



Cronyism and education performance

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ABSTRACT

Recent research suggests that some countries may be unable to use productively their schooling output because of the scope of cronyism or corruption. We investigate further and demonstrate that, in a stylised model, cronyism in the labour market, (e.g. the ability to exert influence to gain high wage positions without merit), may impact heavily on the relationship between schooling inputs and cognitive skills, due to incentive effects. We then use a two-stage DEA approach to identify factors affecting inefficiency in education performance of OECD countries, as measured by PISA scores. Along with other well known factors, a proxy measure for cronyism from the World Value Survey, explains a substantial fraction of the inefficiency. This result suggests that, as in our model, in the presence of cronyism, incentives to cognitive skills acquisition are dampened. The best way to improve education performance may be to increase transparency in labour access.

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1. Introduction

A wide body of evidence shows that in many countries a large fraction of the population believes that social connections, activated mainly through family and therefore depending on one's background, are a prevailing influence on success. For example in the US a wide literature by now has documented the importance of networks to explain individuals' success in the labour market (for comprehensive surveys see Ioannides and Datcher Loury, 2004; Jackson and Zenou, forthcoming).¹ However this strand of the literature explains the differences in the performance of different groups with the existence of job information networks, where the privilege is only in terms of access to information. Some further evidence (see for example Bowles and Gintis, 2002; Bowles et al., 2008) instead suggests that what may be missing is a level playing field. One possibility is that networks restrict access to valuable positions mainly to influential members of society, irrespective of school performance or cognitive skills. The extent to which these phenomena are widespread, tolerated and perceived as normal in different societies may have profound effects on incentives to acquire education and, even more, to perform in education. The consequence is that the perception of the relevance of the cronyism factor must have an impact on the performance of different education systems, other things equal. In the end this must impact on human capital accumulation, productivity and finally growth.

The existing evidence suggests some stylised facts as a basis for further analysis of this hypothesis (see later in the literature review for details):

- the relationship between cognitive skills and growth has been established convincingly at different levels; there is also a sufficient amount of evidence suggesting that educational outcomes are a main factor determining growth potential of advanced countries (Hanushek and Woessman, 2010b);
- surprisingly there is a large and growing evidence that expenditure in education is not correlated with measures of cognitive skills across developed countries;
- corruption in developing countries may impact substantially on the relationship between schooling and expenditure on one side and growth. An influential paper suggests that corruption may impede the use of accumulated human capital in certain countries.

So far, to our knowledge, no theoretical or empirical contribution has explored the hypothesis that incentives to skill acquisition, due to cronyism, impact directly on the skill accumulation process. In this paper we present a stylised model of cognitive skill acquisition in which the incentive to put on effort to increase one's productivity, may be dampened if cronyism allows the allocation of high-salary labour positions to certain 'influential' individuals. We will assume that the influence one can exert is an exogenous feature of individuals stemming from their social position.² We show that more cronyism certainly leads to

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¹ A stylised fact that is the basis for every analysis is that surveys reveal unambiguously that a varying, but always large proportion of jobs have been found through social contacts (Calvo-Armengol and Jakson, 2007).

² Of course it is possible to model it as a rent seeking process, (as for example in Acemoglu, 1995; Aidt, 2003; Aidt and Hillman, 2008) without affecting substantially the results.

less effort in skills acquisition. Cronyism in particular reduces skill acquisition and productivity directly, because some individuals do not need to improve their skills to acquire high job positions. However and more importantly the rent created by cronyism needs to be financed out of the wage bill of non-influential people. This causes a reduction of the ratio of wages to individual productivity and therefore reduces incentives to skill acquisitions also for other workers.

We then test the hypothesis that cronyism decreases incentives to skill acquisition by the use of a proxy, an index of perceived relevance of hard work relative to connections in determining success in life taken from the World value Survey. We use the DEA measures of inefficiency estimated on the basis of PISA scores, to explore the factors that explain cross country differences. The analysis is performed by the double bootstrap approach, a technique pioneered by Simar and Wilson (2007), which allows obtaining unbiased coefficients. In this paper we use the same technique but change substantially the specification by using different measures of output and input, in order to answer our research question. In the second stage of the procedure we explain the 'inefficiency' variable by the use of supply and demand side factors, or, in other terms, the education industry and the general environmental factors. On the supply side we find some evidence of effects of the structure of the education sector, in particular in the number of class hours. On the demand side instead we find that the performance of the education system is heavily influenced by environmental factors, such as the share of immigrant parents and more generally the educational attainments of parents. But the most interesting result is that an appropriately chosen measure of cronyism (gathered from World Value Survey) is always significant in different specifications. We interpret this result as evidence that an important driver of the performance of the education system is the incentive system underlying. When positions are awarded on the basis of influence, the real return on education may be poor. This may not appear in traditional measures of private returns on education because a formal attainment may still be required for access to some positions, but this doesn't mean that they are awarded on the basis of real education performance.³

The contribution of this paper therefore is two-fold. First, we present a stylised model of education and labour with cronyism which demonstrates that the presence and extent of cronyism decrease incentives to acquire cognitive skills. Second we demonstrate empirically that corruption has a significant effect on the inefficiency of education systems.

The remainder of the paper is structured as follows: Section 3 presents the theoretical model, which provides testable implications for subsequent analysis. Section 4 discusses the empirical methodology. Section 5 describes the data. Section 6 discusses empirical evidence. Section 7 reports some robustness check. Section 8 reports policy implication and conclusions.

