Keskusteluaiheita – Discussion papers

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A MACROECONOMIC PERSPECTIVE

ON EDUCATION AND INEQUALITY

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ABSTRACT: This paper attempts to contrast the traditional view of there being a fundamental trade-off between productive efficiency (and/or growth) and social equality against the current knowledge on these matters as mediated by theoretical and empirical analyses reported in the more recent literature of this particular field. An overall conclusion from the subsequent, yet far from comprehensive, overview is that the relationship between inequality and economic growth, as well as the underlying mechanisms, is still far from being well understood. One thing is certain, though: recent empirical evidence has challenged the traditional views that increasing inequality has a positive impact on economic growth, and that redistribution through education subsidies has a negative effect on growth.

Key words: education, inequality, macroeconomic perspective

JEL: D63, H23, H52, I28

TIIVISTELMÄ: Useiden taloustieteilijöiden sekä politiikan tekijöiden esittämän väitteen mukaan tehokkuutta ja tasa-arvoa ei voida sovittaa yhteen. Taloudellista tehokuutta on katsottu voitavan edistää eriarvoisuutta kasvattamalla. Tämän perinteisen näkemyksen keskeisin perustelu on ajatus, että eriarvoisuuden lisäys kasvattaa koulutuksen yksityisiä sekä yhteiskunnallisia tuottoja, ja lisäksi parantaa yksilöiden halua ponnistella elintasonsa hyväksi. Markkinamekanismiin tukeutumalla voidaan saavuttaa koulutusinvestointien tehokas taso. Tämän näkemyksen mukaan koulutuksen tukeminen tulonjakotarkoituksessa aiheuttaa vääristymiä ja näin ollen haittaa taloudellista tehokkuutta ja kasvua.

Tämä kirjoitus tarkastelee tätä perinteistä näkemystä sen tietämyksen valossa, jota viimeaikainen teoreettinen ja empiirinen tutkimus on aiheesta sanonut. Suppean katsauksen yleisjohtopäätös on, että eriarvoisuuden ja talouskasvun välinen yhteys ei ole suinkaan selvä. Epäselvyyttä on myös taustalla olevista mekanismeista. Yksi asia on kuitenkin kiistaton. Tuore empiirinen todistusaineisto on kyseenalaistanut perinteisen näkemyksen, jonka mukaan eriarvoisuuden lisäyksellä on myönteinen vaikutus talouskasvuun ja että koulutuksen julkisen tuen muodossa tapahtuvat tulonsiirrot haittaavat kasvua.

Avainsanoja: koulutus, tasa-arvoisuus, makrotalous

JEL: D63, H23, H52, I28

1   Introduction

An oft-repeated argument among economists, as well as policy-makers, is that efficiency and equality are incompatible economic phenomena. Increased inequality is stated to enhance economic efficiency, irrespective of whether efficiency is approached from a static or a dynamic angle. A major reasoning behind this traditional view[1] is the contention that widening inequality boosts both private and social returns on educational investment, as well as improves individual incentives to exert effort to attain higher standards of living. In other words, greater reliance on market forces is perceived to provide a more efficient level of investment in education. Accordingly, subsidies to education for redistributive purposes are argued to distort the above tendencies and, thus, to also impede economic efficiency and growth.

This chapter attempts to contrast these arguments against the current knowledge on these matters as mediated by theoretical and empirical analyses reported in the more recent literature of this particular field. An overall conclusion from the subsequent, yet far from comprehensive, overview is that the relationship between inequality and economic growth, as well as the underlying mechanisms, is still far from being well understood. One thing is certain, though: recent empirical evidence has challenged the traditional views that increasing inequality has a positive impact on economic growth, and that redistribution through education subsidies has a negative effect on growth.

2   Aggregate inequality and economic growth

The alleged fundamental trade-off between productive efficiency (and/or growth) and social equality is only poorly documented in the literature. Instead, an overwhelming majority of the empirical evidence reported over the past decade or so points to equality having a positive rather than a negative impact on economic growth across countries. In other words, these studies provide no support for the conventional textbook argument that high or increasing inequality is a necessary condition for more rapid economic growth.

2.1   Some theoretical considerations

The traditional view in economic theory of there being a fundamental trade-off between equity and efficiency has, over the years, been challenged by many new theories attempting to assess the complex relations between inequality and economic growth. This renewed interest in inequality–growth theories is largely driven by the obvious need to reassess the theoretical linkage between equality and subsequent economic growth in order to find convincing explanations for the recent evidence of the relationship being positive rather than negative. These theories have recently been surveyed by e.g. Bénabou (1996), Aghion *et al.* (1999) and Bertola (1999), and are therefore commented on only briefly in this context.

The theoretical models derived over the past decade have several features in common. In contrast to the traditional view of perfect markets, they introduce some particular element of market imperfections, which under certain initial conditions predicts a negative relationship between inequality and growth. Accordingly, these theories address the inequality–growth relationship only partially, that is, from a more or less restricted perspective. Of the several ap-

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[1]   For a discussion of the traditional view that wealth inequality is positively related to investment-driven growth and the justifying arguments, see e.g. Aghion *et al.* (1999). Also see the discussion in Topel (1999). For a recent investigation of policy situations in which equity and efficiency need not trade off against each other, see e.g. Blank (2002).

proaches that can be identified in the inequality–growth literature, three key aspects are worthwhile mentioning here, especially as they link strongly to the assessed effect of investment in education on inequality and growth.[2] These three aspects concern credit market imperfections, the political economy of the welfare state and possible imperfection in the labour market.[3] Moreover, although these theories do establish a negative relationship between inequality and growth, many of them involve counteracting effects, for which reason they predict, in effect, multiple equilibria. In other words, the predicted net impact of reduced inequality on subsequent long-term economic growth is ambiguous and can, in the last resort, be solved only empirically.

Credit market imperfections imply a limited ability to borrow and, thus, limited access to credit. As a consequence, poor households tend to forego investment opportunities also in human capital, although their returns on such investments can be expected to be relatively high.[4] Increased equality through a distortion-free redistribution from rich to poor would, in this situation, enhance economic growth. An offsetting force might arise, however, if the investments require large setup costs in relation to median income in order to achieve and go beyond some critical threshold size. With respect to formal education, analyses of economic growth indicate that secondary education is a far better predictor of economic growth than primary education[5], implying that the country needs to undertake investments beyond primary education. Accordingly, the required redistribution may be so sizable that it hampers overall investment and, as a consequence, generates a negative effect on economic growth.[6]

The political-economy theories build on the idea of majority voting, whereby the degree of redistribution from rich to poor through the political process will depend on the degree of inequality, that is, the relation between the median and the mean income in the economy. More inequality induces more redistribution and more associated tax finance, which creates more economic distortions and, in the end, less growth.[7] Also within this framework, however, offsetting effects may arise through the political process depending on, *inter alia*, the distribution of political versus economic power and lobbying activities. This also implies a fundamental distinction between democracies and non-democracies.

In the presence of imperfections in the labour market, for instance those introduced by centralised collective bargaining or efficiency wages, wage compression may be efficiency and growth enhancing in two ways. Wage compression that reduces wage differentials for similar workers across plants of different productivity may decrease efficiency loss due to misallocation of workers across plants or industries. Furthermore, as argued by Moene and Wallerstein (1997),

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[2]   The same "barriers" are taken to shape both the distribution of incomes and the distribution of education for the simple reason that theoretically the two variables are perfectly correlated (see e.g. Checchi (2000) and the references therein).

[3]   Other approaches having received growing attention in the literature focus on the socioeconomic instability in the society, and the links between demographic factors, especially fertility, and income distribution and growth. See e.g. Perotti (1996) and the references therein.

[4]   For a comprehensive presentation of empirical evidence on private returns to education, see e.g. Psacharopoulos (1994), Card (1999) and Harmon *et al.* (2001).

[5]   See e.g. Barro (1991, 1997, 2000) and Gylfason and Zoega (2003). One potential explanation for secondary education exerting a stronger influence on growth than primary education might be a stronger complementarity between the completed level of formal education and training for secondary, as compared to primary, education (cf. the discussion in Psacharopoulos, 1994).

[6]   In very poor societies, maximisation of investment in human capital might, therefore, require a concentration of the resources to the rich, implying a positive rather than a negative relationship between inequality and growth. See e.g. Perotti (1993) and Aghion and Bolton (1997) for such models.

