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On the Quality of Private and Public Education: the Case of Chile

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Abstract

In this essay, we intend to measure the contribution of different factors within the educational system that affect the quality of education. The purpose is to compare, in a completely dispassionate way, the academic achievements of public and private schools (mainly at the secondary level) in one country: Chile. We take Chile because it has the most extensive (voucher-type) program for subsidizing private education and because it has a fairly wide and accessible amount of data. Amongst other factors, we study the influence of the public/private divide, the socio-economic level of the students and the pupil/teacher ratio. The quality of education is measured by the performance of students in standardized national tests administered to all schools in Chile.

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One of the major determinants of a country's economic welfare is the level of its education. The most prosperous economies of the world today exhibit the highest rates of educational attainment (UNDP, 2007) and the poorest countries happen to have very low educational rates. It is certainly not a coincidence. Education provides people with the tools they need to perform adequately in the job market and enhance their productivity. This is well understood by policy-makers and politicians. However, the task of providing the right amount of education and ensuring the quality of its contents and formats is not an easy one. There are financial, cultural and sociological problems to be dealt with, and governments don't always have enough political will to tackle the issue or at least to give it the priority it deserves.

Not only is the provision of a high-quality education linked to economic prosperity, but also the lack thereof creates a perpetuating state of poverty (Perry et al, 2006; Hanushek and Woessmann, 2007). Of course, there are many other factors – socio-economic, psychological and historical - to take into account when analyzing the phenomenon of poverty. However, there is an overwhelming evidence that, at a personal level, poverty strikes hardest on those who are less prepared to depend on themselves for their own support, those who have less physical and mental capacity, those who have fewer skills, worse health and less education; in other words, those with less human capital.

The paper contains basically five sections. In the first one, we review the existing literature, topic by topic. The topics are: the importance of education for developing countries; how education affects human capital and technological growth; types of education needed to affect human development; quantity versus quality of education, and institutional factors affecting the quality of education.

The following sections contain the substance and the contribution of this paper. There is one section identifying the factors that might eventually affect the quality of education, with some reference to the literature; another one describing the particular characteristics of the Chilean educational system, followed by an econometric estimation of factors affecting quality of education in Chile, and we finish with several tentative conclusions that the regression results suggest.

What has been said about the subject

1) The importance of education for developing countries

One of the recurrent topics in the development literature is the one about the vicious circles of poverty, or poverty traps. Perry et al (2006) develop this idea, focusing mainly on how the lack of human capital has impeded Latin American economies to reach a complete development. They propose that the existence or lack of human capital in a country can produce virtuous or vicious circles in the process of development. Countries that don't have enough human capital fall into poverty traps that are self-perpetuating, something like a low-income steady state. Lack of human capital implies low productivity, and in turn low economic growth. And low economic growth brings about poverty. But poverty itself reduces the capacity to absorb new human capital. And the cycle continues. The cycle is reinforced by the discouraging effect that poverty has on investment, and therefore on growth.

If a lack of human capital is a main cause of poverty, then the remedy seems straightforward. Better education and better health should be the target of any responsible government. But, what kind of education is most appropriate? Who will provide it? How do we determine the optimal amount of investment in education? These are the questions suggested by Perry. And it is not just a matter of the *quantity* of education. Quality makes a difference. In this paper, we tackle precisely the question of what factors influence the quality of education.

A vicious circle of the kind discussed is hard to break. It might take a long time before the effects of an enhanced education start to become visible. Few politicians want to start an educational reform that only implies higher expenditure in the short run with no political achievements to show. Hanushek and Woessmann (2007) estimate that it could take up to 75 years for educational reform policies to exert their full effect over economic outcomes. This is one of the main practical impediments to educational improvement in poor countries: the lack of political will to break the vicious circle, knowing that others might reap the benefits of reform.

Perry also suggests that the reproduction of patterns of education across generations might be causing the vicious circle and it would be interesting to investigate more into the cause of this particularly pervasive poverty trap. In more traditional societies, in which social mobility is very low, there is no great incentive for the poor to acquire more education, or in most cases not even the opportunity (due to lack of access to long-term credit). This is something inconceivable in a country like the United States, but quite possible in some Asian, African or Latin American cultures.

One possible economic explanation for the above phenomenon is the fact, mentioned by Perry, that returns to schooling tend to increase with the level of education. In this case, there are perverse incentives to under-invest in education by the poor. And the only way out would be a ‘big push’ (making the analogy with the Rosenstein-Rodan [1943] concept) in the form of large subsidies for the poor to surpass the education threshold.

The idea of the ‘poverty trap’ has been invoked before in the literature. Barham, Boadway, Marchand, and Pestieau (1995) had already referred to a specific ‘poverty trap’ with regards to education. They construct an OLG model in which individual wealth is related to educational attainment. Liquidity constraints operate to force children (or their parents) to invest a sub-optimal amount of resources in their education. The stationary state implies that children of poorer families are caught in a poverty trap because they cannot finance their education.

In general, we can say that Perry and all these studies focus more on the microeconomic benefits of education, with little consideration of externalities and effects over productivity, which enhance the growing capacity of the economy. The micro literature on the subject mostly follows the tradition of the path-breaking study by Mincer (1974), who was the first to propose a micro-econometric model of the returns to education. We will deal in detail with more macro aspects below, to fully assess the importance of the provision of quality education for developing countries.

2) The links between technological growth, human capital and education

In order to understand the foundations of the macroeconomic literature on the subject, one must first explain why human capital, and particularly education, should affect macro performance.

Forty years ago, Denison (1967) already found that factor accumulation could only explain about one third of the growth rates of national economies. Until then, the ‘measure of our ignorance’ was confined to the *Solow residual* in the famous growth model devised by Robert Solow in the 50s. Denison, in a growth-accounting exercise for several economies of Western Europe and the United States for the period 1950-1962, found that two thirds of all the growth of those economies was due to advances in knowledge, educational attainment, economies of scale and improved allocation of resources, with the bulk of those factors being explained by technological progress. Those findings revolutionized the field, by making explicit something which until then had been just a faint suspicion.

More recently, several other studies -most notably Klenow and Rodriguez-Clare (1997), Hall and Jones (1999), Easterly and Levine (2001) and Simoes (2006)- have come to confirm the pre-eminence of technological change in the causation of economic growth. In particular, Easterly and Levine note that while factor accumulation is persistent over time, economic growth is not (their study includes several OECD, Latin American and East Asian countries in the period 1960-1990).

But for technological change to occur, countries need to engage in either of two activities that produce it: innovation or imitation. Both imitation and innovation require the use of human capital as an input, the latter more than the former one.