2. Literature review

One of the most significant and accepted results from economic theory establishes the role of human capital accumulation also through education as the main factor explaining growth, particularly in advanced economies (Lucas, 1988; Romer, 1990). A huge amount of work has been devoted to test the relationship between education and growth with some work focusing on cross-country evidence. Starting with the work of Hanushek and Kimko (2000) and Lee and Barro (2001) direct comparable measures of cognitive skills, measures of the quality of schooling achievement, have been used to proxy human capital and a stable and strong relationship between these measures and growth has emerged (Hanushek and Woessman, 2010a). This result establishes that education is productive only insofar as it produces increases in cognitive skills and therefore explains why education systems spending comparable sums of money and achieving comparable average years

of education may attain completely different results in terms of growth. In particular some work, focusing on the effects of changes of schooling attainment, surprisingly find a weak effect of schooling (Benhabib and Spiegel, 1994; Pritchett, 1996). One interesting explanation for the failure to achieve has been put forward in a paper by Rogers (2008), who finds that, when excluding from regression countries on the basis of a high level of a corruption index, a strong relationship between education expenditure and growth emerges. Rogers (2008) suggests that this may be due to the inability of some countries to exploit the product of their education systems, because of corruption. However the relationship between cognitive measures of human capital and growth suggests that the problem may run even deeper than that, as we will argue here.

Several papers, besides Rogers (2008), investigate a similar topic; the effect of corruption on education and health care provision (Bjorkman, 2006; Gupta et al., 2000, 2002; Reinikka and Svensson, 2005; Schutz et al., 2008; Suryadarma, 2012). Gupta et al. (2002) in particular examines the impact of corruption on some quantitative indicators of education provision and finds a strong effect. The result is interpreted on the basis of Shleifer and Vishney (1993). In this setting corruption increases the cost of education provision, and decreases its quality and volume for a given expenditure due to outright theft or illegal payments required by officials (bribes), and perverse systems of recruitment, rewards and promotions for teachers. While we do not rule out entirely these channels, they seem to be more appropriate to explain the phenomenon in developing or underdeveloped countries than OECD countries. For example Gupta et al. (2000) report evidence that access to universal education may in fact be rationed on the basis of bribes in some countries. This appears unlikely to happen in any advanced OECD country. While we do not rule out entirely this channel, the impact of cronyism on cognitive skills in OECD countries is much more likely to stem from reduced incentives to acquire those skills, than from corruption in education provision. To control for corruption in education however in the second stage of the analysis, we included also some variables of school accountability, that turn out to be insignificant.

To our knowledge no empirical or theoretical contribution has explored our idea in developed countries so far. An interesting theoretical model shows that nepotism may be widespread where delegation of recruitment decision to managers is necessary and in the presence of unverifiable information regarding the skill of job applicants depending also on the prevailing value system (Ponzo and Scoppa, 2011)⁴. An indirect signal that this element may be highly relevant can be found in general in the literature on meritocracy, family background and equality of opportunity (see for example Arrow et al., 2000; Bowles and Gintis, 2002; Bowles et al., 2008).⁵ More specifically Checchi et al. (2008) observe that lower educational attainment in individuals with lower education parents can be partly explained with lower real returns from education for these individuals and find that wages for similar graduates in Italy are positively correlated with the fathers' education. Following the results in Hanushek and Kimko (2000) and the wider availability of comparable cross-country measures of school performance at the OECD (PISA), many researchers explored the relationship between education expenditure and cognitive skills. Several papers tried to measure inefficiencies in education provision through the use of the DEA

⁴ "...nepotism is more widespread in jobs paying high wage rents; in organizations in which 'low powered' incentives are used for managers; when firm performance is slightly sensitive to abilities, when it is easy to make hidden payments and the intensity of family ties is strong; when the uncertainty of the connection process is low" (Ponzo and Scoppa, 2011). It is easy to observe that some of these factors are related to market discipline and firms organization, while others depend on the prevailing value system in different societies.

⁵ Bowles and Gintis (2002) provide another example on earnings inheritability. They observe that there is sufficient evidence that "the estimated direct (e.g. not going through education) effect of parental incomes on offspring earnings has turned out to be remarkably robust... These results just reaffirm that...more than two-fifths of the intergenerational transmission coefficient is unaccounted for".

³ It is generally possible in most countries to gain a degree without much effort from a poor reputation institutions.

technique (see for example Afonso and St. Aubyn, 2006; Verhoeven et al., 2007). This last paper in particular used the DEA measures of inefficiency to explore the factors that may explain cross country differences, an approach we will replicate with our updated database and hypothesis.

3. A stylised model of cronyism in labour market and its effect on education

To illustrate the possibility that cronyism may dampen incentives to acquire cognitive skills, we will present a stylised model with more than one element of realism. Suppose that in a certain economy, positions are allocated on the basis of influence and ability. Ability is in practice cognitive skills (s) both primitive (a) and acquired through education (ϵ). Primitive ability a is randomly and uniformly distributed in the population of workers between 0 and 1. The two terms interact in such a way that a higher primitive ability also increases the gains from education, that is education increases cognitive skills (and productivity) of high primitive-skill workers more than less gifted ones. Hence $s = f(a, \epsilon)$, with $s_a > 0$; $s_\epsilon > 0$; $s_{a\epsilon} > 0$. The education cognitive skills (ϵ) can be acquired with effort by individuals in the population at a fixed monetary-equivalent cost c , and for simplicity takes only two values, e^* and 0. Note that the acquisition of the educational skill does not correspond to the formal acquisition of a degree, but requires additional effort. The cognitive skill level is perfectly observable by the recruiter/selector in the labour market but it is not verifiable. Cognitive skills and therefore education increase lifetime overall productivity, ρ . Hence education is productive contrary to pure signalling models such as Spence (1973).⁶ From society point of view, education for a generic type a worker is productive if:

$$\rho(s(a, e^*)) - \rho(s(a, 0)) > c. \tag{1}$$

Considering the interaction between a and ϵ , the gains in productivity from educational skills are increasing in a . Based on this, we make the implicit additional hypothesis that there is a cutoff level for a^* such that education is only profitable for $a > a^*$.⁷

Suppose the whole risk-neutral population can also exert influence but with different intensity. The influence intensity parameter r is distributed in the population uniformly [0, 1] and independently from the primitive ability parameter in the population (a).⁸ This means in practice that primitive ability is distributed independently from social and economic conditions, hence talent is distributed randomly in the population.

