Schooling, Human Capital and Development: 
The Role of Teacher Quality in Student Achievement

Stefano Magazzini

University of Rome “Tor Vergata”

Master in Development Economics and International Co-operation
Academic Session 2008-2009

Thesis Statement. Most studies on development include the importance of human capital as a driving force, which is enhanced by a strong education system; teacher quality is certainly a central component in the determination of students’ achievements, but it is difficult to measure: a way to overcome this lack of information is to look at the correlation between student achievement and some features of the teachers’ labour market. The aim of this essay is to search if better mechanisms of selecting and allocating teachers to schools have an impact on the quality improvement of education, with evidence related to the Italian educational system and its current teachers’ recruitment system. Evidence demonstrates that a centralized and bureaucratic allocation mechanism, which leaves no room for school competition, does not guarantee a high enough quality level of schooling.
1. Introduction

It is impossible nowadays to ignore the message that education matters and the role it plays in development: “achieve universal primary education” is one of the central pillars of the Millennium Development Goals, but achieving universal primary education means more than full enrolment (as the second Millennium Development Goal is often interpreted); it also encompasses the quality of schooling.

The majority of empirical studies maintain that differences in learning achievements matter more than differences in enrolment rates in explaining cross-country differences in growth and development. Thus there is no significant relationship between resources employed and school outputs, i.e., policies that simply provide more resources within schools are unlikely to produce substantial gains in student outcomes. Instead, what specifically counts as one of the most important school elements seems to be high quality and motivation of the teachers; unfortunately policy recommendations often ignore existing evidence about teacher labour markets and the determinants of teacher effectiveness.

Teacher quality is certainly among the determinants of students’ achievements, but it is difficult to measure: simple indicators such as teacher experience, teacher education, salary or even meeting the required standards for certification, are not closely correlated with actual ability in the classroom. So the link between teachers’ market functioning and teachers effectiveness is not easy to establish because of the dearth of reliable information about teachers’ quality, motivation and exerted effort. A way to overcome this lack of information is to look at the correlation between students’ achievements and some features of the teachers’ labour market, particularly the mechanism that allocates teachers to schools.

A case study about the Italian educational system shows that the current teachers’ recruitment and allocation system does not guarantee a high enough quality level, because this bureaucratic centrally determined mechanism leaves no room for the schools to pursue an active role in selecting and motivating their own teachers. So the absence of schools’ competition in attracting households and
resources produces the result that schools are not able to contrast both the risk of scholastic outflow and the presence of wide inequalities, particularly in those fragile local environments where the accumulation of human capital would represent a critical element for a better development.

2. Human Capital and Development

The neoclassical models of growth and development follow from entirely standard assumptions on technology alone: the pace of growth of an economy is simply attributed to exogenous technical progress, thus per capita growth settles down to equal the rate of technical progress. This implies that at the heart of these models is the prediction of convergence, i.e., the idea that relative income differences between countries must die away in the long run. Convergence is intimately connected to the notion of diminishing marginal productivity of capital, which implies that the marginal product of capital is higher in a less productive economy. Then, if trade in capital goods is free and competitive, new investment will occur only in the poorer economy, and this will continue to be true until capital-labour ratios, and hence wages and capital returns, are equalized. Thus convergence is based on the idea that a poorer country has a marginal return to capital and therefore exhibits a higher rate of per capita growth.

Unfortunately convergence is not supported by empirical evidence: long-run per capita growth may well be driven by technical progress, but this does not mean that technical progress must be exogenously specified, because human beings, through their conscious actions, determine the rate of technical progress. If so, then these actions and decisions have growth-rate effects and should be part of an explanatory theory: models of this kind are called endogenous growth theories, because the pace of growth is determined from within the model and is not simply attributed to exogenous technical progress.

In this class, a very famous model created by Lucas (1988) is based on human capital, a notion of skilled labour which can be created or augmented through education or training. The Lucas model assumes the simple idea that individuals and households can save in two distinct forms: a fraction of
all savings is translated into holdings of physical capital, but another fraction is saved by investing in education, to augment the quality of human capital, which raises the market value of labour that they supply in the future. Therefore, in the Lucas model, a policy that leads to a permanent increase in the time individuals spend obtaining skills generates a permanent increase in the growth of output per worker. Rich countries not only have access to a large stock of physical capital, but it is also possible for them, by investing time and money in education, to produce a large stock in human capital, i.e., labour that is skilled in production. On the other hand, developing countries tend to have a higher marginal rate of return to physical capital because of their surplus relative to unskilled labour, but they also have a shortage of human capital, and this drags down the rate of return of physical capital. Thus the predictions of convergence are considerably weakened and income differences across countries may become more explicable.

