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Education, Social Equality and Economic Growth: A View of the Landscape

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Abstract

One of the main determinants of economic growth around the world since 1965 has been education. This paper discusses three different measures of education, and considers their relationship to the distribution of income as measured by the Gini coefficient and to economic growth across countries: (a) gross secondary-school enrolment, (b) public expenditure on education relative to national income and (c) expected years of schooling for girls. We show that all three measures of education are directly related to income equality across countries. In a sample of 87 countries at all income levels, we also find that more and better education appears to encourage economic growth directly as well as indirectly through increased social equality and cohesion.

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1. Introduction

For a long time, it was a widely held view among economists that economic efficiency and social equality were generally incompatible, almost like oil and water. The perceived but poorly documented trade-off between efficiency and equality was commonly regarded as one of the main tenets of modern welfare economics. One of the key ideas behind this perception was that increased inequality raises private as well as social returns to investing in education and exerting effort in the hope of attaining a higher standard of life. Redistributive policies were supposed to thwart these tendencies and blunt incentives by penalizing the well-off through taxation and rewarding the poor. Economic efficiency – both static and dynamic – would suffer in the process, or so the argument went.

The revival of economic growth theory in recent years has brought dynamic efficiency to the fore. The empirical testing of the theory has involved estimating reduced-form equations in cross sections (sometimes also panels) of countries where the dependent variable is the average rate of growth of output per capita over a longish period and the right-hand side of the equation has initial output per capita – to capture a catch-up effect, or convergence – and a set of other possible explanatory variables among the regressors. More often than not, measures of income inequality have turned out to have a negative effect on economic growth across countries. Thus Alesina and Rodrik (1994), Persson and Tabellini (1994) and Perotti (1996) report that inequality is bad for growth. Barro (2000) uses a panel of countries over the period from 1965 to 1995 to estimate the relationship between economic growth and inequality and finds – by studying the interaction of the Gini coefficient and the initial level of income in a growth regression – that increased inequality tends to retard growth in poor countries and boost growth in richer countries. This empirical finding does not support the claim of Garcia-Peñalosa (1995) that in rich countries increased inequality discourages education and growth by increasing the number of poor people who cannot afford education whereas in poor countries increased inequality encourages education and growth by increasing the number of rich people who can afford education. However, Barro (2000) finds no support for a relationship between inequality and growth in his sample as a whole.

These empirical results – showing, by and large, that rapid growth tends to go together with more, not less, equality – have helped to inspire a number of authors to

attempt an explanation. Numerous models have been developed to explain the apparent absence of a trade-off between efficiency and equality. First, large inequalities of income and wealth may trigger political demands for transfers and redistributive taxation. To the extent that transfers and taxation distort incentives to work, save and invest, inequality may impede growth. A classic example of the effects of such a system of taxes and transfers is regional transfers in Italy. High taxes in northern Italy are used to subsidize ailing enterprises and public employment in the south, the *Mezzogiorno*. These subsidies have been shown to distort incentives and create inefficiencies in both parts of the country. At a theoretical level, an increase in the rate of redistributive taxation on capital tends to reduce the return to saving and hence lower the long-run rate of growth of output per capita. It is not clear, however, that this type of political-cum-fiscal explanation necessarily implies an inverse relationship between inequality and growth, for it is possible that during the redistribution phase increased equality and a drop in growth go hand in hand, especially in panel data that reflect developments over time country by country as well as cross-sectional patterns. Perotti (1996) finds little empirical support for this type of explanation. Moreover, in democratic countries with an unequal distribution of income and with many poor people, the electorate may vote for more and better education as well as higher taxes and transfers (see Saint-Paul and Verdier, 1993, 1996), thus obscuring the relationship between inequality and growth. Absent democracy, dictators may still find it in their own interest to redistribute incomes and improve education in order to promote social peace and strengthen their own hold on political power (see Alesina and Rodrik, 1994). Easterly and Rebelo (1993) report empirical results that suggest that increased inequality is associated with both higher taxes and more public expenditure on education in a large sample of countries in the period 1970-1988.