[7]   As will be discussed below in section 3, the expected impact of education subsidies diverges markedly from that of other redistributive measures.

wage compression through centralised bargaining may fuel the process of creative destruction, by forcing out older, less productive production units and stimulating the entry of new plants.[8]

In a later study, Moene and Wallerstein (2001) show, using a theoretical model of voter behaviour, that higher pre-tax income inequality is associated with more political support for redistributive benefits, but with less support for social insurance based welfare policies, conditional on the distribution of the risk of income loss being held constant. In other words, contrary to the dominant view of majority voting producing a negative relationship between income equality and the demand for welfare spending, Moene and Wallerstein (2001) demonstrate, by combining the redistribute and the insurance view of welfare policy, that increased inequality is associated with less – not more – welfare spending on people having lost their labour market income.[9] Taken together, their work implies that wage compression in the labour market, which may be growth enhancing through the process of creative destruction, can enforce income equality also through a strengthening of the political support for spending on welfare policies targeted at the non-employed, that is, those without earnings.

Apart from these theories attempting to explicitly establish a negative relationship between increased inequality and growth, the past decade has also seen – at least a few – theoretical contributions supporting the traditional view of a positive linkage between inequality and growth (e.g. Grossmann 2003). As remarked by Forbes (2000), who also discusses these contributions at some length, they have received less attention in the literature as the majority of the empirical evidence points to a negative relationship.

All in all, it seems fair to conclude that the various theoretical models derived so far mediate a highly contradictory picture of the relationship between a country's level of inequality and its subsequent rate of economic growth. Indeed, Banerjee and Duflo (2003) state: "…none of the theories give us any confidence that the effect will be properly identified." (p. 281) Moreover, few, if any, of the theories have been subject to rigorous empirical tests.

2.2 Empirical evidence on the relationship between inequality and growth

Next, a selected number of inequality–growth studies are briefly reviewed. The overview focuses on studies having adopted the imperfect credit market or the political-economy (or fiscal policy) framework simply because these two approaches are at the forefront also in the subsequent section dealing with education subsidies. The common point of departure in the reviewed studies is standard reduced-form growth models, where cross-country differences in economic growth are explained by a basic set of variables that are taken to be exogenously given.[10] The technology and institutional frameworks are given once and for all, implying that they are assumed to be independent of the process of development of the economy. Various measures of the distribution of incomes have then been added to these basic regressions.[11]

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[8] It should be noted, though, that in their theoretical model, Moene and Wallerstein (1997) do not consider wage differentials arising from investment in human capital.

[9] Moreover, based on data from eighteen OECD countries over the period 1980 to 1995, Moene and Wallerstein (2001) obtain support for their prediction of countries with a more skewed income distribution spending less on public provision of insurance against income loss.

[10] In this standard "Barro-type" setting, the dependent variable is the average rate of growth of GDP per capita over a specific period. Among the most frequently used independent variables are initial GDP per capita and some proxy of the initial stock of human capital. See Barro (1990, 1991).

[11] For a recent review of cross-sectional inequality–growth studies using cross-country data and OLS techniques, see Bénabou (2000). As noted by Aghion *et al.* (1999), cross-country comparisons of the determinants of growth using standard reduced-form growth models have been criticised for their *ad hoc* specification and the sensitivity of most of the obtained results. Recently, however, Temple (1999) has assessed them to be a powerful tool.

Few attempts have been made to model the underlying mechanisms, that is, to account for the endogenous nature of many of the included explanatory variables – not least education – by estimation of structural models (see further section 4). As will become evident, the empirical literature continues to report highly contradictory results on the relation between inequality and economic growth.

❏ Alesina and Rodrik (1994) derive a political-economy model of long-run endogenous growth[12], in which conflict over distribution is predicted to be harmful for economic growth. They obtain strong support for their hypothesis that income and wealth inequality are inversely related to subsequent economic growth. Their empirical evidence stands out more strongly for what they call their "high-quality sample" of 29 OECD and 17 developing countries than for an extended sample including 24 additional developing countries, and more strongly for the 1970 to 1985 than for the 1960 to 1985 period.

❏ Persson and Tabellini (1994) utilise a theoretical framework similar to that of Alesina and Rodrik (1994) in the sense that also their point of departure is the negative effect on growth of high levels of inequality as caused by the government's inclination to reduce serious conflict over distributional issues by levying higher taxes. Put differently, the negative correlation between initial inequality and long-term growth is seen to arise from high levels of governmental economic intervention provoked by inequality. They obtain support for their theoretical predictions derived from a simplified overlapping generations model by use of cross-country growth regressions based on data for 56 countries over the period 1960 to 1985. Their results are further confirmed by a historical panel data covering nine countries: Austria, Denmark, Finland, Germany, the Netherlands, Norway, Sweden, the UK and the USA.

❏ Clarke (1995) analyses a broad number of developed and developing countries[13] over the period 1970 to 1988, and reports a negative correlation between initial inequality and long-term growth. Moreover, he shows that this finding is robust across different inequality measures, as well as different specifications of the estimated growth model. More specifically, the negative correlation between inequality and growth stands up against scrutiny with respect to tests concerning problems potentially biasing the results, such as measurement error, endogeneity and reverse causation. This robustness makes the inequality measures differ substantially from most other variables included in growth regressions (*cf.* Levine and Renelt 1992; Lindauer and Pritchett 2002). However, as also stressed by Clarke (1995), a robust partial correlation between income inequality and growth does not determine the actual direction of causality, nor does it tell about the impact of specific income distribution policies.

❏ Perotti (1996) investigates the relationship between income distribution and growth, with special reference to democratic institutions, based on a data set covering, at most, 67 countries over the period 1960 to 1985. Particular emphasis is paid to two specific aspects. First, concerning the robustness of the obtained positive relationship between equality and growth, he concludes that "…it does not appear to be unduly influenced by outliers or heteroscedasticity." (p. 164). Second, concerning the specific channels through which the prevailing income distribution affects growth, he finds some support for the capital market imperfections explanation, but none for the political econ-

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[12] Key references in relation to endogenous economic growth are Romer (1986), Lucas (1988), Barro (1990) and Barro and Sala-i-Martin (1992a). A comprehensive overview of endogenous growth models can be found in e.g. Barro and Sala-i-Martin (1995), Aghion and Howitt (1998), Durlauf and Quah (1999) and Topel (1999).

[13] The total number of observations varied between 56 and 81 countries depending on the estimated model specification.

omy explanation. The strongest support he obtains for explanations related to socio-political instability and joint education–fertility decisions.

❑ Deininger and Squire (1998) obtain a significantly negative effect of initial inequality on long-term growth when estimating a simple cross-country growth model from longitudinal data for 55 to 87 countries over the period 1960 – 1992. They, however, note that income inequality is not a robust determinant of future growth, while inequality of assets (proxied by the distribution of land) stays negatively associated with growth also when adding other variables to the growth equation.

❑ Barro (2000) extends his empirical framework for the determinants of economic growth, derived from the neoclassical growth model (Barro 1991, 1997), to include income inequality, and finds a weak negative, if any[14], overall relation between inequality and economic growth based on a panel of about 100 countries over the years 1965 to 1995.

❑ In contrast to previous findings, Li and Zou (1998) find, using fixed effects estimation techniques, income inequality to be positively related to economic growth based on a panel of 46 countries over the period 1947 to 1994. Moreover, for most of the time the significance of the positive relationship between income inequality and subsequent growth obtained passes the undertaken sensitivity test. They propose a theoretical explanation based on a political-economy model.

❑ Similar results are reported by Forbes (2000), who states that "in the short and medium term, an increase in a country's level of income inequality has a significant positive relationship with subsequent economic growth." (p. 869). She addresses the much discussed econometric problems of measurement error and omitted-variable bias by using improved data on income inequality and panel techniques for a sample of 45 countries over the period 1966 to 1995, averaged over five-year periods. Based on a model almost identical to that of Perotti (1996), she concludes that the positive relationship between inequality and growth is highly robust across samples, variable definitions and model specifications.[15] Forbes (2000), however, also underscores that since her results are of a short-term nature, they do not necessarily contradict the long-term negative relationship reported in previous studies, but rather complement these previous findings.