The selector in the labour market is perfectly able to observe individual parameter s , but acts as an agent of some principal and its incentives cannot be perfectly aligned to the principal's. We will assume that work positions are awarded, other things equal, on the basis of influence, that is, given the level of cognitive skills, s , they will be offered to those exerting more influence (higher r). A certain proportion β of fixed lifetime high wage, w_H , positions will be anyway offered to those exerting the highest influence, even when exerting no effort (and therefore not gaining the positive education excellence signal) or possessing no primitive ability. In a market environment without information problems, this assumption would be untenable. However when recruitment is delegated and skills are unverifiable, incentives to hire the most able candidate are never perfect. It is natural then to expect that cronyism is relevant because the selector may gain a direct benefit (for example hiring a relative). Moreover individual success may also be linked to one's ability to create and nurture a network of useful connection. This is

typically done by offering influential people the possibility to 'appoint' someone in a high wage position, irrespective from her ability. Our belief is that this is a relevant factor in any country, but it may be more or less widespread and tolerated depending on the prevailing set of social values. The β parameter is then a measure of the strength of the cronyism factor in different economies.

Suppose also that:

$$w_H > s(1, e^*) - c \tag{2}$$

that is once considering the cost of acquiring educational skills, even the individual with the highest ability and hence the highest gain from education always prefers the high wage granted to high-influence types with no effort. Under these conditions, the β proportion of highest- r types will certainly not exert effort in any case.

Other (non-influential) workers are paid an overall salary equivalent to a fraction $y < 1$ of their lifetime productivity, because of the need to finance the cross subsidy for the high-influence types. In this case a generic type of worker is paid a salary:

$$w_a = \gamma \rho(s(a, \epsilon)). \tag{3}$$

The fraction $(1 - y)$ is therefore a 'cronyism tax'. Now a generic type- a individual has an incentive to acquire educational skills if:

$$\rho(s(a, e^*)) - \rho(s(a, 0)) > \frac{c}{\gamma}. \tag{4}$$

Now comparing Eqs. (4) and (1), it is apparent that the actual cutoff level of a for which a worker acquires the educational skill is higher than the optimal one a^* , and the divergence is a negative function of y . But $(1 - y)$, the cronyism tax, depends on the overall subsidy that needs to be paid to high-salary/high-influence types S :

$$(1 - Y)(1 - \beta)\rho^* = \beta(w_H - \rho_\beta^*) \tag{5}$$

where ρ^* is the average productivity of workers not gaining access to w_H , taking into account their education choice, and ρ_β^* is the average productivity of workers gaining access to w_H . Now differentiating Eq. (5) we find that y decreases with β , and therefore, considering Eq. (4), it increases the threshold level of a for which educational skills are profitable and decreases overall average educational skills acquisition in the economy.

Now we have two channels through which an increase in β decreases the acquisition of educational skills:

- a) on one side, high influence types never have an incentive to acquire skills. Hence, when β increases, a larger share of the population (including some high skill individuals for which it would otherwise be optimal) has no incentive to acquire skills;
- b) on the other side, and more importantly, an increase in β increases the necessary subsidy and decreases other workers' salary relative to productivity. Through this channel it decreases the incentive to acquire educational skills (and average productivity as well). The consequences of this simple model are clear and expected.

Testable proposition: cronyism in the labour market decreases the incentive to acquire educational cognitive skills both directly and because it diminishes private returns from education.

A notable consequence of the model is that, aside from the adverse distributional impact, cronyism decreases through both channels also the productivity of many workers and therefore output (growth). In the next sections we will try to test this proposition by explaining the relative inefficiency of education systems, among other factors, with a measure of cronyism. Of course we don't have data directly measuring cronyism in the labour market in the sense stated above, as the use of influence for gaining labour positions without merit. We will however

⁶ This hypothesis has been relaxed in subsequent studies on signalling. Most evidence (for a comprehensive survey and test see Lange and Topel, 2006) anyway refutes the hypothesis of pure signalling.

⁷ This in practice corresponds to the hypothesis that education's net returns are positive only for a fraction, rather than the all of the population.

⁸ Although this is not necessary for our results.

Table 1
Descriptive statistics.

Variables	Mean	Std. dev.	Min.	Max.
Output				
MATHEMATICS (Score 2009)	505	17.91	482	546
READING (Score 2009)	500	16.8	470	540
SCIENCE (Score 2009)	510	17.55	488	554
Input				
Cumulative spending in education (US dollars)	9138	2820	3956	17825
Exogenous variables				
CRONYISM	8.87	4.45	3.32	21.35
EDUPA (%)	79.48	14.51	28.7	93.9
IMM (%)	21.81	12.48	2.5	44.5
CLASS SIZE (%)	23.56	4.18	19.6	35.31
TEACHING TIME (hours)	665	143	377	1051
RELEARN (%)	18.28	9.49	1	39
UNEM (%)	6.7	3.31	1.7	15.4

use general, sufficiently wide, comparative measures of the belief that economic success depends mainly on connections and luck rather than hard work as a proxy, in the belief that economic success is mainly related to performance in the labour market. Of course this is a perception measure that may diverge from the actual importance and diffusion of cronyism in different countries. We believe there's a very large correlation between perceived and actual cronyism. Note that in the model above we do not distinguish between perceived and actual cronyism. However what influences people's incentives to acquire educational skills is the perception of the extent of cronyism.