In second place, the initial extent of inequality probably makes a difference. An equalization of incomes and wealth in countries with gross inequities, such as Brazil where the Gini coefficient is 60, would seem likely to foster social cohesion and peace and thus to strengthen incentives rather than weaken them, whereas in places like Denmark and Sweden, where the Gini coefficient is 25 and incomes and wealth are thus already quite equitably distributed by world standards, further equalization might well have the opposite effect. Excessive inequality may be socially divisive and hence inefficient: it may motivate the poor to engage in illegal activities and riots, or

at least to divert resources from productive uses, both the resources of the poor and those of the state. Social conflict over the distribution of income, land or other assets can take place through labour unrest, for instance, or rent seeking which can hinder investment and growth (see Benhabib and Rustichini, 1996). Further, Aghion (1998) suggests that excessive inequality may be associated with macroeconomic volatility through credit cycles because of unequal access to credit and thus to investment opportunities, and that this may hurt investment and growth. Alesina and Perotti (1996) report empirical evidence of an inverse relationship between inequality and growth through socio-political instability.[1] However, the hypothesis of an inverse relationship between inequality and growth through macroeconomic volatility remains untested empirically.

Third, national saving may be affected by inequality if the marginal propensity to save depends on the level of income, i.e., if the rich have a higher propensity to save than the poor (see Kaldor, 1956). In this case inequality may be good for growth in that the greater the level of inequality, the higher is the saving rate and hence also the rate of investment and economic growth. Against this Todaro (1997) suggests that the rich may invest in an unproductive manner – think of yachts and expensive cars. Barro (2000) finds no empirical evidence of a link between inequality and investment.

Fourth, it is easy to think of ways in which increased inequality may hurt education rather than helping it as suggested by the political-economy literature reviewed in brief at the beginning of this discussion. If so, increased inequality may thereby also hinder economic growth through education. Galor and Zeira (1993) and Aghion (1998) argue that this outcome is likely in the presence of imperfect capital markets. To see this, imagine that each member of society has a fixed number of investment opportunities, imperfect access to credit and different endowments of inherited wealth. In such a world the rich would end up using up many of their investment opportunities while the poor could only use a few. Therefore, the marginal return from the last investment opportunity of the rich would be much lower than the marginal return of the last investment opportunity of the poor. Redistribution of wealth from the rich to the poor would increase output because the poor would then invest in more productive projects at the margin. This argument can also be applied to investment in human capital if we assume diminishing returns to education. In this case, taking away the last few quarters

[1] See also Aghion, Caroli and García-Peñalosa (1999).

of the university education of the elite and adding time to the more elementary education of the poor would raise output and perhaps also long-run growth, other things being equal. Income redistribution would reverse the decline in investment in human capital resulting from the credit-market failure.[2]

The distribution of income and wealth may also affect the amount of public and private investment in education. When a large part of the population is poor, it may be more likely that the majority of voters will support expenditures on public education aimed at the poor, as argued by Saint-Paul and Verdier (1993, 1996) and corroborated empirically by Easterly and Rebelo (1993), but the effect could also, in principle, go the other way. If so, the more deprived and detached from the mainstream population is the poorer segment, the less likely the poor are to participate in or affect the outcome of elections. As a result the general level of education may suffer – the more so, the more capital-constrained is the poorer segment of the population.

It should be clear by now that a virtuous circle may arise when redistribution of income leads to an increase or improvement in human capital, which then induces voters to prefer higher expenditures on education, which again pulls more workers out of poverty, and so on. At an empirical level, we would expect increased equality to enhance economic growth through its effect on education, and vice versa. That is, more and better general education may be expected to reduce public tolerance against extreme inequality and thus to reduce inequality through the political process, thereby stimulating economic growth. These processes can be mutually reinforcing: that is, if increased social equality encourages education and economic growth, this does not mean that more and better education cannot similarly, and simultaneously, enhance equality and growth.

The main aim of this paper is to explore the possible relationships and interactions among inequality, education and economic growth in a sample of 87 industrial and developing countries in the period from 1965 to 1998. The empirical relationship between the initial level of human capital and economic growth is well established and appears to be more robust than the relationship between measures of inequality and growth. The paper proceeds as follows. In Section 2, we show simple cross-country correlations between three different measures of education, inequality and economic growth, and thus allow the data to speak for themselves. In Section 3, we attempt to

[2] For a further discussion of recent empirical literature on inequality and growth, see Bénabou (1996) and Alesina and Perotti (1994).

dig a little deeper and report the results of multiple regression analysis where growth is traced to education and inequality as well as a number of other factors commonly used in growth regression analysis, and where some of the determinants of growth, including education and equality, hang together. Section 4 concludes.