❑ Gylfason and Zoega (2003) estimate an overlapping generations model of education and endogenous growth from their panel data covering 87 industrial and developing countries over the period 1965 to 1998. They report a statistically significant, albeit not very strong, inverse relation between inequality and economic growth.

❑ Banerjee and Duflo (2003) attempt to explain why previous estimates of the relationship between the level of inequality and subsequent growth rates differ so radically from each other. In particular, their use of non-parametric methods on a panel of 45

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[14] The coefficient is roughly zero when the fertility rate is controlled for. The results are obtained by the use of three-stage least squares (3SLS) techniques.

[15] It might be mentioned in this context that an earlier version of Forbes' study, as well the study by Li and Zou (1998), were dismissed by Barro (2000) with the motivation that the evidence referred to measurement-error sensitive fixed-effects estimates based on relatively few observations. Also Aghion *et al.* (1999) present strong critiques of Forbes' study. Banerjee and Duflo (2003), in turn, criticise these two studies on several grounds: "…none of the underlying theories give strong reason to believe that the omitted variable problem can be solved by including a country fixed effect in a linear specification…" (p. 268); "…the striking results obtained by those who have estimated the growth–inequality relationship with fixed effects arise from giving a … misleading interpretation…" (p. 290); "…the conclusions of Forbes (2000) and Li and Zou (1998) are not warranted: There is no evidence in the data that increases in inequality are good fro growth. In fact, the bulk of the evidence goes in the opposite direction." (p. 293)

countries reveals that the growth rate is, in effect, an inverted U-shaped function of net changes in inequality. More precisely, changes in inequality – in whatever direction – are associated with reduced growth in the next period, and the larger the changes, the larger the decline in growth. The initial level of inequality enters with a statistically insignificant coefficient in the short term, and does not affect the strong association between changes in inequality and growth. Banerjee and Duflo (2003) argue that the very different conclusions drawn from the basic linear model are explained by the omission of these non-linearities in the inequality–growth relationship, and not by differences in the control variables, the samples and the lag structures. When it comes to causality, however, they see the interpretation of any of the evidence – theirs as well as previous – causally to run into difficult identification problems not yet solved satisfactorily in the literature. Answering the fundamental question of whether or not inequality harms growth will, they conclude, require evidence from micro data.

A common feature of the above empirical studies is that they use data on the performance of a broad group of countries at vastly different levels of economic development. Generally speaking, the cross-country findings imply that countries with initially lower levels of inequality have tended to grow faster in the long run. The policy implication of this outcome has then been that long-term economic growth can be improved by use of policies aimed at reduced inequality. It may, however, be questioned how relevant these world-wide findings are for the richer countries as a group and, in particular, for single industrialised countries and especially for those with already quite equitably distributed incomes and wealth, such as the Nordic countries. As the following brief presentation will indicate, there is not much evidence available to shed light on these questions and, when available, it mediates a highly contradictory and scattered picture.

- ❑ Perotti (1996) concludes that the positive association between equality and growth originates strongly from intercontinental variation. He finds it to be much weaker, and statistically insignificant, for poor countries, and to show up more strongly for democracies than for non-democracies, although this latter effect does not appear to be very robust. He concludes by emphasising that since most democracies are rich countries, a distinction between the income effect and the democracy effect in the equality–growth relationship is virtually impossible.

- ❑ Alesina and Rodrik (1994) and Clarke (1995) obtain no support for the hypothesis of the relationship between equality and long-term growth being different in democracies and non-democracies. Persson and Tabellini (1994), in contrast, find the inverse relationship between inequality and growth to hold for democracies only, a finding that lends strong support for the endogenous fiscal policy argument in the political-economy model. This discrepancy in results Alesina and Rodrik (1994) argue to be due mainly to differences in the inequality measures used in their study compared to the Persson–Tabellini study.

- ❑ Deininger and Squire (1998) find initial inequality to affect future growth in undemocratic countries only. If only OECD or high-income countries are considered, inequality turns insignificant. This finding is interpreted as lending support for the credit-market hypothesis rather than the political-economy hypothesis.

- ❑ When dividing his country panel into poor and richer countries, also Barro (2000) obtains a positive association between increased equality and growth for the poor countries only. For the richer countries, on the other hand, he gets support for the prevalence of a trade-off situation; that is, for higher inequality having a tendency to encourage rather than retard economic growth. He suggests, as a possible interpretation of these results, that credit market constraints are so much more serious in poorer countries that the relationship between inequality and growth turns negative.

❑ Forbes (2000), in turn, obtains a significantly positive effect of inequality on growth for both poorer and richer countries. Moreover, Forbes (2000) is one of the few studies having used panel data and techniques and, consequently, having been able to shed light on the within-country – as opposed to the cross-country – relationship between inequality and growth. Her preferred estimate of 0.0013, however, indicates that even a 1.3 per cent increase in average annual growth over the subsequent five years would require a ten-point increase in a country's Gini coefficient, an increase of such a magnitude that she finds it unlikely to occur in a short period of time.

❑ When plotting World Bank data on the annual rate of growth of GNP per capita from 1965 to 1998 against data on the inequality of income or consumption as measured by the Gini coefficient, Gylfason and Zoega (2003) report (but do not show) that a similar pattern of a positive association between equality and growth emerges for poor as well as rich countries. Based on their estimation results they note that changes in the distribution of incomes exert a stronger influence on economic growth in rich than in poor countries, but they do not elaborate on this finding.

❑ An alternative to splitting the country sample is to supplement the whole-sample growth model with continental dummy variables (e.g. for Africa, Central and South America and Asia). In doing so, Gylfason and Zoega (2003) obtain no marked change in their overall pattern of growth–equality findings, a conclusion in line with that drawn by Clarke (1995) and Perotti (1996). Deininger and Squire (1998), in contrast, find their significantly negative effect of initial income inequality on long-term growth to turn insignificant when they add regional variables to their cross-country growth model. A similar change in the significance level of the effect of inequality on growth is also reported by, for instance, Alesina and Perotti (1993), Persson and Tabellini (1994) and Birdsall *et al.* (1995). The fact that the negative effect of inequality on growth tends to become insignificant when including regional dummy variables has been interpreted by Forbes (2000) as an indication of an omitted-variable bias problem; that is, the inequality effect actually reflects the impact of omitted variables instead of a direct influence of inequality on growth.

A final aspect that deserves attention in this context is that redistribution-fostered economic growth will hardly leave inequality unchanged. The early literature on the effect of the process of economic development on income inequality was dominated by the so-called Kuznets hypothesis, named after Simon Kuznets (1955, 1963, 1973). More specifically, the Kuznets curve describes the relationship between income inequality and GDP per capita growth as an inverted-U, where inequality first rises and later falls as the economy develops. The cross-country differences in the observed changes in income distributions are, in other words, explained by the fact that the countries are at different stages on their path of economic development. For the developed countries, this inverted U-shaped relation would imply that lower inequality fosters growth, which reduces inequality further. Indeed, this hypothesis seemed to well describe the experience in most OECD countries, including the USA, up to the 1970s.

In line with increasing inequality in the industrialised world over the past few decades, especially in the UK and the USA, most research un-dertaken in the 1990s pointed to a weakening over time in the relevance of – and consequently also the interest in – the Kuznets curve.[16] Barro (2000), in contrast, reports, based on his large country panel, that the Kuznets curve

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[16] Deininger and Squire (1998), for instance, obtain no support for the Kuznets curve from their sample of countries or for the individual countries covered by their data (with the exception of five developing countries). For most countries, the association between the level of income and its distribution is statistically insignificant, and for a few countries (the UK and the USA, among others) it even turns out to be U-shaped instead of revealing an inverted-U shape.

shows up as a clear empirical regularity across countries also in the 1990s, although it can explain little of the variation in inequality across countries or over time.[17] The weak fit of the Kuznets curve he argues to be due to cross-country differences in the adoption of new technologies. Empirical evidence in support of the Kuznets curve is also obtained by Gylfason and Zoega (2003) based on their 87-country panel data.

In this context, it may finally be noted that Aghion *et al.* (1999) state that the recent empirical evidence on the impact of growth on inequality reveals that new theories are needed to properly understand the feedback effect from growth to inequality. The critical question then is whether this feedback ultimately creates a virtuous circle, as indicated by the Kuznets curve, or whether it generates a vicious circle of increasing inequality and, thus, growing redistributive pressures. In particular, they focus their analysis on the way that the growth-fostering phenomena of trade liberalisation, skill-biased technical change and new organisational forms may affect inequality, with the emphasis being on exploring under which circumstances these three factors may account for the absence of a virtuous circle between growth and inequality. In doing so, Aghion *et al.* (1999), however, concentrate on wage inequality instead of income inequality in order to be able to abstract from, *inter alia*, redistributive policies.