Abramovitz (1986) points out that the differences in productivity levels among countries tend to create a ‘strong potential for subsequent convergence of levels’, but this convergence can only be achieved by the less advanced countries if they have a ‘social capability’ that enables them to absorb the more advanced technologies. He reaches this conclusion after carrying out the historical study of several OECD countries in the 19th and 20th centuries. Simoes (2006), following Benhabib and Spiegel (1994) and using a sample of 23 OECD countries for the period

1960-2000, finds that education -and particularly tertiary education- speeds up technology diffusion among economies closely connected.

If human capital is the key to technological change, then it is important to determine how to increase human capital. Schultz (1975) was a pioneer in this kind of studies. For him, the cognitive ability of individuals is the main component of human capital; it is the ability that renders individuals more productive and enables them to deal with complicated situations (*disequilibria*), like unemployment or the solution of engineering problems. The cognitive ability doesn't necessarily come from formal education, but can certainly be induced and greatly enhanced by it.

Barro (2001) uses panel data for 100 countries in the period 1965-1995, to test how human capital influences economic growth, using education as a proxy for human capital. His results are conclusive in favor of formal education, measured both in terms of enrollment rates and test scores. He finds that an additional year of schooling raises the growth rate by 0.44% a year.

Certainly education is not the only source of human capital, and there are other studies that emphasize the role of child nutrition, health care and other factors. Although it is not the focus of this paper, it is important to realize that those factors are important complements of education, and -in some ways- they strengthen the efficacy of education. It is an interaction to be taken into account in more complete studies of this topic.

Krueger and Lindhal (2001) take a look at the Mincer (1974) model:

$$\ln W_i = \beta_0 + \beta_1 S_i + \beta_2 X_i + \beta_3 X_i^2 + \varepsilon_i$$

In this model, i is the individual, W represents the wage, S stands for school attainment and X for experience. Mincer tested this model for individual wages, and found formal schooling to have a strong positive effect on wages. This is typically the 'returns-to-schooling' model.

Trying to reconcile the micro 'returns-to-schooling' literature with the macro growth models, Krueger and Lindhal conclude that, in the light of the Mincer model, schooling should be one of the key determinants of income growth at a macro level. They also think that a macro model in which the schooling coefficient is the same for all countries is not appropriate. It would not be

congruent with the micro evidence, which suggests different returns to schooling across countries. Consequently, they propose the following variable-coefficient model:

$$\Delta Y_{jt} = \beta_0 + \beta_{1j} S_{jt-1} + \varepsilon_j$$

Here, the coefficients of schooling are particular to each country j .

3) Which education? For whom? For what?

The policymaker might want to know what type of education to favor, what kind of educational policies to implement in order to achieve certain goals. In the first place, we have to target very precise goals. The kind of education that promotes growth might not be the best one to reduce poverty, at least in the short run.

First, there is the question as to whether all types of spending on education are equally effective in reducing poverty. Jha, Biswal and Biswal (2001), using panel data techniques with data for fourteen Indian states, find that expenditure on higher, university, technical, adult and vocational education, as opposed to elementary and secondary education, is more effective. But Ahmad (2003), using household panel data for Bangladesh, finds that social benefits for primary education are high, and both private benefits and costs are rather low, compared with the ones of secondary and higher education. There's no clear-cut answer to this issue.

However, one thing seems to be clear. In order to have a successful tertiary education, both primary and secondary education have to be of the highest possible quality. It would make no sense to devote a great amount of resources to higher education while disregarding the previous stages.

Is public spending on education a pro-poor policy? Is it efficient for attacking the problem of poverty? Or could there be substantial leaks towards more affluent groups of society? This is the question posed by Lanjouw, Pradhan, Saadah, Sayed and Sparrow (2001). Using traditional static benefit-incidence analysis for Indonesian data, they find that spending on primary education and primary health tends to be pro-poor, while spending on higher education doesn't appear to be such a progressive policy. However, allowing for economies of scale in consumption, they find

that the marginal incidence of spending in secondary schooling is more progressive than what static analysis would suggest. Contrasting with this view, Ahmad (2003) finds that inequality in the access to higher education remains the main cause of persistent poverty in Bangladesh.

Secondary and higher education tend to be more technical, and one could assess the benefits that -in terms of the benefits for the whole of society or positive externalities- each one of them contributes. In this aspect, Simoes (2006) is very clear in determining the benefits of each type of education. Both of them contribute to economic growth, in their own special way. Through her study of OECD countries mentioned before, she finds that secondary education enables individuals to successfully perform imitation activities; that is, technological progress through absorption of imported technologies. On the other hand, tertiary education prepares researchers, engineers, technicians, that will be able to develop original and new technology, capable of increasing productivity in their own economy.

Looking at the problem from the point of view of the policymaker of a developing country, and assuming that Simoes' findings are correct, it is probably best to allocate scarce resources to improve the quality of primary and secondary education, and particularly this last one, if one is targeting the development of the economy as a whole. Most of the economies that rose from developing to rich in the 20th century (Japan, Korea, Hong Kong, etc) did so by wisely exploiting foreign technology, while developing very little of their own. China is doing the same thing today. It seems to be the efficient way to go. In that sense, it might be sensible that public spending on education should concentrate on the primary and secondary levels.

There has also been some controversy in the literature about whether female education contributes to economic development in the same way as male education. Barro and Lee (1993) try female schooling attainment as an explanatory variable for growth, but find that it lacks significant explanatory power. Their explanation is based on supposedly discriminatory practices against women in some countries, which 'prevent the efficient exploitation of well-educated females in the formal labor market'. Tellingly enough, the study of Trzcinsky and Randolph (1991) in Malaysia only analyzes the role of male educational attainment in explaining income differentials. To this respect, Hill and King (1995) make a review of some empirical research that analyzes the benefits of female education, and argue that education enhances labor

productivity and income growth for both men and women. They argue that educating women also has some additional effects on social well-being (positive externalities) that are not always measured by the market. Rising levels of education -they continue- can improve women's productivity in the home, which in turn increases family health, child survival and the investment in children's human capital. The social benefits from women's education would range from fostering economic growth to increasing the life expectancy of the population.

4) Quality versus Quantity of Education

One of the most important issues of this type of analysis should be the distinction between quantity and quality of education. Should policy aim at raising educational attainment, measured by years of schooling, or rather pay more attention to the quality of that education? This is the main question posed by Barro (2001). He carries out an empirical analysis of around 100 countries at very different levels of development, over the period 1965-1995. He finds that educational attainment (at the secondary and higher level) is certainly very important in explaining economic growth, but that educational quality, measured by international test scores (particularly math and science), has a higher explanatory power.

