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Abstract

Basically, the extensive theoretical and empirical literature on the interactions between growth/development and distribution can be divided into two main approaches. The first one examines the impact of economic development on income distribution in a long run perspective. The second one focuses on the inverse causality between inequality and growth. This paper aims at reviewing this second view about the effects of initial inequality of income and wealth on future growth rate. The theoretical literature suggests several channels through which inequality might be harmful for growth, namely three economic explanations (the channel of the capital market imperfections, the approach of endogenous fertility, the argument relating to the domestic market size) and two politico-economic arguments (the approach of endogenous fiscal policy and the political instability channel). The following conclusions can be drawn from our survey of the empirical studies regarding the relationship between inequality and growth: first, only the endogenous fertility approach and the explanation based on political instability receive convincing support from the data. Second, initial inequality of assets has a negative and significant effect on subsequent growth. As a result, wealth redistribution is likely to enhance future growth.

Keywords: Inequality; Growth
JEL classification: O15, O40

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1. Introduction

Since the end of the Second World War, three principal phases can be distinguished with regard to the study of the links between distribution and growth or development.

In the late 1940s and the early 1950s, the analysis of the (under)development problems was entirely focused on industrialization and growth and somewhat overlooked the study of the distribution of the fruits of this growth. According to Arndt (1983), the first post-1945 generation of development economists (Rosenstein-Rodan, 1943; Singer, 1949) paid little attention to the issue of inequality within developing countries because they were mainly preoccupied with the question of inequality between advanced and backward nations. They estimated that industrialization-led growth was the most suitable means to reduce poverty in the poor countries and thus to improve the international distribution of income. They probably assumed in an implicit way that the internal distribution of income would remain unchanged during the process of development, so that automatically all income groups would proportionally benefit from the overall growth of per capita income.

The nature of the interactions between inequality and growth or development really became a controversial issue since the mid-1950. Basically, the extensive theoretical and empirical literature on this topic can be divided into two main approaches.

The first approach, initiated by the seminal research of Kuznets (1955), aims at examining how economic development affects income distribution in the long run. The main view which essentially prevailed until the late 1970s is that the degree of income distribution is mostly determined by the level of economic development. More precisely, according to the famous Kuznets' "inverted-U hypothesis", income inequality tends to increase in the early stages of economic development and decrease in the later stages. This basic issue concerning the impact of economic development on income distribution is not addressed here. A comprehensive survey of this approach can be found in Fields (2001). After reviewing the available evidence on the Kuznets' assumption, Fields (2001: 69) comes to the conclusion that "the Kuznets curve is *not* a necessary feature in the data, nor even the best general description of changes over time. It is not the *rate* of economic growth or the *stage* of economic development that determines whether inequality increases or decreases. This is actually a long-standing result. Two decades ago, I wrote: 'Growth itself does not determine a country's inequality course. Rather, the decisive factor is the *type* of economic growth as determined by the environment in which growth occurs and the political decisions taken' (Fields, 1980: 94). This new review of evidence shows that that conclusion remains equally valid today".

After having been relatively neglected during the 1980s, income and wealth inequality is "back on the agenda" (Kanbur and Lustig, 1999) in the discourse about development during the 1990s.

According to Bourguignon (1996a: 46-47), "distribution is again seen as an important dimension of the development". However, the causation between distribution and growth now runs in the opposite direction. In fact, the central concern does not basically consist any more in considering the degree of income inequality as the result of economic growth in the long run (and more exactly as the consequence of the level of development) but mainly focuses on the role of the distribution of income and wealth in the process of economic growth. Indeed, ranked by Stern (1991) among the factors ignored by the early models of endogenous growth developed during the 1980s, initial inequality was quickly integrated thereafter in the new growth theories and in the political economy approach of growth as a fundamental determinant of long-term growth. Moreover, according to Atkinson (1997), this new interest for the distributive issues seems to have moved from the functional (or factor) distribution towards the personal (or size) distribution of income. The new dominant vision is that, through various transmission channels, a greater equality in the initial distribution of incomes and assets may enhance the future rate of economic growth and consequently redistribution may modify in a positive way the long-run rate of growth.

The main purpose of this article is to review the theoretical arguments and empirical findings that emerge from this new approach of the relationship between initial inequality and future growth.[1] The paper is organised as follows: section 2 presents the various theoretical mechanisms that have been suggested by the theory to explain how initial inequality might reduce the long-term growth rate of the economy. Section 3 reports the main findings of econometric studies that test whether initial inequality is really harmful for subsequent economic growth. Section 4 concludes the study.

2. Theoretical effects of inequality on the growth rate

From the theoretical point of view, various mechanisms were suggested to explain how initial inequality in the distribution of income and wealth reduces the long-term potential of growth of the economy. In what follows, the purely economic reasons (2.1) will be distinguished from the politico-economic explanations (2.2) underlying this negative link between inequality and growth.

2.1 Economic dimensions of the relationship between inequality and growth

Three types of economic mechanisms are generally proposed. First, in the presence of an imperfect capital market, a more unequal distribution of assets means that an increased number of individuals do not have access to credit and thus cannot carry out productive investments, which finally results in a reduction in the long-term growth rate (2.1.1). Second, a worsening in the

inequality of wealth jointly generates a rise in the fertility rate and a drop in the rate of investment in human capital of most of the households which are poor and less educated, and this in turn reduces the future growth rate (2.1.2). Last, a more unequal distribution of incomes leads to smaller domestic markets and thus a lower exploitation of the economies of scale, which consequently limits the future potential of growth and industrialization of the economy (2.1.3).

2.1.1 Inequality and growth with imperfect capital market

Several models (Aghion and Bolton, 1992 and 1997; Banerjee and Newman, 1993; Galor and Zeira, 1993; Piketty, 1997a) emphasize the role played by the financial market imperfections in the negative relationship between initial distribution of wealth and long-term growth rate of the economy.

The capital market imperfections mean that, at the given equilibrium interest rate, a phenomenon of credit rationing prevails. According to Piketty (1994), these papers usually use the problems of verifiability of input (moral-hazard problem) or output (repayment enforcement problem) as sources of credit market imperfections. The moral-hazard problem[2] is due to the fact that a borrower has little to lose in case of project failure when most of the investment is financed by a loan. Indeed, the more he/she needs to borrow in order to invest, the less incentives he/she has to supply additional efforts devoted to the success of his/her project, since he/she will have to share a larger fraction of the marginal returns from his/her effort with the lenders. Thus the interest rate on the loan is an increasing function of its size (in relation to the total cost of the project) with some maximum limit on the size of the loan. The problem of verifiability of output[3] comes from the possibility that a borrower might conceal the returns of his/her investment in order to avoid the repayment of the debt contracted to finance his/her project. The larger the amount borrowed is, the more this risk of default from the borrower increases, which results in a rise in the enforcement and supervision costs of the contract. Consequently, Galor and Zeira (1993) assume that the borrowing interest rate is higher than the lending interest rate because of these additional costs. Banerjee and Newman (1993) consider the possibility of a non-monetary punishment (such as imprisonment) to dissuade the borrower to vanish into thin air once the investment returns have been realized.

This phenomenon of credit rationing implies that the initial wealth (endowment) of each agent determines his/her ability to invest in human or physical capital.[4] In fact, although they are assumed to be identical with regard to skills and preferences, the individuals are characterized by heterogeneous levels of initial wealth[5] (inherited from their parents) and thus by different investment opportunities. Indeed, in order to protect themselves against these moral hazard and repayment enforcement problems, the financial intermediaries will accept to lend funds to the

individuals that can put up their personal wealth as collateral. More exactly, the borrowing power of an agent increases with the initial level of his/her personal wealth because of the commitment value of initial endowment. The financial market imperfections thus involves that the agents carry out different levels of investment, since the amount borrowed differs among individuals according to their initial wealth.

Moreover, the existence of investment indivisibilities (each project entails a fixed minimal size) contributes to strengthen this effect. In this case, the access to credit is restricted from the point of view of the number of projects which are really undertaken: only the individuals with enough personal wealth are able to finance their project, either on their personal wealth or through borrowing.

Since the investments are assumed to be indivisible, the explicit introduction of a credit rationing phenomenon has two main consequences: initial distribution of wealth determines (i) the long-term growth rate of the economy and (ii) the equilibrium factor prices.

i) By preventing poor agents from carrying out indivisible investments in human or physical capital, the financial market imperfections perpetuate a process of low and uneven growth. Indeed, in societies with unequal initial distribution of wealth, a large fraction of indivisible investments that are nevertheless beneficial at the individual and aggregate levels cannot be undertaken because the access to the credit is limited to the non poor agents of the population. This leads to a low growth rate in the long-run and the emergence of "poverty traps" which reflect the persistence of initial wealth inequality from generation to generation (Piketty, 1994). The families that are initially poor (whose level of initial wealth is smaller than this threshold) will remain poor forever, while the families that are initially rich (whose level of initial wealth is higher than this threshold) will always remain rich. The initial and long-term distributions of inheritances display the same relative proportions of poor and rich agents.

Nevertheless this type of "threshold effect" of initial wealth rests on the existence of a nonconvex technology (a fixed-size investment). Indeed, as Piketty (2000) underlines, these poverty traps arise only if in addition to the credit constraint, all investment projects are indivisible. Otherwise poor dynasties could gradually invest in larger and larger projects and eventually catch up with the wealthy families.[6]

ii) The second main implication of credit rationing is that the equilibrium factor prices (interest and wage rates) are determined by the initial distribution of inheritances.

In Solow-type models of capital accumulation without credit-rationing, the equilibrium interest rate is only determined by the marginal productivity of capital (i.e. the technological constraint), regardless of the initial wealth distribution. The level of optimal investment corresponds to the point where the marginal productivity of capital is equal to the interest rate. At the point of intersection

between the demand and supply of capital (the latter corresponding to the level of average wealth of the economy), all agents invest the same amount of capital, i.e. the rich individuals lend capital (the surplus amount of capital) to poor agents at the prevailing interest rate, so that the marginal productivity of capital is identical throughout the economy (Piketty, 1997a).

However, in the presence of an imperfect credit market, the initial distribution of wealth determines the supply of savings and the demand for credit, and thus the equilibrium interest rate. Indeed, according to Piketty (1997a), an initial distribution with a large mass of low-wealth agents entails that the demand for capital is markedly higher than the supply of loanable funds. This leads to high equilibrium interest rate, harsh credit rationing and low upward social mobility. The initially large mass of poor agents and high interest rate are therefore self-reproducing. Conversely, an initial (less unequal) distribution results in a low interest rate, which generates high upward mobility, fast accumulation of capital and low equilibrium interest rate.

In addition, Banerjee and Newman (1993) present a dynamic model of capital accumulation and distribution of wealth in which the wage rate is endogenous: it depends primarily on the initial wealth inequality. In the previous model of Piketty (1997a), all the agents were regarded as entrepreneurs that only differ in the size of their investment. However, in the paper of Banerjee and Newman (1993), each agent can "choose" between three professional occupations according to his/her level of initial wealth: wage-earner (which does not imply any investment), self-employed (which involves a medium-sized investment) or employer (which requires a large investment). Because of capital market imperfections, the poorer agents become wage-earners, the middle-wealth agents become self-employed and the wealthier agents become employers (who monitor workers by using a fixed-cost technology).

The equilibrium wage rate, then, is determined by the equalization between the supply and demand for labour, and thus by the initial wealth distribution (through the professional choices). Indeed, an initial distribution (unequal enough) with a large mass of poor wage-earners and a small number of employers (excess supply of salaried labour) imply that equilibrium wage rate, opportunities of accumulation and upward mobility ("low-mobility traps") of the poor agents are low, which tends to reproduce a large initial supply of labour and thus a low equilibrium wage rate. On the other hand, an initial distribution (enough equal) with a large number of potential employers and a limited mass of poor employees (excess demand for salaried labour) leads to high wage rate, high social mobility from employee status towards the one of self-employed persons and thus high wage rate.