2. Cross-country patterns in the data

Education involves the acquisition of knowledge, the ability to acquire further knowledge and the development of a variety of job-related and social skills, all of which encourages productivity and social mobility. Empirical studies have shown that more and better education is a prerequisite for rapid economic development around the world.[3] Education stimulates economic growth and improves people's lives through many channels: by increasing the efficiency of the work force, by fostering democracy (Barro, 1997) and thus creating better conditions for good governance, by improving health, and so on. The question that we address here is this: Does education encourage growth also by enhancing economic and social equality?

Let us begin by looking at the cross-country pattern of inequality and economic growth. Figure 1 shows a scatterplot of the annual rate of growth of gross national product per capita from 1965 to 1998 (World Bank, 2000, Table 1.4) and the inequality of income or consumption as measured by the Gini coefficient (same source, Table 2.8). The growth rate has been adjusted for initial income: the variable on the vertical axis is that part of economic growth that is not explained by the country's initial stage of development, obtained as a residual from a regression of growth during 1965-1998 on initial GNP per head (i.e., in 1965) as well as natural capital, taken from World Bank (1997).[4] The 75 countries shown in the figure are represented by one observation each.[5] The regression line through the scatterplot suggests that an increase of about 12 points on the Gini scale from one country to another is associated with a decrease in per capita growth by one percentage point per year on average. The relationship is statistically significant (Spearman's rank correlation $r = -0.50$). If rich countries and poor are viewed separately, a similar pattern is observed in both groups (not shown). Shaving one percentage point of any

[3] For a survey of the recent literature on education and growth in industrial countries, see Temple (2000).
[4] The Gini index measures the extent to which income (or, in some cases, consumption) among individuals or households within an economy deviates from a perfectly equal distribution. A Gini index of zero represents perfect equality while a Gini index of 100 means perfect inequality. The data come from nationally representative household surveys and refer to different years between 1983-85 and 1998-99. See World Bank (2000), Table 2.8.

country's annual growth rate is a serious matter because the (weighted) average rate of per capita growth in the world economy since 1965 has been about 1½ percent per year.

Let us now consider three different measures of education inputs, outcomes and participation and how they vary with inequality and economic growth. Figure 2 shows scatterplots of public expenditure on education from 1980 to 1997 as reported by UNESCO (see World Bank, 2000, Table 2.9) and (a) inequality and (b) growth as measured above. Public expenditure on education varies a great deal from country to country. In the 1990s, some countries have spent as little as 1 percent of their GNP on education (Haiti, Indonesia, Myanmar, Nigeria, and Sudan). Others have spent between 8 percent and 10 percent of their GNP on education, including St. Lucia, Namibia, Botswana, and Jordan, in descending order. Public expenditure is admittedly an imperfect measure of a nation's commitment to education, not least because some nations spend more on private education than others. Moreover, public expenditure on education may be supply-led and of mediocre quality, and may thus fail to foster efficiency, equality and growth, in contrast to private expenditure on education, which is generally demand-led and thus, perhaps, likely to be of a higher quality. Even so, this yardstick should reflect at least to some extent the government's commitment to education. The regression line through the 74 observations in Figure 2a suggests that an increase in public expenditure on education by one percent of GNP from one country to the next is associated with a decrease of 2.3 points in the Gini coefficient. The relationship is statistically significant ($r = -0.36$). The regression line through the 87 observations in Figure 2b suggests that an increase of about 3½ percentage points in public expenditure on education relative to GNP from one country to the next is associated with an increase in per capita growth by one percentage point. This relationship is also statistically significant, even if it is not particularly strong ($r = 0.29$).

