A New Approach to the Economics of Education:

the Case of the English Schooling System

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Abstract

The paper suggests a new theoretical framework rooted into the theory of incomplete contracts to study the efficiency of the schooling system. A section is devoted to investigate if the features of the English compulsory education schooling system could fit into the new theoretical scheme.

INTRODUCTION

To improve the education effectiveness and efficiency is one of the most challenging issue in the economics of education and education policy research. Although the increase in education public spending is widely accepted as desirable, the relevant question is whether individuals and communities should invest more in education (Machin and Vignoles, 2005). Resources are generally scarce and give larger returns if properly allocated. Moreover, an increase in resources spent per each pupil is not necessarily linked to an improvement in students' achievement (Hanushek 1997, 2003; Bradley e Taylor, 2004). Then, according to Brunello e Giannini (2004) and Wößmann e Schutz (2006) analysis should be focused on the efficiency of the schooling sector, and on the use of the resources, rather than on the amount spent.

This paper provides a new theoretical scheme to the analysis of some basic issues of the traditional economics of education, related to the study of school system efficiency. The new approach should suggest some useful insights to the policy-makers in those countries where restructuring the schooling sector is on the government's agenda.

The paper is organized as follows: section 1 presents a short account of the literature on the economics of education. Section 2 illustrates a model presented by Klaus Schmidt in 1996 and the new theoretical framework taken from it. Finally, section 3 presents the case study of English compulsory education. It tries to investigate which features of the English schooling system could fit the new theoretical framework previously introduced. Some policy issues will be treated in the conclusions.

1. A NEW APPROACH TO THE ECONOMICS OF EDUCATION

We start our new approach recalling some relevant features of education, from an economic point of view. First we consider education as a 'consumption good', then as a 'provided service', and finally we present the traditional scheme of analysis of education based on the human capital theory. A short account of the literature on these topics is presented.

1.1 Economic features of education

A public good is a non-excludable and non-rival good (Musgrave, 1959). This means that no one can be effectively excluded from using the good, and that the consumption of the good by one individual does not reduce availability of any other individual. Although the question is still debated in the literature (Tomlinson, 1986), education cannot be considered a 'pure public good', and this because the marginal cost for the provision of the service to an additional student is far different from being zero, and, moreover, there are no difficulties in forcing all effective users to pay (Stiglitz, 1988).

If the excludability of education is an uncontroversial feature of this good, its non-rivalry nature is indeed more controversial. Non-rivalry is often linked to the idea of the absence of over-crowding costs. In other words, the same unit of a consumption good can be identically enjoyed by any individual, having in return the same utility. Imagine a classroom with a teacher giving a lesson: each student's benefit from the lecture is clearly influenced by the number of students in the classroom. In that sense, it is not possible to affirm that "[…] each individual's consumption of such a good leads to no subtractions from any other individual's consumption of that good" (Samuelson, 1954). Therefore, it is more appropriate to define education as a 'collective public good'.

However, according to Musgrave seminal definition (1959), education can be better classified as a 'merit good'. The nature of merit good is not at all linked to the one of public/private good, as it represents a stand-alone category. A merit good is a good or service considered to be intrinsically desirable, uplifting or socially valuable for other people to consume, independently of the actual desires or preferences of the consumer himself. Then, compulsory education is a merit good because government interferes in individual's preferences, and imposes its consumption. One rationale for this is paternalism: the government provides that good because it can take care of individual's welfare better than to allow the consumer to exercise his sovereignty (Musgrave, 1987). A first reason for this kind of interference in the consumer's sovereignty is due to the fact that merit goods generally carry particular social values, functional to the social and moral development of the community as a whole (i.e. education, health cares, social assistance). A second reason lays on the fact that the non-interference rule with the consumer's preference continues to be preferred, but it cannot be actually applied without serious difficulties. Education is a merit good in both regards. On one hand, education enhances positive externalities effects, so that 'social values' universally shared impose its consumption (Colm, 1965). On the other hand, schooling choice is deeply affected by the problem of asymmetrical information: at the early years of the individual life cycle, the consumption choice of education could better improve

the individual benefit and the social welfare if previously delegated to a subject, such as the government, who disposes of complete information (Musgrave, 1987).

Education has others important features as an economic good. Nobel laureate Amartya Sen defines education as a 'functional good': its consumption is necessary in function to the possibilities of social life. Literacy, reasoning and calculation are an example of this (Checchi, 2006). Education is also defined as an 'experience good' because "[…] the costs of identifying the quality of the provision are higher before the admission than after pupils and parents have spent time at the school" (Adnett and Davies, 2002).

From an economic perspective, it is possible to examine the features of education as a 'service' provided to the community. First of all, it is necessary to consider three basic elements related to the nature of all educational services: *(i)* multiple outcomes, *(ii)* multiple agents and *(iii)* multiple tasks (Besley and Ghatak, 2003; Adnett and Davies, 2002). *(i)* Education has multiple outcomes, reflecting a variety of objectives that individuals and society require to schooling (Adnett and Davies, 2002). Compulsory education aims to reach a certain level of attainment in students' abilities, and to teach basic tools of the most important subjects, functional to access to a normal social-responsible life (Checchi, 2006). However, educational services also provide a variety of non-economic values to the society: transmission of cultural identity, socialization, social cohesion. Some researchers extended the outcomes of education to an even wider range of benefits, such as the decreasing of criminality (Behrman and Stacey, 1997), drugs, smoking and alcohol addiction (Sander, 1995). *(ii)* School, as a microeconomic unit, has to face a multiple agency problem: one hand, it has to be accountable to the parents and the students, on the other hand, in the case of state schools, to different levels of local and central government. *(iii)* Finally, education has to convey multiple tasks, and most of them determine benefits not measurable in monetary terms. Education has different tasks in each stage of individual life cycle: from socialization and care during the pre-compulsory stage of education, to a tough knowledge transmission in the post-compulsory stage (Silvestri, 2003).

1.2 The traditional framework: the human capital theory

Starting from Becker (1962) and Schultz (1962) seminal works, human capital theory has become the traditional analytical framework in the economics of education. We shortly illustrates its basic ideas, and then we will explain our innovative contributes in the following paragraph.

Human capital theory analyses education as an investment in human capital. This investment generates productivity gains and higher earning power for individuals: education decisions are mainly linked with the sole maximization of anticipated returns to investment (Adnett and Davies, 2002). The basic idea is that people enhance their capabilities as producers and as consumers by investing in themselves (Schultz, 1962). Investing in human capital means to embed resources in people through activities that influence future real income. Education is just one of the possible activities of investment, like on-the-job training, progresses in health and growing stock of information about the economy (Becker, 1962).

Economics of education roots on human capital theory, providing the explanation of the amount and the kind of education asked by each individual, and by the society. Johnes (1993) gives an example of the classical framework of human capital theory applied to the economics of education. Assuming economic agents to be utility maximisers, he argues that education exists because it provides utility. Otherwise, there would be no demand for it. First, it gives an immediate pleasure and utility to the student, so it has a 'consumption element'. Second, through education the student enhances his productivity at work for years to come. Since remuneration is determined in large part by productivity, education can increase future earnings. This is the 'investment element' of education. As both the consumption element and the investment element provide present or future benefit, they both determine the discounted stream of utility enjoyed by the economic agent (Johnes, 1993).