The main result of these models is that, for a given degree of capital market imperfection[7], since the liquidity constraints prevent the poor agents from carrying out indivisible productive

investments, the negative impact of inequality on growth rate will be all the higher as the initial wealth distribution is unequal. Consequently, redistribution of wealth from the rich to the poor agents enhances the long-term growth rate by increasing the relative proportion of agents that can undertake indivisible investment projects.[8] As productive technology exhibits decreasing marginal returns with respect to individual investments in capital (the function of production is concave), redistribution (financed by a lump-sum tax on the initial endowments) to the poorly endowed (who exhibit the highest marginal returns to investment) has an overall positive effect on economic growth.

2.1.2 Inequality, joint decisions of the rates of investment in human capital and fertility, and growth

The endogenous fertility approach provides another interesting explanation of the negative link between initial wealth distribution and long-term growth rate. According to this approach, initial income inequality noticeably reduces the future growth rate because of the positive effect of inequality on the overall rate of fertility. The second interest of this approach is that it expands the argumentation previously presented by integrating a new dimension in the decision carried out by the households: in case they cannot invest in the human capital of their children, the parents will decide to increase their fertility rate. As their absolute income rises, the parents substitute the "quality" for "quantity" of children, preferring a few healthy and well-educated children to many who are in bad health and not educated. In other words, poor parents with relatively low levels of human capital that cannot finance their children's education will thus increase the family income by augmenting the size of their household (the income effect leads to a higher demand for children). Conversely, rich parents with relatively high human capital levels that can afford their children's education will jointly increase the human capital spending by child and reduce their fertility rate. They prefer "to invest" rather in the quality that in the quantity of their immediate descendents (the substitution effect outweighs the income effect and implies a decrease in the demand for children).[9] As Perotti (1996) rightly underlines, in spite of this close and negative theoretical link between the fertility rate of the households and the amount of the parental spending in human capital, demographic factors and, in particular, fertility choice of the households, were largely ignored (up until recently) in the literature on income distribution and economic growth.

The paper of Galor and Zang (1997) is one of the first main contributions which simultaneously deals with the interactions between income distribution, education and fertility within the framework of imperfect capital markets. In their model, given the distribution of income, a greater fertility rate means than fewer financial resources are available within each family. Owing to fixed costs of education and credit constraints, fewer children will be able to attend school. In a similar way, given the fertility rate, a more unequal income distribution is associated with lower enrolment

rates because of the inability for a larger number of households to borrow on the capital market against a higher expected future income. Although interesting in many respects, this theoretical model has a major shortcoming: the size of the households is regarded as an exogenous variable, excluding the possibility that overall fertility rate of the economy will be influenced by the distribution of wealth.

The article of Dahan and Tsiddon (1998) really examined the dynamic interactions among demographic transition, income distribution and economic growth. In an endogenous growth model based on human capital accumulation with an endogenous fertility rate, they show that the overall rate of fertility and the distribution of income follow a Kuznets-type "inverted-U shaped" dynamics during the process of development. Indeed, during the first phase, the poor households decide not to invest in human capital and increase their fertility rate. The return to education is not sufficiently high to incite them to invest and borrow funds at a cost relatively high on an imperfect credit market. The supply of poor uneducated workers increases and their wage rate falls. Meanwhile the rich households choose to invest in human capital (their spending is self-financed and thus carried out at a lower cost) and decrease their fertility rate. The supply of rich educated workers grows less rapidly than the supply of uneducated workers, and the wage rate of skilled agents rises. This change in the composition of the labour force increases the return to educational investment (i.e. the wage differential between skilled and unskilled individuals) and thus increases wage inequality (a decreasing proportion of wage-earners becomes richer and richer). As the wage premium increases, poor agents are gradually induced to invest in human capital. It is only when the distribution of wealth is sufficiently unequal that poor individuals finally decide to invest in human capital and reduce the size of their household. It follows an immediate decline in the supply of uneducated agents and an increase in the supply of educated individuals. As a result, the wages of unskilled workers increase and the wages of skilled workers drop, leading to a reduction in the wage differential. During this second phase, the population’s overall level of education increases, average rate of fertility decreases, income becomes more equally distributed and growth of income per capita accelerates as the economy accumulates human capital more rapidly.

In addition, Dahan and Tsiddon (1998) emphasize that income inequality affects in a different way the growth rate during the process of development. Indeed, during the first stages of development, an unequal income distribution is a necessary condition for economic growth to take off since, as the economy is relatively poor, only the rich agents can invest in human capital because of the borrowing constraints and the fixed costs of education. Economic growth takes off and income inequality widens. The worsening in the wage inequality between the skilled and unskilled workers gradually incites poor agents to invest in education and reduce their rate of fertility. Economic growth is therefore boosted by a more equal distribution of human capital and

thus earned income (but also by the joint fall in the average rate of fertility). Thus, during the last stages of development (when the economy becomes relatively rich), a greater equality in the distribution of income raises the long-term growth rate by allowing an increasing proportion of individuals to carry out investment projects in human capital. Consequently, an underdeveloped economy that prematurely implements measures designed to reduce income inequality may be doomed to stagnation in the long-run. Other theoretical models developed by Galor and Tsiddon (1997), Galor and Moav (1999) and Galor (2000) also suggest that income inequality positively (negatively) affects economic growth rate during the first (last) stages of development. But these various models do not address the problem of fertility choice.

Whereas Dahan and Tsiddon (1998) focused on transition dynamics towards a single steady state (characterised by higher growth and lower income inequality in comparison with the initial situation), Kremer and Chen (2000) show that the positive feedback effects between fertility differentials and income inequality may generate multiple steady-state levels of inequality. If the initial relative proportion of skilled workers is large enough, wage and fertility differentials between skilled and unskilled workers will be small, leading the economy to converge towards a stationary state with low inequality. However, if the initial relative proportion of skilled workers is too low, inequality will tend to persist and the economy may approach a stationary state with great inequality between educated and uneducated individuals.

In contrast with the work of Dahan and Tsiddon (1998) in which parental altruism motivates fertility decisions, Koo and Dennis (1999) and Morand (1998) hold that the decision to have children is based on the old-age-support motive. This is a more relevant assumption for developing countries.

The theoretical analysis developed by Morand (1998) demonstrate that due to externalities in the production of human capital, the economy evolves on a path of persistent growth along with average fertility decline if initial per capital human capital is above a critical threshold. In contrast, the economy can be locked in a poverty trap if the initial average capital human level is loo low, unless there is a sizable class of agents with human capital above the threshold level. In this case, a rather unequal distribution of human capital is therefore a necessary condition for the economy to move out a poverty trap. Income transfers from rich to poor individuals may increase demographic growth rate since, as they can not invest in the quality of children, a large proportion of the poor decides to exclusively increase their family size.

Koo and Dennis (1999) contend that the primary channel through which initial inequality negatively affects subsequent growth rests on the positive effect of an unequal distribution of wealth on the fertility rate of the households. Actually, the parents are assumed to be risk averse, and risk aversion decreases as parental income rises. Indeed, the parents are incited to have more children

insofar as, via an implicit contract, the children will care for their parents once the latter retire. But this implicit payoff is risky, either because some children may die or because some children may renege on their promise of support. So increasing the number of children will decrease this risk by reducing uncertainty of future income. Because the payoff from children is higher for poor parents, the poor tend to have more children than the wealthy. As a result, a transfer of incomes or assets from the rich towards the poor households will cause a fall in the overall rate of fertility since fertility decline in poor families will be larger than fertility increase in rich families. Lower average fertility rate increases the rate of growth through a reduction in the capital dilution and the dependency ratio.

Finally, according to the endogenous fertility approach, a more equal income distribution usually reduces the average fertility rate through a progressive transfer of incomes or human capital assets. Nevertheless, to be economically effective, this policy of redistribution requires that the level of national income is not too low in order to avoid the possibility that economic growth takeoff triggered by the production of positive externalities will be impeded by this type of State intervention. If this drop in the overall rate of fertility is simultaneously associated with rising investment rate in human capital, then the economic growth rate will increase in the long run.

2.1.3 Income distribution, domestic market size and growth

In the previous theoretical analyses of the relationship between inequality and growth, the initial distribution of income and wealth affected the rate of accumulation of physical or human capital (and thus the long-term growth rate) by directly acting on the future supply of productive factors. It was assumed that all the agents consumed a homogeneous consumer good, the demand for produced goods played a passive role and thus did not have an impact on the incentives to undertake productive investments. However, it seems rather obvious that the level of expected demand (in the Keynesian sense of the word) is also a relevant determinant of the decisions of investment and innovation carried out by the entrepreneurs. Indeed, since the rich and poor consumers can buy heterogeneous consumer goods in different amounts, the initial degree of income inequality, by establishing the structure of expected demand, determines the structure of future effective supply. So the initial distribution of national income can also affect the long-term growth rate of the economy by modifying the size and the composition of domestic end demand.

This mechanism, which rests on the demand side of the economy rather than on the supply side, received less attention in the recent literature on the link between inequality and growth. It was in particular introduced by the so-called approach of "balanced growth" (Nurkse, 1968; Rosenstein-

Rodan, 1943) that emphasizes the role played by the extent and composition of local demand in the triggering of the process of industrialisation of underdeveloped countries. According to this approach, the major constraint on industrialization is the small size of the domestic market. The low incentive to invest in poor nations is mainly attributed to the fact that the size of home demand is too small to generate markets large enough for local industries. An initial "big push" which contributes to the simultaneous industrialization of many complementary sectors is therefore necessary to break off the "vicious circle" of underdevelopment. Under these conditions, newly industrialized sectors of the economy get reciprocal outlets, making industrialization profitable.

Murphy, Shleifer and Vishny (19898) formalized this preceding approach to development by explicitly integrating the distribution of income as a basic determinant of the size and composition of local demand and thus the potential of industrialization of a developing country. They consider a static model in which industrialisation is initially caused by an agricultural innovation or an export boom (the economy has already reached a minimum level of development) that raises individual incomes and thus local demand for manufactured goods. As the size of the domestic markets for manufactures enlarges, increasing returns technologies come into profitable use and home industry develops. However, for industrial markets really to expand, the distribution of income must induce a composition of local demand in which the purchasing power is concentrated in the hands of consumers of manufactured goods. Thus, insofar as the access to the world markets is difficult for a developing country, the degree of industrialization (i.e. the extent of the variety of goods produced by using modern technologies) highly depends on the size of the home markets, which is influenced by within-country income distribution.

More precisely, the rise of home industry depends on the number of local consumers that can afford manufactured goods. In fact, in this model, agents differ only in their income. They have identical, non-homothetic/hierarchical preferences over the space of consumer goods. As their income level rises, they expand the range of demanded goods instead of purchasing more of the same goods that they already consume. Poor people only consume food which is produced by using only one decreasing returns technology. Middle-class agents consume, in addition to food, some manufactures which can be produced by using two alternative technologies depending on the importance of the size of the domestic markets. Rich people consume all the goods available in the economy.

So the success or failure of industrialisation basically depends on within-country income distribution. The industrialisation of a poor nation can fail completely in the case of too much equality or in that of extreme inequality. In the first case, no consumer will be interested in manufactures (all consumers will buy just food) and no sector industrializes. In the second case, no modern (increasing returns) technology can be implemented, since no domestic market is large

enough for this to be profitable. An oligarchic income distribution leads to a substantial shrinkage in the local demand for manufactures which prevents a large number of sectors from industrializing. These two results therefore suggest that redistribution of income from the upper towards the middle class (which are "natural" consumers of manufactures) should foster the industrialisation of the developing countries by increasing the dimension of their home markets. This has the effect of homogenizing the domestic demand for industrial goods, which results in the creation of mass markets for a large number of goods which are produced by using modern technologies.