Another model of endogenous growth, developed by Romer (1990), emphasizes the importance of research and development (R&D) activities, related to the stock of human capital, as the source of technical progress and growth. Technical progress does not occur in a vacuum: it is a characteristic of recent history that R&D is carried out by firms, who deliberately divert resources from current productive activity in the hope of increasing economic productivity and future profits through gains in knowledge and innovations. These innovations may take the form of the introduction of new products for production or consumption (product innovation) or the introduction of new methods to carry out the production or distribution of an existing product (process innovation). Therefore, in the Romer model technical progress occurs at some rate, but the point is that both the stock of human capital in the economy and its degree of utilization in R&D affect the rate of technical progress: thus the stock of human capital is capable of exhibiting growth effects.

Qualitative descriptions of human capital generally come from one of two sources: measures of schooling inputs (such as expenditure or teacher salaries) or direct measures of cognitive skills of individuals. Empirical research demonstrates that consideration of cognitive skills alters the
assessment of education and knowledge in the process of development and it has a remarkable impact on differences in economic growth.

In an effort to shed light on the role that the quality of education, measured by the cognitive skills learned, plays in economic growth, Hanushek and Kimko (2000) studied international differences in mathematics and science knowledge, as evidenced by testing since the 1960s. Their analysis is a direct application of the Romer model of endogenous growth and the concentration on mathematics and science corresponds to the theoretical emphasis on the importance of R&D activities as the source of growth.

In their research all of the available earlier international test scores are formed into a single composite measure of educational quality and related to differences in annual growth rates across countries. The basic statistical model, which includes the level of income, the quantity of schooling, population growth rates and several other control variables, explains a substantial portion of the variation in national economic growth rates. But the quality of the labour force as measured by math and science scores also proves extremely important: their estimates suggest that one country-level standard deviation difference on test performance would yield about one percentage point higher annual growth, thus the impact of such a difference in growth rates is very large. In sum, the existing evidence suggests that the quality of education, measured by the knowledge that students gain as depicted in tests of cognitive skills, is substantially more important for economic growth than the mere quantity of education.

One common concern about this type of analysis is that schooling might not be the actual cause of growth but may instead reflect other attributes of the economy that are beneficial to growth. To test this proposition, Hanushek and Kimko investigated a number of other factors that might explain the relationship between the quality of education and growth, but ended up rejecting all of them.

For example, the East Asian countries consistently score very high on the international tests, and they also had extraordinarily high growth over the 1960-1990 period. It may be that other aspects of these East Asian economies have driven their growth and that the statistical analysis of labour force
quality simply is picking out these countries. But in fact, even if the East Asian countries are excluded from the analysis, a strong (albeit slightly smaller) relationship is still observed between growth and test performance. This consistency of results across alternative samples suggests again the basic importance of cognitive skills.

Another concern is that other factors that affect growth, such as efficient market organizations, are also associated with efficient and productive schools, so that, again, the test measures are really a proxy for other attributes of the country. To investigate this, Hanushek and Kimko concentrate on immigrants to the United States who received their education in their home countries. They find that immigrants who were schooled in countries that have higher scores on the international math and science examinations earn more in the United States. On the other hand, immigrants receiving part or all of their schooling in the United States do not see any earnings advantage linked to the cognitive skills of their home country. This analysis makes allowance for any differences in school attainment, labour market experience, or being native English-language speakers. In other words, skill differences as measured by the international tests are clearly rewarded in the United States labour market, reinforcing the validity of the tests as a measure of individual skills and productivity.

Finally, the observed relationships could simply reflect reverse causality, that is, that countries that are growing rapidly have the added resources necessary to improve their schools and that better student performance is the result of growth, not the cause of growth. As a simple test of this, Hanushek and Kimko investigated whether the international math and science test scores were systematically related to the resources devoted to the schools in the years prior to the tests. Their results suggest that there is no significant relationship between resources employed and school outputs and therefore policies that simply provide more resources within schools are unlikely to produce substantial gains in student outcomes.