Human capital theory studies education in a long term perspective and dynamic context. Time plays a key role since the costs of education are borne over time, and benefits of an education are especially durable. The discounted stream of future costs and benefits must be considered, just as a business man considers net present values when making an investment in a new piece of capital (Becker, 1964). An investment in education is tantamount to an investment in a machine which can be fitted on to the human body and that improves one's performance in the workplace. The future returns to such a machine, that is the educated individual, are expected to exceed the outlay of time and money involved in its purchase (Johnes, 1993).

1.3 A new approach to the Economics of Education

As we have seen, human capital theory has been the classical framework to analyse several aspects of education, and, above all, the key topic of the return of education to individual and society (Machin and Vignoles, 2005). This theory gives explanations on how

and to which extent economic growth (macro view) and personal income (micro view) can be regarded as a consequence of an investment in education (Schultz, 1962).

However, the modern economics of education is concerned with a much wider range of issues, and provides an analytical framework in which questions, such as what is the best way to raise pupil achievement, how much we should pay teachers, how we could enhance equity and efficiency of schooling system, can be answered (Machin and Vignoles, 2005). Moreover, when adequate database are available, a growing interest in economics of education quantitative analysis has led to a much greater emphasis upon observing performance and student outcomes in order to establish links of causality with educational inputs (Hanushek, 1997).

The human capital theory traditionally explains the individual and community demand for education, and the impact and consequences of education. It is primarily concerned with the individual's behavior and his rational choice to consume the good 'education'. Consequently, human capital theory fails to give adequate answers to a wide range of questions that modern economics of education is facing. For example, how schooling systems work, how education can be better produced or organized, or how to improve students' achievement.

Since Hanushek works in the 1980s (Hanushek, 1986), the English and the American approaches to the economics of education are known for having adopted an economic rather than a social view. More recently, the studies on the effects of market and quasi-market reforms in education have been privileged over the human capital theory. Adnett and Davies (2002) try to clarify the economic fundamentals of this new 'market theory' for education. Here, we accept the idea of a market theory for education but propose a different framework of analysis which applies regulatory microeconomic models to the study of schooling systems. We focus on the market relationship of demand and supply of education rather than on the study of individuals behavior in consumption choice. Our approach primarily deals with the rationale of the government intervention in providing and funding education (i.e. market failure and market reforms).

If the human capital theory can be considered the classical analytical model for the study of the consumer choice of education, Johnes (1993) argues that new analytical frameworks should be used to analyse the supply side, that is the production of education, the market equilibrium and the government intervention. Johnes (1993) points out that many aspects of labour and industrial economics are blended together in the study of education production. Several advanced microeconomic topics find interesting applications in education sector,

including overlapping-generations models, public choice, auctions theory and principal-agents problems.

As compulsory education is generally managed by public sector, or, in some cases, by coexisting public and private institutions, it is more appropriate to look for microeconomic regulatory models in an incomplete contracts context. For instance, according to our new approach, the study of the costs and the benefits of public versus private provision of educational services has to be treated referring to Laffont and Tirole (1986, 1991 and 1993), Hart (1993, 2003), Shapiro and Willing (1987) and Schmidt's (1996a, 1996b) works. Schools are production agents, like firms, and more precisely, regulated firms. The ownership can be both public or private, and this is not indifferent on the governance effects (Sappington and Stiglitz, 1987). As they describe basic features of public, private and regulated firms, we should try to use their schemes to analyse the case of the provision of a particular service, that is education. The use of this kind of contractual and regulatory schemes allow us to draw interesting conclusions in the study of education systems.

So, a new analytical framework should be considered to examine the supply side of education. Incomplete contracts and regulatory microeconomic models provide frameworks that better fit all kind of researches oriented to the provision of education, and the organization of schooling system because they focus their attention on the school as a production agent. The basic hypothesis we made are quite simple, but carry relevant consequences on the research. The school is assimilated to a 'regulated firm' (production agent), and the schooling system, which is composed by all kinds of schools, naturally constitutes the education 'industry'. As a firm, school and schooling system receive inputs, and provide outcomes. Previous researches focused their attention on the school production function (Hanushek 1979; Blaug 1991), but did not investigate education system using microeconomic models outside the classical human capital approach.

As well as time plays a fundamental role in human capital theory, information is the key element of our approach, in an incomplete contracts view. The distribution and availability of information deeply influences agents behavior, while asymmetrical information problems allow the application of principle-agents schemes of analysis.

1.4 Efficiency and equity in schooling systems

As Hanushek (1997) states, "[…] there is no strong or consistent relationship between school resources and student performance. In other words, there is little reason to be confident that simply adding more resources to schools, as currently constituted, will yield performance

gains among students". Looking for methods to increase school efficiency should be one of the most challenging issue of education policy.

However, efficiency analysis refers to the supply side, and to the organization of schooling system, so that it should be properly treated using our new approach. Many studies have been carried out upon school efficiency (Wößmann and Schutz, 2006), but none of them within the regulatory microeconomic schemes. Though important, efficiency cannot be taken as the sole evaluation criteria as the merit nature of education good imposes to consider the importance of the equity dimension as well. First of all, we need to define efficiency and equity concepts in the schooling context.

A common starting point in defining efficiency in schooling systems is that output should be maximised for the given amount of resources (Adnett and Davies, 2002). However, this is a quite narrow definition. According to Hoxby (1996), the definition of efficiency and equity in education requires to take into account several dimensions. She argues that the ultimate function of an educational system is to create an environment that induces people to take socially optimal investments decision. In this context, equity will ensure that such a standard of optimality will be applied to all groups, regardless of family background or wealth. Allocative efficiency concerns the standard, type and amount of schooling provided, whereas productive efficiency concerns minimising the costs of that provision (Hoxby, 1996). Hence, another dimension need to be taken in account: dinamic efficiency (Adnett and Davies, 2002). It is defined as the changes of performance over time, and it can be applied to many context, from a single pupil or a single school, to a classroom or the whole schooling system.

Equity, allocative, productive and dinamic efficiency are the dimensions to be considered in our analysis. However, all of them depend on how school inputs, outputs and performance results are defined. Many researches have been carried out on these topics, as well as on school production functions (Hanushek, 1979; Blaug, 1991). We shall try to simplify the assumptions usually adpted. We define input of a school and of the whole schooling system, any human or capital resource needed (teachers, administrative personnel and their wages, commodities etc.); the outcome of a school is the students' achievement level at each stage of their compulsory education; the school outcome is an indicator of the school performance.

2. DESCRIPTION OF THE MODEL

In this section we propose the regulatory model in an incomplete contracts world presented by Schmidt in several papers (1990, 1996a and 1996b). First, we explain the basic

assumptions and outline the analytical framework. Then, we shall draw some interesting insights in order to apply the model to a real educational context.

To summarize, Schmidt identifies "[…] a trade-off between a less efficient production level (lower allocative efficiency) and better incentives for the manager to save costs (productive efficiency), which can explain some of the costs and benefits of privatization" (Schmidt, 1996b). The model assumes a benevolent, fully rational and unitary decision-maker government. Schmidt argues that, though far from being real, this hypothesis shows that privatization can be strictly superior to nationalization even in the best of all worlds (Schmidt, 1996b).