Jamarillo (1995) combined the static model of Murphy *et al.* (1989), in which income distribution determines the level of industrialization through market size effects, with an endogenous growth model, in which the long-term growth rate depends on the learning process in industries which require modern production technologies. Unlike the paper of Murphy *et al.* (1989) which only studies the positive effect of a decrease in initial income inequality on the level of production, Jamarillo (1995) also shows that a more equal income distribution positively influences the long-term growth rate of the economy by causing an increase in the number of workers employed in the modern sector and thus a widening in the domestic markets for manufactures. Indeed, if a less unequal income distribution leads to an increase in the size of the local markets large enough so that the implementation of modern production technologies turns out to be profitable, employment in the modern sector rises and the training process is furthered: labour productivity goes up throughout modern industries, which causes a fall in the selling prices of manufactures and thus an increase in the real demand for modern products. As a result, the growing number of workers employed in the modern sector stimulates the economic growth.

Falkinger (1994) and Falkinger and Zweimüller (1997) explored the relationship between income inequality and demand structure in an endogenous growth model. In accordance with Engel’s law, the consumption structure of an individual depends on the level of his/her income. This hierarchical structure of consumer demand implies that the demand for new products comes mainly from the relatively rich agents, whose demand for old goods is already saturated. The long-run growth rate positively varies with rising labour productivity which can occur in three sectors (production, imitation and innovation activities) according to the composition of demand, which is determined by the personal distribution of income. Then the authors show that the impact of inequality on growth may be positive or negative depending on the assumptions concerning the mechanisms which drive labour productivity growth. If labour productivity is assumed to be positively related to product diversity, then a more unequal income distribution fosters long-term growth rate because of the positive link between income inequality and product diversity. Alternatively, if labour productivity growth is caused by an increase in average per-capita income, then long-run growth rate is negatively related to income inequality. Indeed, since a more unequal

income distribution leads to a larger product diversity and the latter does not result in an increase in the labour productivity, more resources for the innovation and imitation activities means fewer resources for the expansion of the production of consumer goods and thus a relatively lower growth rate in the long run.

Thus it seems that, if innovation activities are the driving forces behind endogenous growth in the long run, then rising wealth inequality enhances economic growth since it induces an increased demand for new goods from the relatively rich consumers. However, according to Zweimüller (2000a, 2000b), redistribution of income from the very rich towards the very poor consumers also promotes the activities of innovation (and thus growth) by increasing the size of the demand of new goods within a shorter time. The reason is that a decrease in the incomes of very rich consumers has no impact on their demand for new products: they will still consume this type of goods after redistribution. But very poor consumers will become relatively richer and will buy the innovative products sooner. Foellmi and Zweimüller (2002, 2004) also analyzed how a change in income distribution affects the incentive to innovate and hence long-run growth. One of their main findings is that inequality has an ambiguous effect on the incentive to innovate. On the one hand, a reduction in inequality due to a lower relative income of the rich is harmful for growth since the early fall in the innovator's profits outweighs the later increase and the discounted value of an innovation decreases. On the other hand, a lower inequality due to a larger population size of the rich may discourage or foster innovative activities depending on the innovator's market power. Indeed, such an income transfer has a market size effect (a larger number of households buy new products) and a price-effect (innovators are forced to lower their prices because the same income has to be shared among a larger group of wealthy people). When the innovator's market power is low (high), the market size effect dominates (is smaller than) the price-effect and less inequality has a positive (negative) influence on innovation decisions.

The previous models only focused on the impact of the distribution of income on the growth rate through structure demand, without considering the feedback effect of the composition of demand on income distribution. However, introducing heterogeneous goods and non-homothetic preferences (which take the form of greater preference for sophisticated goods at higher income levels) in a model of distribution and growth with imperfect credit market, Mani (2000) examines how the two-way interaction between income inequality and demand structure affects human capital accumulation and growth in a developing country.

Three categories of goods are produced by using labour of different skill intensity: unskilled labour for essentials, medium-skill labour for simple manufactures and high-skill labour for more sophisticated manufactures. The demand for sophisticated goods from the rich agents therefore leads to a relatively higher "derived" demand for more skilled labour than the demand for less

sophisticated goods from the individuals with low and middle incomes. In addition, acquiring new skills requires an initial indivisible investment. Borrowing constraints make it difficult to obtain loans for education. So the skill levels the agents can reach is limited by their parents' wealth and bequests. Whereas some poor can afford medium level education, only the rich individuals can acquire higher education.

Within such a framework, the initial distribution of incomes not only determines the long-term growth rate through its effect on the pattern of demand for goods (like in the previous models), but also the future distribution of incomes through the impact of the composition of demand for goods on the derived demand for various labour skills and the level of investment in human capital. A high initial income inequality results in the absence of a broad middle class. The agents are either too poor to consume anything but essentials, or rich enough to purchase complex manufactures. As a result, the relatively low demand for simple manufactures generates a relatively low demand for medium-skilled labour, which implies relatively low wages for the medium-skilled workers who cannot thus afford higher education. Moreover, this also means that these wage-earners will not be able to afford higher education for their children, thus perpetuating a vicious circle of high income inequality, low human capital accumulation and slow growth. On the other hand, a low initial income inequality results in a large demand for simple manufactures from a broad middle class and thus a relatively high wage rates for medium-skilled workers. These wage-earners who were too poor to invest in higher education for themselves, will be able to finance the same investment for their children. The average skill level rises, which involves a higher growth rate and a more equal income distribution in the long run.

To sum up, a more equal distribution of the purchasing power can make it possible to shift the domestic demand towards the manufactures which can be effectively produced only on a very large scale. The production of these goods (which requires increasing return technologies) is only profitable if the amount of domestic sales is large enough to cover at least the fixed set up costs of these industrial plants. In this case, an initial redistribution of income (in an economy that has reached a minimum level of development), by generating a large middle class, may have a positive impact on future growth by inducing a higher demand for a broad range of manufactures. However, the coexistence of a small upper class may also promote long-run growth by encouraging/initiating the production of new goods (resulting from the innovation activities) which will be purchased later by a large class of middle income consumers. In other words, as Matsuyama (2002) underlines, for the rise of mass consumption societies to occur, income distribution should be neither too equal nor too unequal.

2.2 Politico-economic dimensions of the link between inequality and growth

Except for the three economic arguments previously discussed, it is also possible to identify two other main politico-economic explanations which justify the existence of a negative relationship between initial inequality and subsequent growth. Firstly, a more unequal income distribution increases the redistributive tax pressures, which deters private investment and decreases the future economic growth rate (2.2.1). Secondly, a worsening in income inequality affects the long-term growth rate negatively by leading to a more unstable socio-political environment which is harmful for private investment (2.2.2).

2.2.1 Inequality, redistributive conflicts and growth

The political economy of inequality and growth stresses how fiscal policy can play a major role in explaining growth. This approach considers the fiscal policy as an endogenous variable which reflects, through a process of political participation of the members of a society, the voters' preferences for income redistribution. Each individual therefore behaves like an economic agent and a citizen who votes on the tax rates.

The first "traditional" models of political economy (Alesina and Rodrik, 1994; Bertola, 1993; Persson et Tabellini, 1994) emphasized the negative link between initial inequality of income and wealth and long-run growth rate.[10] Assuming that capital markets are perfect, the main idea is that in a more unequal society, social demand for redistribution financed by distortionary taxation is higher, involving a lower rate of private investment and thus a slower rate of growth.

In fact, this argument suggested by the approach of "endogenous fiscal policy" (Perotti, 1996) rests on two basic mechanisms. A first political mechanism indicates how the distribution of income determines the level of government taxation through a voting process and a second economic mechanism describes the effects of the current fiscal policy on the future growth rate.

The political mechanism is based on the "median voter" hypothesis which was in particular put forward by Meltzer and Richard (1981). According to this assumption, the equilibrium tax rate is negatively related to the degree of market income inequality among voters. Indeed, the level of government taxes and transfers is the result of a democratic voting process (under majority rule) in which market income is the main determinant of the voters preferences. If it is assumed that taxation is proportional to income and tax revenues are redistributed in lump sum way to all individuals, then the tax rate preferred by each agent is inversely proportional to his/her market income. In fact, each individual compares the gains (the government expenditures he/she would benefit from) with the losses (the direct taxes he/she would pay) from redistributing in order to

maximize his/her net expected income. So for the voters whose income is below (above) the average income, the net gains from redistributive transfers are positive (negative).

Moreover, since all the agents are voters and have the same political weight and the voters' preferences are single-peaked, the equilibrium tax rate that prevails at the end of the voting process corresponds to the level of taxation preferred by the median voter (i.e. the agent with the median level of income). The median voter's decision on taxes and thus transfers only depends on his/her relative position in income distribution. In unequal societies, the median voter is relatively poor, i.e. his/her income is lower than the average income. Thus, he/she is likely to vote for a higher tax rate since he/she expects his/her net income to increase. If the level of income inequality is measured by the difference (or the ratio) between the median income and the average income of the economy, then a more unequal income distribution (i.e. a median income lower in relation to average income) leads to a higher equilibrium tax rate.

According to the second economic mechanism, if these redistributive transfers are financed by proportional taxes on physical/human capital endowments, more redistribution brings about lower rates of physical/human capital accumulation by reducing the after-tax return on individual investments. So the current redistributive policy has a negative impact on the future growth rate because of its disincentive effects on private savings and investment.

To sum up, the traditional political economy approach attributes the negative effect of initial inequality of income and wealth on future growth to the two following mechanisms: higher inequality leads to higher redistributive taxation (political mechanism) and more redistribution is harmful for growth by creating adverse incentives for investment in physical and human capital (economic mechanism).

As regards the political mechanism, Saint Paul and Verdier (1996) enumerated various reasons which can invalidate a positive relationship between inequality and redistribution.[11] First, for a given average income, the increase in income inequality does not necessarily involve deterioration in the relative position of the median agent in relation to the average and thus a rise in the tax rate. Indeed, if income inequality is concentrated among the poorest, then the relative position in income distribution of the median agent may very well improve in relation to the mean. Second, this argument can be further enhanced if one takes into account the fact that the agents have unequal political weights or that political participation is endogenous. Third, the measure of inequality by the median income (or wealth)/mean income (or wealth) ratio is the adequate determinant of the level of tax imposition only in the special case of flat tax rates and lump-sum transfers. It is not the case any more when taxes and transfers are progressive. Last, taxation may be more distortionary when applied to the richest and poorest segments of the population. This is because the lot of the

poorest mainly depends on the transfer payments, so that the marginal tax rate is higher for them. The richest agents typically have access to more opportunities of tax evasion than the middle class.[12] It follows that the tax rate preferred by the majority may drop when inequality increases.

With regard to the economic mechanism, the previous account of economic dimensions of the link between inequality and growth suggested that more redistribution is not necessarily harmful for growth and especially that long-run economic growth may be boosted by progressive initial transfers, provided that the economy is not too poor.

The traditional approach of political economy assumes that credit markets perfectly work and the distribution of (primary) incomes and the participation of agents in the political process are exogenous. Reasoning within a framework where the capital market is imperfect, other models of political economy tried to relax these two restrictive assumptions by endogenizing, on the one hand, (i) the distribution of income and, on the other hand, (ii) the participation in the process of political decision-making in relation to the process of growth.

i) The various models of political economy consider steady state situations where the distribution of primary incomes is constant and exogenous, i.e. independent of the growth rate of the economy. The causality therefore runs only in the following direction: the level of initial inequality influences the future growth rate through income redistribution whose extent solely depends on the degree of relative poverty of the median voter. Other models of political economy (Perotti, 1993; Saint-Paul and Verdier, 1993) are based on more complex mechanisms in which the initial distribution of primary incomes determines the future growth rate of the economy which affects in turn the future distribution of incomes. The causality between inequality and growth runs in both directions in the sense that these variables interact endogenously during the process of convergence towards a steady state. These new types of models of political economy lead to more ambiguous conclusions about the relationship between inequality and growth.[13]

Saint-Paul and Verdier (1993) point out that inequality does not necessarily have adverse effects on growth in democratic societies. In their model, future economic growth is positively affected by the actual amount of public education which, according to the median voter theorem, depends on the initial income distribution. The main channel of redistribution is public education which is provided in an egalitarian way and financed by a proportional (non-distortionary) tax on labour income. Thus, a more uneven initial distribution of incomes implies an increase in the equilibrium tax rate (since the median voter becomes relatively poorer in relation to the average) and thus the amount of public education rises. More public spending on education results in a higher growth rate (by increasing the average stock of human capital of the actual generation in comparison with the

precedent generation) and less income inequality (because of the egalitarian aspect of public education) in the long run. However, along the transition path, as income distribution becomes more equal, the tax rate, the amount of public education and the growth rate will decrease. The economy finally converges towards a steady-state growth path where the rate of growth is positively related to private investment in education.