3. Improving the Quality of Education
The general lack of any systematic relationship between student achievement and resources raises the question of whether or not there is some minimum required level of resources even if impacts are not seen at higher levels of resources. This is certainly the case: a developing country may gain comparatively more by investing in education than a developed country because it is starting from a lower point. A number of studies provide convincing evidence that some minimal levels of basic school resources (such as adequate facilities or textbooks) are noticeably valuable in promoting student learning. Nonetheless, the evidence does not indicate that simply spending more, even in poor countries, can be expected to have a generally significant effect on student outcomes without closer attention to the uses of resources (see Hanushek, 2003).

The evidence about what specifically counts in terms of schools is rather limited, but the most consistent finding across a wide range of investigations is that high teacher quality is one of the most important school elements and the key to student achievement. Parents, teachers, and administrators emphasize repeatedly the fundamental role that teachers play in the determination of school quality, yet there remains little consensus among researchers on the characteristics of a good teacher, let alone on the importance of teachers in comparison to other determinants of academic performance.

Hanushek and Rivkin (2006) tried to investigate the extent to which specific teacher characteristics account for differences in student achievement. The general approach to the identification of the determinants of teacher quality is to estimate the relationship between student achievement and other outcomes on the one hand and specific measures of teacher quality on the other.

Investigations of measurable teacher characteristics begin with their education and experience levels, the items that generally enter into pay determination. Perhaps most remarkable is the finding that a master’s degree has no systematic relationship to teacher quality as measured by student outcomes. This immediately raises a number of issues for policy, because advanced degrees invariably lead to higher teacher salaries and because advanced degrees are required for full
certification in a number of states. Teacher experience has a more positive relationship with student achievement, but still the overall picture is not that strong. Hanushek and Rivkin find that experience effects are concentrated in the first few years of teaching; following the initial period, however, there is little additional improvement at least in terms of measured achievement. Consequently this contributes to the failure to find a systematic link between quality and experience.

It is possible to analyse whether or not teacher salary directly relates to student performance: Hanushek and Rivkin again find no strong evidence that salaries are a good measure of teacher quality. Overall, the studies show that salaries are more likely to be positively related to student achievement than negatively; nonetheless, only a minority is statistically significant.

One measured characteristic, teacher scores on achievement tests, has received considerable attention, because it has more frequently been correlated with student outcomes than the other characteristics previously discussed. Yet the tests employed in these various analyses differ in focus and content, so the evidence mixes together a variety of things: besides, even when significant, teacher tests capture just a small portion of the overall variation in teacher effectiveness.

The most pervasive policy action of states aimed at teacher quality is setting certification requirements. The literature provides mixed evidence on the effects of certification on teacher quality. Extensive literature has been accumulating on the importance of teacher certification and credentials, although it has proved quite controversial. The overall weight of the evidence indicates that existing credentialing systems do not distinguish very well between “good” and “bad” teachers. Because many people teach even though they do not have standard credentials, it is possible to compare teachers with and without certification, and there is little evidence that existing hurdles provide much information about performance in the classroom.

In sum, extensive research shows clearly that teacher quality is difficult to measure, because it is unrelated to simple measures commonly used, such as education, experience, salary, tests and certification: this implies that resources, at least as currently spent, are not effective at leading to
generally improved teachers. This difficulty of regulating the employment of good teachers suggests that the institutional structure of the school system must be designed to provide better incentives, that will lead to management keyed to student performance and that will promote strong schools with high quality teachers. To improve the overall incentives in schools it is possible to highlight three institutional features that may be part of a successful system for providing students with cognitive skills. These three interrelated sets of politics are: promoting more choice and competition, so that parental demand will create strong incentives to individual schools; decentralization and autonomy of schools in local decision making, so that individual schools and their leaders will take appropriate actions to promote student achievement; and an accountability system for outcomes that identifies good school performance and leads to rewards based on this (see Hanushek and Wössman, 2007). Thus, when asking how education policies in developing countries can create the competencies and learning achievements required for their citizens to prosper in the future, the binding constraint seems to be institutional reforms, not resource expansions within the current institutional systems. For educational investments to translate into student learning, all the people involved in the education process have to face the right incentives that make them act in ways that advance student performance.