Figure 3 shows scatterplots of the expected number of years of schooling for females from 1980 to 1997 and (a) inequality and (b) growth as before. This indicator of schooling is intended to reflect the total education resources, measured in school years, that a girl will acquire over her lifetime in school or as an indicator of an education system's overall state of development. In Figure 3a, the regression line

[5] All countries for which the requisite data are available are included in Figures 1-4, without exception.

through the 46 observations, one per country, suggests that an increase by one year of the schooling that an average girl at the age of school entry can expect to receive is associated with a decrease in the Gini coefficient, i.e., increased equality, by almost one point. The relationship is statistically significant (*r = -0.49*). Unlike the relationship in Figure 2a, the one in Figure 3a is significantly nonlinear (not shown), suggesting that the marginal effect of increased education on equality is rising in the level of enrolment – that is, there may be increasing returns to schooling in terms of equality. Sen (1999), among others, emphasizes the importance of educating girls in developing countries. The corresponding relationship for males (not shown) is virtually the same as for females. Figure 3b shows the cross-country relationship between growth and years of schooling. The regression line through the 49 observations suggests that an extension of schooling by about four years is associated with an increase in annual economic growth by one percentage point. The relationship is significant (*r = 0.50*).

Figure 4 shows scatterplots of gross secondary-school enrolment for both genders from 1980 to 1997 and (a) inequality and (b) growth as before. The regression line that passes through the 75 observations in Figure 4a suggests that an increase in the secondary-school enrolment rate by about five percentage points from one place to another goes along with a decrease by one point on the Gini scale. The regression is statistically significant (*r = -0.54*). Like the relationship in Figure 3a, the one in Figure 4a is significantly nonlinear (not shown). At last, Figure 4b shows the cross-country relationship between growth and school enrolment. The regression line through the 87 observations suggests that an increase in secondary-school enrolment by 25-30 percentage points is associated with an increase in annual economic growth by one percentage point. The relationship is significant (*r = 0.69*). Secondary-school enrolment is probably the most commonly used indicator of education in empirical growth research. Of the three indicators used here, it is the one that is most closely correlated with economic growth.

3. Regression analysis

Table 1 reports seemingly unrelated regression (SUR) estimates of a system of four equations for the 87 countries in our sample for the years 1965-1998. The first equation shows how economic growth depends on (i) the logarithm of initial per capita

income (i.e., in 1965), defined as income in 1998 divided by an appropriate growth factor, (ii) the share of natural capital in national wealth (which comprises physical, human and natural capital), (iii) the share of gross domestic investment in gross domestic product in 1965-1998, (iv) the logarithm of the secondary-school enrolment rate (the logarithm in order to capture diminishing returns to education) and (v) the Gini coefficient. The second equation shows the relationship between the investment rate and the natural capital share (as in Gylfason and Zoega, 2001; the underlying explanation is that the more abundant are natural resources in relation to GDP, the smaller the share of physical capital in GDP and the weaker is the incentive to save and invest by the Golde Rule). The third equation shows how the enrolment rate depends on initial income (because wealthy countries can afford to spend more on education) as well as on natural capital (as in Gylfason, 2000, and Gylfason and Zoega, 2001; the idea behind this formulation is that the natural-resource-intensive sector may use workers with fewer skills than the manufacturing sector). The fourth and last equation shows the relationship between the Gini index and the enrolment rate that we documented in Section 2. The recursive nature of the system and the conceivable correlation of the error terms in the four equations make SUR an appropriate estimation procedure (Lahiri and Schmidt, 1978). However, the fact that ordinary least squares (OLS) estimates of the system (not shown) are almost the same as the SUR estimates shown in the table indicates that the correlation of errors terms across equations is of minor consequence.

All the coefficient estimates shown in Table 1 are economically and statistically significant. The coefficient on initial income in the growth equation indicates a convergence speed of 1 percent per year. The direct effect of natural capital on growth is -0.06 and the indirect effects through investment and education are $-0.20 \cdot 0.13 \approx -0.03$ and $-(0.71/E) \cdot 0.71 \approx -0.015$, the latter evaluated at the median value of the enrolment rate, $E = 35$. The total effect of natural capital on growth is thus about -0.10 (for given initial income). Of greater interest here, however, are the effects of education and inequality on growth. The first equation in the table shows the direct effect of education on growth to be $0.71/E \approx 0.02$ at the median value of the enrolment rate; this means that an increase in the enrolment rate by five percentage points from one country to another increases growth by one-tenth of a percentage point. Combining the results reported in the first, third and fourth row in the table, we see

that an increase in the enrolment rate by six points reduces the Gini coefficient by one point and this, in turn, increases growth further by 0.03 percentage points. Hence the total effect on growth of an increase in the enrolment rate by, say, 20 percentage points – a dire necessity in many developing countries – is about one-half of a percentage point, with the indirect effect through increased equality accounting for about one-fifth of the total.