Considering a democratic society where the political power is equally distributed, Perotti (1993) shows that the impact of income redistribution on economic growth depends not only on the initial degree of income inequality but also on the initial level of economic development. The private investment in human capital is the source of endogenous growth in the long run. The private investment in education is indivisible and there is no capital market. The investment in human capital by one group is assumed to increase the future labour productivity and income of other groups, thus enabling an increasing number of groups to invest in education. Under these conditions, the author stresses that the configurations of the distribution of income which maximises the growth rate of the economy are sharply opposite in the case of a poor economy and in that of an intermediate-income or rich economy. Indeed, in a poor economy, total resources may be so scarce that at most only the upper class can invest in education. In this case, only a sufficiently unequal income distribution spurs economic growth by channelling the meagre resources towards the upper class. Thus, economic growth can occur only if the distribution of secondary incomes is sufficiently unequal. During this first phase of the process of development, economic growth is therefore associated with a worsening in income inequality. Conversely, in an intermediate-income and rich economy, a more equal distribution of post-tax incomes, by enabling all income groups to invest eventually in human capital, contributes to the persistence of a high economic growth and a lessening in income inequality. So during this second phase of the process of development, fast growth and reduced inequality go hand in hand. Accordingly, this model clearly implies a Kuznets' inverted U-relationship between the degree of income inequality and the level of income per capita in which the variables of distribution and growth interact endogenously during the process of development.

Like Perotti (1993), Bénabou (1996) and Lee and Roemer (1998) combine the political economy approach with an imperfect capital market assumption. They emphasize that, in this case, the relationship between inequality and growth is again much more complex than in the standard political economy models of growth and inequality.

According to Bénabou (1996), when the assumption of capital market imperfection is inserted within the general framework of a political economy model, income redistribution from rich to poor both generates economic efficiency losses (investments in human capital by the rich decrease because of the disincentive effect of redistributive taxation) and economic efficiency gains

(investments in education by the poor increase due to the relaxation of credit constraints). Nevertheless, he demonstrates that, as long as the production technology exhibits markedly decreasing marginal returns with respect to individual investments in human capital, this type of progressive income redistribution will have an overall positive impact on the future growth rate of the economy.

Lee and Roemer (1998) reason that the relationship between initial inequality and future private investment in education is not simple even if the decisive voter is the median voter when a positive "threshold effect" of inequality on private investment (caused by different marginal propensities to invest within the population) is taken into account. Moreover, if this threshold effect is substantially supplemented by the positive effect of inequality on the public investment in education (as in Saint-Paul and Verdier (1993)), then future economic growth may be also positively related to initial wealth inequality.

ii) One second possible complication of the conventional political economy models consists in giving up the median voter theorem whose implementation rests on the strong assumption that the society considered has a "pure" or "perfect" democracy as a particular regime political in which the distribution of the political power is equal. All the voters vote (the right to vote is universal and is fully exerted by every member of the society) and have the same political weight (the political influence is equal across the individuals), and this regardless of the fact that the economic power is distributed in an uneven way. In other words, the participation in the political decision-making process is assumed to be exogenous.

This last assumption implies that the link between inequality and redistribution should be stronger in democracies, where fiscal policy reflects the preferences of the majority and therefore income distribution, than in authoritarian regimes where the governments can decide to ignore to a large extent the preferences of the poor. Bénabou (1996) inserted this general proposal advanced by the traditional political economy approach within a more complete framework by stressing that the extent of the impact of inequality on redistribution mainly depends on the direction in which one moves away from pure or perfect democracy. Indeed, according to this author, compared to a perfect democracy, the effect of inequality on redistribution and thus growth should be higher in a left-wing, "populist" regime than in a right-wing, "elitist" regime. Furthermore, if the unequal distribution of economic resources results in a greater political power of the richest members of the society (as it is the case in an "elitist" regime), then inequality is not related any longer to redistribution positively and thus growth negatively, contrary to the predictions of the conventional political economy approach.

Recent political economy models of inequality and growth studied the more complex

relationship between inequality, redistributive conflicts and growth according to the type of political regime in power. The current political institutions as well as their evolution during the process of economic and political development according to the will of the political players who control them at a given period, are made endogenous by assuming quite simply that the political participation of the members of the society is determined in an endogenous way.

Ades and Verdier (1996) introduce an endogenous political participation by assuming an exogenous fixed cost of entry into politics. Because of liquidity constraints, the society is segmented into two large classes. The rich agents afford to pay the cost of entry into political activity and they belong to the ruling elite. This enables them to vote on the tax rates and share the political rents between them. The poor individuals can not participate into politics but they have to pay the taxes without benefiting from them. In their model, the "technology of political participation" (the fixed cost of entry into politics) and the initial distribution of wealth therefore determine the extent of entry into politics. The size of the resulting political elite affects in its turn the long-run economic rate of growth and the future distribution of wealth through the effect of the level of taxes on the allocation of labour between an untaxed traditional sector and a taxable modern sector. The theoretical results suggest that societies with unequal initial distributions of wealth and relatively high costs of political participation will experience economic stagnation, political decline of elites, increasing tax distortions and a worsening in social polarization. On the contrary, societies with more equal distributions of wealth and a less costly access to political activity will benefit from a broader political participation and lower tax distortions and will experience sustained growth and a process of wealth homogenization in the long run.

In the political economy model of Acemoglu and Robinson (1996), the participation in the political decision-making process mainly depends on the level of income. So the political power is controlled by a rich and minority elite. Although initially excluded from the political system, the masses (poor agents) are endowed with a "revolution technology" according to which the overthrow threat of the current government is all the more important as income inequality is high. Then the authors show that, when the initial income difference between the political elite and the masses is excessively high, the social revolution becomes a real danger and the political elite is forced to initiate a process of democratic transition, even if this political transition implies an increase in the tax rate and thus more income redistribution thereafter.

The paper of Bourguignon and Verdier (2000a) analyses the joint dynamics between inequality, democratization and economic development in a political economy model of growth where education is both the engine of the growth and the determinant of the political participation. In a context with imperfect capital market and indivisible investments in human capital, they examine the incentives for a educated oligarchy to subsidize the education of the poor and thus to initiate a

democratic transition. Indeed, oligarchy may find in its interest to subsidize the education of the poor in order to benefit from the positive externalities of human capital accumulation "à la Lucas": a more educated population increases the return on its own human capital. However, subsidizing the education of the poor entails two types of costs for the oligarchy: a direct/immediate cost due to the financing of the subsidies by income transfers, and an indirect/future cost resulting from the potential loss of the political power facing a better educated population, the political participation being an increasing function of the educational level. As a result, the number of the poor the oligarchy decides to subsidize the education of, key variable which determines the type of political institutions and the growth rate that will prevail in the long run, primarily depends on the initial conditions in terms of average income and income inequality. When the economy is initially rich and relatively equal, oligarchy is induced to promote the education of the poor because the increase in the return of its human capital exceeds the financial and political costs of income redistribution. This process of broad-based education speeds up the pace of democratization and improves the growth performances of the economy. On the contrary, an initially poor and very unequal economy does not accumulate human capital and thus remains oligarchic and stagnant. The elite decide not to promote education of the poor since the benefits of human capital accumulation are lower than the political cost of losing power. Finally, in an intermediary case, the oligarchy favours the emergence of a middle class by only educating the number of poor that will enable it to retain its political power while benefiting from educational externality. The economic growth is slower than in the broad-based educational strategy.

Bourguignon and Verdier (2000b) extended their previous analysis of the link between education, democratization and economic development by adding two new dimensions in their reasoning: physical capital accumulation by a capitalist oligarchy and the effects of openness to foreign capital on the incentives for the capitalist oligarchy to subsidize the education of the poor and to initiate a process of political transition. In a closed economy, because of the technological complementarity between capital and skilled labour, the capitalist oligarchy may find in its interest to subsidize the education of poor workers so as to increase the return on its own physical capital, but possibly at the cost of future loss of political control in favour of a newly educated class of workers.[14] On the other hand, in an open economy, i.e. with the opening up of the economy to foreign capital, such incentives vanish and it will never be in the interest of the capitalist oligarchy to give up a part of its political power. Indeed, since the foreign capital movements prevent the domestic rate of return on physical capital from moving away from the international rate of return (which is exogenous for a "small" open developing economy), the capitalists do not profit any longer from subsidizing the education of even a minority proportion of the workers and the process of democratic transition will be delayed. So the rate of return on the investment by the capitalists in

the workers' education is equal to zero in an open economy. Nevertheless, according to Bourguignon and Verdier (2000c), by lowering the domestic interest rate to its international level, financial openness causes a rise in the income surplus of the workers and thus contributes to reduce poverty and income inequality between capitalists and workers.

Moreover, according to Bourguignon and Verdier (2000d), the incentives for the capitalist elite to promote the education of poor workers are also reduced when the economy opens up to international trade. As trade openness reduces the sensitivity of domestic factor rewards to changes in local factor endowments, the return on physical capital is less sensitive to an increase in the relative amount of skilled work under trade liberalization than under autarky. Finally, in the case of technology transfers, it is in the interest of the capitalist elite to subsidize the education of poor workers insofar as skilled labour is strongly complementary to technology transfers and these technological improvements also increase the returns on their productive assets.

In conclusion, setting aside its two main relevant extensions, the conventional political economy approach of inequality and growth puts forward a negative relationship between initial inequality of income and wealth and subsequent economic growth by stressing the distortionary impact of redistributive taxation on the private incentives to invest in a perfect democracy. Nevertheless, when income and wealth inequality turns out to be excessive, since they can not get satisfaction as regards their redistributive claims through legal channels (in particular because the political power is controlled by a rich and minority elite), most of the poor citizens may eventually resort to private or collective violence to appropriate in an illegal way a larger income share.

2.2.2 Inequality, political instability and growth

The second politico-economic mechanism linking income distribution and economic growth, the political instability channel (Alesina and Perotti, 1994, 1996; Gupta, 1990; Perotti, 1994, 1996) suggests that initial inequality of income and wealth generates political instability, which deters the investment private and thus reduces the future rate of growth. In fact, this argument is based on two rather intuitive links. The first link deals with the impact of income distribution on political instability, while the second link relates to the effect of political instability on the prospects of long-term growth.

With regard to the first link, the general idea is that excessive inequality in the distribution of income and wealth represents an important determinant of political instability. According to Gupta (1990), political instability can take on the three following main forms: political violence against the regime (mass protest movements against the current government), by the regime (repression acts

against the anti-government social disturbances) and within the regime (successful and unsuccessful coups).

These various dimensions of political instability were linked together in an interesting way by Acemoglu and Robinson (1999a) that stressed that high levels of inequality are generally associated with frequent changes of political regime. Indeed, an excessively unequal and polarized distribution of economic resources between the rich and the poor strongly incites the organized poor agents to assert their interests outside the normal market relations and the legal political channels. Thus in very uneven non-democratic societies, most poor citizens, facing a political system controlled by a rich elite, are likely to fight against this current political regime through social riots or protests and the collective participation in overthrow attempts of the ruling political power, in order to obtain radical political changes (see also Acemoglu and Robinson, 1996). However, in very unequal societies, the rich political leaders may decide to resort to a repressive strategy in order to prevent the success of a social revolution and the resulting democratization of the political life (see also Acemoglu and Robinson, 1999b). This possibility is all the more probable as excessive levels of inequality also mean that the rich have more (police and military) means at their disposal to repress these behaviours of political instability emanating from the most destitute agents.