2.1 Basic assumptions and formal framework

Consider a firm producing $y \in \mathbb{R}_0^+$ quantity of a certain good or service: $b(y)$ is the social benefit deriving from production of y quantity of output, and $r(y) = p(y) \cdot y$ the private revenue, where $p(y)$ is the market price at output level y. The firm cost function is $c(y,\theta)$, where θ represents the state of the world. It is assumed that only two states of the world exist, $\theta \in (\theta_1, \theta_2)$, 'good' if $\theta = \theta_1$, or 'bad' if $\theta = \theta_2$, and: $c(y, \theta_1) < c(y, \theta_2) \ \forall y$. It is assumed that this market is not efficient, so that a government (G) intervention is required. Government has two possible ways to influence output level: (a) to nationalize the firm and manage it directly as a State-owned enterprise (SOE); (b) to privatize the firm and offer the private owner (P) a subsidy and to define a regulatory scheme to induce a profitable production level.

In period 0 the government decides if to privatize (a) or not (b). All propriety rights are owned by the government, so in the case of privatization the firm is auctioned on a competitive market to the private owner. The firm expected profits (or loss) are equal to the auction price (z). In any case, a manager (M) is employed to organize and carry out the production. The expected utility from his wage (w) equals his reservation utility ($\bar{U}$).

In period 1 the manager takes unobservable actions e, $e \in \mathbb{R}_0^+$, to reduce the expected

production costs in period 2. The expected costs of production are influenced by the level of e as it influences the probability distribution over the states of the world: $\theta = \theta_1$ with probability $q(e)$; $\theta = \theta_2$ with probability $1 - q(e)$.

At the beginning of period 2, the realization of θ can be recorded only by the manager and the owner. This is a very important assumption on the distribution of information because, in the case of nationalization (a), the State is the owner, so that it knows θ. Later on, it has to decide the level of output $y^n(\theta)$ subject to the constraint that production costs are covered by revenues and subsidies. In the case of privatization (b), the private owner observes the realization of θ, whereas the government just knows the ex ante probability function $q(\cdot)$. The private owner has to decide the output level $y(\theta)$ and pays the production costs. In this case, the government plays the part of a regulatory authority, trying to influence the production level through a direct mechanism of subsidy: $\mathsf{M} = \left[y^p(\theta^*), s^p(\theta^*), \theta^* \in (\theta_1; \theta_2) \right]$. If the

private owner reports the cost parameter θ^*, he must produce $y^p(\theta^*)$ and gets a subsidy $s^p(\theta^*)$.

The subsidy can be negative. Hence, the regulatory scheme must be voluntary accepted by the private owner. All payoffs realized at the end of period 2 are reported in Table 1.

Table 1. Payoffs

Payoff	Nationalization (a)	Privatization (b)
State (G)	$V = b(y^n) + r(y^n) - c(y^n, \theta) - w^n$	$V = b(y^p) - s^p + z$
Private owner (P)	$P = 0$	$P = r(y^p) + s^p - c(y^p, \theta) - w^p - z$
Manager (M)	$U = w^n - e^n + u(y^n)$	$U = w^p - e^p + u(y^p)$

Common assumptions are necessary to be taken both on the agents behavior and on the technology[1]. Schmidt (1996b) underlines that in the case of privatization the State cannot decide the output level, but it has to force the regulated firm to an efficient production through

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[1] See Schmidt (1996b) for a complete analysis.

the subsidy scheme. Incomplete contracts and information distribution are the key points. The government has no information about the privatized firm cost technology, as information is a residual right linked to the firm ownership (Hart, 1993). Complete contracts cannot be easily written on it. If the government could know the realization of θ, there would be no difference between the two cases (Shapiro and Willing, 1990).

2.2 Nationalization

In period 2, the government faces the following problem:

$$G: \underset{y_i}{Max}\left[V^n = b(y_i) + r(y_i) - c(y_i, \theta_i) - w^n\right],$$

where y_i is the output level if $\theta = \theta_i$, $i = 1,2$. Given the first order condition $\dfrac{\partial V^n}{\partial y} = 0$ and the technological assumptions (Schmidt, 1996b), a unique interior solution exists and satisfies: $b'(y_i^n) + r'(y_i^n) = c'(y_i^n, \theta_i)$ with $y_1^n > y_2^n$.

In period 1, the manager anticipates the production decision of the government in period 2, and he faces the maximisation problem:

$$M: \underset{e}{Max}\left[q(e) \cdot u(y_1^n) + (1 - q(e)) \cdot u(y_2^n) - e + w^n\right]$$

The optimal action of the manager, e^n, is characterized by: $q'(e^n) \cdot \left[u(y_1^n) - u(y_2^n)\right] = 1$. Given the output level y_i, $i = 1,2$, e^n is chosen inefficiently low. Moreover, e^n is increasing in y_1^n (if costs are low), and decreasing in y_2^n (if costs are high).

In period 0, the government anticipates the manager's effort decision. It will offer a wage w^n so that: $w^n = e^n - q(e^n) \cdot u(y_1^n) - \left[1 - q(e^n)\right] \cdot u(y_2^n) + \bar{U}$. Thus, the government expected payoff in the case of SOE is:

$$V^n = q(e^n) \cdot W(y_1^n, \theta_1) + \left[1 - q(e^n)\right] \cdot W(y_2^n, \theta_2) - \bar{U} - e^n,$$

where $W(y, \theta) = b(y) + r(y) + u(y) - c(y, \theta)$ represents the social welfare if y is produced in θ state of the world.

Eventually, in the case of SOE: (*i*) allocative efficiency is high because the output level is chosen ex post efficiently; (*ii*) productive efficiency is low because the manager invests too little in costs reduction (Schmidt, 1996b). As it is not possible to write complete contracts in period 0, the threats to cut subsidies, to reduce production, or even to close the firm, are not credible. Once observed the state of the world, "[…] it is optimal [for the government] to 'forgive' high costs and to carry out production efficiently. Anticipating this, the manager

faces a classical 'soft budget constraint' and has little incentive to save costs" (Schmidt, 1996b).

2.3 Privatization

In the case of privatization, the government cannot observe the firm cost function, it only knows the probability function $q(\cdot)$. The government supposes, for example, that the manager tooks effort $e = \varepsilon$ with probability 1. The government has to maximise its payoff choosing a regulation scheme that induces the private owner to a socially efficient output level. The auction price (z) is a sunk cost for the private owner and it does not influence any decision in period 2. Referring to Baron-Myerson (1982) simplest model, the direct mechanism, based on the report θ^* of the private owner, and on the estimated effort $e = \varepsilon$, is:

$$\mathsf{M}\,(\varepsilon) = \left[\, s^p(\theta^*, \varepsilon),\, y^p(\theta^*, \varepsilon), \theta^* \in [\theta_1; \theta_2] \,\right],$$

where $s_i^p(\varepsilon)$ and $y_i^p(\varepsilon)$ are the subsidy and the production level in the case the private owner reports $\theta^* = \theta_i, i \in [1;2]$. Thus, the government's maximisation problem is the following:

$$G: \underset{y_i^p(\varepsilon),\, s_i^p(\varepsilon)}{Max} \left[q(\varepsilon) \cdot (b(y_1^p(\varepsilon)) - s_1^p(\varepsilon)) + (1 - q(\varepsilon)) \cdot (b(y_2^p(\varepsilon)) - s_2^p(\varepsilon)) \right]$$