More work needs to be done. In particular, we need to study the interaction of inequality with other determinants of growth, especially education and initial income. Of special interest is the possibility that the multiple regression results may be different in rich countries and poor, as reported by Barro (2000), even if the simple correlation between inequality and growth in Figure 1 applies to rich and poor countries alike, together or separately. Our cross-country data support the notion of a Kuznets curve (not shown): inequality tends to increase with income at low levels of income and to decrease with income at higher levels of income.

4. Conclusion

We have seen that, across countries, (i) economic growth varies inversely with inequality, (ii) three different measures of education intended to reflect education inputs, outcomes and participation are all inversely related to inequality, and (iii) economic growth varies directly with all three measures of education. These cross-country patterns in the data are supported by multiple regression analysis which shows that both education and inequality have a significant, independent impact on growth, even if education and inequality are closely correlated. We conclude that education seems likely to encourage economic growth not only by increasing and improving human capital but also social capital – that is, by reducing inequality. If so, the adverse effects of inequality on economic growth since the mid-1960s that have been reported in the literature may in part reflect the positive effect of more and better education on growth.

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Table 1. Regression Results

Dependent variable	*Initial income*	*Natural capital*	*Investment rate*	*Enrolment rate*	*Gini coefficient*	*R^2*	*Countries*
Economic growth	-1.04 (5.51)	-0.06 (4.22)	0.13 (4.61)	0.71 (2.60)	-0.03 (2.28)	0.67	74
Investment rate		-0.20 (3.97)				0.15	87
Enrolment rate	20.42 (13.13)	-0.71 (4.50)				0.72	87
Gini coefficient				-0.16 (4.97)		0.31	74

Note: t-ratios are shown within parentheses. Constant terms, statistically significant throughout, are not reported.