Moreover, as Acemoglu and Robinson (1999a) underline, if the outcome of the socio-political disturbances is eventually the emergence of democracy, this type of political regime is not necessarily permanent because the rich elite may have an opportunity to mount a coup d'Etat. This opportunity is all the more attractive for the rich as income distribution is very unequal. Indeed, under these conditions, the rich are more likely to regain power insofar as, since greater income inequality implies higher tax rates through a democratic voting process (in accordance with the median voter theorem), democracy is relatively costly for them. So excessive inequality is likely to lead to political instability, either in the form of frequent changes of political regimes (the changeover of political power between democratic and non-democratic regimes) or repression of social unrest.

In turn, according to Alesina, Özler, Roubini and Swagel (1992), Benhabib and Rustichini (1996), Grossman and Kim (1996), Keefer and Knack (2000), Lane and Tornell (1996), Riedl (1999), Svensson (1998), and Tornell and Velasco (1992), political instability has an adverse effect on future economic growth by reducing significantly the legal security of private property rights.

As the property rights over productive assets are ill defined or cannot be enforced by legal political institutions, organized social groups have the opportunity to grab a larger share of domestic production either by means of direct appropriation (like robberies or social revolts), or by manipulating the political system in order to extract transfers from the rest of society (through, for instance, lobbying or bribes). Indeed, because of a weak legal security of claims to property and

because there are no strong countervailing institutions against private powerful groups, the latter have common access to other groups' economic resources ("tragedy of the commons"). Thus this legal insecurity of property rights gives rise to predatory activities which mostly consist for an interest group in appropriating the fruits of the domestic investment of other private groups.

As a result, the owners of productive assets are induced to allocate some resources to protect their property rights from these unproductive rent-seeking activities undertaken by powerful interest groups. In addition, the owners of economic resources may also decide to transfer their capital abroad, in more developed countries where the property rights are generally better protected than in their poorer country of origin, but at the cost of a fall in the rate of return on capital due to the relative capital abundance in rich countries. The capital flight from poor towards rich countries can be viewed as the will of domestic capital owners to place their own wealth out of reach of the "voracity" of the local powerful interest groups. In both cases (private investment in the security of property rights and capital flight), there follows a reduction in the local rate of capital accumulation and thus a lower future growth rate of the domestic economy.

Lastly, as Bourguignon (1999) underlines, the increase in the "private" violence, which is mostly characterized by the development of criminal and illegal activities, may also be the consequence of an excessive inequality of incomes and assets More exactly, the extent of private criminality may be explained by the degree of relative poverty of the poorest segments of the population in relation to average income. Indeed, in a very unequal society, the social cost of these criminal and illegal activities is not negligible: in addition to physical and psychological pain of the victims, the material damages and the costs of crime prevention and punishment they entail, private violence and crime have also negative indirect effects on economic activity by discouraging private domestic investment, the development of tourism activities and the inflows of foreign investments.

Once again, the redistribution of incomes or assets (through, for example, education or land reform) can really stimulate economic growth by promoting a more stable and less uncertain socio-political environment and by reducing the participation of the poor to criminal and illegal activities. For instance, land reform represents an optimal answer for the landowners to the threat of illegal appropriation of their land by the peasants (Grossman, 1994). Moreover, according to Grossman (1995), the effect of a redistribution of property incomes from the capitalists towards the workers is to induce the working families not to engage in extralegal activities of appropriation. Acemoglu and Robinson (1999a) also suggest that asset redistribution may be used to stabilize both democratic and non-democratic regimes. In a democracy, a redistribution of assets, by reducing the level of inequality permanently (and thus by limiting the future redistributive tax pressures), makes coups less attractive for the elite. However, if the rich anticipates a radical redistribution of assets, such as

a land reform, the elite may mount a coup to avoid these reforms. In a non-democratic regime, the rich may also decide to undertake a redistribution of assets to prevent a revolution and democratization.

So far we have explored in detail the various theoretical mechanisms as to why initial inequality of income and wealth is likely to reduce future growth. Let us review now what we have learned from the data.

3. Empirical effects of inequality on the growth rate

Within the vast literature relating to the determinants of economic growth, econometric studies introduced, among other explanatory variables, measurements of initial distribution of income and/or wealth in the growth equations in order to measure their effective contribution in the explanation of the cross-country differences in economic growth. The empirical side of this new literature on the link between inequality and growth rests in a very large part on cross-section regressions and, to a lesser extent, on econometrics of panel data.

The econometric tools generally used to assess the empirical effects of inequality on growth lie within quite distinct temporal horizons: whereas the cross-section regressions are used to examine the incidence of initial inequality of incomes and assets on the long-term growth rate (3.1), the panel data estimates aim at measuring the impact of initial distribution of income and wealth on the short- and medium-term growth rate (3.2).

3.1 Rather disappointing results stemming from cross-section studies

Cross-section empirical works on the relationship between distribution and growth basically tried to answer the two following main issues: what is the effect of initial income and/or wealth inequality on the long-term growth rate? and what are the mechanisms through which initial inequality affects future growth?

On the one hand, requiring reduced form equation estimates, the first issue consists in examining whether, in accordance with the theoretical predictions, there is indeed a sufficiently strong and robust negative correlation between inequality and growth in the long run (3.1.1). On the other hand, requiring structural form equation estimates, the second issue aims at verifying whether various theoretical explanations underlying this correlation (i.e. the transmission channels from initial inequality to future growth) are econometrically borne out (3.1.2).

3.1.1 Reduced form estimations of the direct effect of inequality on growth

The first regressions of this type are due to Alesina and Rodrik (1994) and Persson and Tabellini (1994). They underscore a strong negative and statistically significant relationship between inequality and growth in the long run. This relationship between inequality and growth is only present in democracies (Persson and Tabellini, 1994) and is not different in democracies and non-democracies (Alesina and Rodrik, 1994). Initial land distribution is negatively related to subsequent growth (Alesina and Rodrik, 1994).

The empirical work carried out by Clarke (1995) also reveals that there is a negative and significant correlation between initial income inequality and long-run growth rate. He demonstrates that this result is robust to various income inequality measures and different specifications of the growth regression. The correlation between inequality and growth holds for both democracies and non democracies. However, the central result stressed by Clarke (1995) at the end of his battery of sensitivity tests, i.e. the robustness of the significantly negative relationship between inequality and growth, is seriously challenged by other cross-section reduced form estimates for the three following main reasons:

Firstly, it is possible that the strong negative correlation between inequality and growth simply reflects the effect of an omitted variable. The distributive variable may capture the effects of other omitted variables which are both correlated with the distribution of income and the growth rate, which finally leads to an over-estimate of the direct effect of inequality on growth. For example, according to Birdsall, Ross and Sabot (1995), the strong negative correlation between inequality and growth results from the omission of the educational variables (primary and secondary school enrolment rates). In addition, Perotti (1996) points out that the strong positive correlation between equality and growth is not robust to the inclusion of the variable measuring the share of over sixty-five years of age.

Secondly, as indicated for instance by the empirical works carried out by Birdsall, Ross and Sabot (1995), Bourguignon (1993) and Fishlow (1996), **the extent of the negative direct effect of inequality on growth may be sensitive to the inclusion of regional dummy variables.** The negative correlation between initial inequality and future growth might reflect regional variations in omitted characteristics. Indeed, Bourguignon (1993) notices that the inclusion of dummy variables for Latin America and Africa substantially reduces the size of the effect of the variable of income distribution on the growth rate. In the paper of Birdsall *et al.* (1995), the introduction of an East Asia or a Latin America dummy variable makes the income inequality variable insignificant in the

growth regression. This is because East Asia countries are generally characterized by higher growth rates and lower levels of income inequality than Latin America countries. Fishlow (1996) also finds that the inclusion of a dummy variable for Latin America makes the income inequality variables non-significant in the growth equation since Latin American countries have higher inequality than do other developing countries.

Finally, according to Knowles (2001), **all the existing empirical works on the direct effect of income inequality on economic growth suffer from two main potentially serious data problems.**

The first problem, emphasized by Deininger and Squire (1996), **relates to the poor quality of the data on income distribution used in the empirical literature.** In fact, empirical studies of the link between inequality and growth preceding the publication of Deininger and Squire (1996) "high quality" data set include data of dubious quality. Many of the observations included in the empirical studies of Alesina and Rodrik (1994), Birdsall *et al.* (1995), Bourguignon (1993), Clarke (1995), Perotti (1996) and Persson and Tabellini (1994) do not meet the three main "high quality" criteria stated by Deininger and Squire (1996): data must come from nationally representative household surveys, be based on a comprehensive coverage of all sources of income and be representative of the population at the national level.[15] Those studies used in various combinations data on income distribution compiled by Fields (1989), Jain (1975), Lecaillon, Paukert, Morrisson and Germidis (1984) and Paukert (1973) that do not satify these basic standards. Using their high-quality database, Deininger and Squire (1998) found that initial income inequality affects future growth negatively. However, the inequality variable ceases to be significant once regional dummies are introduced.

Deininger and Squire (1998) also examined the direct impact of initial inequality of wealth on future rate of growth. According to theory, it is mostly the inequality of assets rather than that of income that matters for growth. But much of the empirical literature used data on income distribution as a proxy of wealth inequality since measures of wealth distribution are hard to find and income inequality data are available for a sufficient number of countries and periods. Like Alesina and Rodrik (1994), Deininger and Squire (1998) used land distribution as a proxy for inequality of assets in general. Their findings indicate that there is a strong negative relationship between initial land inequality and long-run growth. This result is robust to the introduction of regional dummies and other variables often included in growth regressions. But Griffin and Ickowitz (1997) point out that the degree of inequality is almost always understated in conventional measures of land concentration for several reasons. First, the data refer to the distribution of land among landowners and thus ignore those who own no land at all. Second, most of the data refer to

the distribution of land holdings that tend to be distributed more equally than land ownership. Third, as each farm is counted as a separate unit of ownership, measures of the distribution of land disregard those who own more than one farm. Finally, since land is considered as a homogeneous asset of uniform quality, measures of land concentration are not in practice measures of inequality in the value of land as a productive asset.

However, the distribution of human capital is another essential aspect of wealth inequality. Land can be an insufficient measure of wealth since other assets such as human capital are important determinants of wealth. In fact, due to the scarcity of available data on human capital inequality, the empirical literature has devoted little attention to the influence of human capital distribution on growth. The empirical studies of Birdsall and Londoño (1997) and Castelló and Doménech (2002) assessed the impact of initial distribution of human capital on future economic growth. The results found by Birdsall and Londoño (1997) suggest that the effect of inequality of assets (land and human capital) on growth dominates the impact of income inequality and that the initial distribution of wealth, especially that of human capital, affects subsequent growth negatively. This negative effect of initial human capital inequality on future growth is not altered by the introduction of other more traditional factors of growth and a dummy variable for countries of the Latin American region. According to Castelló and Doménech (2002), the econometric findings indicate that there is a negative, statistically significant and robust effect of human capital inequality on economic growth rate. Furthermore, in accordance with Birdsall and Londoño (1997), Castelló and Doménech (2002) find that human capital inequality measures provide better results than income inequality measures in the growth regressions.