3 Aggregate inequality and subsidisation of education

The overwhelmingly positive and statistically significant, although typically not very strong, association between initial income equality and long-term average per capita growth rates documented in a fairly broad number of cross-country studies covering the period from around the mid-60s up to recent years has inspired a search for potential explanations for this lack of clear-cut support for the conventional trade-off argument. Apart from the possibility of there being a direct link between initial inequality and subsequent economic growth, the literature refers to a multitude of specific channels – mainly political but occasionally also non-political ones – through which inequality might influence growth. One of the strongest candidates among these is the argument that the distribution of income and wealth influences investment in education, which in turn affects long-term growth. This, in turn, raises the question to what extent education subsidies should be used for redistributive purposes.

Subsidisation of education has, over the years, been justified on several normative grounds. A common feature of these justifications is that they refer, in one way or the other, to equity and redistribution. Below, three main types of arguments are presented and discussed in some more detail: imperfect capital markets, positive externalities and welfare gains.[18]

3.1 Capital market imperfections

One argument in favour of education subsidies relates to the role of capital market imperfections and the detrimental effect of the consequent borrowing constraints on investment in human capital and, in a broader perspective, on growth. Galor and Zeira (1993) derive a model that attributes the persistency in growth differences between economies to differences in human capital, due to credit market imperfections. More specifically, they explore, by use of an equilibrium model of open economies with overlapping generations and inter-generational altruism, the theoretical linkage between credit market imperfections, the initial distribution of

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[17] Similar results are reported also by Deininger and Squire (1998) and De Gregorio and Lee (2002).

[18] Apart from these, justifications stressing equality of educational opportunities and paternalistic aspects have also been put forth. See further e.g. Lott (1987), Cohn and Geske (1990), Trostel (1996) and Aghion *et al.* (1999).

income and wealth and a society's aggregate investment in human capital. They demonstrate that in growth models accounting for liquidity constraints, the income distribution will determine the share of the population that can invest in education, an outcome which is shown to be consistent with the relationship between inequality and growth being positive at low levels of income, but negative otherwise, that is, in richer economies.[19] Moreover, in the presence of indivisibilities – i.e. non-convexities – in investment in human capital, these effects are likely to be carried to the long term as well, since the different levels of investment in human capital feed back into the distribution of income and, gradually, also wealth.[20] If so, economic growth can be encouraged by increased equality through education.

Similar outcomes are reported by Aghion *et al.* (1999), who derive a theoretical model where the effect of inequality on growth is analysed for economies with heterogeneous endowments of wealth or human capital across individuals in combination with imperfect capital markets characterised by moral hazard. They demonstrate that within this context inequality may exert a direct negative influence on growth, and show that reduced inequality, through redistribution to the less endowed, can under such circumstances be growth-enhancing.

But the capital market imperfection rationale has been subject to critiques, as well. Dur and Teulings (2001), for instance, put forth two reasons why the widespread use of education subsidies cannot be fully rationalised by the capital market imperfections argument. Their first reason relies on the fact that recent empirical evidence fails in lending support for the importance of borrowing constraints for educational choices. They thereby refer to work by Cameron and Heckman (1998, 1999), Cameron and Taber (2000), Shea (2000) and Keane and Wolpin (2001). On the whole, recent evidence instead attributes a major role for educational outcomes to the social background, that is, to the family and the neighbourhood in which the individual has grown up. However, the social background is inevitably linked with capital market imperfections, for which reason both effects are likely to influence educational choices and, thus, the inequality–growth relationship. So far, this outcome has been shown only theoretically, though.[21]

What the empirical research can shed some scattered but highly contradictory light on is the likely impact of inequality on educational attainment. Based on their cross-country data, Deininger and Squire (1998) report a significantly negative impact of inequality on attainment of schooling in the population. Moreover, introduction of continental dummy variables does not eliminate the significance of the inequality coefficient. Checchi (1999) finds that, when controlling for the degree of development, his 102-country panel data extending from 1960 to 1990 suggest that financial constraints (measured by income inequality) are relevant mainly in limiting enrolment rates at the secondary level. Moreover, female participation in education is more strongly conditioned on family wealth, and this concerns all levels of education. Barro (2000), in contrast, while referring to the impact of credit market constraints, reports his country panel data provides no support for income inequality to exert a significant influence on the average years of school attainment at the secondary and higher levels of adult males.

The second reason pointed to by Dur and Teulings (2001) relates to the fact that government subsidies to education are generally much more comprehensive in character than the mere attainment of equality of opportunity would require. A similar line of reasoning is used by Trostel (1996), who argues that the borrowing constraint problem should be solved by the

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[19] This result is repeated in a recent paper by Galor and Moav (2004) based on an approach combining the credit-market imperfections view with the classical view.

[20] Piketty (1997) derives similar predictions but without relying on the assumption of there being a fixed-size investment technology (technological non-convexities).

[21] See e.g. Bénabou (1996), Durlauf (1996) and Fersthman *et al.* (1996). *Cf.* Grossmann (2003).

use of government-supported loans instead of subsidies, as the latter "…lower the private cost of education and redistribute income to all publicly educated students,…" (p. 4). The argument that loans rather than subsidies are the most direct way of addressing borrowing constraints is also repeated by Bovenberg and Jacobs (2001). Similar lines of reasoning in relation to liquidity constraints are expressed by de la Fuente (2003) in his concluding remarks: "Hence, policies specifically targeted at these problems should be more effective in raising upper-level enrolments than further decreases in already low tuition charges that imply a large subsidy for relatively privileged groups. Indeed, higher tuition fees, coupled with a well designed loan programme and with an increase in means-tested grants, may be an efficient way to provide additional resources to increase the quantity and quality of post-secondary education while at the same time reducing the regressivity of its financing, ensuring equal access to opportunities regardless of socioeconomic background, and improving student motivation to take full advantage of educational opportunities." (p. 49)

3.2   Positive externalities

Spillover benefits from human capital accumulation have been stressed by, *inter alia*, Lucas (1988), Tamura (1991), Barro and Sala-i-Martin (1995) and Aghion and Howitt (1998). The basic hypothesis of endogenous growth models of any investment, including those in human capital, giving rise to positive external effects extending to subsequent generations[22] is the common feature also of a number of studies where the initial income distribution is shown to affect the equilibrium level of investment in human capital and, ultimately, economic growth.[23]

If the acquisition of education generates spillover benefits, then individuals will typically invest in amounts of education, and especially of higher education, that are too low from a social point-of-view. Education subsidies can encourage students to invest amounts closer to the social optimum, and thereby help internalising the externality. The empirical evidence for the existence of positive externalities is, however, still rather weak and increasingly contradictory (e.g. Acemoglu and Angrist 1999; Topel 1999; Krueger and Lindahl 1999, 2001; Bils and Klenow 2000; Bassanini and Scarpetta 2001; de la Fuente and Doménech 2002; Moretti 2002; de la Fuente 2003; Teulings and Van Rens 2002, 2003). Moreover, it has been questioned whether these perceived positive external effects are of such a magnitude that they can warrant as large subsidies as are actually observed (e.g. Trostel 1996).

3.3   Welfare gains

In the absence of capital market imperfections and externalities, market forces are taken to drive the economy towards an optimal level of investment in education and subsidisation of such activities would only create distortions, not least in the distribution of income. Indeed, as education subsidies are likely to favour high ability people[24], the redistribution would favour higher income people and, thus, increase rather than decrease inequality.

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[22]   Alternative models to these political-economy-type approaches have also been used in the growth literature. Benhabib and Rustichini (1996), for instance, develop a game-theoretic model for analysing the relationship between the level of wealth, income distribution and growth based on the idea that individuals can appropriate society's resources to their own benefit.

[23]   For a comprehensive review of the literature, see Bénabou (1996). For more recent research, see e.g. Bénabou (2002), De Gregorio and Lee (2002) and Gylfason and Zoega (2003).

[24]   A seminal contribution to the by now huge literature on the ability bias in the return on educational investment is the study by Angrist and Krueger (1991).