$s.t.$

$$s_i^p(\varepsilon) + r(y_i^p(\varepsilon)) - c(y_i^p(\varepsilon), \theta_i) \geq s_j^p(\varepsilon) + r(y_j^p(\varepsilon)) - c(y_j^p(\varepsilon), \theta_i)$$

$$\forall i, j \in \{1; 2\}$$

$$s_i^p(\varepsilon) + r(y_i^p(\varepsilon)) - c(y_i^p(\varepsilon), \theta\,) \geq 0$$

$$\forall i \in \{1; 2\}$$

The first is the incentive compatibility constraint, ensuring that truth telling is a weakly dominant strategy for all possible states of the world. The second is the participation constraint, ensuring private profits not to be negative. Actually, to induce the private owner to reveal the true value of θ, a trade-off between ex post efficiency and subsidy is outlined. On one hand, the government can pay a higher subsidy if a low value is announced, in order to make more attractive to report $\theta = \theta_1$ truthfully. On the other hand, it can distort $y^p(\theta)$ for a high value of θ, making less attractive to overstate costs (Schmidt, 1996b).

Schmidt (1996b) demonstrates that, if the government believes the manager to have taken the effort level $e = \varepsilon$ with probability 1, then the optimal direct mechanism under privatization is:

$$s_1^p(\varepsilon) = c(y_1^p(\varepsilon), \theta_1) + c(y_2^p(\varepsilon), \theta_2) - c(y_2^p(\varepsilon), \theta_1) - r(y_1^p(\varepsilon))$$

$$s_2^p(\varepsilon) = c(y_2^p(\varepsilon), \theta_2) - r(y_2^p(\varepsilon))$$

$$y_1^p(\varepsilon) = y_1^n$$

$$y_2^p(\varepsilon) = \overline{y}_2^p(\varepsilon) :$$

    1. if there exists $\overline{y}_2^p(\varepsilon) \geq 0$

    2. and $b(\overline{y}_2^p) + r(\overline{y}_2^p) - c(\overline{y}_2^p, \theta_2) - \dfrac{q(\varepsilon)}{1 - q(\varepsilon)} \cdot \left[c(\overline{y}_2^p, \theta_2) - c(\overline{y}_2^p, \theta_1) \right] \geq 0$

$$y_2^p(\varepsilon) = 0 \text{ otherwhise,}$$

where $\overline{y}_2^p(\varepsilon)$ is implicitly defined by:

$$b(\overline{y}_2^p) + r(\overline{y}_2^p) = c(\overline{y}_2^p, \theta_2) + \frac{q(\varepsilon)}{1 - q(\varepsilon)} \cdot \left[c(\overline{y}_2^p, \theta_2) - c(\overline{y}_2^p, \theta_1) \right]$$

Anticipating this mechanism for period 2, the manager has to decide his effort level in period 1. The optimal government's regulation scheme distorts output below its ex post efficient level if costs are high. This fact induces the manager to work harder ($e\uparrow$) under privatization (Schmidt, 1996b). The manager chooses e^p, with probability 1, so that: $q'(e^p) \cdot \left[u(y_1^p(\varepsilon)) - u(y_2^p(\varepsilon)) \right] = 1$. Thus, $\forall \varepsilon > 0 \Rightarrow e^p > e^n$, and there exists e^p with $e^p = \varepsilon$.

Finally, in period 0 the auction price is determined by the zero expected profit condition $z = q(e^p) \cdot \left[c(y_2^p(e^p), \theta_2) - c(y_2^p(e^p), \theta_1) \right] - w^p$, and the manager's wage will be: $w^p = e^p - q(e^p) \cdot u(y_1^p(e^p)) - (1 - q(e^p)) \cdot u(y_2^p(e^p)) + \overline{U}$. Through the auction, the government extracts all the information rent ex ante. Given that $y_1^p = y_1^n$, and that $W(y, \theta) = b(y) + r(y) + u(y) - c(y, \theta)$, and substituting the auction price z in the government's payoff, it results:

$$V^p = q(e^p) \cdot W(y_1^n, \theta_1) + (1 - q(e^p)) \cdot W(y_2^p(e^p), \theta_2) - e^p - \overline{U}$$

2.4 The new theoretical framework

The model demonstrates two aspects generally and empirically recognized to any privatization process: the trade-off between allocative and productive efficiency, and the budget constraint effects. Before giving some explanations on these two aspects, we will illustrate how the allocation of ownership rights affects the distribution of information and the privatization process.

The owner of the firm (the government or the private owner) has direct access to all information available in his firm, from which he may exclude outsiders. The access to information is a 'residual right' tied in with the ownership right (Hart, 1993). Information is collected, accounted, elaborated so that, after the information has been produced, ex post, it will be impossible to an outsider to verify it. Therefore, a change in the allocation of ownership rights can be used to change the distribution of information (Schmidt, 1990). According to Schmidt, the privatization can be seen as a commitment device of the government. The government privatizes because it deliberately wants not to have certain information about costs and profits of the firm, that it would have under nationalization (Schmidt, 1990). Under nationalization, if costs turn out to be high the government may find optimal, ex post, to pay more subsidies than announced ex ante. Anticipating this, there are not enough incentives for the management to save costs. Under privatization, the private owner has a strong incentive to overstate costs to get higher subsidies. As government cannot verify costs, it will implement a subsidy scheme inducing private owner to announce his costs truthfully by imposing an inefficient low output level if costs are high. Thus, privatization can be used as commitment device of the government. Through privatization the government deliberately creates an informational problem, so that it becomes optimal to distort production in high cost state of the world to limit the informational rent of the private owner (Schmidt, 1990).

Schmidt demonstrates the basic trade-off between productive and allocative efficiency. In the SOE, the government will choose an efficient level of production, so that allocative efficiency is high. However, as we say before, this give little incentives to managers to commit in cost reducing efforts. Managers rationally anticipate the government behavior, they know that high cost will be forgiven, so that productive efficiency is poor. Under privatization, the government wants to limit the information rent of the private owner in the good state of the world. If reported costs are high, it will cut back subsidies and induce an inefficiently low output level. Hence, this reduces allocative efficiency, while it may improve productive efficiency imposing a 'harder budget constraint' on the manager. The manager will

try harder to save costs as he knows that if costs turn out to be high, the government will reduce the output, or even close the firm (Schmidt, 1996b).

Finally, Schmidt's model can be seen as a formalization of the 'soft budget constraint effect' observed first by Kornai (1979). Budget constraint hardness or softness are linked to a government's behavioral reputation mechanism. In the case of nationalization, the government forgives high costs in order to reach an optimal allocative efficiency. SOE debts are always filled at the end of each period. Anticipating this, managers do not have sufficient incentives in costs minimization ('soft budget constraint'). On the other hand, under privatization, managers face a harder budget constraint than in the SOE.

Government commitment device (*1*), the trade-off between allocative and productive efficiency (*2*), and the budget constraint effects (*3*) are the three essential features of privatization processes demonstrated in Schmidt's models (1990, 1996a, 1996b). In the next paragraph, we shall try to apply this model and its basic findings to the case of the provision of education. We shall try to investigate in which ways and to which extent the model findings can be applied to the case of the English schooling system.