4. Empirical model

In order to test the theoretical model described in Section 3, we use a two-stage semi-parametric procedure. The procedures normally used for the quantitative analysis of the efficiency can be classified into two broad classes: parametric, such as the Stochastic Frontier Approach (SFA), and non-parametric, as Data Development Analysis (DEA). In this study, we chose a non-parametric methodology since it does not require ex-ante an assumption regarding the functional form of the cost or production function (contrary to SFA) and allows to manage multiple inputs and outputs jointly. Recently, the DEA has become the dominant approach to efficiency measurement in the education system and other public services (Alexander et al., 2010; Johnes, 2006; Kempkes and Pohl, 2010; Wolszczak-Derlacz and Parteka, 2011).

Specifically in the first part of our analysis, following Farrell (1957), output efficiency scores are estimated by solving a DEA. In the second part, the efficiency scores obtained from the DEA in the first step are corrected with a bootstrap procedure introduced by Simar and Wilson (2007) and explained in a truncated regression with discretionary inputs as independent variables. The algorithms implemented by Simar and Wilson (2007) are based on a measure of technical efficiency defined as the inverse of the output increasing efficiency score. For this reason all the scores generated in this study are interpreted in terms of inefficiency. DEA measures efficiency by estimating a "best practice" and evaluating the relative inefficiency of different units of analysis, traditionally called Decision Making Units (DMUs). In the context of education, output-orientation seems to be the best choice to measure the school performances of students. An education system is considered more efficient if its producers make the best possible use of available inputs (in this case, per capita cumulative spending in education). Consequently, we suppose that DMUs can be characterized by a technological set Ψ defined as:

$$\Psi = \left\{ (x, y) \in \mathfrak{R}^N \times \mathfrak{R}^M \mid x \text{ can produce } y \right\} \tag{6}$$

where x represents a vector of N inputs and y the vector of M outputs. Taking OECD Countries as the units of observation, we measure inputs in terms of cumulative expenditure on educational institution per

student from 6 to 15 years-old (as Hanushek and Woessman, 2010b), while the output is measured by the performance of 15-year-olds on the OECD PISA reading, mathematics and science tests in 2009. The efficient transformation of inputs into output depends on different endogenous or exogenous factors. In this study we use a Farrell/Debreu-type output-oriented technical efficiency measure:

$$\delta_j(x, y) = \max_{\theta} \{ \theta : (x, \theta y) \in \Psi \} \tag{7}$$

where θ measures the maximum possible increase in output y , given that inputs x remain constant. Note that, technical inefficiency scores are bounded between unity and infinity, with $\delta_j > 1$, the DMU is inside the frontier (i.e. the Country is inefficient), while if $\delta_j = 1$, the DMU lies on the frontier (i.e. the Country is efficient).

The Farrell measure of technical inefficiency may be estimated under the assumption of a production frontier characterized by either constant returns to scale (CRS) or variable returns to scale (VRS). In this study, we assume variable return to scale (VRS), given the set of input and output selected, therefore our model can be derived for the i -th Country by solving the following linear programming:

$$\hat{\delta}_i = \max_{\gamma} \left\{ (x, y) \in \mathfrak{R}^N \times \mathfrak{R}^M : \sum_{i=1}^n \gamma_i y_i \geq y ; \sum_{i=1}^n \gamma_i x_i \leq x ; \text{ such that } \gamma_i \geq 0, i = 1, \dots, n \right\} \tag{8}$$

where y is a 1×1 vector of constants.

In the second stage, to capture what determines this inefficiency, we use the DEA scores (calculated in the first step) as the dependent variable ($\hat{\delta}_i$) regressing them on potential exogenous variables:

$$\hat{\delta}_i = \mathbf{z}_j \beta + \varepsilon_j, \quad j = 1, \dots, n \tag{9}$$

where \mathbf{z}_i is a vector of structural and environmental variables that is expected to affect the inefficiency of OECD countries under consideration and β refers to a vector of parameters with some statistical noise ε_i . All variables in the second step are taken in natural logarithms, allowing us to consider the estimated coefficients as elasticities.

Until a few years ago, in the DEA standard technique for estimating Eq. (9) was the Tobit-estimator. However, Simar and Wilson (2007) have emphasized two possible problems stemming from applying Tobit in this context. First, the results may be biased in the presence of serial correlation between variables at the two stages. Second, the efficiency scores may be biased in finite samples. To obtain unbiased beta coefficients with valid confidence intervals, we follow the double-bootstrap procedure suggested by Simar and Wilson (2007), where DEA scores are bootstrapped in the first stage to achieve bias corrected inefficiency scores and explained in a bootstrapped truncated regression with discretionary explanatory variables. The parameters of the model (9) are estimated simultaneously using the maximum likelihood

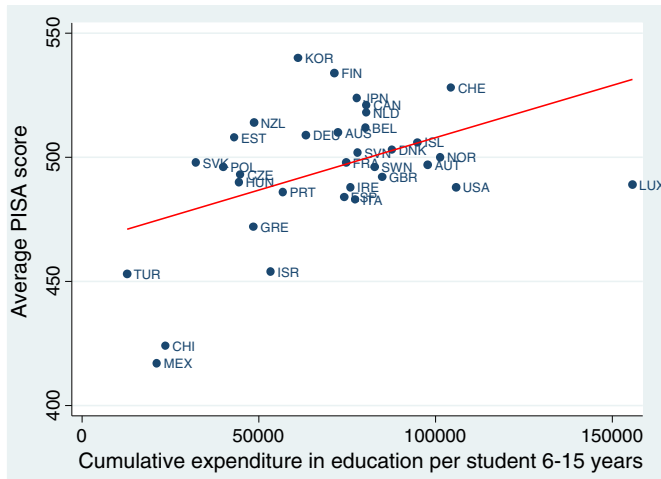


Fig. 1. Cumulative expenditure in education and education attainment.

estimator. Further investigations will be directed to analyse data from more recent years (e.g. new results of Programme for International Student Assessment), to proxy additional outputs and take into account the influence of outliers in the explanation of inefficiency determinants by applying the recently developed non-parametric conditional methodology (Badin et al., 2012).