A very complete study on this issue is the one provided by Hanushek and Woessmann (2007). They carry out some research on 50 countries for which there exists reliable data on school attainment and results of an internationally recognized test on cognitive ability (the International Adult Literacy Survey). As we can see in the Table 1, they perform regressions of growth in income per capita against GDP per capita in the base year (1960), years of schooling in the base year (1960), test scores and some other control variables. Their results are very clear and conclusive in favor of the importance of educational quality. Years of schooling appear to have a significant positive effect only when test scores are not included in the regression; otherwise, they have little significance. Test scores appear to have a significant and strong positive influence, robust to the inclusion of regional dummies and other control variables, such as openness and protection against expropriation (which have the expected positive signs).

Table 1: Education as a Determinant of Growth in Income per Capita, 1960-2000

	r1	r2	r3 (a)	r4 (b)
GDP per capita 1960	-0.379 [4.24]	-0.302 [5.54]	-0.277 [4.43]	-0.351 [6.01]
Years of schooling 1960	0.369 [3.23]	0.026 [0.34]	0.052 [0.64]	0.004 [0.05]
Mean of test score		1.980 [9.12]	1.548 [4.96]	1.265 [4.06]
Openness				0.508 [1.39]
Protection against expropriation				0.388 [2.29]
Constant	2.785 [7.41]	-4.737 [5.54]	-3.701 [3.32]	-4.695 [5.09]
R ² (adjusted)	0.252	0.728	0.741	0.784

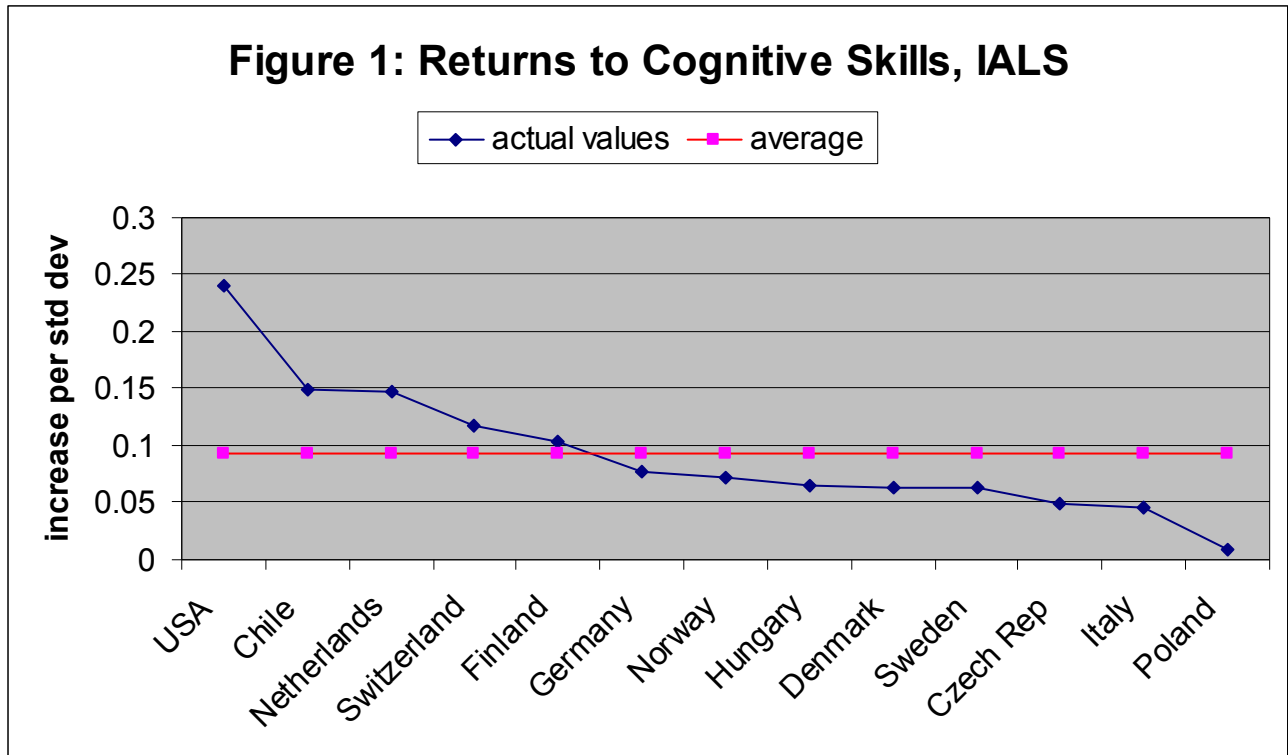
Dependent variable is average annual growth rate in GDP per capita, 1960-2000;
t-statistics in parentheses.

(a) regression includes 5 regional dummies; (b) sample contains only 47 countries

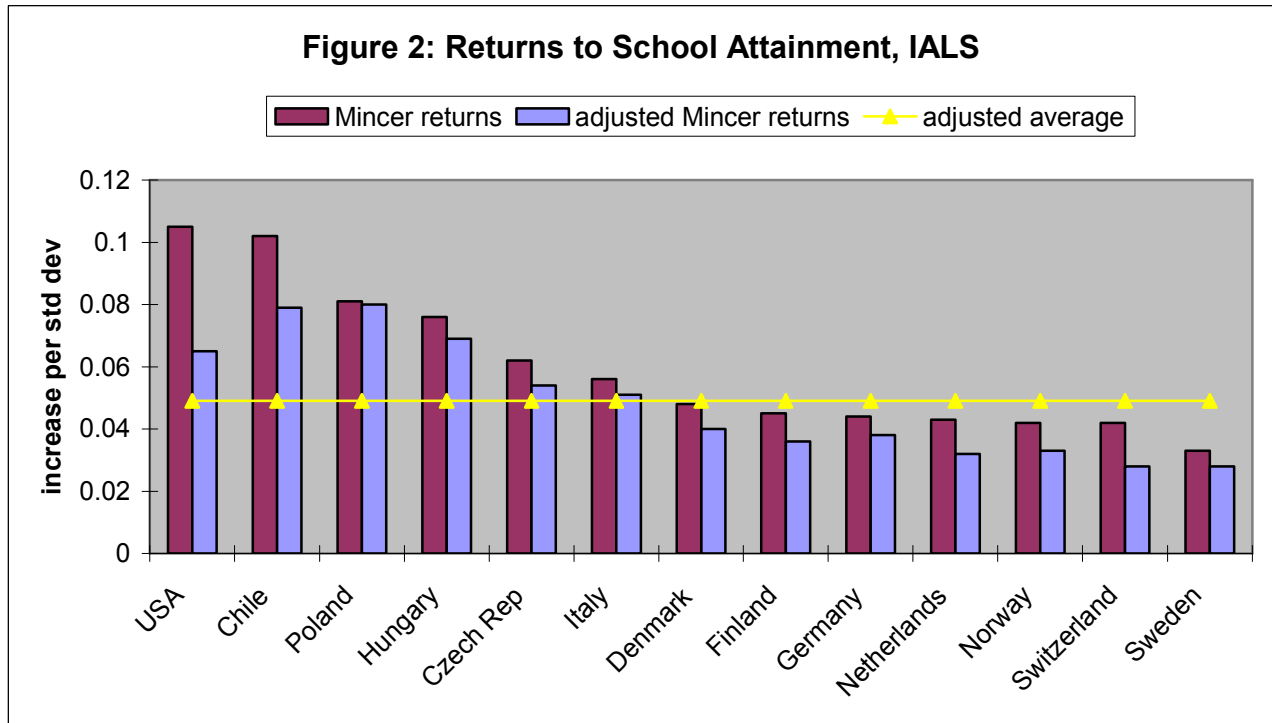
Source: Hanushek and Woessmann (2007)

Notice how the R^2 jumps from a very low level to a significantly high level as soon as you include the quality of education among the explanatory variables.