3. CASE STUDY: THE ENGLISH COMPULSORY SCHOOLING SYSTEM

Our purpose is to investigate whether the English system can be considered an application of the model presented in section 2. In other words, we want to investigate if the institutional and economic organization of the English system contains the three key elements of Schmidt's model: (*1*) the government commitment device, (*2*) the trade-off between allocative and productive efficiency, and (*3*) the budget constraint effects.

This section is organized as follows: the first paragraph illustrates the most important features of English compulsory schooling system (from now on simply called 'English system'). The next paragraphs try to enforce the new theoretical framework.

3.1 Main features of the English compulsory education system

English schools are distinguished between maintained or community schools, that are state schools, and private schools. The proportion of pupils enrolled in private education has remained constant at about 7% since the 1970s (Machin and Vignoles, 2005). Private schools do not receive public funds and maintain an almost complete independence, while maintained schools refer to the territorial Local Authority (LA). The Department for Children, Schools and Families (Dcsf) is not directly involved in the school financing, management and control

since it operates through independent authorities: the Office for Standards in Education (Ofsted), and the Qualification and Curriculum Authority (QCA).

The 1988 Education Reform Act is the single most important piece of education legislation since the 1944 'Butler' Education Act (Glennerster, 1991). The Education Reform Act and the following legislative acts[2] have deeply reorganized the English education system. Scottish and Welsh schooling systems, though similar, maintain some differences.

Important new elements were introduced (Gonrard, Taylor and Fitz, 2002). (*a*) Local management of school budget (LMS) and accountability: schools and school budgets were no longer managed by the Local Education Authorities (LEAs or LAs) and resources were directly attributed to each school governing body and head teacher who are now responsible for the financing management of school resources; (*b*) National Curriculum (NC), Key Stages (KS) and league table: the purpose of the NC for students aged between 7 and 16 was to raise standards by ensuring that all pupils have to study a prescribed set of subjects up to a minimum level until the age of 16. The NC and the evaluation standards are managed by the QCA. The UK is one of the very few countries where the attainment of children throughout the education system is monitored by external authorities with standardized systems. There are national examinations at ages 7 and 11 in primary school, and at ages 14 and 16 in secondary school. Since 1995, school league tables, or performance tables, have been published. They show information on the achievement of all pupils in all schools at these ages (Key Stages 1, 2, 3, and 4) (Machin and Vignoles, 2005); (*c*) parental choice: parents are free to enroll children in any school, or, at least, to express preferences.

3.1.1 A quasi-market for education

The Conservative governments of the 1980s and 1990s introduced the so called 'market mechanisms' into the UK education system, in order to force schools to raise standards. The Education Reform Act marked the beginning of the 'quasi-market' in education (Machin and Vignoles, 2006). These market-oriented reforms aimed to increase parental choice and improve the accountability of maintained schools. Parents could choose, or at least express a preference, which school to enroll their child (Machin and Vignoles, 2006). A new Admission Code (Tough and Brooks, 2007) has been recently published to fix rules for non discriminatory access to maintained schools. School funding has become largely dependent on the number of enrolments, giving the schools the incentives to attract as many students as possible. Schools began to manage directly their own budgets, and this gave them greater

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[2] See Daun (2006) for a short legislative review.

autonomy from the LAs and the Dcsf. To make effective the possibility of parental choice and solve problems of asymmetrical information between schools and families, performance tables are published yearly. Publicly available test score information are based on the results of the standardized KS tests. They provide scores and more sophisticated information on the school outcomes to help parents to choose the best performer institute. As we will show, information plays a key role in the quasi-market.

The quasi-market for education can be defined as a regulated market for the provision of educational services. The idea that a certain degree of competition among schools could increase their effectiveness and improve students attainment has to be balanced with the necessity to regulate a market otherwise subject to failure (Adnett and Davies, 2002). Ofsted was created in 1992 to carry out regular inspections of all schools. QCA manages the NC and the standardized system of examination. They are defined as 'quango', that is 'quasi-non-governmental-organization' (Turner, 2006), but they play as regulatory authorities of the quasi-market (Johnson, 2004; Turner, 2006; Daun, 2006). Their activities have three principal functions. First, to offer a feedback to the head teacher and staff at school, helping them to understand what has to be corrected and improved. Second, to offer substantial information to parents to help their decision-making process. Third, Ofsted identifies schools suffering from 'serious weakness'. If inadequate progress is made, the school can be closed by order of the Secretary of State for Education (Johnson, 2004).

Ofsted and QCA provide a framework of regulation and accountability for schools, giving information to participants in the quasi-market which would otherwise be subject to severe information failures (Johnson, 2004). Market-oriented reforms, regulation, accountability and parental choice are the basic features of English quasi-market for education and the distribution and availability of information is a key element.


3.2 The institutional framework as an application of Schmidt's model

According to our new approach, English schools can be seen as 'public regulated firms'. The government maintains the ownership rights, but it tries to reach the typical benefits of privatization through appropriate regulatory schemes. Figure 1 shows an analysis of the English system according to Schmidt's model.

A typical multiple agency problem is shown. In the first level of the agency problem, school managers (head teacher and governing body) are the agents, while the central government (Dcfs) and students and their parents play the role of the principal. The second

level of the agency problem, teachers (workers) have as principals, on one hand, school managers, and, on the other hand, students and their parents.

Figure 1. Institutional structure: application of Schmid's model
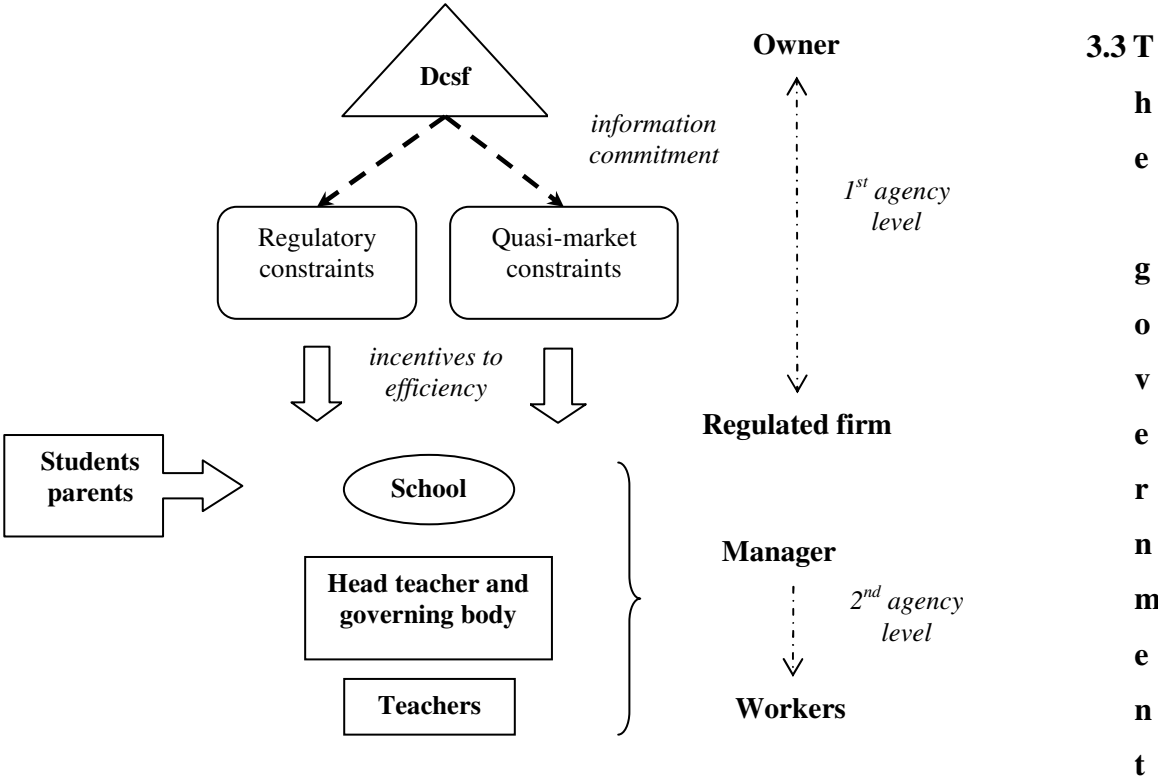
3.3 The government commitment device