4. The Italian Educational System

The quality and motivation of teachers are certainly among the determinants of students’ achievements, but, as seen before, they are difficult to measure, and therefore a case study about the Italian educational system developed by Barbieri, Cipollone and Sestito (2008) considers the institutional features that motivate Italian teachers’ behaviour. The link between teachers’ market functioning and teachers effectiveness is not easy to establish because of the dearth of reliable information about teachers’ quality, motivation and exerted effort. Thus the idea of their paper is to overcome this lack of information by looking at the correlation between student achievement and
some features of the teachers’ labour market, particularly the mechanism that allocates teachers to schools.

The large flow of teachers across schools in Italy is likely to have a negative impact on students’ achievement as it is not driven by standard matching effort that both parties, schools and teachers, exert in the attempt to find the most suitable mate; on the contrary teachers are allocated to schools by centrally determined administrative mechanisms, based mostly upon seniority rules and regardless any efficiency or optimal matching consideration. As a matter of fact a typical teacher at the beginning of the carrier spends several years working under temporary contracts and often changing school every single year. By means of this peregrination among schools, the teacher accumulates years of seniority that eventually will allow him to gain a fully tenured position. From that moment onwards he cannot be dismissed nor transferred to any other school without his explicit request. Yet he can always ask to move to another school and his request cannot be refused as long as there are vacancies open and no other applications with higher priority. All these allocation processes occur without any selection of candidates taking place at either the central or the school level; the individual school has no voice in choosing among its own applicants and even no right to refuse the candidates assigned to them by the centrally managed allocation mechanisms: in Italy teachers choose schools, but schools never choose teachers.

The authors believe that these administrative rules governing the Italian teachers’ market are such to divert teachers’ incentives from pursuing the best performance of their students, so that the way teachers are allocated to schools creates a wedge between teachers incentives and school goals. They try to support this idea by using administrative data in order to construct three indicators for each individual school: one indicating the level of teachers turnover, one the quality of the match between tenured teachers and their school (a mismatch indicator) and the third measuring the quality of the school as evaluated by the whole population of tenured teachers (revealed preferences indicator).
Firstly, they define a standard measure of job turnover at school level; in the Italian educational system it reflects two phenomena: the peregrination of teachers hired under temporary contracts, whose main motivation is to accumulate seniority rights, and the presence of mismatched tenured teachers aspiring to change school. In both cases there is no link between the actual performance and the chances to step up, because the allocation of both temporary and tenured teachers to schools is defined according to centrally determined rules that preclude any choice from the school side. In other words, teachers do not have any incentive to be effective: they do not see any link between how well they teach and their chances of being retained and rewarded as tenured teacher in the individual school. Their chances to move to their most preferred school are related only to seniority and other administrative features, rather than to the choice of the school or their teaching performance, somehow evaluated, in the current school. Thus the authors interpret the turnover measure as an indicator of turmoil in the teaching activity that may hamper the continuity in teaching activity because teachers, and not the school, are in charge of most decisions concerning what actually is done in the classroom.

The mismatch indicator is defined as the share of the tenured teachers present in a school that have actually filled in a formal request to move elsewhere. Whether these aspirations will be met or not depends upon a complex set of administrative norms unrelated to their current teaching performance. Therefore this indicator can be interpreted as a measure of the commitment of teachers to a long run relationship with their current school. The authors maintain that a large mismatch may reduce student achievement because teachers wishing to leave could have a lower motivation in their current activity and could be quite uninterested to establish good lasting relationships with their colleagues and their students. Moreover, they may have no incentive to well perform in the current school as their behaviour does not change their chances to move to the desired school (see also Hanushek, Kain, O’Brien and Rivkin, 2005).

The revealed preferences indicator is constructed by counting how many tenured teachers want to leave a given school and how many want to move into the same school: a school with a positive
balance is a school where more teachers are willing to move in than those who want to move out. This indicator can be interpreted as a measure of the overall judgement about the teaching environment present in a given school: thus the authors can classify schools according to the degree of preferences received from the whole population of tenured teachers.