Hanushek and Woessmann also inquire into the effect of educational quality over individual incomes, following Mincer (1974). They use the same International Adult Literacy Survey (IALS) as before, for a sample of 13 countries (the ones for which there is availability of continuous measure of individual earnings). The results, which are shown on the following two diagrams, are what we could expect, but impressive nonetheless. The increase of one standard deviation in cognitive skills, as measured by IALS, will raise individual incomes by 9.3% on average. On the other hand, the same increase of one standard deviation in school attainment will raise individual incomes by only 4.9%, after adjusting for literacy scores. If we don't adjust for these scores, the effect would only be a relatively low 6% (Mincer returns).



Source: Hanushek and Woessmann (2007)



Source: Hanushek and Woessmann (2007)

In the light of these data, Hanushek and Woessmann conclude that there is ‘strong evidence that the cognitive skills of the population -rather than mere school attainment- are powerfully related to individual earnings, to the distribution of income, and to economic growth’. It is a certainly a very compelling statement. They complete their study by providing some data showing how far most developing countries stand in relation to their developed counterparts in relation to educational quality standards.

Educational quality is not just a matter of resources, as Hanushek & Woessmann argue. Once you have reached an indispensable minimum to get the educational system going, in terms of buildings, materials, teachers and infrastructure in general, additional resources might just be absorbed by the system in a very inefficient way, when not destined to unjustified overpayments or simply corruption. Something that really matters for the quality of education -as the authors put it- is the ‘quality’ of the teachers. But this doesn’t even depend on the wages they receive or the experience they might have. It is institutional factors that will make a real difference, both for teaching quality and for the efficiency of the system in general. Motivated teachers are the product of institutional efficiency. A complete structural reform might be needed in order to improve the quality of education in developing countries.

5) Institutional factors

Hanushek and Woessman (2007) deal with a series of institutional aspects that are important for the quality of education. To have an efficient institutional structure seems to be the most important task to improve the quality of education. It should be a structure that gives the right incentives to the operators of the educational system, because performance responds to incentives. The system of incentives must include rewards and penalties.

The institutional structure that Hanushek & Woessmann propose is based on three pillars:

- a) choice and competition

This means that parents and beneficiaries should be able to choose the school they wish to attend. This will trigger the necessary competition among educational establishments.

b) decentralization and autonomy of schools

The schools must be autonomous to make their own decisions regarding what they will offer to students (curriculum, schedules, etc).

c) accountability

Educators must be held responsible for the performance of their students and, therefore, receive the corresponding rewards or penalties.

At first glance, it may seem that these goals can only be achieved by private schools, and that they would be taken for granted in a private educational system. However, this is not necessarily true. Competition is not a characteristic of many private schools, especially in more traditional societies. On the other hand, public systems of education can really produce competition among schools if the right incentives are provided, as Hanushek and Woessman point out.

It is important to realize also that successful reforms need to address all these aspects as a whole. For example, it would be unconceivable to implement free choice and competition, if there isn't some sort of system of accountability in place. The results could be disastrous, as the authors argue. As for the types of incentives that would work, it seems that monetary incentives have been quite efficacious in some countries of the world, most notably Israel and England. But this does not exclude other possibilities (promotion, recognition, etc).

The factors that determine quality

As we have seen, the quality of education is a complex phenomenon. First of all, we want to determine whether private schools tend to provide a higher quality than public schools or not. The main reason why one thinks they should is not so much the amount of resources that they

devote, but rather the institutional structure, supposedly based on the ‘pillars’ suggested by Hanushek and Woessmann.

Hanushek and Woessmann remind us that it was Friedman (1962) who first proposed a system of vouchers to introduce choice and competition in the educational system. Mizala and Romaguera (2000) and Rouse (1998) have found some evidence of very positive results of voucher experiences in Chile and Milwaukee.

Glomm and Ravikumar (1992) build an overlapping-generations model in which investment in human capital through formal schooling is the main determinant of growth. They find that private education yields higher income per capita in the long run, but it can also lead to higher income inequality. However, this last conclusion is not very relevant for our purposes, since they are assuming that beneficiaries pay the full cost of private education, while they wouldn’t if they attended public schools. This asymmetry distorts the real benefits of private education.

Mizala and Romaguera (2000), in a cross-section analysis with more than 1000 observations in Chile (unit of analysis is the school), find striking differences in the performance of students of the same educational level across different types of school. Whether education is privately or publicly provided seems to make a difference, but controlling for family characteristics the difference seems to get smaller. Mizala, Romaguera and Farren (2002), using the production-frontier technique and data-envelopment analysis on a sample of 2000 schools in Chile, conclude that it is not just resources that make the difference between efficient and low-performing schools. It has to do with incentives. Mizala and Romaguera (2002) find that the school plays a significant role in students’ performance, although they cannot identify the precise characteristic of the school that is directly responsible.

Studies in the US that compare performance of public and private schools include Coleman, Hoffer and Kilgore (1982), Hoffer, Greely and Coleman (1985), Alexander and Pallas (1985), Willms (1985) and Chubb and Moe (1990). The evidence in favor of private schools is mixed. In Chile, a country that has pioneered in the introduction of school vouchers, several studies have been conducted since the 1980s, apart from the works of Mizala, Romaguera and Farren. The most important ones are the ones by Rodriguez (1988), Aedo and Larrañaga (1994) and Carnoy

and McEwan (1997). Most of them conclude that private subsidized schools tend to perform better than the public ones. At this point, we need to describe the specific characteristics of the school system in Chile.

Characteristics of the Chilean educational system

In order to assess the results of any exercise on the measurement of the quality of education in Chile, we need to know how the educational system works there. There are basically three types of schools. The most numerous ones are the public schools, which are run by the municipalities in a decentralized way (indirectly funded by the central government). The second type is the private schools subsidized by the central government, which are managed completely by private corporations and compete for the subsidies of the state. In practice, both the municipal schools and the private subsidized ones compete for the same subsidies. Finally, there are the fee-paying private schools, which don't receive any financial support from the government. Students and parents must pay high tuition fees to attend those institutions.