Starting from the Education Reform Act, the central government (Dcfs) has progressively restructured and reduced its functions in the educational system. Therefore, according to Schmidt's model, the English system realizes an informational commitment of the central government (Dcfs). In fact, the government does not interfere in the activities of the Local Authorities (LAs) and schools, and maintains only two sets of functions: the definition of educational standards and improvement levels, and the distribution of the resources to the LAs. Some resources are directly allocated from the Dcfs to the schools, but they are constrained. Roughly speaking, the government centralizes all activities concerning subjects and educational standards (National Curriculum and KS examinations), and it decentralizes all the activities involved in the school management and organization (local management of schools budgets). So that, there is no more a direct government management of schools.

This decision, enforced through the Education Act, is quite original. Kandel (1954) traditionally identified two kinds of activities managed in a school: 'interna activities', that

are classroom activities (teaching, curricula), and 'externa activities' (budget management, transports, meals, cleaning). According to Kandel, the proper allocation concerns with decentralization of the interna activities and centralization of the externa ones. Actually, the Education Reform Act has worked in the opposite sense, decentralization of all externa activities, and centralization of the interna.

Though schools remain public schools, and government remains the owner of all propriety rights, it decides to reduce its powers to enhance a regulated quasi-market for education and force schools to be efficient. Thus, schools face a harder budget constraint, originated from the simple commitment device of the central government and the quasi-market mechanism. The unusual aspect is that compulsory schooling system is a regulated sector even if propriety rights remain to the government. In the quasi-market for education, regulated firms in competition are still public firms. In 2001, just 7% of pupils attended private schools (Machin and Vignoles, 2005). Through the commitment device and quasi-market reforms, the government tries to reach a higher level of productive efficiency. The public ownership and the regulatory scheme tries to enhance a greater allocative efficiency.

Every school faces two kinds of constraints: funding constraints (resources are allocated to the schools through the LAs), and regulatory constraints given by regulatory authorities (Ofsted and QCA). Hence, no relevant constraint exists between the government (Dcfs) and maintained schools, and, in this way, the commitment device is realized.

The government is still the owner, it handles all propriety rights, and, above all, it has the direct access to information. However, thanks to the commitment device, it does not intervene directly in collecting and elaborating information. The informational system, necessary to the quasi-market correct functioning, is managed by the regulatory independent authorities (Ofsted and QCA). The direct access to a vast database of information, and its diffusion to the consumers remains an owner's residual right, but the government decides not to intervene directly to commit itself to an informational barrier in order to harden budget constraints upon schools and LAs.

3.4 The trade-off between productive and allocative efficiency

The English institutional framework and quasi-market organization reaches a good level of both allocative and productive efficiency, trying to overcome the basic trade-off underlined in Schmidt's model (1996a, 1996b). On one hand, public ownership is a guarantee of an allocative-efficient provision, on the other hand, institutional and quasi-market reforms give incentive to improve the system productive efficiency.

As previously said, the efficiency and equity analysis is one of the most challenging issue to face in education policy. It is widely demonstrated that there is no strong correlation between resources spent per each pupil and the pupil's achievement (Hanushek, 2003; Gundlach, Wöβmann and Gmelin, 2001; Wöβmann 2003, 2005). On the contrary, it is known that it is possible to enhance schooling system efficiency throughout institutional reforms focused on the incentives to improve pupils achievement. Wöβmann and Schutz (2006) provide evidence that, coeteris paribus, proper institutional reforms increase education sector efficiency, without additional resources and thus giving net social welfare benefits. They identified the following institutional and organization mechanisms originating incentives to a better performance for all school agents (pupils, teachers, schools, administrative boards): (*a*) school autonomy and accountability; (*b*) standardized and certified external examinations; (*c*) a certain degree of competition among the institutes; (*d*) performance measurement management.

As we analysed in the previous paragraphs, English system presents all these features. Empirical researches show that efficiency levels reached by the English educational system are higher than the majority of the OECD countries (OECD, 1998). As we have already shortly outlined the aspects (*a*), (*b*) and (*c*), in this paragraph we will now focus on the performance measurement management (*d*).

3.4.1   Productive efficiency: performance measures

Since the early 1990s, performance measures (PMs) have become a widespread reality in the UK public sector (Propper and Wilson, 2003). Educational PMs can be both 'internal' and 'external' measures. Internal PMs are not published and concern with each institute general and financial information. They are collected by the institute itself, or by the regular inspection of the Ofsted. A particular kind of internal PMs are those related to the teachers performance pay.

Educational external PMs are output measures giving three kinds of indicators. *i*) Level indicators: that are gross indicators based on the percentage of pupils reaching an expected level at KS-tests; *ii*) evolution indicators: they account the performance results of different cohorts having the same test examinations in different years; *iii*) value-added indicators: the CVA (Contextual Value Added) measure is a statistical mean of assessing the relative effectiveness of a school measuring pupils progress. The model is based on the actual test and exam results of the given year group. It calculates the national average results attained by each category of pupil, the statistical 'prediction', and compares each individual's test/exam results against that prediction (Dcfs, 2007). External PMs are yearly published by the Dcfs,

and available on internet. Each school has its 'Achievement and Attainment Tables', simply called 'performance tables' or 'league tables', to provide standardized information to support the consumers choice and avoid asymmetrical information problems.

Therefore, pupils' results at standardized exams provide us a wide range of information. They enhance productive efficiency and school accountability, and in the meanwhile they give information to the consumers, to support an effective choice among the institutes. Performance tables make possible the functioning of the quasi-market mechanism as institutes receive pupil-led funding. About 75% of total resources are given from LAs to the institutes in proportion to the number of pupils attending the school. For this reason, PMs are indirect mechanisms of resource allocation. Performance tables create a competition pressure which leads schools to be constantly focused on pupils' achievement, as it represents the source of information and evaluation to support consumers choice. The publication of PMs influences parental choice and behavior and enhances the quasi-market mechanism.

3.4.2   An example of performance tables and value-added indicators

Table 2 shows three primary schools performance tables at KS test 2. School 1 (Barnfields Primary School) presents the best results, its average point score (29.4) is higher than both the average point score of England (27.8) and of the Staffordshire LA (27.9). About 90% of pupils attending S1 reached L4+ in all the three fundamental subjects, and about a half of them reached level 5.