The second problem, stressed by Knowles (2001), is that **the vast majority of the empirical literature studying the impact of income inequality on economic growth does not measure income inequality in a consistent manner**. Due to a lack of comparable data, researchers have been forced to combine heterogeneous non-comparable inequality data based on gross income, net income, expenditure and concerning individuals and households. However, combining inequality data that are not consistently measured in the same sample is an inadequate procedure since we would expect the distribution of income after tax to be more equal than the distribution of income before tax in a country with progressive tax structure, the distribution of income (before or after tax) to be less equal than the distribution of expenditure insofar as individuals or households smooth their expenditure over their life times and the distribution of income to be more equal for households than for individuals because in developing countries most households contain a large number of children with very low resources (Knowles, 2001). Moreover, other studies (particularly, Deininger and Squire, 1996; Perotti, 1996) have attempted to deal with the problem of data heterogeneousness by transforming the raw data to make them more comparable.[16] Knowles (2001)

acknowledges that the transformations proposed by Deininger and Squire (1996) and Perotti (1996) are an improvement on using inconsistent data. But he maintains that this methodology, which amounts to making the disputable assumption that the relationship between the various categories of incomes and expenditures is constant across countries and across time, is less satisfactory than using comparably measured data.[17]

Knowles (2001) shows that there is no evidence of a significant negative correlation between inequality and growth when consistently measured data on gross income are included in a cross-country growth regression. According to the author, this significant result is hardly surprising since most of the theoretical arguments relating to the negative influence of inequality on growth refer to the distribution of income after redistribution has taken place. Indeed, among the four theoretical explanations discussed by the author, only one relates to the distribution of income before tax (the approach of endogenous fiscal policy). Data on inequality of net income or expenditure are therefore required to test the empirical relevance of the three other theoretical assumptions (the channels of capital market imperfection, endogenous fertility and political instability).[18]

However, since the World Income Inequality Database, compiled by the United Nations University/World Institute for Development Economics Research (1999), contains very few reliable data on the distribution of net income, Knowles (2001) is led to use data on the distribution of personal expenditure, for which data are available for a reasonable number of thirty countries (where Portugal is the only industrialised country). The econometric results obtained when the expenditure data are used reveal that there is a significant negative correlation between inequality and growth but only at a 10 % level.

To sum up, first, the cross-section reduced form estimates therefore suggest a strong negative impact of initial inequality of income and wealth on long-run growth. But, because of the three main above-mentioned insufficiencies, this direct effect of inequality on growth proves to be rather weak. Second, in accordance with the theory, the negative effect of initial wealth inequality on long term rate of growth is significant and more robust than that of income inequality. Last, the statistical loss of significance of the inequality variable following the introduction of new empirical determinants of growth, may mean quite simply that inequality may affect growth indirectly through various transmission channels suggested by the theory. According to Bourguignon, "one way of checking that a correlation [between inequality and growth] indeed corresponds to the causality link consistent with some theoretical hypothesis is to estimate the structural form corresponding to that hypothesis and make tests on it, rather than to rely on a reduced form which might pick up many different effects at the same time" (Bourguignon, 1996b: 30).

3.1.2 Structural form estimates of the transmission channels

The theoretical arguments presented previously stressed on the negative impact of inequality on investment rates in physical and human capital to explain the inverse relationship between inequality and growth. So the aim of various cross-section structural form estimates (Bourguignon, 1993, 1998; Castelló and Doménech, 2001; Deininger and Squire, 1998; Koo and Dennis, 1999; Mo, 2000; Perotti; 1996; Persson and Tabellini, 1994) is to check whether the initial distribution of income and wealth influences effectively in an indirect way the future growth rate through the accumulation of the production factors. The structural model that makes it possible to test this assumption on the relationship between inequality and growth contains a series of simultaneous equations including the rates of growth and accumulation of physical and human capital as endogenous variables, and some measures of the distribution of income and wealth.

On the whole, the empirical results are very heterogeneous with regard to the effect of inequality on the rate of investment in physical capital. Bourguignon (1993) finds that the variable of income distribution becomes only significant (but only at the threshold level of 10%) when regional specificities are taken into account. Bourguignon (1998a) also shows that income equality has a significant negative effect on the rate of investment in physical capital at the higher level of significance of 5%. On the other hand, the econometric analysis of Persson and Tabellini (1994) reveals that there is a significant positive relationship between income equality and the rate of investment in physical capital but only at the level of 10%. Moreover, the empirical studies carried out by Koo and Dennis (1999) and Mo (2000) found a negative but non-significant link between income inequality and the rate of investment in physical capital. So it seems that a more equal income distribution does not necessarily lead to a faster growth rate through a higher share of investment in GDP.

In addition, Deininger and Squire (1998) and Castelló and Doménech (2001) statistically assessed the influence of the inequality of wealth on the rate of physical capital accumulation. The econometric findings resulting from these two empirical studies are also mixed. Indeed, on the one hand, according to Deininger and Squire (1998), the initial land inequality has a negative but non-significant effect on the share of investment in GDP. On the other hand, Castelló and Doménech (2001) find that the initial inequality of human capital reduced in a rather significant way the rate of investment in physical capital.

The empirical results are much more satisfactory with regard to effect of inequality on the rate of investment in human capital. On the whole, it appears that the initial inequality of income affects negatively the long-term growth rate by reducing the secondary school enrolment rate

(Bourguignon, 1993; Perotti, 1996) or the future stock of human capital (Mo, 2000) significantly. In addition, the econometric results found by Deininger and Squire (1998) and Castelló and Doménech (2001) indicate that the effect of the initial inequality of assets, especially of human capital, on the investment rate in human capital is significantly negative.

These econometric results not only indicate that income inequality does not exclusively affect in an indirect way economic growth rate through the accumulation of production factors but more especially that the distribution of income may also influence the accumulation rate of the physical and human capital and thus growth, through the economic and politico-economic mechanisms considered previously.

i) *The channel of the imperfection of the capital market.* Because the degree of imperfection of the credit market is generally difficult to measure, there are very few empirical works (Perotti (1994, 1996) that attempted to test directly its implications on the relationship between inequality and growth.

Perotti (1994) uses the loan-to-value ratio for home mortgages as a measure of the degree of imperfection in credit markets. Considering the data set assembled by Jappelli and Pagano (1994) and almost exclusively composed by high and upper-middle income countries, Perotti (1994) finds that the measures of income equality and capital market imperfections and the interaction term between the two previous variables have the expected (positive, positive and negative respectively) signs but are only significant at the 10 percent-level of significance. These results indicate first that a higher share in income of the two bottom quintiles of the distribution increases the investment rate in physical capital for a high degree of imperfection of capital market, but this effect tends to decrease as capital market becomes less imperfect. Moreover, these findings reveal that, for a given income distribution, a decreasing level of capital market imperfections leads to a higher rate of investment. However, employing the same database of Jappelli and Pagano (1994) but for only high-income countries, Perotti (1996) shows that the variable of income distribution and the previous interactive term have an insignificant effect on the secondary school enrolment rate. In addition, using an alternative measure of the development of credit markets - the ratio of domestic credit to GDP - taken from De Gregorio (1994) also gave inclusive results.

It is worth underlying here that these rather inconclusive econometric results established by Perotti (1994, 1996) are not very surprising since the various indicators of credit market imperfections used in the empirical literature are crude approximation to the concept of borrowing constraints and the data on credit rationing are mainly available for rich countries where the degree of capital market imperfections is expected to be relatively low.

In addition, several indirect tests of the role of capital market imperfections in the transmission from initial inequality to future growth rate were proposed by some researchers. For instance, according to Deininger and Squire (1998), initial land inequality has a significant and quantitatively important impact on future growth performance in developing countries, in which the capital markets tend to be less developed (less perfect) than in rich countries. Conversely, Perotti (1996) finds that the positive effect of income equality on secondary school enrolment rate in rich economies is markedly higher than in underdeveloped nations. This last finding is consistent with the theoretical argument developed Perotti (1993) according to which a redistribution of income to the poor may lower the growth rate in low-income countries since the extent of liquidity constraints tends to be larger in these countries and there are fixed costs of investment in human capital.

ii) *The approach of endogenous fertility*. The supposition that inequality adversely affects growth by raising the fertility rate is strongly supported by the empirical results. More precisely, Koo and Dennis (1999) Kremer and Chen (2000) and Perotti (1996) examined the first part of this hypothesis that more inequality leads to higher fertility rate. Koo and Dennis (1999) and Perotti (1996) find empirical evidence that income inequality has a positive and very significant impact on the fertility rate net of infant mortality. Kremer and Chen (2000) show that an increase in income inequality is associated with higher fertility differential between the rich and the poor. To explore the second part of this assumption, the negative link from fertility to growth, a fertility variable is introduced in a standard growth regression. The econometric findings reveal that that a rise in net fertility rate (Koo and Dennis, 1999 and Perotti, 1996) or higher differential fertility (de la Croix and Doepke, 2003) has a sizable negative effect on growth. All the previous results suggest that initial inequality lowers future growth by increasing fertility. In addition, considering that fertility and education decisions are interdependent in the approach of endogenous fertility, Perotti (1996) explores the interactions between fertility and investment in human capital. He finds that female secondary enrolment ratio has a significant and negative influence on fertility rate and reciprocally. According to Perotti (1996), it implies that a more equal distribution of income is good for growth by jointly reducing fertility rate and increasing the investment rate in education.

iii) *The argument relating to the domestic market size.* Very few empirical papers (Falkinger and Zweimüller, 1997 and Keefer and Knack, 2000) have been devoted to the impact of income distribution on economic growth rate through the change in domestic demand composition.

First of all, Falkinger and Zweimüller (1997) carried out an original econometric analysis of the relationship between income inequality, product diversity and economic growth. In fact, the authors assess the empirical relevance of two competing assumptions on the effect of inequality on growth.

The first hypothesis – standard in many endogenous growth models - stipulates that if labour productivity increases with the number of products available in the economy, then inequality is expected to affect positively growth since the amount of economic resources allocated to innovation activities rises in response to the growing demand of new goods of relatively rich consumers. The alternative assumption asserts that if the labour productivity is not determined by product diversity but by other factors which are positively related to the level of development, then more income inequality should lead to lower growth rate in so far as the reduction in the purchasing power of the relatively less rich consumers limits the expansion of the production of existing goods. Using a set of 27 observations concerning developed and developing countries, they show that absolute product diversity varies positively and significantly with per capita income, thereby reflecting Engel's law. Moreover, they find that relative product diversity (i.e. the absolute diversity per unity of income) also depends positively and significantly on income inequality. This means that a more unequal distribution of income leads to a comparatively higher demand of new products of richest consumers and then induces the firms to invest in the product innovations. On the other hand, it turns out that the initial absolute diversity of the products does not have a significant effect on the future growth rate of the economy, thus calling into question the standard assumption used in many models of endogenous growth according to which the expansion of the innovation activities boosts the labour productivity and thus the economic growth rate.

Then, according to the "balanced growth" approach, in the developing countries where trade barriers make foreign markets difficult to penetrate, the success of the process of industrialization depends to a great extent on the existence of a huge pool of middle-class consumers that incites the local entrepreneurs to use production technologies with increasing returns to scale. Keefer and Knack (2000) tested this "big push" mechanism by including in the growth rate regressions various measurements of the size of the local market such as the national population, the aggregate GDP and the degree of openness to the foreign trade, which are either taken separately or crossed with the variable of income distribution. The empirical analysis leads to two main results that are unfavorable to the preceding theoretical proposal. First, although the size of the economy (as measured by the aggregate GDP) has a higher impact on growth in the countries with high trade barriers compared to the nations with lower trade barriers, yet the difference is small and especially the size of the domestic market is not a significant determinant of the international differences in growth rate. Second, it appears that income inequality has a higher negative effect on the growth rate in the countries with small domestic markets, but again this effect is weak and not statistically significant.

Finally, plausibly because of the very crude nature of the indicators used to measure the extent of the internal market, the econometric studies mentioned above do not seem to bear out the theoretical

argument which asserts that income distribution acts on the growth rate through its effect on the structure of the domestic demand.

iv) *The approach of endogenous fiscal policy*. The first structural form estimates of Persson and Tabellini (1994) and Perotti (1994, 1996) do not provide empirical support that a more unequal initial distribution of incomes results in greater income redistribution (political mechanism) which, because of its distortionary impact on private investment incentives, affects negatively the long-term growth rate (economic mechanism).