The voucher system is a particular one termed 'follow-the-student'. The amount of the voucher is around \$50 per student per month. This amount is not given to the parents or the students, but to the school that manages to attract the student. In Chile, parents can send their children to the school of their choice, regardless of residential districts. That introduces competition amongst all types of schools, which can attract students from relatively distant localities.

Curiously enough, there seems to be more competition amongst public and subsidized private schools than amongst private ones or amongst these ones and the other two types. One sign of this phenomenon is the amount of advertising that is observed at the beginning of each academic year; higher among the former than the latter ones. The reason seems to be that attendance to private schools is dictated more by considerations of status and tradition than by concerns about quality. Private schools perform, in some sense, like private exclusive clubs. The Chilean society is a very traditional one, and high levels of segregation persist through generations, in spite of the economic emergence of the middle class over the last thirty years. Schools, clubs, hospitals and

many other social institutions separate, in a very subtle and almost unnoticeable way, the types of individuals and families they receive. Of course, there is also the monetary factor (prices), which segregates by purchasing power.

An econometric exercise

In what follows, we will try to assess the effects of the different types of schools in Chile on the performance of the students, measured by their scores in national standardized tests that are applied to all students of different levels (4th, 8th and 10th) every 3 years over an overlapping calendar. We control for other variables that we believe affect that performance. The unit of analysis is the school. The same type of exercise was carried out by Mizala and Romaguera (2000), with results for the year 1996. Here we do a revisit of that analysis ten years later, making some slight changes in the model, according to our views and to what Hanushek and Woessmann suggest. Ten years might not seem a very long period for capturing significant changes, but it is in this case, since this new Chilean educational system was put in place at the end of the 1980s. In other words, in 1996, the system was still in its beginnings. By 2006, it had gained some experience and maturity.

The variables used in this analysis are the following:

- * L_{it} : generic variable indicating average performance of students of school i in year t
- * F_{it} : generic variable indicating family characteristics of students of school i in year t (any other than the socio-economic level)
- * S_{it} : generic variable indicating average characteristics of students of school i in year t (character, ability, health, etc)
- * A_{it} : generic variable indicating family characteristics of teachers of school i in year t (education, experience, etc)
- * I_{it} : generic variable indicating family characteristics of school i in year t (basically institutional features)
- * **SIMCE score**: specific regression variable indicating the average score (in mathematical and verbal abilities) obtained by the students of a particular school

- * **subsidized private**: specific dummy (binary) variable indicating whether a school is a private subsidized one or not (1=yes; 0=no)
- * **fee-paying private**: specific dummy (binary) variable indicating whether a school is a private fee-paying one or not
- * **urban**: specific dummy (binary) variable indicating whether a school is an urban one or not
- * **socio-economic level medium-low**: specific dummy (binary) variable indicating whether the average socio-economic level of the students in a particular school is medium-low or not
- * **socio-economic level medium**: specific dummy (binary) variable indicating whether the average socio-economic level of the students in a particular school is medium or not
- * **socio-economic level medium-high**: specific dummy (binary) variable indicating whether the average socio-economic level of the students in a particular school is medium-high or not
- * **socio-economic level high**: specific dummy (binary) variable indicating whether the average socio-economic level of the students in a particular school is high or not
- * **number of pupils**: specific regression variable indicating number of students in a given school (proxy for size of school)
- * **number of teachers**: specific regression variable indicating number of students in a given school (alternative proxy for size of school)
- * **pupil/teacher ratio**: ratio of students to teachers in a given school
- * **girls only**: specific regression variable indicating whether the school is for girls only
- * **boys only**: specific regression variable indicating whether the school is for boys only
- * **urban-private**: interaction dummy (binary) variable indicating whether the school is fee-paying private and urban
- * **urban-subsidized**: interaction dummy (binary) variable indicating whether the school is subsidized private and urban
- * **pupil/teacher private**: interaction variable which indicates whether the fact of being fee-paying private has any influence on the effect of the pupil/teacher ratio
- * **pupil/teacher subsidized**: interaction variable which indicates whether the fact of being subsidized private has any influence on the effect of the pupil/teacher ratio
- * **pupil/teacher urban**: interaction variable which indicates whether the fact of being urban has any influence on the effect of the pupil/teacher ratio

The model for Mizala and Romaguera was:

$$L_{it} = f(F_{it}, S_{it}, A_{it}, L_{i,t-1})$$

In their econometric exercise, Mizala and Romaguera used the SIMCE test (Measurement System of the Quality of Education) as a specific measure for L_{it} . $L_{i,t-1}$ are the scores of the last time the same grade took the test (in this case, 4th grade). This last variable represents a proxy for unobservable characteristics of the students or what affects their performance. Mizala and Romaguera used the SIMCE scores for 4th grade in 1996 as their independent variable and the scores of the same grade in 1994 as their control variable.

Our model is slightly different, as we substitute ‘school characteristics’ for ‘teacher characteristics’, where *school characteristics* represent features of the institutional structure of the school that will eventually affect teachers’ performances, but also parents’ decisions and students’ efforts. It is basically a variable that will affect the motivation of all the agents involved. Therefore, we restate our model as:

$$L_{it} = f(F_{it}, S_{it}, I_{it}, L_{i,t-1})$$

where the new variable I stands for the school characteristics. Consequently, we don’t use ‘teachers’ experience’ in our experiment, as Mizala and Romaguera did. It wasn’t a very significant variable in their study, and other studies in the literature ignore it. Based on these facts and our basic intuition, we think the variable is relatively irrelevant compared to the motivation of teachers.

Apart from being an update of Mizala and Romaguera’s work, our contribution here is to refine a little on the independent variables. Those authors use two variables to denote social origin: the socio-economic level and the vulnerability index. We eliminate this last one, not only because we think it is redundant, but because it can never give proper account of the situation of all schools; it is not measured for private schools. Mizala and Romaguera assume that it takes a

value of zero for private schools. We do not think it is a good solution; students of private schools are not all rich or free of social deprivation.

Our exercise is also different from theirs in the sense that they are measuring primary school performance, whereas we are dealing with high school performance. This last one –we believe– is more relevant for assessing the productive potential of a country and the welfare implications for the future of these students.

We also eliminate another variable: the existence of preschool level in every institution. This appeared relatively insignificant in the study by Mizala and Romaguera, and would probably be more irrelevant in our study, which deals with high school performance.