5. Data

Our analysis takes into account 34 OECD countries⁹: South Korea, Slovak Republic, Turkey, Estonia, Finland, New Zealand, Luxembourg, Switzerland, Poland, Japan, Canada, Netherlands, Belgium, Czech Republic, Hungary, Australia, Germany, Iceland, Denmark, Slovenia, Norway, France, Austria, Sweden, Portugal, United Kingdom, Greece, Mexico, United States, Ireland, Spain, Italy, Chile, and Israel. Data on education systems were collected from the report “Education at Glance 2011”, annually conducted by OECD (OECD, 2011). The chosen proxy for measuring the effect of cronyism on incentives to skill acquisition is taken from the World Value Survey (WVS, 2009). The descriptive statistics are reported in Table 1. In line with previous studies (Afonso and St. Aubyn, 2006; Verhoeven et al., 2007), the outputs are measured by the performance of 15-year-olds from the last “Programme for International Student Assessment” for reading, mathematics and science scales in 2009 (average of the three scores for each country), while input is given by the cumulative expenditure on educational institution per student from 6 to 15 years-old (US dollar converted using PPPs for GDP, by level of education).

In the second stage, we consider several factors that may influence school performances such as: Parents' educational attainment (EDUPA) proxied by the percentage of population aged 35–44 that has attained at least upper secondary education¹⁰; Immigrant status (IMM) measured as the percentage of students from immigrant background; labour-market indicators like differential unemployment rate (UNEM) with secondary education and relative earnings (RELEARN) of the population with income from employment. To test the effect of cronyism on school performance, we chose the World value survey, specifically from the responses to the question E = 040. Does hard work bring success? Answers are recorded over a 10-point scale from “In the long run, hard work usually brings a better life” (coded as 1) to

⁹ The OECD countries excluded from the analysis did not provide data on inputs and/or outputs selected.

¹⁰ The relationship between educational attainment and performance with parents' education background has been extensively proved both at an individual level (see for example Holmlund et al., 2011; Lee and Barro, 2001) and at aggregate level (see for example Afonso and St. Aubyn, 2006; Brunello and Checchi, 2005, for Italy).

Table 2
DEA results (output oriented).

Countries	Eff. scores (VRS)	Eff. bias-corrected
South Korea	1.000	1.012
Slovak Republic	1.000	1.012
Turkey	1.000	1.014
Estonia	1.006	1.026
Finland	1.007	1.027
New Zealand	1.009	1.028
Luxemburg	1.009	1.030
Switzerland	1.022	1.038
Poland	1.023	1.040
Japan	1.027	1.043
Canada	1.028	1.044
Netherlands	1.038	1.049
Belgium	1.042	1.054
Czech Republic	1.043	1.060
Hungary	1.048	1.061
Australia	1.048	1.066
Germany	1.055	1.069
Iceland	1.061	1.070
Denmark	1.067	1.076
Slovenia	1.067	1.077
Norway	1.069	1.086
France	1.075	1.087
Austria	1.077	1.090
Sweden	1.079	1.091
Portugal	1.092	1.104
United Kingdom	1.093	1.104
Greece	1.097	1.105
Mexico	1.097	1.105
United States	1.097	1.112
Ireland	1.100	1.116
Spain	1.106	1.117
Italy	1.108	1.118
Chile	1.120	1.142
Israel	1.135	1.211
Mean	1.057	1.073

Note: VRS TE – variable returns to scale technical efficiency with bias corrected (1000 rep.). Estimates are made using FEAR 1.15.

“Hard work does not generally bring success – it is more a matter of luck and connections” (coded as 10). In detail, to construct this variable (CRONYISM), we considered the percentage of individuals who responded by choosing a value from 7 to 10, hence the proportion of those believing that success is mainly a matter of luck and connections.

The perception of the population about the importance of connections appears to be appropriate for our purpose, because it is a credible measure of the order of magnitude of the β parameter in the model in Section 3.

In addition to socioeconomic variables we control for features of the education system, such as the number of students per class (CLASS SIZE); Teaching time, defined as the number of teaching days per year multiplied by the number of hours (TEACHING TIME). Furthermore we included two dummy variables to control for the presence of the national examination (FINAL EXAMS) and inspections (INSPECTIONS) in education system. National examinations are standardised tests that have formal consequences for students, such as an impact upon a student's eligibility to progress to a higher level of education. A school inspection is a formal process of external evaluation with the aim of holding schools accountable. The practice of school inspections varies considerably among and within countries (OECD, 2011). Both these variables are intended as checks for the presence of other, non-incentive, channels through which cronyism may impact on the education performance, notably through cronyism within the education system.

6. Results

Fig. 1 plots the cumulative expenditure in education and school performance measured by the latest results of the PISA test. Note that, there

Table 3
Truncated bootstrapped second stage regression.