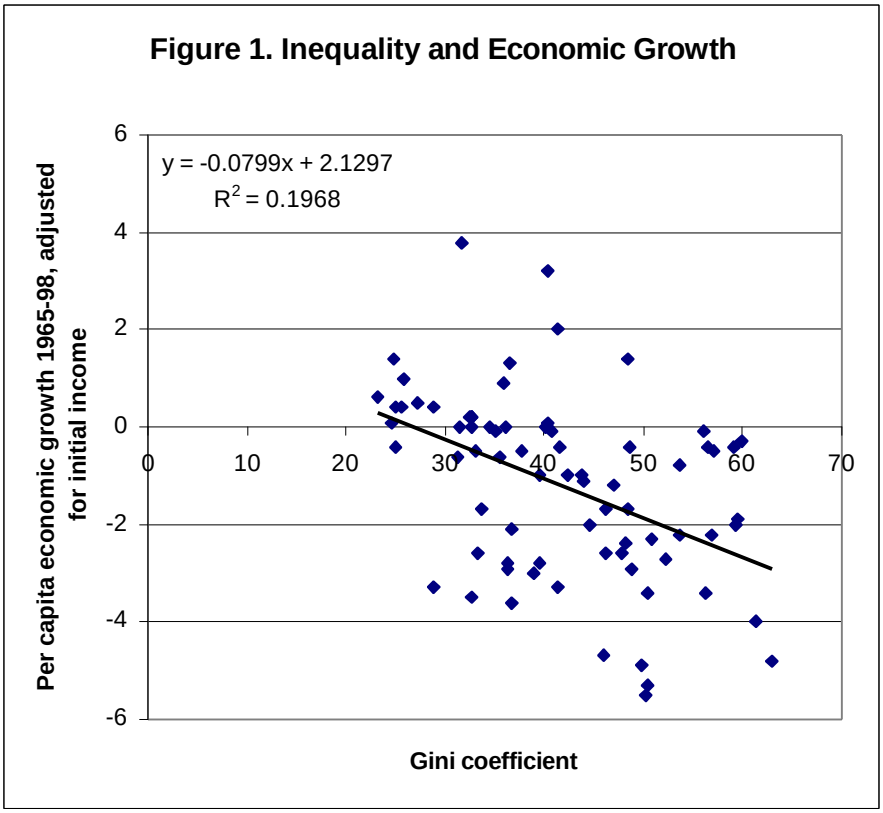


Figure 2a. Expenditure on Education and Inequality

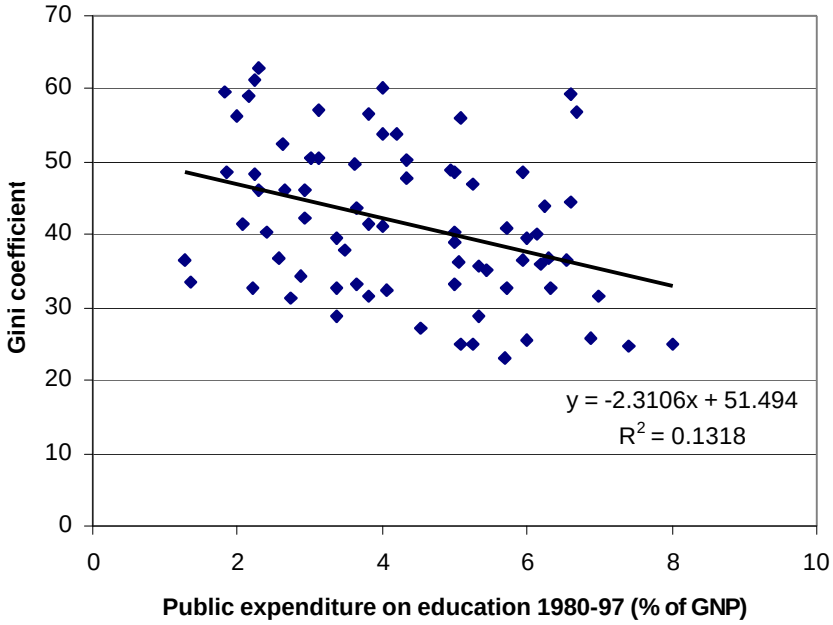


Figure 2b. Expenditure on Education and Economic Growth 1965-1998