The main innovation is that we use a better variable for controlling for unobserved characteristics. Instead of using the scores of the same grade the last time the test was taken, we use the scores of the same group of students for the last time they took the SIMCE test in a previous grade. In other words, we are measuring the scores of the SIMCE test for 10th grade of 2006, and we use the SIMCE scores for 8th grade of 2004 as our control variable. One might worry about the rates of attrition from 8th to 10th grade. Fortunately, this rate is minimal. In Chile, the minimal obligatory level of school attendance is 12th grade, even though a small percentage of students leaves anyway. Another problem might be some students changing school. Again, the Chilean system makes this occurrence very rare, since all schools that have high-school levels also have the previous levels (elementary and junior-high), with very few exceptions. So we can be sure that this is our best bet at measuring the characteristics of that specific group.

There are dummy variables for the type of school (excluded is the public or municipal school), for socio-economic levels (there are 5, and we exclude the ‘low’ level), for gender of school (there are 3; we exclude co-ed) and for the geographical index (urban or rural; we exclude ‘rural’). The other independent variables are the pupil-teacher ratio, the number of teachers and the number of students. These last two are supposed to account for the size of the school, and we use either of them but not the two together.

The institutional factors given by the school characteristics are not something easy to measure. However, we propose that some of it is reflected in the type of management (whether private or public). Further research is needed in this area, and could constitute a refinement of this paper.

The SIMCE scores are the average for Language and Mathematics of the SIMCE test, and there are 1615 observations (all the schools for which information about all the variables was available).

The method of estimation is OLS, and the results of the regressions are given in Table 2.

The first regression includes all the independent variables, except the interactions. The purpose is to test the joint significance of the whole set. The SIMCE score control appears quite significant, as will happen in all the regressions. This comes as no surprise, as there is a high correlation between this independent variable and the resulting score we are measuring; it is basically the same group of people. The relevance of this variable can be assessed by running a regression without it: we did it, and the R^2 drops to half the previous level. It is also interesting to note that the coefficients of the control variable are positive and consistently close to 1 in all the regressions, which reflects that relative performances of schools stay relatively constant.

In that first regression, the subsidized private variable appears quite significant, but the fee-paying private one is not significant at the 10% level. This pattern is repeated in all the regressions where we include the socio-economic variables. All the socio-economic variables are quite significant and have the expected values. For the high socio-economic level, the additional score points are more than 30 (for a typical score of between 200 and 300). The urban dummy doesn't appear significant, but the 'girls only' school type appears to make a difference in terms of scores, while the 'boys only' schools have much less significance. In any case, both types score better than co-ed schools.

In regression 2, we have the full model, with all the interactions. The purpose is similar to that of regression 1, but now we want to test the joint performance of all the interactions. The main

finding here is that being urban doesn't add to the effects of private schools over scores nor to the effect of subsidized private schools. Moreover, in this case, the type-of-school dummies become insignificant and with the wrong sign (we are expecting private schools to add value over public schools and not to decrease it). Neither does being private or subsidized add to the effect of the pupil/ teacher ratio over scores. This ratio remains insignificant anyway. Along the same lines, the fact of being urban does not affect the non-influence of the student/teacher ratio.

From the third regression onwards, we start trying different combinations of variables, but with the main purpose of assessing the strength of our main variables of interest: the private-public divide and the influence of the socio-economic level. We never eliminate the SIMCE control, because it is crucial for the reliability of the rest of the coefficients. It is like an anchor, which captures most of the information not possible or difficult to obtain by other means.

Regression 3 uses only the type-of-school variables and the SIMCE control. Here, the fee-paying private dummy becomes significant, both statistically and practically, adding 17 points to public school scores. The subsidized private dummy remains significant, adding 10 points over public school performance. In Regression 4 we have added the socio-economic dummies, and retain the type-of-school variables. The fee-paying private dummy becomes insignificant due to the inclusion of the socio-economic levels. But the subsidized private one remains highly significant.

In regressions 5 through 8, we omit the public/private divide dummies, in order to assess the strength of the other variables, particularly the socio-economic levels. Regression 5 tries only the socio-economic dummies along with the SIMCE control. They are all highly significant, in a regression with high explanatory power. In the sixth one, the socio-economic variables retain their high explanatory power, in spite of the inclusion of several other supposedly relevant variables. Amongst these, the number of teachers (proxy for the size of the school) and the urban location of the school appear to be non-significant, and the pupil/teacher ratio has a non-expected sign. However, the gender variables are relatively significant, indicating that girls-only schools add value to schools' performances. The case is not so clear for boys-only school, but in any case there is some weak evidence that they tend to be more efficient than co-educational schools.

In the seventh regression, we test only for the effects of the pupil/teacher ratio. Finally, the sign is the expected one: the higher the ratio, the lower will be the students' performance. Unfortunately, the coefficient is not statistically significant. Regression 8 tests this same variable, but now including the socio-economic levels, and the coefficient reverts again to the wrong sign.

Regressions 9 through 16 eliminate the gender variables, which have proved to be rather significant, and the 'pupil/teacher private' and 'pupil/teacher subsidized' interaction, which have proved to be non-significant. Regressions 9, 13, 14 and 16 concentrate on the public/private divide variables, which are the ones of most interest to us. Interestingly enough, the fee-paying private dummies become significant (and have the expected sign) in three of these regressions, but only when the socio-economic levels are not present. A similar thing happens with the subsidized private dummies. In regressions 10, 11, 12 and 15, we test basically the strength of the socio-economic variables, and they are all consistently significant, both in magnitude and statistically. In all of these regressions, none of the interactions is significant or has the expected value, and the urban dummy continues to be completely insignificant.

The salient features of the whole set of regressions are the following:

- 1) The type-of-school variables tend to be significant only in the absence of the socio-economic dummies. However, the fourth regression shows that the subsidized private dummy has a greater significance than the fee-paying private one, even with the inclusion of the socio-economic levels.
- 2) The socio-economic levels are crucial in explaining performance of the different schools. They are always significant, no matter what other variables we include.

Table 2: Regressions of the Determinants of Students' Performance

Dependent variable: SIMCE score 10th grade (2006) (P> |t| values in parentheses)