Variables	Model A	Model B	Model C
CRONYISM	0.036*** (0.016)	0.037** (0.018)	0.034** (0.018)
EDUPA	−0.064*** (0.015)	−0.057*** (0.017)	−0.061*** (0.017)
RELEARN	−0.012** (0.005)	−0.013** (0.006)	−0.010** (0.005)
TEACHING TIME	−0.087*** (0.022)	−0.074*** (0.023)	−0.076*** (0.023)
IMM	−0.010** (0.005)	−0.013** (0.006)	−0.013** (0.006)
CLASS SIZE	−0.010 (0.027)	−0.001 (0.029)	
UNEM	0.011 (0.007)	0.012 (0.008)	
FINAL EXAMS	−0.014 (0.009)		
INSPECTIONS	−0.013 (0.011)		
CONSTANT	1.735 (0.199)	1.560 (0.206)	1.640 (0.188)

Table reports coefficients and standard error (in parentheses).
***, **, *: statistically significant at 1%, 5% and 10% respectively.
All variables are expressed in logs.

is a little evidence of a correlation between increased spending and educational outcomes in the sample of countries. Therefore expenditure in education is not necessarily the way out of a low-competitiveness trap (for a similar opinion see for example Hanushek, 1996, 2008). In Table 2 we reported the efficiency scores obtained with a DEA output-oriented analysis, assuming variable return to scale (VRS). The efficiency scores were corrected by the bootstrap procedure suggested by Simar and Wilson (2007). South Korea, Slovak Republic and Turkey are located on the efficient frontier. By contrast Spain, Italy Chile and Israel appear to be the most inefficient with, 1.108, 1.120 and 1.135 inefficiency scores respectively.

In order to determine the causes of inefficiency scores, we present in Table 3 the estimation results from the double bootstrap procedure as described in Section 4. The dependent variable is Farrell's bias-corrected efficiency score of the i -th countries derived from DEA estimates. Table 3 reports coefficients and standard error of three different specification models.

Table 4
Regression results (sensitivity analysis).

Variables	Model 1 without AUSTRALIA	Model 2 without JAPAN	Model 3 without USA	Model 4 without ITALY	Model 5 without SPAIN
CRONYISM	0.042*** (0.016)	0.046*** (0.017)	0.058*** (0.017)	0.032** (0.015)	0.039** −0.015
EDUPA	−0.068*** (−0.015)	−0.069 (−0.016)	−0.072*** (−0.015)	−0.060*** (−0.014)	−0.060*** (−0.015)
RELEARN	0.008** (0.004)	0.008** (0.004)	0.003 (0.004)	0.001** (0.000)	0.001** (0.000)
TEACHING TIME	−0.081*** (−0.022)	−0.089*** (−0.023)	−0.084*** (−0.021)	−0.086*** (−0.020)	−0.081*** (−0.021)
IMM	0.012** (0.005)	0.013** (0.006)	0.010** (0.005)	0.010** (0.005)	0.012** (0.005)
CLASS SIZE	−0.017 (−0.026)	−0.027 (−0.028)	−0.036 (−0.026)	−0.015 (−0.023)	−0.016 (−0.025)
UNEM	0.009 (−0.007)	0.010 (−0.007)	0.005 (−0.007)	0.010 (−0.006)	0.005 (−0.007)
FINAL EXAMS	−0.016 (−0.007)	−0.01 (−0.008)	0.009 (−0.010)	−0.016 (−0.007)	−0.011 (−0.008)
INSPECTIONS	0.009 (0.011)	0.014 (0.012)	0.014 (0.012)	0.022 (0.011)	0.008 (0.010)
CONSTANT	1.739 (0.199)	1.795 (0.211)	1.801 (0.192)	1.755 (0.186)	1.717 −0.194

Table reports coefficients and standard error (in parentheses).
***, **, *: statistically significant at 1%, 5% and 10% respectively.
All variables are expressed in logs.

We started from a general model with all listed demand and supply side variables (Model A). Several variables proved to be highly not significant, therefore we proceeded with progressive deletion of two dummies in Model B, still including some non significant variables, notably relative earnings, unemployment rate and class size. Finally we test a parsimonious model (Model C). All these specifications generate remarkably consistent results on the relationship between socioeconomic variables and inefficiency scores.

Our main result is that in every specification there is a positive and significant relationship of our cronyism variable with the inefficiency score. This is entirely consistent with the predictions of our theoretical model and testable proposition. Cronyism decreases incentives to skill acquisition and hence decreases PISA performances, given expenditure. As expected and coherent with most of the existing empirical literature, parents' educational attainment has a negative and significant impact on inefficiency. These results appear in line with Afonso and St. Aubyn (2006) and Brunello and Checchi (2005). They suggest that there may be persistence in differentials across nations and that some nations could actually be caught in under-education traps unless active policies promoting education for young people with disadvantaged background are implemented. In addition, immigrant status impacts negatively on efficiency. As pointed out by the OECD Education at a Glance 2011 report, students with an immigrant background are socioeconomically disadvantaged, and this explains their worse average performance (OECD, 2011). Of course this is not a reason for adopting a restrictive immigration policy, but it helps interpreting the relative score of some countries.

We found in all specifications a negative impact of teaching time on inefficiency. To our knowledge this result is novel in the literature. In most countries, teachers are formally required to work a specified number of hours per week, including teaching and non-teaching time. This result suggests that increasing classroom time, other things equal, can improve the performance of education systems. Boosting teaching time without increasing costs is, of course, difficult, but it could be done in principle by modifying the apportionment of teachers' time among different tasks. The policy suggestion here seems to be that a heavy load of administrative and non-classroom duties on teachers may indirectly impact negatively on the efficiency of education systems and should be therefore limited as far as possible.

The effects of unemployment rate, class-size and the dummy variables are not statistically significant.

Table 5
Truncated regression results (with alternative cronyism measure).

Variables	Model A	Model B	Model C
CORRUPTION (GCI)	0.018** (0.010)	0.020** (0.010)	0.022** (0.009)
EDUPA	−0.061*** (−0.016)	−0.054*** (−0.018)	−0.055*** (−0.018)
RELEARN	0.014** (0.005)	0.014** (0.006)	0.013** (0.005)
TEACHING TIME	−0.090*** (−0.023)	−0.078** (−0.024)	−0.079** (−0.023)
IMM	0.016** (−0.007)	0.018** (0.007)	0.018** (0.007)
CLASS SIZE	−0.002 (−0.027)	0.010 (0.029)	
UNEMPLOYMENT	0.003 (0.008)	0.003 (0.009)	
FINAL EXAMS	−0.014 (−0.008)		
INSPECTIONS	0.010 (−0.011)		
CONSTANT	1.882 (0.198)	1.729 (0.202)	1.780 (0.176)

Table reports coefficients and standard error (in parentheses).
***, **, *, statistically significant at 1%, 5% and 10% respectively.
All variables are expressed in logs.

