countries.

#### 4.3. COMMENTS

The two main empirical approaches that have been followed to assess the importance of inequality for growth are the reduced-form equation that relates inequality to output growth, and the transmission mechanisms specifications that shed additional light on the channels that explain the sign of the relationship between inequality and growth by exploring different theoretical foundations. In fact, it was the estimation of the reduced-form equation that motivated a number of papers trying to explain the mechanisms through which inequality influences economic growth (see e.g. Aghion, Caroli and García-Penalosa (1999)). After reviewing the main empirical findings from each of these approaches we identified some methodological issues that hinder the comparability of the results, which are common to most empirical growth studies<sup>31</sup>.

Taking the studies as a whole, there is no compelling evidence that higher inequality decreases growth. The evidence concerning the existence of a relationship between inequality and growth and the identification of its sign is thus weak, which can be due to a whole host of problems, namely data problems and econometric issues. For instance, the effect of inequality on growth is sensitive to the econometric technique used. While the cross-country empirical literature that estimates reduced-form equations is replete with studies that find that higher inequality slows future growth, the evidence from the

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<sup>31</sup> For a more technical discussion on methodological issues that confront empirical growth studies see Temple (1999) and Durlauf, Johnson and Temple (2004).

studies that explore cross-country time series information is not compelling, pointing to an ambiguous effect of income distribution on growth. In any case, the size of the effect does not seem large relative to that of alternative growth determinants. But the inconsistency of the results may also be due to the complexity of the effects of inequality on growth predicted by the theoretical literature that does not necessarily imply that more inequality decreases growth as initially put forwarded by new growth theories (see e.g. Aghion, Caroli and García-Penalosa (1999) and section 3 above). In fact, many of the new growth theory models aimed at explaining the relationship between inequality and growth predict multiple equilibria so that, depending on the initial conditions, inequality can have a positive or a negative effect on growth.

The picture conveyed by the studies that explore some mechanism through which the effect of initial inequality may be transmitted is also somewhat blurred. The results from the studies that explore the fiscal policy channel depend to a great extent on the fiscal variable used and the credit markets imperfection mechanism demands data that is not yet readily available to be properly tested. Additionally, none of these transmission mechanisms studies<sup>32</sup> attempts to explore the panel structure of the data.

## **5. CONCLUSIONS AND AREAS OF FURTHER RESEARCH APPLIED TO THE PORTUGUESE ECONOMY**

Since the eighties of the last century a renewed interest on the relationship between economic growth and inequality has occurred, due probably to the increase of within income inequality in advanced economies, with the USA and the UK standing as examples of economies of innovation that operate in a globalised environment. Additionally, the persistent worldwide cross-country differences in real income per capita led to an inquiry into the main factors and mechanisms explaining those differences. The slowdown of worldwide economic growth after the end of the thirty glorious years, the fall of the Berlin Wall in 1989, the economic growth disaster experienced by the African continent in the last forty years of the Twentieth Century, as well as the growth experiences of emergent economies like the BRICs, implied a deeper scientific curiosity for subjects such as inequality and poverty, as well as to their links to economic growth.

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<sup>32</sup> The exception is Partridge (1997).

Meanwhile, in the seventies and eighties of the last century important economic literature strands emerged as suitable to be used, later on, as a solid anchorage to new avenues of research on the relationship between income (wealth) distribution and economic growth. Microeconomics of information (Stiglitz (2002))<sup>33</sup>, the economics of inequality and poverty (Silber (1999), Bourguignon and Verdier (2000), Sala-I-Martin (2006))<sup>34</sup>; economics of income distribution (Atkinson and Bourguignon (1999)); endogenous growth theories (Barro and Sala-i-Martin (2004), Aghion and Howitt (1998) and Azariadis (1993)); theories of Political Economy (Drazen (2000), Persson and Tabellini (2000)) are important strands of the economic literature mentioned above. The growing importance of this avenue of research on the relationship between income distribution and economic growth is well documented by Bertola, Foellmi and Zweimuller (2006) handbook on the subject.