Indeed, these authors estimate a system of two simultaneous equations where a measure of government transfers and the future growth rate or the investment rate in physical capital represent the two dependent variables. In addition to other control variables, an indicator of income inequality is introduced into the equation of public transfers in order to assess the empirical validity of the political mechanism. The government transfers are included among other determinants in the regression of the growth or investment rate to test the empirical relevance of the economic mechanism.

Persson and Tabellini (1994) consider a small sample of thirteen OECD developed countries for which the data on welfare transfers are available. The extent of government redistribution is captured here by the share of current transfers in GDP. They find that the variable of income equality (the income share of the third quintile) has the predicted positive sign but it is not statistically significant, thus questioning the statistical pertinence of the political mechanism. Moreover, the variable of social transfers has the expected negative sign but it is also not statistically significant, thus challenging the empirical validity of the economic mechanism.

The cross-country econometric findings of Perotti (1994) concerning the two mechanisms are even inconsistent with the theoretical predictions. On the one hand, a higher share of the third quintile (taken as a proxy for the income of median agent compared to the average) leads to higher fraction of government transfers in GDP and this effect is even stronger in democratic nations. On the other hand, the welfare transfers have a positive and significant impact on the investment in physical capital.

In the empirical analysis carried out by Perotti (1996), the data reject the hypothesis that income equality is associated negatively with the marginal tax rate when the income share of the middle class is only taken into account or is crossed with the democracy dummy variable. And even when the sample is restricted to democratic nations, the preceding interactive term remains statistically not significant in the equation of the marginal tax rate. Moreover, in spite of the use of other several measurements of public redistribution (government expenditures on social security and welfare, health, housing and education expressed as a percentage of GDP), the political mechanism is

statistically borne out only in the case of the expenditures of social security and welfare. Regarding the economic mechanism, Perotti (1996) notes that, contrary to the theory, not only the marginal tax rate but also the various welfare expenditures (except for the public education expenditures) are positively and very significantly linked to the long-term growth rate of the economy.

On the whole, it appears that the empirical findings are not in concordance with those expected by the approach of endogenous fiscal policy. According to Milanovic (1999), these non-convincing econometric results are mainly due to the fact that the methodological approach employed by the authors quoted above is doubly incorrect since the two important exogenous and endogenous variables used in their empirical work are badly specified. Indeed, on the one hand, the exogenous variable generally selected corresponds to the inequality of disposable incomes, i.e. the inequality after taxes and transfers. However, the citizens' voting decisions on redistribution are based on their pre-tax incomes. Hence the methodologically correct approach consists in linking the choices of the voters concerning the desired extent of redistribution to the distribution of market or factor incomes. On the other hand, the endogenous variable (the share of government transfers in GDP) is an imperfect indicator of the extent of redistribution. In fact, it is not so much the size of this type of public transfers that matters here but rather the degree of progressiveness of taxes and transfers. After all, small-scale public welfare expenditures may be very redistributive or alternatively large-scale social transfers may have a lower redistributive impact.

As a consequence, according to Milanovic (1999), a methodologically correct approach requires to observe how the distribution of income changes when one moves from the market-determined incomes to disposable incomes including taxes and transfers. Using the Luxembourg Income Survey data base, Milanovic (1999) aims at testing two main assumptions relating the political mechanism.

A first series of cross-section regressions aims at checking the empirical relevance of the assumption that the extent of redistribution, as measured by the share gain of poor and very poor people in disposable income following the government-induced redistribution, is linked either positively to the initial level of inequality in the factor income distribution or negatively with the initial shares in market incomes. The data strongly supports this first hypothesis that countries with more unequal distribution of market income distribution tends to redistribute more in favour poor and very poor households.

Milanovic (1999) argues that it is simply an empirical finding and the next step is to find the exact mechanism whereby this redistributive effect takes place. The median voter hypothesis provides one possible economic explanation of this phenomenon. Testing a weaker formulation of the median voter hypothesis, namely that lower factor income share of the middle class (the fifth and sixth deciles of the population) or higher factor income mean-to-median ratio is associated with

their grater share gain in disposable income, the author finds that this second assumption is statistically confirmed as long as pensions are included among government cash transfers. On the other hand, since the pensions are excluded from this type of welfare transfers, the median voter hypothesis no longer holds. This implies that the redistributive gain or loss of the middle class is independent from the initial distribution of factor incomes. In other words, the data rejects the median voter hypothesis when one focuses on the really redistributive government transfers (i.e. non-pension cash transfers, such as unemployment benefits, social assistance and family allowance) the middle class benefits relatively little in relation to lower income groups. Thus Milanovic (1999) concludes that it is necessary to define a completely different political mechanism to explain the positive relationship previously observed between initial inequality in factor income and redistribution.

v) *The channel of political instability*. Several empirical studies (Alesina and Perotti, 1996 and Perotti (1994, 1996) showed that political instability is the channel through which income inequality influences negatively economic growth. These two researchers considered a structural model comprising two simultaneous equations where the two endogenous variables are a measurement of political instability and the growth rate or the investment rate. In fact, political instability can be defined in two distinct ways. The first approach focuses on the instability of the executive power measured by the propensity to observe constitutional or unconstitutional government changes. The second approach emphasizes on violent or non-violent phenomena of social disturbances, including those which do not lead to constitutional government changes, such political assassinations, mass demonstrations, political strikes and coups d'Etat.

Alesina and Perotti (1996) and Perotti (1994, 1996) adopt the second definition of political instability in their econometric work. The index of political instability is constructed by applying the method of principal components to the following indicators of social dissatisfaction and political violence: number of political assassinations, number of people killed in conjunction with phenomena of domestic mass violence, number of successful and unsuccessful coups and a dummy variable for democracy. Using the same sample of 71 data for the period 1960-1985, the various papers of these two economists leads to very similar econometric findings: the relevant variables (the index of income inequality in the equation of socio-political instability and a measurement of the latter in the regression of the growth or investment rate) have the expected negative signs and are significant at conventional levels. This indicates that an improvement in the distribution of income (higher income share of the middle class) reduces the degree of social and political instability, causing an increase in the growth or investment rate. Moreover, Alesina and Perotti (1996) and Perotti (1996) point out that these empirical results are robust to the use of various

econometric specifications of the structural model.

So according to these authors, a greater income inequality reduces the future rate of economic growth by generating a more unstable social and political environment and thus unfavourable to the accumulation of physical capital. However, Knack and Keefer (2000) and Svensson (1998) stress that the preceding empirical studies neglect a potentially important channel through which income distribution may have also an impact on growth, namely the quality of property rights.

Svensson (1998) especially underlines that the mechanism linking negatively political instability to the investment rate has not been clearly defined by Alesina and Perotti (1996) and Perotti (1994, 1996). Using a series of cross-country regressions, Svensson (1998) finds that the negative link between these two variables operates in fact through the quality of property rights defined as the capacity of legal institutions to define, enforce and protect the property rights. Using a sample of 101 data for the period 1960-1985, the empirical investigation of Svensson (1998) leads to three main econometric results: first, political instability (defined as the probability of an imminent government change) has a negative and statistically significant effect on the quality of property rights, while the latter variable have a positive and very significant influence on the (total or private) investment rate. Second, "political" polarization (measured either by an index of income inequality or by an indicator of social dissatisfaction and political violence) affects negatively and quite significantly the quality of property rights. Third, when the indicators of political instability and measurements of political polarization are alternatively introduced, in addition to the index of quality of property rights, in the equation of the ratio of (real) investment, only the last explanatory variable remains statistically significant in all the cases examined. Therefore, it appears that the quality of property rights is the mechanism through which political instability influences negatively the rate of real investment of the economy. In addition, a battery of sensitivity tests reveals that these empirical findings are robust to a variety of potential statistical problems.

Knack and Keefer (2000) challenge the statistical validity of the result found by Alesina and Perotti (1996) and Perotti (1994, 1996) that a rise in the income share of the middle class reduces political instability. Indeed, carrying out the similar econometric regressions and using the sample of "high quality" data on income inequality compiled by Deininger and Squire (1996), Knack and Keefer (2000) stress that the estimated coefficient of the income distribution variable falls strongly and becomes no significant. Moreover, they show that the addition of the index of quality rights in the growth rate equation diminishes substantially the value of the estimated parameters of the measurements of income and land inequality. However, the estimated coefficients of these inequality measurements do not decrease significantly when the indicators of political instability are added into the growth rate regression. This implies that the quality of property rights is a main channel through which social polarization affects negatively economic growth.

Last, parallel to its positive incidence on the phenomena of collective violence, a more unequal income distribution can also generate a noticeable rise in the acts of private violence. Indeed, the results of the econometric study of Bourguignon (1999) provide strong empirical support that greater income inequality produces an increase in the phenomena of private violence, such as homicides and robberies which can be interpreted as (illegal) property transfers from victims to criminals.

In short, among the five main theoretical channels by which the initial inequality of income and wealth affects negatively the long-term growth rate of the economy, **only the approaches of endogenous fertility and political instability finally prove to be borne out by the facts.** Though very interesting, the theoretical arguments relating to credit market imperfections, the size of domestic markets and the government transfers are empirically invalidated.

These overall rather disappointing econometric results thus suggest either that the transmission mechanism really at work are maybe different from those which are mentioned by the theory or that "the data and instruments at hand are simply not sufficient to estimate and test the true structural models of the way the degree of equality of the income distribution affects growth" (Bourguignon, 1996b: 38).

3.2 Disconcerting conclusions resulting from panel-data reduced form estimates

One of the significant limits of cross-section empirical studies is that the negative relationship between inequality and growth may be potentially biased by the omission of variables that are time-invariant and country-specific. By controlling these unobserved characteristics, the panel-data estimate techniques have the main advantage of eliminating any bias resulting from the correlation between these omitted characteristics with the explanatory variables. So, with the recent extension of the temporal dimension of data available on the distribution of income in a higher number of countries, the panel-data estimates in reduced form can tackle now a new relevant issue: how variations in income and wealth inequality at the initial period in a given country systematically affect its growth rate at the next period?

The econometric results found by a first set of papers (Forbes, 2000; Li and Zou (1998) suggest that in the short and medium term, an increase in a country's level of income inequality has a significant positive effect on future economic growth. Using a sample of 180 observations regarding 45 countries and panel-data reduced form regressions, Forbes (2000) shows that an increase in income inequality in a given country has a positive and significant impact on its future short-run (over five years) growth rate. This positive short-run relationship between inequality and growth is

even robust to a large variety of sensitivity tests carried out by Forbes (2000). In the same manner, Li and Zou (1998) find that the direct link between income inequality and growth rate becomes significantly positive in the case of panel-data reduced form estimates using a data set of 217 observations covering 46 countries. This positive effect of initial income inequality on subsequent growth rate is also robust to various sensitivity tests.

It would thus seem, in the light of the results found by Forbes (2000) and Li and Zou (1998), that income inequality affects positively and significantly the short-term growth rate in a given country, which would imply that a redistribution of incomes would have a negative impact on the future short-run growth rate of this economy. Moreover, the completely opposite conclusions that arise from cross-section studies (a negative effect of income inequality on the long-run growth rate over periods of 25 to 30 years in general) and from panel-data estimates (a positive impact of income inequality on the short-term growth rate usually over periods of 5 to 10 years) reveal that the short- and long-run empirical links between these two variables operate through very different transmission channels and are of opposite signs, and maybe that the positive short-term consequences of income inequality on growth tend to soften and finally reverse over sufficiently long periods. In other words, the panel-data econometric findings indicate above all that "the relationship between inequality and growth is far from resolved, and that further careful reassessment of the sign, direction, and strength of the linkages between these two variables is necessary" (Forbes, 2000: 885).