School 2 (Amington Heath Community) and school 3 (Anglesey Primary School) did not record brilliant results because of the presence of a higher percentage of pupils with SEN[3] (23.6% and 36.4%). Though the higher percentage of SEN pupils, the performance (average point score) of school 3 is slightly better than school 2, but school 2 records a higher percentage of pupils reaching level 5.

Table 2. Performance tables, LA Staffordshire, West Midlands

		Pupils		*English*		*Maths*		*Science*		Avg point score
	tot	School Mobility Indicator	With SEN	L4+	L5	L4+	L5	L4+	L5	
LA avg			18.5%	80%	31%	77%	32%	88%	47%	27.9
Eng avg			23.2%	79%	32%	76%	33%	87%	46%	27.8
S 1	49	80%	8.1%	90%	47%	84%	55%	92%	53%	29.4
S 2	29	86%	23.6%	41%	7%	48%	17%	55%	10%	24.0
S 3	66	77%	36.4%	67%	6%	45%	5%	59%	3%	24.3

Notes. S 1 (School 1): Barnfields Primary School; S 2 (School 2): Amington Heath Community School; S 3 (School 3): Anglesey Primary School; Eligible pupils: number of pupils eligible for Key Stage 2 assessment in

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[3] SEN (Special Education Needs). Statements of SEN describe any learning difficulties that pupils have, and specify the extra help they need.

the 2005/2006 school year. All pupils, including those with SEN, are eligible for assessment under the National Curriculum when they reach the end of Key Stage 2. Most will be aged 11 by the end of the school year, but some will be older or younger; L4+ (Level 4 or above): the percentage of eligible pupils achieving Level 4 or above in the test. Level 4 is the level expected of most 11 year old; L5 (Level 5): the percentage of eligible pupils achieving Level 5 in the test. Level 5 means pupils are achieving beyond the expected level; School Mobility Indicator: shows the percentage of pupils eligible for KS2 assessment who were in the school for the whole of their KS2 education. The mobility indicator is based on pupils' dates of entry to the school. With SEN: pupils of all ages with statements of SEN. **Source**: http://www.dfes.gov.uk/performancetables/.

Since 2002, a value added indicator is reported on performance tables, as Table 3 shows. Concerning KS2 tests, the value added measure is calculate as follows. Each pupil's value added score is based on comparing his KS2 performance with the median performance of other pupils with the same or similar results at KS1. The individual scores are averaged for the school to give a score that is represented as a number based on 100. This indicates the value the school has added on average for its pupils (Dcfs, 2007). Only school 1 recorded a positive value-added (+4%), while school 2 and 3 recorded negative values from KS1 to KS2 (-2.4% and -2.5%). Of course, all kinds of educational PMs should be treated with proper wariness.

Table 3. Value-added indicator

	Value-added indicator	
	Measure (%)	*Coverage (%)*
LA avg	99,6	
S 1	100,4	96
S 2	97,6	97
S 3	97,5	97

Notes. The coverage indicator shows the percentage of pupils eligible for KS2 assessment that are included in the value added calculation and gives some indication of schools where the value added measure may be unrepresentative. **Source**: http://www.dfes.gov.uk/performancetables/.

3.4.3 Allocative efficiency

Maintained schools ensure compulsory education for each child from the age of 5 to 16. The quantity of schooling provided is enough to allow every child to attend a public school. The major concerns with allocative efficiency and equity are about the admission to schools and the selection and polarization effects derived from the adoption of PMs.

In February 2007, a new admission code was adopted for all maintained schools. Personal interviews for application to the pupils and their parents are forbidden to avoid cream-skimming and polarization effects (Tough and Brooks, 2007).

Smith (1995) documented the possibility that performance tables could distort agents behavior for at least three reasons since they may follow three kinds of strategies. (*i*) Focalization strategies: there could be incentives to focus only on the activities measured by

PMs. Important aspects, such as socialization activities, cannot be measured, and, as a consequence, agents take less care about them. Wiggins and Tymms (2002) found evidence of focalization strategies towards some PMs in primary schools. In addition, most PMs schemes concentrate on immediate outcomes and avoid long term objectives. (*ii*) Cream-skimming strategies: Meyer (1997) and Gillborn (1996) found evidence that institutes could implement cream-skimming strategies not to accept the enrollment of problematic pupils that could fail exams and need additional resources. The use of value-added indicators instead of level indicators help to partially solve this kind of problems. (*iii*) Resources allocation strategies: PMs carry specific consequences on how resources are allocated among students (Propper and Wilson, 2003). Schools allocate resources on students that can reach an upper level in KS tests with few additional efforts. Students far from being able to pass the exams are not helped, as they could hardly reach good results. Wiggins and Tymms (2002) provide examples of this strategies in KS2 tests in primary schools. Value-added measures help to avoid such problems.

Bradley, Crouchley, Millington and Taylor (2000) tried to identify the possible effects of the introduction of PMs in the UK education sector. In general, we can affirm that an improvement in productive efficiency has been recorded. (*i*) Evidence of a weak statistical link between competition and attainment is provided. They found that examinations results of other local schools have a significant but 'negligible' influence on the performance of each school. (*ii*) New enrolments are positive correlated with each institute performance results, and negative correlated with the results of neighbouring institutes. (*iii*) Schools facing excess demand have increased their pupil capacity. (*iv*) Schools present better performance if competing with other schools with good performance tables. (*v*) An increase of some cream-skimming and polarization effects has been recorded. Bradley *et al.* (2000) suppose they were preexisting phenomena, but, it is uncontroversial that the quasi-market reform enhanced equity problems that must be carefully studied (Machin and Vignoles, 2005).

3.5 The budget constraints effects

Every school faces regulatory and financial constraints affecting its behavior. As we explain in section 2, according to Kornai (1979) and Schmidt's formalization (1996a, 1996b), budget constraints are soft or hard. Budget constraints nature depends on the allocation of propriety rights, and, consequently, on the allocation of information streams (Kornai, 1979). Privatization, thanks to the government commitment device, hardens the budget constraints, that are soft in case of public ownership. A harder budget constraint provides managers with

greater effort in costs reducing. Thus, productive efficiency is higher but allocative efficiency turns out to be poor. Therefore, regulatory and financial constraints determine the soft or hard nature of budget constraints upon schools. Now we examine the features of regulatory and financial constraints in order to determine if they make soft or hard the budget constraints.

Actually, a variety of elements should be considered. Some of them make the budget constraints hard, some others make them soft. On one hand, the features of the English system determining a soft budget constraint upon schools are two. (*1*) Public ownership: schools are, in the end, state-owned enterprises, so that opportunistic behavior is always possible. According to a paternalistic view, the government could 'forgive' inefficient schools, as its purpose is to keep high allocative efficiency. Schools can predict this, and have less incentives in improving productive efficiency. (*2*) Resources myopia: schools are not primarily focused on resources and cost savings, as they can use all money they receive from the LA. Schools are not focused on a profit maximization problem, but on the efficient use of all available resources. As resources primarily depend on the enrollments, and the enrollments depend on the school and students performances, institutes are more concerned with the improvement of pupils' attainment rather than on costs saving.