It is thus not surprising that there is by now an extensive and rich theoretical and empirical literature that examines the role of inequality in economic growth. This paper surveys the literature produced on the theme within the boundaries of new growth theory or endogenous growth models, from the perspective of the Portuguese economy. Based on the characterization of the Portuguese economy in terms of inequality and poverty that points to education (see Rodrigues (1996; 1999a; 2007) and European (2007; 2008a,b,c) and fiscal choices (see Budria (2007)) as main determinants of inequality in Portugal, we conduct a review of some theoretical models that aim at explaining the link between education/fiscal choices and income distribution and between this and the rate of economic growth. These are known as, respectively, the borrowing constraints on human capital and the fiscal policy approaches. Both approaches predict a positive relationship between equality in the distribution of human capital and income and economic growth. The first approach, concludes that a higher initial income (wealth) distribution implies higher economic growth through higher investments in human capital (see Galor and Zeira (1993)). This prediction also applies to a growth model with different regimes of economic development if human capital accumulation is the main engine of economic growth (see e.g. Chiu (1998), Galor and Moav (2004)). The second approach, is anchored on two recent strands of economic literature, political economy models and endogenous growth models, and results from

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<sup>33</sup> For a wider coverage of the subject see the seminal references included in the paper.

<sup>34</sup> The author estimates the world distribution of income and for the period under inspection, 1970-2000, and using several measures of poverty and of income inequality, he concludes that poverty decreased over the period and that worldwide inequality has also decreased irrespective to the inequality measures used.

the political links between income distribution and economic growth (see Alesina and Rodrik (1991; 1994), Bertola (1993) and Persson and Tabellini (1991; 1994). The median voter's preference for income distribution determines income redistribution through voting, which in turn translates into government expenditures and taxation. The higher the preference of the median voter for income redistribution relative to the average voter, the higher the level of taxation he will vote for. This in turn will discourage private investment, hindering in this way economic growth. The fiscal approach thus predicts a positive relationship between equality and economic growth, no matter the specific redistribution mechanisms that might be used to achieve it. Additionally, models that allow for multiple equilibrium solutions are able to predict an inverted U-shaped relationship between inequality and growth similar to the Kuznets curve and are also able to predict that permanent redistribution policies can foster economic growth (see e.g. Persson and Tabellini (1991), Perotti (1993), Aghion and Bolton (1997)).

The two main empirical approaches that have been followed to assess the importance of inequality for growth are the reduced-form equation, with the main objective of identifying the sign of the relationship, and the transmission mechanisms specifications, with the main objective of clarifying the channels of influence that explain that sign (see e.g. Perotti (1996), Aghion, Caroli and García-Penalosa (1999), Barro (2000)). The evidence shows that sign of the relationship is sensitive to a number of criteria, and only the socio-political instability channel finds clear support in the data, while the empirical relevance of the fiscal channel and the borrowing constraints on investments in human capital channel remains the subject of further research (see Perotti (1996), Castelló-Climent and Doménech (2002), Voitchovsky (2005)). Thus, taking the studies as a whole, there is no compelling evidence that higher inequality decreases growth, a result that lead us to the identification of some methodological issues that confront the empirical studies on inequality and growth. For instance, while the cross-country empirical literature that estimates reduced-form equations is replete with studies that find that higher inequality slows future growth, the evidence from the studies that explore cross-country time series information is not compelling, pointing to an ambiguous effect of income distribution on growth. The results are also sensitive to the group of countries under analysis (rich vs. poor countries) and the inequality proxy used (wealth vs. human capital vs. income distribution based proxies). In any case, the size of the effect does not seem large relative to that of alternative growth determinants.



Despite the considerable theoretical and empirical literature that has already been produced on this subject, it is the authors' opinion that there is a great potential for research on this theme applied to the Portuguese economy. Existing work on inequality in the Portuguese economy (see e.g. Pereirinha (1988), Cardoso (1991), Gouveia and Tavares (1995), Rodrigues (1996), Cardoso (1998), Rodrigues (1999a), Cardoso and Cunha (2005), Vieira, Couto and Tiago (2005), Carneiro (2007) and section 2 above) has concentrated on providing a description of this phenomenon without relating it with macroeconomic performance, namely, economic growth in Portugal.