Recent research has, however, demonstrated that this perspective overlooks the fact that income taxation discourages investments in human capital.[25] Trostel (1996) shows that education subsidies can correct for these distortions and, consequently, may be welfare improving. His calculations indicate that subsidising education is efficient up to a fairly high rate, that these results are not dependent on how the subsidies are financed, and that the consequent welfare effects are quite large. While the welfare effects are calculated for an economy with no imperfections except for a proportional income tax and a tuition subsidy, Trostel (1996) concludes by noting that the welfare gains and/or optimal subsidy rates are likely to be even larger in the presence of market imperfections, growth enhancing externalities, or a progressive income tax.

Bovenberg and Jacobs (2001), in turn, analyse to what extent education subsidies can help remove the distortions in human capital accumulation induced by redistributive policies in the form of progressive income taxation.[26] They conclude by investigating to what extent their model can explain the present level of education subsidies to higher education in eight OECD countries: Canada, Denmark, Finland, Germany, Italy, the Netherlands and the USA. Broadly speaking, their findings indicate that the calculated optimal levels of education subsidies are quite close to the actually observed ones, implying that a large part of the actual subsidies to higher education can be justified on efficiency grounds.

Dur and Teulings (2001) build their analysis on the theoretical work of Alesina and Rodrik (1994) and Persson and Tabellini (1994) briefly referred to above. As noted earlier, the main point of departure in their political-economy models is that a dispersed pre-tax distribution of income increases the political support for governmental intervention in the form of higher marginal tax rates[27], which tend to reduce incentives and, consequently, also growth. Accordingly, in order to enhance growth within such a framework, policies should be directed at achieving a flatter pre-tax income distribution. Dur and Teulings (2001) derive a general equilibrium model suggesting that subsidies to education may serve this goal, their rationale being that differences in inequality might be driven by the level of human capital, rather than by marginal taxes. They argue that their hypothesis is consistent with the fact that "the wide differences in inequality in disposable income between both sides of the Atlantic are largely driven by differences in the dispersion of pre-tax income" (p. 5).

Finally, it is noteworthy that in line with Trostel (1996) and Bovenberg and Jacobs (2001), also Dur and Teulings (2001) abstract from capital market imperfections and positive external effects. Just like Bovenberg and Jacobs (2001) they also account for the progressivity of the income tax schedule, but take workers to be imperfect rather than perfect substitutes in production. Accordingly, in the Dur–Teulings model, education subsidies not only correct tax distortions arising from redistributive policies, but also generate positive distributional effects by compressing the wages of skilled and unskilled labour through an increase in the relative supply of skilled workers.

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[25] Apart from the research briefly presented below, also the contributions by, for example, Lommerud (1989) and Van Ewijk and Tang (2000) may be mentioned in this context. In both papers, the government resorts to education subsidies in order to avoid distorting human capital accumulation. In Lommerud (1989), this need arises from the government's taxation of labour income in an attempt to internalise the negative externalities from status seeking. In Van Ewijk and Tang (2000), it is caused by the government's use of progressive taxes in order to punish wage demands of unions and to stimulate employment.

[26] Alstadsaeter (2003) analyses, by use of a simple partial model, whether or not a progressive tax system might introduce distortions also in an individual's choice of educational type (and not only in his choice of educational level – a by now well-studied field of research), inducing him to choose more of the educational type with a higher consumption value. Empirical evidence for Norway lends support to these predictions. As noted by the author, a next step would be to introduce the impact of educational subsidies in the form of tuition fees.

[27] Empirical evidence in support of such political pressure being present in democracies has recently been provided by Milanovic (2000).

All in all, the theoretical work on the welfare improving redistributive effects of education subsidies briefly reviewed above seeks to find an optimal income distribution policy mix to entail the trade-off between two distortions working in opposite directions: the over-investment tendency induced by education subsidies and the disincentive effect of income taxation on human capital accumulation. One challenge facing this field of research is that the optimal level of subsidies to education from a redistributive point-of-view is not easily determined, but the joint outcome of the various effects that investments in human capital exert on the distribution of income. In their theoretical model, Dur and Teulings (2001), for instance, account for three key parameters measuring such effects: the degree of substitutability between skill types in production, the price elasticity of educational attainment, and the degree of complementarity between education and ability in skill formation. The direct effect works through the complementarity between education and ability and tends to raise inequality. The two indirect general equilibrium effects, in contrast, work in the opposite direction; they contribute to redistribution by raising the human capital of the workforce, which will flatten relative wages due to declining returns to education. Indeed, it is this finding of powerful externality effects on the pre-tax distribution of income that make Dur and Teulings (2001) argue in favour of the use of education subsidies as a redistributive policy tool, and not the relative weight of the two opposite effects. The relative importance of the direct (income) effect versus the indirect (substitution) effect remains, in effect, an open question in their analysis because of the limited availability of empirical evidence on the absolute magnitude of the three parameters in question.

4   Education and aggregate inequality

A recent OECD report (2001a) concludes that "economic inequality goes hand in hand with inequality in educational access and adult literacy" (p. 26). This statement captures a major reason why public spending on education is seen as a highly effective tool for reducing and combating income inequality. Simultaneously, however, a contemporary OECD study (2001b) emphasises that those from socially disadvantaged backgrounds may not always have benefited from the expansion in tertiary education. This, in turn, shows that the provision of educational opportunities is not necessarily a sufficient tool.

These contentions serve well to highlight how intimately connected education and equality are at the individual as well as the whole-economy level. Moreover, the causality between education and inequality runs both ways. Income and wealth inequality determines the investment in and, hence, the accumulation of human capital and, in the last resort, long-term productivity and growth. This process can be affected through subsidisation of education, as discussed in the previous section. Despite a growing theoretical literature, the empirical evidence on the importance and effectiveness of educational subsidies is still scarce and partial, though.

Simultaneously, an expansion of education feeds back on income inequality in at least two ways, since the distribution of incomes is determined both by the level and the distribution of education across the population. Moreover, the predictions derived from the theoretical literature are highly ambiguous concerning the relation between educational expansion and aggregate inequality.

First, educational accumulation influences the distribution of education across the population. According to development economics, this effect will either increase or decrease income inequality depending on where in the educational distribution the incremental investment occurs.[28] In a developing country with a low-educated population, an increase in the relative size of those

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[28]   See e.g. Knight and Sabot (1983) and Topel (1999).

with more education may initially raise income inequality, but subsequently lower it as the economy develops. A "composition" effect evolving in this way is also consistent with the Kuznets curve discussed above.[29] The human capital model, in contrast, predicts an unambiguously positive association between educational and income inequality.[30]

Second, educational accumulation affects the average educational attainment level. Here, the human capital model provides an ambiguous answer in that, for a given distribution of education, the effect of increased average education on income inequality may be either positive or negative, depending on the evolution of educational returns. The development literature, on the other hand, is dominated by the "wage compression" effect, which implies lower income inequality as the rate of return to education is expected to decline with the increase in the relative supply of educated labour. Indeed, and at odds with theoretical predictions of factor price equalisation, empirical evidence does suggest that an increase in the average educational level will change the relative proportions of differently educated labour and, thus, their relative wages. In particular, a rise in the relative share of the more educated will cause a fall in their relative price due to declining rates of return on higher education and, as a consequence, inequality will diminish. Put differently, the rate of return on additional investments in education declines in the average level of education of the workforce.

There is both country-specific and cross-country evidence in support of the view that an increase in the stock of human capital reduces income dispersion. A standard reference on this issue is Katz and Murphy (1992), who estimate the elasticity of substitution between high- and low-skilled US workers to be 1.4.[31] Barth and Røed (2001) estimate the elasticity of substitution between workers with tertiary and non-tertiary education to be 1.3 based on a panel of 15 European countries. A similar value is obtained by Teulings and Van Rens (2002, 2003) based on panel data on GDP per worker, income dispersion and the average years of education for some 100 countries over the period 1960 to 1995. In particular, they estimate a one-year increase in the average level of education of the workforce to reduce the private rate of return on education by 1.5 percentage points, while the corresponding decline in the social rate of return is estimated to be 4 percentage points.