On the other hand, as Schmidt's (1990, 1996b) suggests, privatization and regulation efforts contribute to harden the school budget constraints. Examples of this are (*1*) the government commitment device, (*2*) the regulation framework, (*3*) the incentives in the resources distribution mechanism, (*4*) the quasi-market incentives, and (*5*) the school accountability. Therefore, even if the ownership remains public, all the elements determining the regulated quasi-market for education create a harder budget constraint. Regulatory and quasi-market constraints increase the productive efficiency of the schooling system as a whole, and increase the managers' (head teachers) and workers' (class teachers) productive efforts.

3.6 Teachers in the quasi-market

Class teachers constitute the core of every schooling system (Santiago, 2004). Their importance on the students performance was widely demonstrated in empirical works (Hanoushek, 2003). On top of that, the importance of teachers is due to the large amount of resources they need: about two third of public resources spent in education is accounted for salaries (Santiago, 2004). The English quasi-market for education contributes to enhance the teachers efforts in improving pupils attainment. A certain degree of competition among the institutes increases the teachers' efforts since they face a higher probability of being sacked if

their results are not satisfactory (Adnett and Davies, 2002). Moreover, schools facing a higher competition look for the most skilled teachers able to improve the pupils achievement levels. Better results increase the new enrolments, and, as a consequence, the amount of resources.

To realize this virtuous circle, three essential elements need to be implemented in a regulated quasi-market for education: (*1*) the possibility for each school to hire and fire teachers directly; (*2*) an adequate regulatory framework for the labour market for teachers; (*3*) some performance-related pay (PRP) devices.

The 'hire and fire' system (*1*) represents the necessary, but not sufficient, condition for the implementation of an effective teacher market. In England, the teacher recruitment is not subject to national concourses and pass-lists, as each school hires and fires teachers directly. Through LAs, the institutes publish the summary of the vacant places. Teachers present their candidature, and have an interview with the governing body. Usually at the end of the school year, a teacher can be fired. This system creates both positive and negative effects. The negative effects are related to the qualitative and quantitative shortage of skilled teachers (Santiago, 2004), while the positive impact is linked to the reputational mechanism enhanced through the direct hire and fire recruitment. Teachers unable may be sacked a lot of times, and, consequentially, they may be automatically skimmed out of the market.

The public intervention in the teacher labour market (*2*) remains necessary to solve problems of adverse selection and multiple agency (Adnett and Davies, 2002). The teacher market is characterized by the state having both monopoly power in the provision of credentials, as the state determines who is qualified to teach, and the near monopsony power in the recruitment, since the majority of teachers is employed in state schools (Machin and Vignoles, 2005). Because of its commitment device, the government does not intervene directly but through the 'Training and Development Agency for Schools' (TDA). This is an independent regulatory agency, similar to Ofsted and QCA, created with the purpose of giving the qualification for teaching, and raising standards in schools by attracting able and committed people to teaching and by improving the quality of teacher training.

Whether PRP should be the best way to increase teacher performance is still debated (Holmstrom and Milgrom, 1991), since the outcome of interest and pupil achievements is multi-dimensional and depends on the efforts of a group of teachers rather than single individuals. Anyway, one of the main principle launched by the 1998 Green Paper, 'Teachers: meeting the challenge of change', was to provide better rewards for teachers and to implement performance-related pay systems (*3*). In the UK, a form of PRP was introduced in 2000. It was intended to boost teachers' earnings making the increase in pay dependent upon teachers

demonstrating effective performance in their job (Machin and Vignoles, 2005). PRP aims to provide the teachers, who play the part of workers, in Schmidt's model, with a greater effort, but little empirical evidence is available. In the UK, around 80% of class teachers who were eligible for an upper scale pay related to their performance, applied for it, and around 90% received it.

4. CONCLUSIONS

The case study presented in section 3 is an attempt to adopt Schmidt's analytical model to the case of the provision of a particular good, that is compulsory education. The new approach to the economics of education is concerned with the use of a model rooted into the regulatory and incomplete contracts literature instead of the traditional human capital framework.

Approaching the study of the economics of education through regulation and privatization models in an incomplete contracts world, like Schmidt's one, allow us to compare the school to a regulated firm, deeply changing the traditional framework of analysis. Speaking of an 'industry of education' is not so unusual in all contexts similar to the UK, Canadian and American one (Hanushek 1986, Blaug 1991). Our new approach can support the development of researches focused on mechanisms increasing the schooling system efficiency. Moreover, this new theoretical framework can offer some interesting policy suggestions on the best ways to provide education. In particular, the English system is an hybrid form because it assumes a sort of privatization and regulation of public owned schools. This intuition, though unusual, is useful to realize a higher productive efficiency, due to the regulation and quasi-market mechanisms, while the public ownership is a guarantee for attaining high allocative efficiency level. We want to underline that our analysis is primarily focused on the issue of school system efficiency so that equity analysis, though fundamental, is only partially faced.

The English system turns out to be a good performer if compared to other European schooling systems, particularly in the pupils' attainment level (Johnson, 2004). The analysis of the English system shows that quasi-market framework mimics the privatization mechanisms demonstrated in Schmidt's model. In conclusion, we can affirm that the English system may represent an application of Schmidt's model (1996b) as the regulatory, institutional and organizational devices fit the three elements of the model. (*1*) A sort of commitment device of the central government (Dcsf) is realized. Though the ownership remains public, the Dcsf does not interfere in the school management and regulation, leaving this to the institutes themselves and to regulatory independent agencies. (*2*) The trade-off

between allocative and productive efficiency is overcome. The English system gathers the benefits due to the public ownership, a higher level of allocative efficiency, with the benefits coming from regulation and privatization frameworks, a higher level of productive efficiency. (*3*) Regulation, privatization and quasi-market mechanisms harden the schools budgets constraints.

Multiple agency problems can be solved choosing a central aim, that is pupils' attainment, shared by all the agents operating in the quasi-market. The government, as a benevolent maximiser of social welfare, wants that the schooling system focuses on the improvement of pupils' achievement levels, and provides all agents with incentives mechanisms aimed at this. Information plays a fundamental role. The standardized testing system is an attempt to break the asymmetrical information barrier and provides a wide information database enhancing the quasi-market mechanisms. Good results at KS tests are linked to a greater number of enrollments, and consequently determine an increase in pupil-led school resources, while performance-related pay mechanisms give incentives to class teachers.

Although it is generally accepted that the English educational reforms have increased the system efficiency, some costs are to be born. Equity problems are still debated (Machin and Vignoles, 2005): negative effects due to the use of performance measures, such as polarization and social segregation, need to be carefully studied (Bradley *et al.*, 2000, Bradley and Taylor, 2002).

To conclude, we suggest that some policy issues can be drawn from the English case. First of all, market reforms in education may help to improve the productive efficiency, but serious equity problems must be taken into account. Secondly, performance indicators are necessary to solve asymmetrical information problems and foster a wide database for econometric analysis. However, distortive allocative efficiency problems carried by the use of such indicators must be further studied. Lastly, the commitment device of the central government and the regulatory framework are fundamental to harden the schools budget constraints and force the institutes to a higher efficiency level.

Further studies should be carried out on the use of regulation and privatization frameworks in the economics of education. An interesting research perspective deals with the comparative analysis of different schooling systems within the framework proposed. For instance, the Italian compulsory education system should be analyzed following this new approach, to focus to which extent the actual and the future legislative framework could fit the model suggested.

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