Variables	1	2	3	4	5	6	7	8
SIMCE score 8th grade (2004)	0.911 [0.000]	0.909 [0.000]	1.091 [0.000]	0.934 [0.000]	0.944 [0.000]	0.917 [0.000]	1.184 [0.000]	0.933 [0.000]
subsidised private	5.032 [0.000]	-2.048 [0.686]	10.077 [0.000]	4.527 [0.000]				
fee-paying private	3.977 [0.106]	-4.181 [0.564]	17.152 [0.000]	1.495 [0.538]				
urban	-1.794 [0.317]	-7.368 [0.249]				-1.785 [0.322]		
socio-economic level medium-low	4.661 [0.004]	5.025 [0.002]		5.647 [0.000]	7.158 [0.000]	6.246 [0.000]		5.940 [0.000]
socio-economic level medium	13.259 [0.000]	13.609 [0.000]		13.519 [0.000]	15.934 [0.000]	15.802 [0.000]		15.314 [0.000]
socio-economic level medium-high	23.282 [0.000]	23.655 [0.000]		22.132 [0.000]	24.422 [0.000]	26.137 [0.000]		25.320 [0.000]
socio-economic level high	30.678 [0.000]	30.943 [0.000]		29.965 [0.000]	29.978 [0.000]	33.328 [0.000]		32.840 [0.000]
number of teachers	0.044 [0.028]	0.044 [0.031]				0.027 [0.177]		
pupil/teacher ratio	0.240 [0.003]	-0.194 [0.591]				0.291 [0.000]	-0.114 [0.088]	0.311 [0.000]
girls only	5.503 [0.003]	5.723 [0.002]				5.321 [0.004]		
boys only	4.057 [0.115]	4.362 [0.091]				3.580 [0.165]		
urban-private		1.929 [0.752]						
urban-subsidised		3.062 [0.419]						
pupil/teacher private		0.428 [0.139]						
pupil/teacher subsidised		0.217 [0.291]						
pupil/teacher urban		0.243 [0.477]						
constant	-1.728 [0.733]	7.633 [0.328]	-35.213 [0.000]	-4.260 [0.378]	-2.846 [0.556]	-1.516 [0.765]	-48.398 [0.000]	-5.868 [0.228]
F	705.55	498.22	2468.55	1185.35	1643.56	838.24	3424.77	1387.12
Prob > F	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
R² adjusted	0.840	0.840	0.821	0.837	0.836	0.838	0.809	0.838

Table 2 (continued)

Dependent variable: SIMCE score 10th grade (2006) ($P > |t|$ values in parentheses)
(N=1615)

Variables	9	10	11	12	13	14	15	16
SIMCE score 8th grade (2004)	1.090 [0.000]	0.926 [0.000]	0.933 [0.000]	0.945 [0.000]	-0.944 [0.000]	1.083 [0.000]	0.933 [0.000]	1.083 [0.000]
subsidised private	9.983 [0.000]				1.363 [0.692]	4.311 [0.226]		10.368 [0.000]
fee-paying private	17.874 [0.000]				0.044 [0.994]	20.579 [0.000]		18.109 [0.000]
urban			-1.562 [0.386]	-0.891 [0.622]	-2.681 [0.314]	0.619 [0.818]	-6.422 [0.216]	
socio-economic level medium-low		5.888 [0.000]	6.307 [0.000]	7.379 [0.000]	5.944 [0.000]		6.364 [0.000]	
socio-economic level medium		15.417 [0.000]	15.735 [0.000]	16.180 [0.000]	13.755 [0.000]		15.787 [0.000]	
socio-economic level medium-high		25.461 [0.000]	25.774 [0.000]	24.671 [0.000]	22.325 [0.000]		25.853 [0.000]	
socio-economic level high		32.453 [0.000]	32.266 [0.000]	30.192 [0.000]	30.123 [0.000]		33.337 [0.000]	
number of students								0.002 [0.022]
number of teachers		0.029 [0.136]						
pupil/teacher ratio	0.084 [0.267]	0.277 [0.000]	0.317 [0.000]				0.044 [0.875]	
urban-private					1.831 [0.739]	-3.218 [0.572]		
urban-subsidised					3.570 [0.323]	6.123 [0.104]		
pupil/teacher urban							0.286 [0.318]	
constant	-36.647 [0.000]	-4.637 [0.347]	-5.004 [0.314]	-2.323 [0.639]	-2.239 [0.667]	-33.979 [0.000]	-0.425 [0.950]	-34.826 [0.000]
F	1851.99	1190.18	1188.88	1369.03	828.94	1238.20	1040.40	1857.61
Prob > F	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
R² adjusted	0.821	0.838	0.837	0.836	0.837	0.821	0.837	0.822

- 3) Perhaps the most striking feature of all these regressions is that the pupil/teacher ratio has a positive coefficient in most of them; in other words, a higher pupil/teacher ratio would lead to better SIMCE scores. However, none of these results are of a great practical significance (less than one score point). There is practically a no-relationship between the ratio and the SIMCE scores.
- 4) None of the interactions are very significant in any of the regressions we tried.
- 5) The size of the school, as measured by the number of teachers, never appears too significant from a practical point of view. Neither does it when it is measured by the number of students (regression 16). The same thing happens with the geographic location of schools. That dummy variable is consistently insignificant and has an unexpected sign.

Also, the importance of using the right controls (lagged SIMCE scores of the same group of students) can be observed by comparing the R^2 in these regressions (all above 80%) with the ones obtained by Mizala and Romaguera (below 60%).

Conclusions

From the previous results, we can draw some simple tentative conclusions. First and foremost, what appears to be always significant and relevant in our results is the family background, represented by the socio-economic level. And this means that in a stagnant social structure, the poor have little chance of emerging into higher levels of economic welfare. When you come from a poor family in a developing country, your educational performance will tend to be low and be transmitted in that way to your offspring. It is important for public policy to find ways, through redistribution of educational resources, to break these patterns of reproductive cycles from generation to generation.

The size of the school is not an issue in determining the quality of education. A similar conclusion can be drawn from the results for the urban variable. Being urban doesn't seem to add anything to the quality of education.

In general, it seems that private schools seem to incorporate better the elements of choice, competition and accountability that we have mentioned before, as shown by the higher scores obtained by those schools in Chile. We must admit that the results are weak in favor of this hypothesis. However, the results for the private subsidized schools seem to be more robust to the inclusion of socio-economic variables, when other distractive variables are not present. The reason for the relative superiority of private subsidized schools is still to be determined. However, it is quite likely that it has to do with the fact that these schools have to compete for the public subsidies of the state along their municipal counterparts.

Certainly the characteristics of choice, competition and accountability are not a monopoly of private schools. In Chile, public schools have become more efficient through decentralization and a certain degree of competition. This can be clearly observed when looking at the evolution of SIMCE scores through the years over the last two decades; the gap has been narrowing between public and private schools, as shown by the statistics of the Chilean Ministry of Education.

However, the advantage of private schools over public ones can be clouded by segregation, as it happens in Chile. The influence of fee-paying private schooling is almost annulled by the inclusion of socio-economic factors into the analysis. What happens in very traditional societies like Chile is that parents send their children to private schools not so much seeking a higher-quality education, but rather in search of status or following family traditions. It might be hypothesized that this fact relieves the school somehow from their main responsibility of delivering quality, rendering it less competitive and less accountable (something which should be investigated more thoroughly). Hence, this could be explaining the mediocre academic results of Chilean private schools, as compared to the results of other private schools throughout the world. This can be easily verified by comparing the results of Chile with the results of other countries in the international PISA tests for private schools worldwide.