Considerably less attention has been paid to the question how a change in the relative price of skills will influence further investments in education and, as a consequence, the supply of educated labour. Barth and Røed (2001) estimate from their panel of 15 European countries that there has been an average shift in the relative demand for tertiary education of 5 per cent per year over the period 1980 to 1995. Empirical evidence for Sweden and the USA implies that higher returns do stimulate the demand for education (see Topel 1999). Does this effect work equally effectively also in the opposite direction, with declining returns having a depressing impact on the demand for education and, thus, the supply of educated labour? Or could it be that complementarities between education and technological progress fuel a continuous increase in the supply of educated labour despite of declining returns? Or are these complementarities likely to offset – partly or fully – the downward trend in educational returns caused by improved average educational attainment in combination with imperfect substitutability between lower- and higher-skilled labour, as suggested by, for instance, Teulings and Van Rens

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[29]   Apart from the prevailing distribution of income and wealth, and the development stage of the economy, the concentration in the educational distribution of the additional investment is affected by a multitude of other factors as well, not least by the structure and financing of the educational system. The current state of knowledge on these matters is still scarce and scattered, though.

[30]   See e.g. De Gregorio and Lee (2002).

[31]   Most of the country-specific studies on the sensitivity of the return on education to changes in the average level of education were published in the mid-90s or earlier and only a few of them concern European countries, e.g. Hartog *et al.* (1993) on the Netherlands, Edin and Holmlund (1995) on Sweden, and Katz *et al.* (1995) on France, Japan, the UK and the USA.

(2002, 2003)? Or are government interventions in the form of increased subsidisation of education called for in order to reverse the negative impact of declining returns on investment in higher education in an attempt to avoid or, at least, mitigate scarcity of a well educated labour force necessary for sustained long-term economic growth?

These are examples of delicate and important questions to which the empirical literature has few answers. Moreover, the available evidence mostly concerns specific issues investigated, at most, for a few single countries and, moreover, typically in isolation from important feedback effects to educational and/or income inequality. This holds even more so for the consequences of the intertwined relationships between education and aggregate equality on economic growth.

A snapshot on the available empirical research based on cross-country data indicates the following. The early evidence on the relationship between education and aggregate inequality has been reviewed by, for instance, Psacharopoulos and Woodhall (1985) and Ram (1989, 1990). A majority of these early studies seems to indicate a positive correlation between educational and income inequality, but a negative correlation between the average level of education and income inequality. In other words, a higher educational level tends to reduce income inequality, while a wider distribution of education across the population is likely to increase income inequality. There are, however, also studies indicating that income inequality is affected neither by the average level of education nor by educational inequality.

Among the more recent cross-country studies focusing on the effects of education on income inequality are Barro (2000), Checchi (2000), De Gregorio and Lee (2002), Gylfason and Zoega (2003) and Teulings and Van Rens (2002, 2003). In his analysis of determinants of inequality based on a large panel of countries, Barro (2000) finds the average years of school attainment at the primary level to be negatively and significantly, those at the secondary level to be negatively but insignificantly, and those at the higher education level to be positively and significantly related to inequality. These education-induced effects remain roughly unchanged also when adding continent dummies (for Sub-Saharan Africa and Latin America) or measures of population heterogeneity (ethnicity, language, religious affiliation). Moreover, they seem to have changed only marginally over time, which Barro (2000) interprets as a result that contradicts sharply with the view that the increases in income and wage inequality in a number of countries, especially in the UK and the USA, over the past few decades are largely caused by skill-biased technological change; that is, by a technological change having favoured the skilled part of the workforce at the expense of the unskilled.[32] It may also be noted that when supplementing the inequality regression with the ratio to GDP of public expenditure on schooling, the variable comes out with a significantly positive coefficient although schooling attainment is already controlled for. Barro (2000) hypothesises that the outlay variable captures a reverse effect from inequality to education-induced income redistribution.

Checchi (2000) analyses the relationship between inequality in incomes and educational achievement (in terms of both average educational attainment and its dispersion) from a country panel data set covering five-year intervals over the period 1960 to 1995. His results lend support to there being a strong negative linkage between average years of education and income inequality. A significantly negative, although weaker, association is found also between educational and income inequality, suggesting a U-shape rather than the theoretically predicted inverse-U shape for the relation between the two variables. Education is estimated to explain between 3 and 16 per cent of the dispersion in incomes, with the relative contribution of education being higher

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[32] A similar conclusion is drawn by Teulings and Van Rens (2002, 2003), while Acemoglu (2002) argues to the contrary. For recent reviews and discussions of this topic, see e.g. Chennels and Van Reenen (1999), Sanders and Ter Weel (2000), OECD (2001b) and Acemoglu (2002). For a discussion and overview of the perceived skilled-bias effects of the ICT- and IT-revolution, see e.g. Soete and Ter Weel (2001).

and, moreover, showing a rising trend in developed countries. The OECD countries stand out in the analysis in the sense that despite improved average educational attainment, inequality in educational achievement has been rising, instead of declining, during the entire period under study. Since 1975, this trend has been accompanied by rising income inequality.

De Gregorio and Lee (2002) investigate the relationship between educational attainment and income distribution from an unbalanced panel data set covering a broad number of countries at five-year intervals from 1960 to 1990. Their results suggest that countries with higher educational attainment also have a more equal income distribution. Furthermore, educational inequality, measured as the standard deviation of educational attainment of the population, comes out with a significantly positive effect on income inequality. Hence, higher educational attainment and less educational inequality result in a more equal income distribution. De Gregorio and Lee (2002) also find that government social expenditure, measured in relation to GDP, reduces income inequality.[33] They note that this effect could occur through two mechanisms: direct transfers from rich to poor, or improved access for the poor to education activities, especially in the presence of credit market imperfections. Taken together, however, the investigated income and educational factors, albeit important, prove to leave the bulk of the observed cross-country differences in income inequality unexplained.[34] De Gregorio and Lee (2002) argue that the small quantitative effects of educational expansion on income distribution to be due, in part, to the detrimental impact of educational expansion on the equality of educational attainment in the population. Accordingly they point to the importance of following-up the effects of educational expansion policies not only on educational attainment levels, but also on the distribution of education across the population and the workforce.

All in all, our knowledge on the impact of education on income inequality is still scarce and scattered. The skill level of the population, as measured by average educational attainment, seems to play an evident role, whereas that of educational inequality is less clear. This holds even more so for the joint impact of average attainment and its dispersion on income inequality.[35]

Compared to the studies briefly reviewed above, Gylfason and Zoega (2003), as well as Teulings and Van Rens (2002, 2003), move one step further in that they extend their analysis of the effect of education on inequality to also cover the subsequent impact on growth. Indeed, both studies argue that the favourable effects of more and better education on both equality and growth may offer (part of) an explanation for the inverse relationship between inequality and economic growth reported in the literature over the past few decades.

Gylfason and Zoega (2003) explore empirically the possible relationships and interactions among education, equality and economic growth in a sample of 87 countries over the period 1965 to 1998 in the search for an explanation for the positive association between equality and growth observed from simple scatterplots of the data. The point of departure in their endogenous growth model with overlapping generations is that improvements in the national level of education will enhance both equality and growth. More specifically, more and better education financed by public expenditure is taken to encourage economic growth not only directly, but also through reduced economic and social inequality. A precondition for this interaction be-

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[33] It may be further noted that their analysis of the determinants of education shows that social expenditure also helps to explain cross-country differences in the average level of educational attainment and the dispersion of education across the population.

[34] This average cross-country outcome (as calculated for 1990) differs, however, largely both between and within continents (see De Gregorio and Lee 2002, Table A.2).

[35] Checchi (2000) also draws attention to the fact that no measure related to labour market institutions has been considered in this context.

tween education and equality to arise is that a redistribution of education expenditures from higher education to more basic education increases the total supply of educated people while simultaneously enhancing equality. The key for this situation to occur is diminishing returns to education expenditures. An increasing supply of human capital, in turn, raises the return on physical capital in relation to that on human capital, and these complementarities between human and physical capital will generate further saving, investment and growth. The estimation results obtained from a system of four equations confirm the predictions of their model; that is, education (as measured by the secondary-school enrolment rate) exerts a positive (albeit statistically insignificant) influence on investment in physical capital, and a significantly negative influence on income inequality. Both effects carry on to economic growth, suggesting that the indirect effect of education through increased equality and investment accounts for, on average, about one-fourth of the total effect of education on growth. Their results also indicate that increased inequality in the distribution of income reduces the efficiency (the contribution to growth) of increased investment in education. Moreover, the more educated the population, the stronger the adverse effect of increased inequality on economic growth. The same holds for investments in physical capital.