The main contribution of the paper within the analysis of inequality and economic growth is to provide a selective review of the role of inequality in economic growth using as our main criteria the evidence on this relationship and its main determinants for a particular country, Portugal, following the suggestion of recent empirical growth studies that highlight the need for country studies in order to shed additional light on the conclusions of the studies that have been undertaken at the cross-country level (see e.g., Rodrik (2003; 2005; 2007)). Country studies are fundamental for a better understanding of the relationship between inequality and growth and present possible ways to overcome data constraints and empirical methodological issues.

As far as Portugal is concerned, there is first the need to identify the sign of the relationship between inequality and growth, followed by the need to clarify the (relative) contribution of the two different mechanisms selected as crucial for the Portuguese economy, the borrowing constraints on investments in human capital and the fiscal policy channel, in explaining this link.

Additionally, the inconsistency of the results at the cross-country level may lie on the complexity of the effects of inequality on growth predicted by the theoretical literature. In fact, many new growth theory models aimed at explaining the relationship between inequality and growth predict multiple equilibria (see e.g. Perotti (1993), Aghion and Bolton (1997)) so that, depending on the initial conditions, inequality can have a positive or a negative effect on growth. This suggests regional level analysis as an interesting avenue of research as far the Portuguese economy is concerned since Portuguese regions present different levels of output and human capital and different initial patterns of income and human capital distribution, possibly corresponding to different stages of influences as regards the impact of inequality on economic growth. Differences at the regional level may also point to variations in the extent to which countries, and especially Portugal, are benefiting from broader economic changes such

as skill-biased technological change, with its consequences on the shape of the income distribution and inequality, given human capital distribution in Portugal, especially at the regional level. Furthermore, regions experiencing different (high) levels of inequality will probably be more vulnerable to adverse shocks on economic growth, which in turn can lead to more inequality in the present and hinder further future growth.

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**Table 1. Summary review of the theoretical literature**

<b>Authors</b>	<b>Model</b>	<b>Assumptions</b>	<b>Solution</b>	<b>Inequality/growth mechanism</b>	<b>Inequality effect on growth</b>
Galor and Zeira (1993)	Overlapping generations model (2 periods)	Borrowing constraints Inherited wealth Indivisibility of individual human capital investment	Multiple equilibriums depending on initial wealth distribution	Market/imperfections borrowing constraints to human capital investments	-
Chiu (1998)	Overlapping generations model (2 periods)	Borrowing constraints Talent heterogeneity Inherited wealth	Steady state growth equilibrium	Market/imperfections borrowing constraints to human capital investments	<b>0/-(y)</b>
Galor and Moav (2004)	Overlapping generations model (2 periods)	Borrowing constraints Two accumulation regimes: 1) physical capital and 2) human capital	Poverty traps Steady state growth equilibrium	Market/imperfections borrowing constraints to human capital investments	<b>inverted-U</b>
Alesina and Rodrik (1991)	Optimal AK endogenous growth model	Two class model Pure redistribution	Steady state growth equilibrium	Fiscal approach	-
Alesina and Rodrik (1991;1994)	Optimal AK endogenous growth model	Individuals with different factor endowments Pure redistribution or public expenditures	Steady state growth equilibrium	Fiscal approach	-



**Table 1. Summary review of the theoretical literature (continued)**

<b>Authors</b>	<b>Model</b>	<b>Assumptions</b>	<b>Solution</b>	<b>Inequality/growth mechanism</b>	<b>Inequality effect on growth</b>
Bertola (1993)	Optimal one sector AK growth model	Individuals with different endowment shares of accumulated to non-accumulated factors. Redistribution of income from capital to labour	Steady state growth solution	Fiscal approach	-
Persson and Tabellini (1991,1994)	Overlapping generations model (2 periods)	Non-altruistic individuals with different endowments: basic individual skills and capital. Pure redistribution	Multiple equilibrium Steady state growth equilibrium	Fiscal approach	<b>inverted -U</b> -
Perotti (1993)	Overlapping generations model/ infinite time horizon model	Human capital externality Pure redistribution of income	Multiple equilibriums	Fiscal approach	<b>inverted-U</b>
Aghion and Bolton (1997)	Stochastic growth model	Moral hazard and limited wealth constraints Trickle-down process	Multiple equilibriums Steady state growth equilibrium	Capital imperfections	- <b>inverted-U</b>