Of course monetary compensation will be an important factor in producing motivation, which will eventually lead to a better teaching quality. But it is perhaps not the most important one. We would like to propose (and this is a matter of a deeper study) that accountability, competition

(even within the school) and work atmosphere will probably matter most. And this is the responsibility not only of national educational authorities, but mainly of parents and school directors.

Social segregation is a serious problem and can affect the economic evolution of a country as a whole. In this sense, one of the main tasks for educational policy-makers in countries like Chile is to provide some kind of redistribution in the resources given to the schools. Public spending in education is one of the best redistributive policies in developing countries. Chile spends between 6 and 7% of its GDP on education. Perhaps it should be more; the amount of the subsidy per student is still rather low.

The intuition behind our conclusions –and this is subject to debate and further research- is that what matters most for economic performance and efficiency in education is the provision of a set of institutional factors that will produce the motivation needed to succeed, both to teachers and to students. This institutional structure encompasses competition, accountability, choice and efficient public spending with redistributive objectives. And this clearly transcends the traditional division between public and private schools. In Chile, public schools have become relatively efficient by decentralization, by being allowed to be independent and autonomous in their decisions, competing openly with their counterparts in the system. The quantification of the effects of these institutional factors remains the task of further research on this issue.

Bibliography

- Abramovitz, Moses (1986). 'Catching up, Forging Ahead, and Falling Behind', *Journal of Economic History*, vol 46, #2
- Aedo, Cristián and Osvaldo Larrañaga (1994), 'Educación Privada vs. Pública en Chile: Calidad y Sesgo de Selección', *Graduate Economics Program ILADES/Georgetown University*, mimeo, Santiago
- Alexander, Kart and Aaron Pallas (1985), 'School Sector and Cognitive Performance: When is Little a Little?', *Sociology of Education*, 58
- Ahmad, Alia (2003), 'Inequality in the access to education and poverty in Bangladesh', *Working Papers Lund University*, 2003, #5
- Barham, Boadway, Marchand, and Pestieau (1995), 'Education and the Poverty Trap', *European Economic Journal*, vol 39, #7, 1995
- Barro, Robert J (2001), "Human Capital and Growth", *American Economic Review*, v91, #2
- Barro, Robert and Jong-Wha Lee (1993), 'Losers and Winners in Economic Growth', *NBER Working Paper Series*, #4341
- Benhabib, Jess and Mark Spiegel (1994), 'The Role of Human Capital in Economic Development: Evidence from Aggregate Cross-Country Data', *Journal of Monetary Economics*, v34, #2
- Carnoy, Martin and Patrick McEwan (1997), 'Public Investment or Private Schools?: A Reconstruction of Educational Improvements in Chile', mimeo, *Stanford University*

Chubb, John, and Terry M Moe (1990), 'Politics, Markets and America's Schools', The Brookings Institution, Washington DC

Coleman, James S, Thomas Hoffer and Sally Kilgore (1982), High School Achievement: Public, Catholic and Private Schools Compared, Basic Books, New York

Denison, Edward (1967), Why Growth Rates Differ, Brookings Institution

Easterly and Levine (2001), 'It's not factor accumulation: stylised facts and growth models', Central Bank of Chile Working Papers #164

Friedman, Milton (1962), Capitalism and freedom, University of Chicago Press

Glomm, Gerhard, and B Ravikumar (1992), 'Public versus Private Investment in Human Capital: Endogenous Growth and Income Inequality', The Journal of Political Economy, vol 100, # 4

Hall, Robert and Charles Jones (1999), 'Why Do Some Countries Produce So Much More Output per Worker than Others?', NBER Working Papers, #6564

Hanushek, Eric and Ludger Woessmann (2007), 'The Role of Education Quality in Economic Growth', World Bank Policy Research Working Papers, #4122

Hill, M Anne Hill and Elizabeth King (1995), 'Women's education and economic well-being', Feminist Economics, vol 1, #2

Hoffer, Thomas, Andrew M Greely and J S Coleman (1985), 'Achievement Growth in Public and Catholic Schools', Sociology of Education, 58

- Klenow, Peter and Andres Rodriguez-Clare (1997), 'Economic growth: A review essay', Journal of Monetary Economics, v40, #3
- Krueger, Alan and Mikael Lindhal (2001), 'Education for Growth: Why and for Whom?', Journal of Economic Literature, v39, #4
- Jha, Raghendra, Bagala Biswal and Urvashi Biswal (2001), 'An Empirical Analysis of the Impact of Public Expenditures on Education and Health on Poverty in Indian States', ASARC Working Papers, 2001
- Lanjouw, Peter, Menno Pradhan, Fadia Saadah, Haneen Sayed and Robert Sparrow (2001), 'Poverty, education and health in Indonesia: who benefits from public spending?', Policy Research Working Paper Series from The World Bank, #2739, 2001
- Mincer, Jacob (1974), 'Schooling, Experience and Earnings', National Bureau of Economic Research, New York
- Mizala, Alejandra, and Pilar Romaguera (2000), 'School performance and choice: the Chilean experience', Journal of Human Resources vol 35, # 2
- Mizala, Alejandra, and Pilar Romaguera (2002), 'Equity and Educational Performance', Documentos de Trabajo Centro de Economía Aplicada, # 136, Universidad de Chile
- Mizala, Alejandra, Pilar Romaguera and Dario Farren (2002), 'The technical efficiency of schools in Chile', Applied Economics, vol 34, #12
- Perry, Guillermo E; Omar S Arias, J Humberto Lopez, William F Maloney and Luis Servén (2006), Poverty Reduction and Growth: Virtuous and Vicious Circles, The World Bank
- Rodríguez, Jorge (1988), 'School Achievement and Decentralization Policy: the Chilean Case', Revista de Análisis Económico, 3(1)

Rosenstein-Rodan, Paul (1943), 'Problems of Industrialisation of Eastern and South-Eastern Europe', The Economic Journal, vol 53, # 210/211

Rouse, Cecilia Elena (1998), 'Private school vouchers and student achievement: An evaluation of the Milwaukee Parental Choice Program', Quarterly Journal of Economics vol 113, # 2 (May)

Schultz, Theodore W (1975), "The Value of the Ability to Deal with Disequilibria", Journal of Economic Literature, v13, #3

Sen, Amartya K (1997), "Human Capital and Human Capability", editorial, World Development, v25, #12

Simoes (2006), 'How does education affect economic growth? An empirical investigation', Faculdade de Economia da Universidade de Coimbra, unpublished paper

Trzcinsky, Eileen and Susan Randolph (1991), "Human Capital Investments and Relative Earnings Mobility: Considering the Role of Education, Training, Migration and Search", Economic Development and Cultural Change, v40, #1

United Nations Development Programme (2007), Human Development Report 2007-2008

Willms, J Douglas (1985), 'Catholic School Effects on Academic Achievement: New Evidence from the High School and Beyond Follow-up Study', Sociology of Education, 58