A second set of articles (Barro, 2000; Banerjee and Duflo, 2000) seriously called in question the results found by Forbes (2000) and Li and Zou (1998). Barro (2000) employs a panel-data random-effect model where the average growth rates over successive periods of ten years (1965-1975, 1975-1985 and 1985-1995) depend among other things on the initial degree of income inequality around the years 1960, 1970 and 1980 respectively. He shows that the short and medium term relationship between inequality and growth is not linear. Indeed, using first a broad panel of countries with different levels of development, Barro (2000) finds that the initial differences in income inequality have no significant relation with future economic growth. According to this author, one possible interpretation of this result is that the various theoretical effects of inequality on growth are almost completely offsetting. Nevertheless, splitting the same sample in two sub-groups of rich and poor countries, he provides evidence that income inequality is bad for growth in poor countries but good for growth in rich nations. In addition, using nonparametric estimate techniques, the empirical results of Banerjee and Duflo (2000) establish that, in line with their simple model of political economy of growth, changes in inequality (in any direction) are associated with lower growth rates.

Finally, Deininger and Olinto (2000) examined the effect of the initial distribution of assets (approximated by the Gini coefficient for land distribution) on the future growth rate in a short and

medium run perspective. First, they find that the initial land inequality reduces significantly the future rate of growth. Second, when the variable of asset inequality is crossed with a measurement of the global stock of human capital drawn from the database of Nehru, Swanson and Dubey (1995), this interactive term turns out to be significantly negative. This indicates that the public policies which aim at increasing the educational level of the population will have a lower impact in the countries where the assets are unequally distributed. Last, the introduction of the variable of income inequality among the explanatory factors of the growth rate does not modify substantially the preceding results: the indicator of land distribution remains statistically significant and negative whereas the measurement of income inequality is significantly positive in almost all the cases considered. According to Deininger and Olinto (2000), this suggests that the distributions of incomes and assets affect growth through different transmission channels that it still remains to identify clearly.

To sum up, taken together, these panel-data reduced form estimates do not make easier the understanding of the real nature of the relationship between inequality and growth. Whereas the link between income inequality and growth seems to be rather tenuous and even of opposed sign in comparison with the cross-section reduced form regressions, nevertheless **it appears that initial inequality of assets (and more particularly land inequality) remains a significant and negative determinant of the future growth rate in spite of resorting to new econometric panel-data methods.**

4. Conclusion

The following conclusions can be drawn from this survey of the theoretical and empirical literature regarding the effects of initial inequality on future growth.

On the theoretical side, the main point that arises from the new literature on the relationship between inequality and growth is that a less unequal initial distribution of income and wealth can be associated with faster long-term growth. However, this does not mean that a progressive redistribution of income and wealth therefore increases necessarily the future growth rate of the economy. Indeed, on the one hand, a progressive redistribution can support long-run growth for the three following reasons: first, by relaxing the liquidity constraints, it permits the poor agents to accumulate more and more productive assets (for instance, it enables low-income agents to invest in human capital or for the landless peasants to buy plots of land on credit) and thus to reduce their fertility rate. Second, by raising their purchasing power, it also supports the progressive access of low-income individuals to a larger variety of new goods produced by modern industries. Last, it

reduces finally the social dissatisfaction and the participation of poor agents in illegal and criminal activities. On the other hand, this redistributive measure can also slow down the long-term growth since it reduces the incentives of richer classes to accumulate productive assets and innovate in the production of new goods.

Nevertheless, as Bourguignon (2000) rightly suggests, a wealth redistribution which would be financed through a progressive taxation of incomes of some part of the population (in particular the upper class) and proceeds of which would be intended to support the accumulation of productive assets among the poorest members of the society, should contribute to accelerate both growth and poverty reduction. Under these conditions, the gains (more assets being accumulated by the poorest) should more than compensate the losses (i.e. less assets being accumulated by favoured classes) caused by this redistributive measure. In addition, the feasibility of this progressive redistribution policy supposes that the total wealth of the economy is large enough to prevent that this type of redistribution of the meagre national resources results in a null rate of accumulation of productive assets and thus a non-existent growth in the long run.

On the empirical side, the econometric estimates of the direct and indirect links from initial inequality to future growth led to overall rather mixed results: first of all, the cross-section reduced form regressions show that inequality of wealth (human capital and land) affects significantly and negatively the future growth rate. Asset inequality turns out to be a more robust determinant of growth than income inequality. Then, the findings from cross-section structural form estimates reveal that only the endogenous fertility approach and the explanation based on political instability receive convincing support from the data. Last, initial inequality of assets has a significant and negative effect on the future growth rate in panel data regressions.

According to Bourguignon (1998b), the general inconclusiveness of cross-sectional [and panel data[19]] studies of the relationship between income inequality and growth means that "on the whole, it is probably an exaggeration to consider that redistribution of income and/or productive assets is a panacea for economic growth […] [and] there is no reason to consider that redistribution is systematically inefficient. In other words, redistribution may not be an engine of growth, but, in some circumstances, it may be an adjuvant of it" (Bourguignon, 1998b: 20). More basically, as Bourguignon (2000, 2004) also points out, the appearance of a complementary relationship between wealth equality and growth suggests that if the ultimate goal of development is poverty reduction, then a "redistribution for growth" strategy including asset redistribution policies may be the most efficient for poverty reduction.

Notes

[1] Other surveys of this new theoretical and empirical literature about the link betwen inequality and growth can be found in the papers of Aghion, Caroli and Garcia-Penalosa (1999), Bénabou (1996), Bourguignon (1996b, 1998a, 1998b and 2000) and in the two reference books on this topic published by Atkinson and Bourguignon (2000) and Bertola, Foellmi and Zweimüller (2005).

[2] See Aghion and Bolton (1997) and Piketty (1997a).

[3] Refer to Banerjee and Newman (1993) and Galor and Zeira (1993).

[4] Most of the conclusions of these models are valid whether the liquidity constraints focuse on investment in physical capital or investment in human capital. However, the credit market imperfection is a particularly suitable explanation of the link between inequality and growth when it is a question of long-run investments in human capital, for which it is difficult to commit oneself to refunding in a credible way the granted credits (Piketty, 1997b).

[5] Chiu (1998) brings in the possibility that the agents are also endowed by heterogeneous innate abilities or talents. The initial distribution of talents is thus independent of initial income distribution so that a child that is born into a poor (rich) family may very well have high (low) innate talents or abilities. In a long-run endogenous growth model (in which human capital accumulation is the engine of growth), the author shows that a greater initial income equality leads to a higher future growth rate through an increase in the pace of human capital accumulation of the more talented individuals.

[6] In other words, as Galor and Zeira (1993) and Loury (1981) underline, since one gives up the assumption that each investment project entails a fixed minimal size, in the presence of an imperfect credit market, the initial distribution of wealth only affects individual levels of investment and aggregate output in the short run but it has no effect on the long-term growth rate, since, in this case, the economy converges towards an unique stationary equilibrium, whichever the initial distribution of the endowments across the agents.

[7] In these various models, the degree of imperfection of the capital market is generally assumed to be given once and for all and particularly independent of the level of development. However, it is possible to consider that the importance of the effect of initial wealth distribution on the future rate of investment tends to decrease with the lessening of the imperfection of the capital market. Moreover, if economic development generates an improvement in the performances of financial market, one can consider that this effect of inequality on growth will be more important in poor economies than in rich ones (Barro, 2000).

[8] Nevertheless, the economic efficiency of this progressive redistribution measure of the national income requires that the economy has reached a minimum level of development. Otherwise, i.e. if the economy is characterized by a very low level of national income, this type of redistributive policy may cause long-term stagnation (persistence of the economy in an "underdevelopment trap") by reducing significantly the number of individuals that are rich enough to cover the fixed costs of their investment projects.

[9] For a more exhaustive review of this "household demand" model of fertility, see in particular Birdsall (1988) and Becker and Barro (1988).

[10] For a review of this literature and its extensions, see particularly Alesina and Perotti (1994), Persson and Tabellini (1992) and Verdier (1994, 1999). It is worth mentioning here that the theoretical result found by Alesina and Rodrik (1994) was seriously questioned by Li and Zou (1998). Alesina and Rodrik (1994) found a negative relationship between inequality and growth in a political-economy model of endogenous growth where government spending generates only production services. Considering a more general theoretical framework than Alesina and Rodrik (1994), Li and Zou (1998) show that a more equal income distribution can lead to a higher tax rate and thus lower economic growth when the government expenditure is used entirely for the purpose of public consumption services. In addition, as Li and Zou (1998) underline, in the more realistic case where government expenditure is divided into production services (Alesina and Rodrik, 1994) and public consumption services (Li and Zou, 1998), so the effect of income distribution on economic growth is ambiguous.

[11] See also Putterman, Roemer and Silvestre (1998) and Borck (2007) on this aspect. Putterman, Roemer and Silvestre (1998) put forward six categories of reasons why the median voter theorem provides a too simplified description of the political process in a democracy, so they explain that the inequality of income and wealth tends to persist in the capitalist democracies. Borck (2007) suggests two main arguments to explain why higher inequality through the political process may not lead to increasing redistribution from rich to rich agents. First, the rich may use their political power to avoid paying taxes. Second, it may be that the assumption of a positive link between inequality and redistribution in the traditional political economy approach holds for some transfers, such as cash transfers to the poor, while this is not a suitable hypothesis for certain categories of government transfers, in particular education the upper or middle classes benefit more from. Besides, using a formulation of government budget constraint different from the "traditional" political-economy model of Alesina and Rodrik (1994), Bao and Guo (2004) show that the sign of the relationship between wealth inequality and the optimal tax rate becomes indeterminate.

[12] In fact, high-income individuals can resort to two main types of tax evasion. On the one hand, according to Rodriguez (1999), a greater income inequality, by transferring economic resources from poor towards rich agents, increases the political influence of the rich and thus their capacity to extract fiscal favours from policymakers. This leads to an

increase in the amount of economic resources deviated from productive activities (capital accumulation) into directly unproductive rent-seeking activities, hence a reduction in the future growth rate. The predominantly poor voters perfectly understand the workings of the political process and prefer to set tax rates low enough to control the incentives for rent-seeking and corruption. So inequality is negatively associated with redistribution. On the other hand, Saint Paul and Verdier (1997) presents a model of political economy in which the distribution of political power in society is unequal so that the politically decisive agents have a greater access to world capital markets. Anticipating a rise in the domestic tax rate on capital, they will invest more saving abroad in order to escape the heavier burden of domestic taxation. In addition, as an increase in expected tax rate on capital reduces their tax base relative to the average (because of capital flight), they will actually vote for a higher home tax rate (since their savings are abroad and not subject to the tax), thus slowing down capital accumulation and economic growth in the domestic country.

[13] This interesting remark is drawn from the paper of Bourguignon and Verdier (1997).

[14] However, according to Bourguignon and Verdier (2000d), in the case of an agrarian elite owning land, it will never be incited to promote the education of some poor workers since there is a strong complementarity between land and unskilled labour. In fact, by increasing the number of skilled individuals, education decreases the amount of unskilled workers available for the agricultural activity. This effect pushes up the wage rate of unskilled workers and thus reduces the rent left to landowners.

[15] These three basic criteria for high-quality data are similar to those formulated by Anand and Kanbur (1993) and Fields (1994).

[16] A clear account of these transformations carried out by Deininger and Squire (1996) and Perotti (1996) is provided by Knowles (2001).

[17] Atkinson and Brandolini (2001) and Galbraith and Kum (2003) also emphasized this problem of comparability in the Deininger and Squire (1996) data set due to a combination of heterogeneous measures of inequality into it and argued for using data consistently based on a common definition.

[18] Not mentioned by Knowles (2001), the theoretical argument concerning the size of the local market also rests on a measure of the distribution of the net (disposable) income or the consumer expenditure.

[19] Initially, this interesting interpretation of the econometric results suggested by Bourguignon (1998b) referred to the distribution of both incomes and assets and was based only on cross-section regressions. However, the accumulation of new empirical evidence led him to somewhat revise its final conclusion in two more recent articles (Bourguignon, 2000, 2004).

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