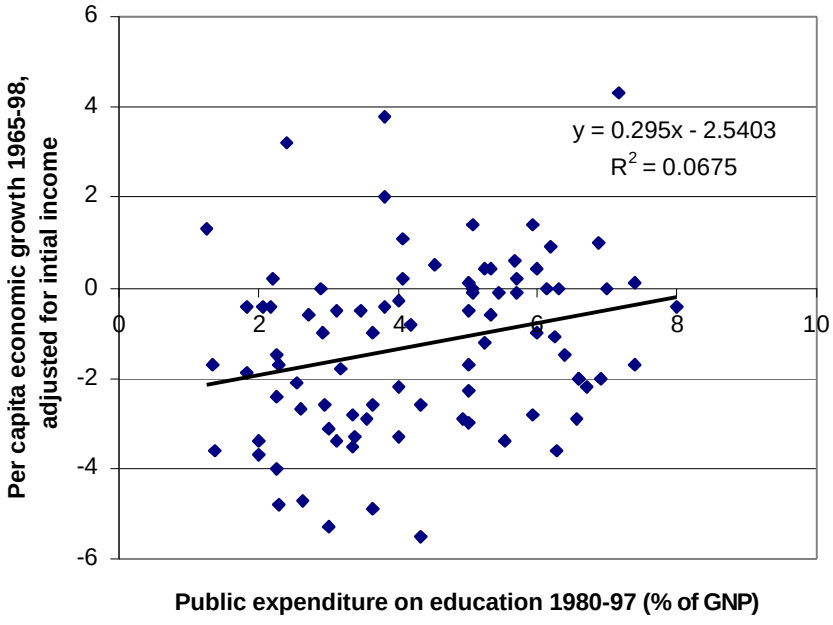


Figure 3a. Years of Schooling and Inequality

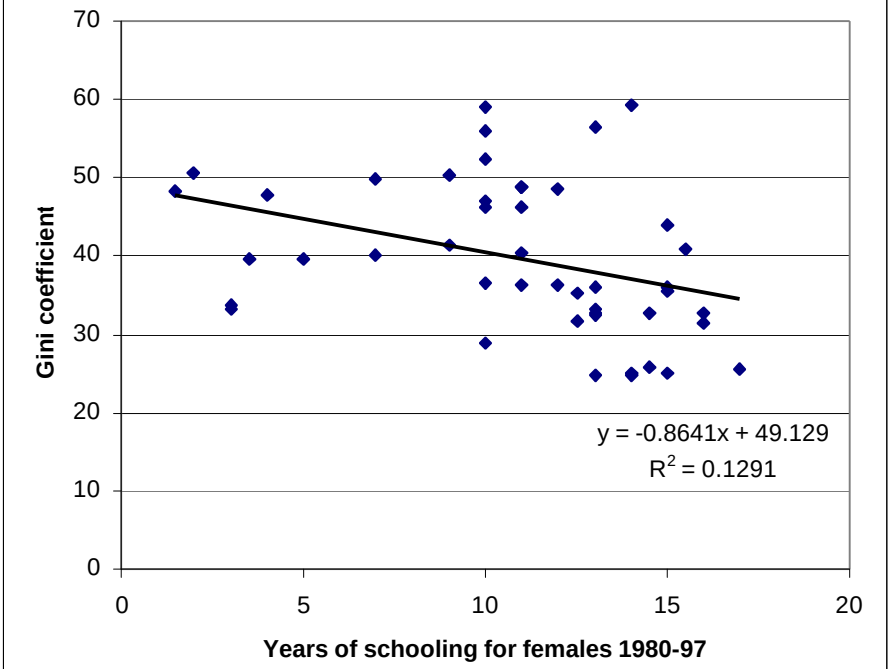
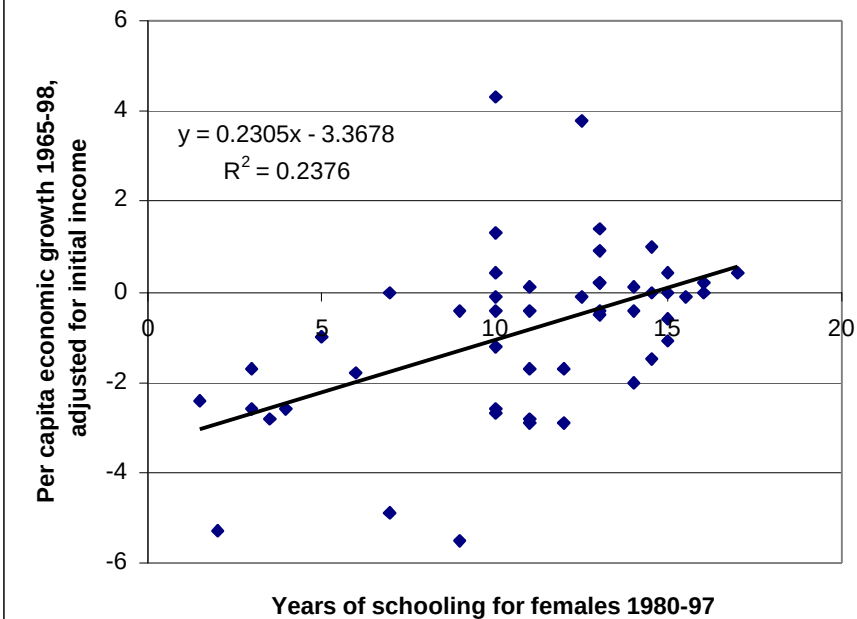