7. Robustness checks

7.1. Sensitivity

As a robustness check for our results, we run the truncated regression again but now removing one country at a time from the sample. Table 4 reports coefficients and standard error of five different specification models. The countries chosen are: USA, Australia, Japan, Italy and Spain. This choice was made based on the increasing degree of perceived cronyism in different countries (from lowest to highest). The results show that in all specifications, the results of the key variables are confirmed. In addition, to reinforce our results, the coefficient of cronyism is reduced when we removed countries (e.g. Italy and Spain) where the phenomenon of cronyism is more perceived.

7.2. Alternative cronyism indicator

To further test the effect of cronyism on school performance, we chose an alternative cronyism indicator: the Gallup Corruption Index (GCI), reported by Gallup World Poll in 2010. The Gallup World Poll is conducted in over 140 countries around the world based on a common questionnaire administered to household, translated into the predominant language of each country¹¹. The GCI is based on a binary question of whether corruption is widespread in business and government. Table 5 shows the results of the Gallup approach. The direct effect of corruption is positive and statistically significant. Hence, the main findings are robust to changes in the cronyism measure.

8. Concluding remarks

Education expenditure fails to explain the large differences in PISA scores among OECD countries. In the past the literature on the causes of these differences focused on productive efficiency, looking mainly at the education sector features, but with scant results. No one has, so far, linked performance in cognitive skill acquisition to appropriate

incentives on the ‘demand side’ (the students). However recently Zingales (2012), referring to Italy, one of the countries that performed worse on our inefficiency score, observed that:

“Cronyism represses freedom of speech, eliminates the incentive to study, and jeopardizes career opportunity. It has robbed my home country of much of its potential to grow.”

In this work we presented a theoretical model and an empirical test to demonstrate that the presence of cronyism in the society may impact heavily on the relationship between schooling input and cognitive skills in OECD countries. In the spirit of Rogers (2008), we developed a stylised model of cognitive skill acquisition with cronyism/corruption in the labour market. In particular the job positions may be allocated on the basis of connections, even if a formal schooling achievement is required. We found that the presence of cronyism decreases the incentive to acquire educational cognitive skills, because it decreases the real private return from education. Furthermore, in order to test the theoretical model, we used a two-stage semi-parametric analysis with bootstrap procedure (Simar and Wilson, 2007) to identify factors affecting inefficiency in secondary education provision when the output is proxied by the scores in the Programme for International Student Assessment (PISA_2009) in 34 OECD countries. Empirical results suggest that cronyism, proxied by an index of perception of the relative importance of connection for success drawn from the World Value Survey, explains a substantial fraction of inefficiency. Other factors that appear to have an important role are the parents’ educational attainment (as in many previous work, see for example Schutz et al., 2008), the immigration background and time spent in classroom by teachers. Taking the evidence as a whole, our result suggests that efficiency in the education sector (that is skill acquisition) may depend more on external, structural society’s factors rather than sectorial efficiency problems. With the important exception of teaching time, no supply side variable proved to be significant in any specification. Given the difficulty of impacting with economic policies on the other factors found to be relevant, notably the average educational attainment of the parents’ population, the cronyism factor becomes central to policies to improve the education system performance in some OECD countries. Even far reaching education reform may be disappointing if the causes of reduced incentives to acquire educational skills are not removed. The most effective reforms for improving the performance of education systems may well be those improving transparency and accountability, reducing discretionality and punishing arbitrary behaviour in recruitment, especially in the public sector.

Finally note that this result presents striking analogies with the results of existing analyses of developing countries where governance issues and corruption specifically seem to be more important than the amount of funds spent in education (see for example Bjorkman, 2006; Gupta et al., 2002; Reinikka and Svensson, 2005; Suryadarma, 2012). However the explanation provided in those contexts, bribes and illegal appropriation of education funds, hardly applies to OECD countries. Incentives are the most likely explanation. Considering the tantamount importance of education for human capital formation, we add an additional important channel through which the performance of economic systems can be explained by the prevailing value systems (the degree to which the use of influence for gaining positions is tolerated) and the degree of transparency in the labour market.

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¹¹ We also controlled for other corruption indices such as Global corruption Barometer and World Value Survey. In both cases the coefficient is confirmed as statistically significant.