These three indicators allow to measure the effect of the system of recruitment and allocation of teachers for each individual school and to understand how they correlate to pupils’ achievements as captured by the Programme for International Student Assessment (PISA) carried out by the Organisation for Economic Co-operation and Development (OECD) in 2003, which was focused upon mathematics.

Students’ performance appears to be negatively related to teachers turnover; it is remarkable that the result remains significant also when controlling for the incidence of temporary teachers, which may affect turnover as well as having a direct impact upon student achievement through teachers’ experience and motivation. On this subject, Mocetti (2008) shows that the effectiveness of the educational system in narrowing the risk of failure and the scholastic outflow depends also on the reduction of the number of teachers on temporary contracts. The negative incidence of teachers hired under temporary contracts on the regularity of the students’ educational career can be interpreted as a consequence of the lower motivation of the teaching staff, the lesser knowledge of the class and the lack of didactical continuity.

Student achievement is also negatively associated to the incidence of tenured teachers mismatched to their school (the mismatch indicator), even if the relevance is less robust from a statistical point of view. Finally, the revealed preferences indicator is positively correlated to the students’ performance, showing that teachers, notwithstanding the lack of standardised exams, know which are the best learning environments and gradually attempt to move there.

5. Conclusions
Evidence demonstrates that the rules governing the teachers market may have an impact on student achievement by shaping teachers behaviour in such a way to create a contradiction between their incentives and school goals, that eventually de-motivate the teachers and produces poorly educated students. As here described, the many pitfalls of current teachers’ recruitment and allocation system in Italy do not guarantee a high enough quality level of schooling. The initial screening is almost absent and no relationship exists between a teacher’s practice and performance and the subsequent passage to a tenured position. Moreover, the centralized and bureaucratic allocation system leaves no room for the schools to pursue an active role in selecting and motivating their own teachers. This unnatural amputation of one side of the market, as schools are rather passive in these processes in which only teachers are allowed to make their choices, does not prevent the inequalities within the educational system. Possibly because teachers are the only subjects relatively well informed in a system lacking a proper comparability of exams and grades across different schools, the majority of the teachers are willing to move towards the schools where, because of their social background and support from the local community, students fare well. No compensatory policy is therefore put in place and problematic schools are left with poorly motivated teachers and high turmoil, as the teachers there working are just waiting to move elsewhere. Thus the absence of schools’ competition in attracting households and resources produces the result that schools are not able to contrast the presence of wide and systematic inequalities in the educational system (such as in the technical and vocational upper secondary schools) and across different learning environments, like a lot of problematic areas in the South of Italy.

ANNOTATED BIBLIOGRAPHY

Primary sources

The authors show that qualitative descriptions of human capital come from direct measures of cognitive skills of individuals. The analysis of international differences in growth rates suggests that labour force quality, affected by cognitive skills, is directly related to productivity and growth.


This chapter reviews research on teacher labour markets, the importance of teacher quality in the determination of student achievement, and the extent to which specific observable characteristics often related to hiring decision and salary explain the variation in the quality of education.


This paper examines teachers’ labour market in Italy; in particular it considers the mechanism that allocates teachers to schools. The authors show that the administrative rules governing this market are such to divert teachers’ incentives from pursuing the best performance of their students.


The aim of this paper is to analyse the selection process at work before and after compulsory schooling in the Italian education system by assessing the determinants of school failures, dropouts and upper secondary school decisions of young Italians.

**Secondary sources**

This is one of the first contributions to the study of the relationships between development and human capital, seen as a notion of skilled labour that can be created or augmented through education or training; thus, income differences across countries may become more explicable.


This is one of the models treating technical progress as endogenous: the main idea is that growth rates are affected by the importance of research and development (R&D) activities, which in turn are related to the stock of human capital.


The paper maintains that there is no significant relationship between resources employed and school outputs, i.e., policies that simply provide more resources within schools are unlikely to produce substantial gains in student outcomes.


The authors use student achievement gains to estimate teacher quality and find some evidence that teachers on a move are less effective in their teaching.


This paper suggests that better incentives will promote strong schools with high quality teachers; a fact emerging from cross-country analysis is that the most effective education systems are those
promoting more school competition and combining schools’ autonomy and accountability of results.