The analysis by Teulings and Van Rens (2002, 2003) runs much along the same lines in trying to capture the joint effect of the average educational level on GDP and income inequality. More precisely, due to imperfect substitution between workers with different levels of human capital, the effect on GDP of an increase in the average level of education should decline with the level of education. This negative association between the average level of education and the return on education at both the individual and the whole-economy level will reduce wage and income inequality. Simultaneously, skill-biased technological change will raise the return on education to the extent that the final effect of an increase in the average educational level on growth will be positive. With the average level of education having a positive effect on growth and a negative effect on inequality, the correlation between inequality and growth turns negative. Moreover, their empirical results provide strong support for the negative correlation between inequality and growth to be caused by the co-movement of these economic phenomena with the average level of education. They also interpret their results in support of Quah's (2001) recent questioning of the causal relationship between inequality and growth.

5   Discussion

Needless to say, in the real world economy, the factual effect of education subsidies on the distribution of incomes will depend on the sign and magnitude of a variety of both direct and indirect effects of education subsidies. In addition, the net effect on income inequality of subsidising education is dependent also on the evolution of other potential channels through which the income distribution can be influenced, as well as on eventual feedback effects from changes in income inequality (and/or economic growth) on both the level of education and its dispersion.

As shown above, existing research addresses these complex interactions between education and income inequality only partially, building on simplifying assumptions which, by necessity, lead to rather simple testable hypotheses paying little, if any, attention to potential interactions between education policies and other income inequality affecting phenomena. So far, the main justifications for education subsidies being an efficient policy tool have been approached only separately. In other words, no attempts have been made to integrate capital market imperfections, positive external effects and taxation policies into the same analytical framework.

Future research faces other challenges as well. In addition to seeking an optimal policy design for redistributive purposes with exogenously given education subsidies, also the optimal

level of subsidisation in itself would deserve some attention. Finally, a common point of departure in the existing research is that the mean level is considered to be a sufficient measure of the distribution of education. With growing evidence on widening within-educational-group wage and income inequality, this is likely to be an all too restrictive assumption also in this context.

All in all, the negative correlation between inequality and growth and the key role played by education in that context raise the question through which mechanisms these effects are actually achieved and mediated. Do we know enough about the optimal level – in terms of balanced costs and benefits – of governmental economic intervention in order to efficiently enhance equality and economic growth through education subsidies? Do we know enough about the actual direction of causality? The obvious answer to both questions is – NO.!

Literature

Acemoglu, K.D. (2002), Technical Change, Inequality, and the Labour Market, *Journal of Economic Literature* 40(1), 7–72.

Acemoglu, D.J. and J. Angrist (1999), *How Large are the Social Returns to Education? Evidence from Compulsory Schooling Laws*. NBER Working Paper No. 7444.

Aghion, P. and P. Bolton (1997), A Theory of Trickle-Down Growth and Development, *Review of Economic Studies* 64(2), 151–172.

Aghion, P. and P. Howitt (1998), *Endogenous Growth Theory*. MIT Press, Cambridge MA.

Aghion, P., E. Caroli and C. García-Peñalosa (1999), Inequality and Economic Growth: The Perspective of the New Growth Theories, *Journal of Economic Literature* 37(4), 1615–1660.

Alesina, A. and R. Perotti (1993), The Political Economy of Growth: A Critical Survey of the Recent Literature, *World Bank Economic Review* 8(3), 351–371.

Alesina, A. and D. Rodrik (1994), Distributive politics and economic growth, *Quarterly Journal of Economics* 109(2), 465–490.

Alstadsaeter, A. (2003), *Income Tax, Consumption Value of Education, and the Choice of Educational Type*. CESifo Working Paper No. 1055.

Angrist, J.D. and A.B. Krueger (1991), Does Compulsory School Attendance Affect Schooling and Earnings?, *Quarterly Journal of Economics* 106(4), 979–1014.

Banerjee, A.V. and E. Duflo (2003), Inequality and Growth: What Can the Data Say?, *Journal of Economic Growth* 8, 267–299.

Barro, R.J. (1990), Government Spending in a Simple Model of Endogenous Growth, *Journal of Political Economy* 98, S103–S125.

Barro, R.J. (1991), Economic Growth in a Cross Section of Countries, *Quarterly Journal of Economics* 106, 407–444.

Barro, R.J. (1997), *Determinants of Economic Growth: A Cross-Country Empirical Study*. MIT Press, Cambridge, MA.

Barro, R.J. (2000), Inequality and Growth in a Panel of Countries, *Journal of Economic Growth* 5, 5–32.

Barro, R.J. and X. Sala-i-Martin (1992), Public Finance in Models of Economic Growth, *Review of Economic Studies* 59(4), 645–661.

Barro, R.J. and X. Sala-i-Martin (1995), *Economic Growth*. McGraw-Hill, New York.

Barth, E. and M. Røed, (2001), Do we need all that higher education?, in Asplund, R. (ed.), *Education and Earnings. Further Evidence from Europe*. The Research Institute of the Finnish Economy, Series B183, Helsinki.

Bassanini, A. and S. Scarpetta (2001), *The Driving Forces of Economic Growth: Panel Data Evidence for the OECD Countries*. OECD Economic Studies No. 33, 2001/II.

Bénabou, R. (1996), Inequality and Growth, *NBER Macroeconomics Annual* 11, 11–74.

Bénabou, R. (2000), Unequal Societies: Income Distribution and the Social Contract, *American Economic Review* 90(1), 96–129.

Bénabou, R. (2002), Tax and Education Policy in a Heterogeneous Agent Economy: What Levels of Redistribution Maximize Growth and Ef-ficiency?, *Econometrica* 70(2), 481–517.

Benhabib, J. and A. Rustichini (1996), Social Conflict and Growth, *Journal of Economic Growth* 1(1), 129–146.

Bertola, G. (1999), Macroeconomics of Distribution and Growth, in Atkinson, A.B. and F. Bourguignon (eds), *Handbook of Income Distribution, Volume 1*. North-Holland, Amsterdam.

Bils, M. and P.J. Klenow (2000), Does Schooling Cause Growth? *American Economic Review* 90(5), 1160–1183.

Birdsall, N., D. Ross and R. Sabot (1995), Inequality and Growth Reconsidered: Lessons from East Asia, *World Bank Economic Review* 9(3), 477–508.

Blank, R.M. (2002), *Can equity and efficiency complement each other?* NBER Working Paper 8820.

Bovenberg, A.L. and B. Jacobs (2001), *Redistribution and education subsidies are Siamese twins.* Tilburg University, CentER Discussion paper No. 2001-82.

Cameron, S.V. and J.J. Heckman (1998), Life Cycle Schooling and Dynamic Selection Bias: Models and Evidence for Five Cohorts of American Males, *Journal of Political Economy* 106(2), 262–333.

Cameron, S.V. and J.J. Heckman (1999), *The Dynamics of Educational Attainment for Blacks, Hispanics, and Whites.* NBER Working Paper No. 7249.

Cameron, S.V. and C. Taber (2000), *Borrowing Constraints and the Returns to Schooling.* NBER Working Paper No 7761.

Card, D. (1999), The Causal Effect of Education on Earnings, in Ashenfelter, O. & D. Card (eds), *Handbook of Labor Economics, Volume 3*. Elsevier, Amsterdam.

Checchi, D. (1999), *Inequality in Incomes and Access to Education: A Cross-Country Analysis.* WIDER Working Papers No. 158.

Checchi, D. (2000), *Does Educational Achievement Help to Explain Income Inequality?* WIDER Working Papers No. 208.

Chennels, L. and J. van Reenen (1999), *Has Technology Hurt Less Skilled Workers? An Econometric Survey of the Effects of Technical Change on the Structure of Pay and Jobs.* Institute for Fiscal Studies, working paper series W99/27.

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

Cohn, E. and T.G. Geske (1990), *The economics of education.* Pergamon Press, New York. (3rd ed.)

De Gregorio, J. and J-W. Lee (2002), Education and Income Inequality: New Evidence from Cross-Country Data, *Review of Income and Wealth* 48(3), 395–416.

De la Fuente, A. (2003), *Human capital in a global and knowledge-based economy, part II: assessment at the EU country level. Final Report.* Instituto de Análisis Económico (CSIC).