**Table 2. Summary review of the empirical literature – reduced-form equations, cross section data**

Authors	Sample	Structure of the data	Inequality measure	Estimation method	Inequality effect on growth
Persson and Tabellini (1994)	i. 9 developed countries; 1830-1985 ii. 56 countries; 1960-85	Cross-section	Income	i. Pooled OLS; 2SLS ii. OLS; 2SLS	-
Alesina and Rodrik (1994)	46-70 countries 1960-1985	Cross-section	Income Land	OLS; 2SLS	-
Alesina and Perotti (1996)	41-70 countries 1960-1985	Cross-section	Income Land	OLS	-
Clarke (1995)	74-81 countries 1970-88	Cross-section	Income	OLS; WLS; 2SLS	-
Perotti (1996)	Max 67 countries 1960-85	Cross-section	Income	OLS; WLS	+ rich countries - poor countries
Birdsall and Londono (1997)	43 countries 1960-92	Cross-section	Income Human capital	OLS	-
Deininger and Squire (1998)	66-87 countries 1960-92	Cross-section	Income Land	OLS	-
Castelló-Climent and Doménech (2002)	108 countries 1960-2000	Cross-section	Income Human capital	OLS	-
Chen (2003)	43 countries 1970-92	Cross-section	Income	OLS	<b>inverted-U</b>
Balisacan and Fuwa (2003)	Philippines' Provinces 1988-1997	Cross-section	Land	IV	+
Bleaney and Nishiyama (2004)	42-69 countries 1965–1990	Cross-section	Income	OLS	- / +

**Table 3. Summary review of the empirical literature – reduced-form equations, panel data**

Authors	Sample	Structure of the data	Inequality measure	Estimation method	Inequality effect on growth
Persson and Tabellini (1994)	9 developed countries 1830-1985	Panel	Income	Pooled OLS	-
Partridge (1997)	Panel of 48 U.S. states 1960-1990	Panel	Income	Pooled OLS 2SLS	- / +
Li and Zou (1998)	46 countries 1960-90	Panel	Income	Fixed effects Random effects	- / +
López, Thomas and Wang (1998)	12 developing countries 1970-1994	Panel	Human capital	Fixed effects	-
Forbes (2000)	45 countries 1966-95	Panel	Income	Fixed effects Random effects Chamberlain's $\pi$ -matrix First-differenced GMM	+
Barro (2000)	Max 84 countries 1965-1995	Panel	Income	3SLS Random effects	+ rich countries - poor countries
Panizza (2002)	48 U.S. states 1940-80	Panel	Income	Fixed effects First-differenced GMM	- / + / <b>0</b>
Banerjee and Duflo (2003)	45 countries 1965-95	Panel	Income	Kernel regression Series estimator	- (changes)
Voitchovsky (2005)	21 industrialized countries 1975-2000	Panel	Income	Pooled OLS Within groups First-differenced GMM System GMM	<b>0</b> (aggregate) - (bottom) + (top)

**Table 4. Summary review of the empirical literature – transmission mechanisms specifications**

Authors	Mechanism	Sample	Structure of the data	Inequality measure	Mechanism proxy	Estimation method	Inequality effect on growth
Alesina & Perotti (1994)	Fiscal	41-49 countries 1960-85	Cross-section	Land	Interaction term inequality and dummy for democratic regimes	OLS	<b>non</b>
Perotti (1996)	Fiscal	49/27 democratic countries 1960-85	Cross-section	Income	Average marginal tax rate	2SLS OLS	<b>non</b>
Perotti (1996)	Borrowing constraints	62 countries 1960-85	Cross-section	Income	Male and female secondary school enrollment ratios	2SLS OLS	?
Partridge (1997)	Fiscal	48 U.S. states 1960-1990	Panel	Income	Percent state and local taxes Percent public welfare Government employment share	Pooled OLS 2SLS IV	<b>non</b>
Deininger and Squire (1998)	Fiscal	28 democratic 25 non-democratic countries; 1960-92	Cross-section	Income Land	Sample split (democratic/non-democratic)	OLS IV	<b>non</b>
Deininger and Squire (1998)	Borrowing constraints	52-81 countries 1960-92	Cross-section	Land	Sample split (low/high-income)		- (developing)
Sylwester (2000)	Fiscal	52-54 countries 1970-1985	Cross-section	Income	Public education expenditures	3SLS	- (short run) + (log run)

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