Figure 3b. Years of Schooling and Economic Growth 1965-1998



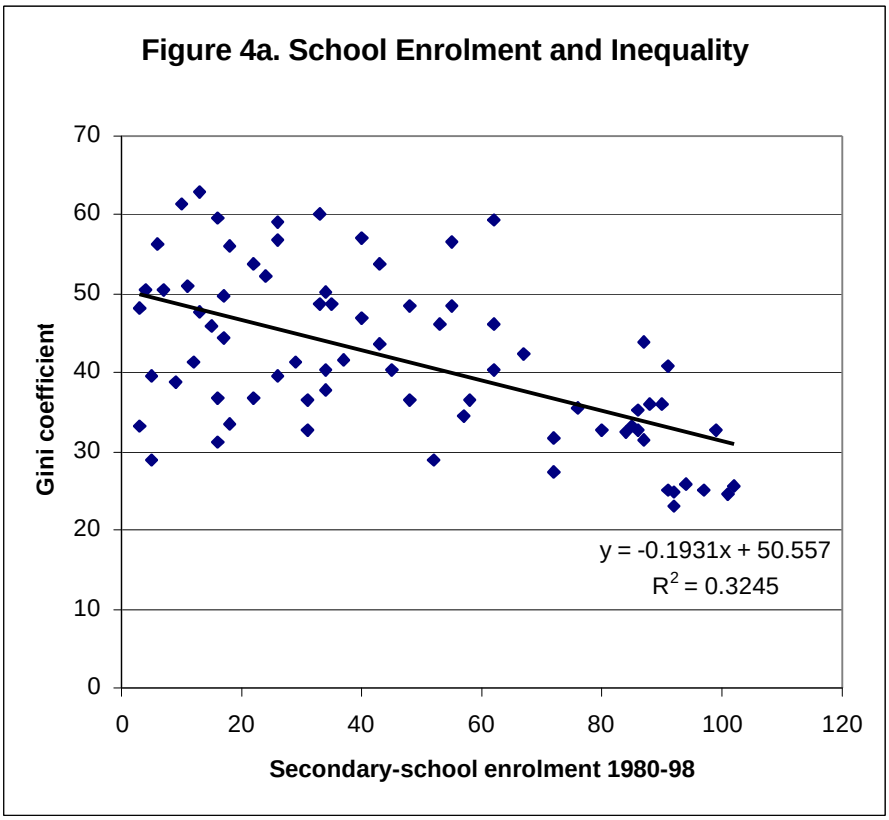


Figure 4a. School Enrolment and Inequality
Gini coefficient
70
60
50
40
30
20
10
0
0
20
40
60
80
100
120
Secondary-school enrolment 1980-98
y = -0.1931x + 50.557
R2 = 0.3245

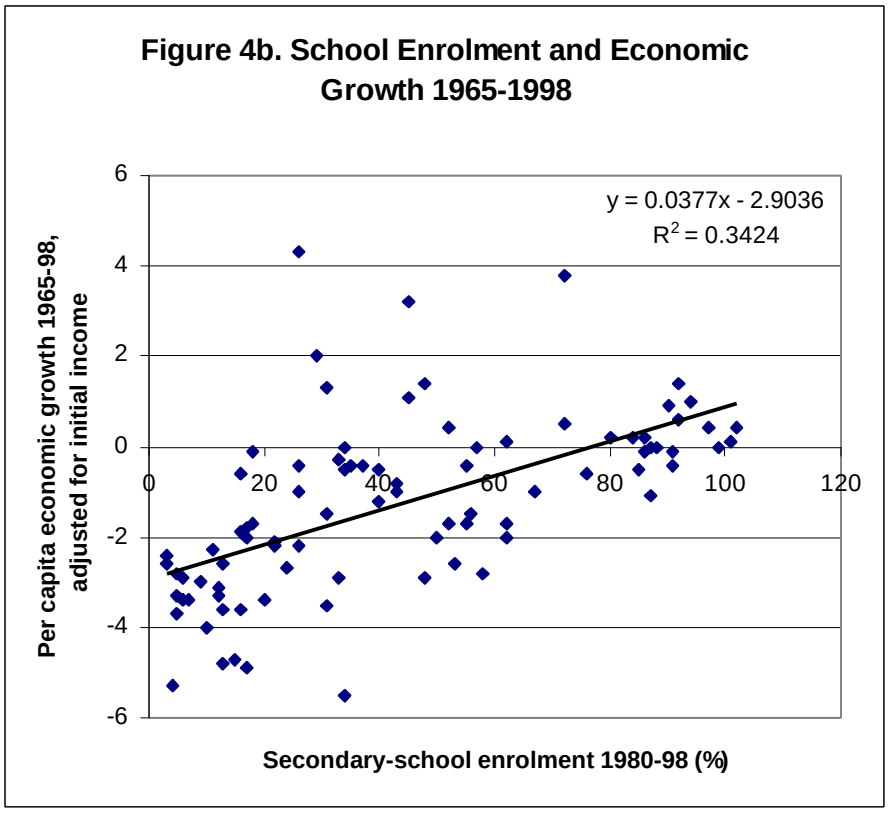


Figure 4b. School Enrolment and Economic Growth 1965-1998
Per capita economic growth 1965-98, adjusted for initial income
6
4
2
0
-2
-4
-6
0
20
40
60
80
100
120
Secondary-school enrolment 1980-98 (%)
y = 0.0377x - 2.9036
R2 = 0.3424