References

- Acemoglu, D., 1995. Reward structures and the allocation of talent. *Eur. Econ. Rev.* 39, 17–33.
- Afonso, A., St. Aubyn, M., 2006. Cross-country efficiency of secondary education provision: a semi-parametric analysis with non-discretionary inputs. *Econ. Model.* 23, 476–491.
- Aidt, T., 2003. Economic analysis of corruption: a survey. *Econ. J.* 113, F632–F652.
- Aidt, T., Hillman, A.L., 2008. Enduring rents. *Eur. J. Polit. Econ.* 24, 545–553.
- Alexander, W.R.J., Haug, A.A., Jaforullah, M., 2010. A two-stage double-bootstrap data envelopment analysis of efficiency differences of New Zealand secondary schools. *J. Prod. Anal.* 34, 99–110.
- Arrow, K., Samuel, B., Durlauf, S., 2000. *Meritocracy and Economic Inequality?* Princeton University Press, Princeton, NJ.
- Badin, L., Daraio, C., Simar, L., 2012. How to measure the impact of environmental factors in a nonparametric production model. *Eur. J. Oper. Res.* 223, 818–833.
- Benhabib, J., Spiegel, M., 1994. The role of human capital in economic development: evidence from aggregate cross-country data. *J. Monet. Econ.* 34, 143–173.
- Bjorkman, M., 2006. Does money matter for student performance? Evidence from a Grant Program in Uganda. IGER Working Paper n. 326.
- Bowles, S., Gintis, H., 2002. The inheritance of inequality. *J. Econ. Perspect.* 16, 3–30.
- Bowles, S., Gintis, H., Osborne Groves, M., 2008. Introduction to unequal chances: family background and economic success. *Introductory Chapters, in: Unequal Chances: Family Background and Economic Success* Princeton University Press.
- Brunello, G., Checchi, D., 2005. School quality and family background in Italy. *Econ. Educ. Rev.* 24, 563–577.
- Calvo-Armengol, T., Jakson, M.O., 2007. Networks in labor markets: wage and employment dynamics and inequality. *J. Econ. Theory* 132, 27–46.
- Checchi, D., Fiorio, C., Leonardi, M., 2008. Intergenerational persistence in educational attainment in Italy. Discussion paper no. 3622. Institute for the Study of Labor (IZA), Bonn.
- Farrell, M.J., 1957. The measurement of productive efficiency. *J. R. Stat. Soc. Ser. A* 120, 253–281.
- Gupta, S., Davoodi, H., Tiongson, E., 2000. Corruption and the provision of health care and education. IMF Working Paper 00/116, Washington, DC.
- Gupta, S., Verhoeven, M., Tiongson, E.R., 2002. The effectiveness of government spending on education and health care in developing and transition economies. *Eur. J. Polit. Econ.* 18, 717–737.
- Hanushek, E.A., 1996. Measuring investment in education. *J. Econ. Perspect.* 10, 9–30.
- Hanushek, E.A., 2008. Incentives for efficiency and equity in the school system. *Perspekt. Wirtsch.* 9, 5–27.
- Hanushek, E.A., Kimko, D.D., 2000. Schooling, labor-force quality, and the growth of nations. *Am. Econ. Rev.* 90, 1184–1208.
- Hanushek, E.A., Woessman, L., 2010a. The economics of international differences in educational achievement. In: Hanushek, A.E., Machin, S., Woessman, L. (Eds.), *Handbook of the Economics of Education*, vol. 3. Elsevier.
- Hanushek, E.A., Woessman, L., 2010b. How much do educational outcomes matter in OECD countries. CES IFO Working Papers No 3238.
- Holmlund, H., Lindahl, M., Plug, E., 2011. The causal effect of parents' schooling on children's schooling: a comparison of estimation methods. *J. Econ. Lit.* 49, 615–651.
- Ioannides, Y., Datcher Loury, L., 2004. Job information networks, neighborhood effects, and inequality. *J. Econ. Lit.* 42, 1056–1093.
- Jackson, M.O., Zenou, Y., 2014. *Economic Analyses of Social Networks*. Edward Elgar Publishing (forthcoming).
- Johnes, J., 2006. Data envelopment analysis and its application to the measurement of efficiency in higher education. *Econ. Educ. Rev.* 25, 273–288.
- Kempkes, G., Pohl, C., 2010. The efficiency of German universities: some evidence from nonparametric and parametric methods. *Appl. Econ.* 42, 2063–2079.
- Lange, Fabian, Topel, Robert, 2006. The social value of education and human capital. *Handbook of the Economics of Education*. Elsevier.
- Lee, J.W., Barro, R.J., 2001. Schooling quality in a cross-section of countries. *Economica* 68, 465–488.
- Lucas, R.E., 1988. On the mechanics of economic development. *J. Monet. Econ.* 22, 3–42.
- OECD, 2011. *Education at a Glance: OECD Indicators 2011*. OECD, Paris.
- Ponzo, M., Scoppa, V., 2011. A simple model of favouritism in recruitment. *Res. Econ.* 65, 78–88.
- Pritchett, L., 1996. Population growth, factor accumulation, and productivity policy research. Working Paper Series 1567. The World Bank.
- Reinikka, R., Svensson, J., 2005. Fighting corruption to improve schooling: evidence from a newspaper campaign in Uganda. *J. Eur. Econ. Assoc.* 3, 259–267.
- Rogers, M.L., 2008. Directly unproductive schooling: how country characteristics affect the impact of schooling on growth. *Eur. Econ. Rev.* 52, 356–385.
- Romer, P., 1990. Endogenous technological change. *J. Polit. Econ.* 98, 97–103.
- Schutz, G., Ursprung, H.W., Woessmann, L., 2008. Education policy and equality of opportunity. *Kyklos* 61, 279–308.
- Shleifer, A., Vishney, R., 1993. Corruption. *Q. J. Econ.* 108, 599–617.
- Simar, L., Wilson, P.W., 2007. Estimation and inference in two-stage, semiparametric models of production processes. *J. Econ.* 136, 31–64.
- Spence, M., 1973. Job market signaling. *Q. J. Econ.* 87, 355–374.
- Suryadarma, D., 2012. How corruption diminishes the effectiveness of public spending on education in Indonesia. *Bull. Indones. Econ. Stud.* 48, 85–100.
- Verhoeven, M., Gunnarsson, V., Carcillo, S., 2007. Education and Health in G7 Countries: Achieving Better Outcomes with Less Spending IMF Working Paper 07/263. International Monetary Fund, Washington.
- Wolszczak-Derlacz, J., Parteka, A., 2011. Efficiency of European public higher education institutions: a two-stage multicountry approach. *Scientometrics* 89, 887–917.
- World value survey, 2009. Official aggregate 1981–2008. World Values Survey Association (www.worldvaluessurvey.org).
- Zingales, L., 2012. *A capitalism for the people*. Basic Books (Eds). New York.