De la Fuente, A. and R. Doménech (2002), *Human capital in growth regressions: how much difference does data quality make? An update and further results.* CEPR Discussion Paper No. 3587.

Deininger, K. and L. Squire (1998), New ways of looking at old issues: inequality and growth, *Journal of Development Economics* 57(2), 259–287.

Dur, R.A.J. and C.N. Teulings (2001), *Education and Efficient Redistribution.* CESifo Working Papers No. 592.

Durlauf, S. (1996), A Theory of Persistent Inequality, *Journal of Economic Growth* 1, 75–93.

Durlauf, S.N. and D.T. Quah (1999), The new empirics of economic growth, in Taylor, J. & M. Woodford (eds), *Handbook of Macroeconomics*. North-Holland, Amsterdam.

Edin, P-A. and B, Holmlund (1995), The Swedish Wage Structure: The Rise and Fall of Solidarity Wage Policy?, in Freeman, R.B. and L.F. Katz (eds), *Differences and Changes in Wage Structures*. University of Chicago Press, Chicago.

Fersthman, C., K.M. Murphy and Y. Weiss (1996), Social Status, Education, and Growth, *Journal of Political Economy* 104, 108–132.

Forbes, K.J. (2000), A Reassessment of the Relationship Between Inequality and Growth, *American Economic Review* 90(4), 869–887.

Galor, O. and J. Zeira (1993), Income Distribution and Macroeconomics, *Review of Economic Studies* 60, 35–52.

Galor, O. and O. Moav (2004), From Physical to Human Capital Accumulation: Inequality in the Process of Development, *Review of Economic Studies*. (forthcoming)

Grossmann, V. (2003), *Risky Human Capital Investment, Income Distribution, and Macroeconomic Dynamics*. IZA DP No. 955.

Gylfason, T. and G. Zoega (2003), *Education, Social Equality and Economic Growth: A View of the Landscape*. CESifo Working Paper No. 876.

Harmon, C., I. Walker and N. Westergaard-Nielsen (2001), *Education and Earnings in Europe. A Cross Country Analysis of the Returns to Education*. Edward Elgar Publishing.

Hartog, J., H. Oosterbeek and C. Teulings (1993), Age, Wages and Education in the Netherlands, in Johnson, P. and K.F. Zimmermann (eds), *Labour Markets in an Ageing Europe*. Cambridge University Press, Cambridge.

Katz, L.F. and K.M. Murphy (1992), Changes in Relative Wages, 1963–1987: Supply and Demand Factors, *Quarterly Journal of Economics* 107(1), 35–78.

Katz, L.F., G.W. Loveman and D.G. Blanchflower (1995), Changes in the Structure of Wages in Four OECD Countries, in Freeman, R.B. and L.F. Katz (eds), *Differences and Changes in Wage Structures*. University of Chicago Press, Chicago.

Keane, M.P. and K.I. Wolpin (2001), *The Effect of Parental Transfers and Borrowing Constrains on Educational Attainment*. Penn Institute for Economic Research Working Paper 01-018.

Knight, J.B. and R.H. Sabot (1983), Educational Expansion and the Kuznets Effect, *American Economic Review* 73, 1132–1136.

Krueger, A.B. and M. Lindahl (1999), *Education for Growth in Sweden and the World*. NBER Working Paper 7190.

Krueger, A.B. and M. Lindahl (2001), Education for Growth: Why and for Whom? *Journal of Economic Literature* 39, 1101–1136.

Kuznets, S. (1955), Economic Growth and Income Inequality, *American Economic Review* 45, 1–28.

Kuznets, S. (1963), Quantitative Aspects of the Economic Growth of Nations, *Economic Development and Cultural Change* 11(2), 1–80.

Kuznets, S. (1973), Modern economic growth: findings and reflections, *American Economic Review* 45, 1–28.

Levine, R. and D. Renelt (1992), A Sensitivity Analysis of Cross-Country Growth Regressions, *American Economic Review* 82(4), 942–963.

Li, H. and H. Zou (1998), Income Inequality is not Harmful for Growth: Theory and Evidence, *Review of Development Economics* 2(3), 318–334.

Lindauer, D.L. and L. Pritchett (2002), What's the Big Idea? The Third Generation of Policies for Economic Growth, *Economía* 3(1), 1–39.

Lommerud, K.-E. (1989), Educational Subsidies when Relative Income Matters, *Oxford Economic Papers* 41, 640–652.

Lott, J.R., Jr. (1987), Why is education publicly provided? A critical survey, *Cato Journal* 7, 475–501.

Lucas, R.E., Jr. (1988), On the Mechanics of Economic Development, *Journal of Monetary Economics* 22(1), 3–42.

Milanovic, B. (2000), The Median-Voter Hypothesis, Income Inequality, and Income Redistribution: An Empirical Test with the Required Data, *European Journal of Political Economy* 16(3), 367–410.

Moene, K.O. and M. Wallerstein (1997), Pay Inequality, *Journal of Labor Economics* 15(3), 403–430.

Moene, K.O. and M. Wallerstein (2001), Inequality, Social Insurance, and Redistribution, *American Political Science Review* 95(4): 859–874.

Moretti, E. (2002), *Estimating the social return to higher education: evidence from longitudinal and repeated cross-sectional data.* NBER Working Paper 9108.

OECD (2001a), *The Well-being of Nations: The Role of Human and Social Capital.* Paris.

OECD (2001b), *Education Policy Analysis.* Paris.

Perotti, R. (1993), Political Equilibrium, Income Distribution, and Growth, *Review of Economic Studies* 60(4), 755–776.

Perotti, R. (1996), Growth, Income Distribution, and Democracy: What the Data Says, *Journal of Economic Growth* 1(2), 149–187.

Persson, T. and G. Tabellini (1994), Is Inequality Harmful for Growth? *American Economic Review* 84(3), 600–621.

Piketty, T. (1997), The Dynamics of the Wealth Distribution and the Interest Rate with Credit Rationing, *Review of Economic Studies* 64, 173–189.

Psacharopoulos, G. (1994), Returns to Investment in Education: A Global Update, *World Development* 22(9), 1325–1343.

Psacharopoulos, G. and M. Woodhall (1985), *Education for Development: An Analysis of Investment Choices.* Oxford University Press, New York.

Quah, D. (2001), *Some simple arithmetic on how income inequality and economic growth matter.* LSE. Mimeo.

Ram, R. (1989), Can Educational Expansion Reduce Income Inequality in Less-Developed Countries? *Economics of Education Review* 8(2), 185–189.

Ram, R. (1990), Educational Expansion and Schooling Inequality: International Evidence and Some Implications, *Review of Economics and Statistics* 72(2), 266–273.

Romer, P.M. (1986), Increasing Returns and Long-Run Growth, *Journal of Political Economy* 94(5), 1002–1037.

Sanders, M. and B. ter Weel (2000), *Skill-Biased Technical Change: Theoretical Concepts, Empirical Problems and a Survey of the Evidence.* Maastricht University, MERIT RM2000-012.

Shea, J. (2000), Does Parents' Money Matter? *Journal of Public Economics* 77(2), 155–184.

Soete, L. and B. ter Weel (2001), Computers and employment: The thruth about e-skills, *EIB Papers* 6(1), 133 – 150.

Tamura, R. (1991), Income Convergence in an Endogenous Growth Model, *Journal of Political Economy* 99(3), 522–540.

Temple, J. (1999), The New Growth Evidence, *Journal of Economic Literature* 37(1), 112–156.

Teulings, C.N. and T. van Rens (2002), *Education, Growth and Income Inequality.* CESifo Working Paper No. 653 (4).

Teulings, C.N. and T. van Rens (2003), *Education, Growth and Income Inequality.* CEPR Discussion Paper No. 3863.

Topel, R. (1999), Labor Markets and Economic Growth, in Ashenfelter, O. & D. Card (eds), *Handbook of Labor Economics, Volume 3.* Elsevier, Amsterdam.

Trostel, P.A (1996), Should Education be Subsidized?, *Public Finance Quarterly* 24(1), 3–24.

Van Ewijk, C. and P.J.G. Tang (2000), *Efficient Progressive Taxes and Education Subsidies.* CPB Netherlands Bureau for Economic Policy, CPB Research Memorandum 170.

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