# Public Versus Private Education: Is There a Role for Institutions?*

Pantelis Kammas
University of Ioannina
Ioannina, Greece

Anastasia Litina
University of Luxembourg
Luxembourg

Theodore Palivos†

University of Macedonia
Salonica, Greece

**Abstract**

Extending the research of De La Croix and Doepke (2009) we ask whether the quality of insitutions affects the level of funding of public education in the presence of private schools for the rich. We find that while in societies with strong isntitutions increases in inequality decrease participation in public schooling but improve its quality, in societies with weak isntitutions participation in public schooling increases whereas its quality deteriorates.

*JEL Classification:* D63; H26; I20
*Keywords:* Tax Evasion, Public Education, Private Education, Income Inequality

*Anastasia Litina and Theodore Palivos gratefully acknowledge financial support from J. S. Latsis Public Benefit Foundation. We are grateful for comments from Alexandros Apostolides, Stelios Michalopoulos, Omer Moav and Fabrizio Zilibotti. Comments from participants in 2nd Minerva Summer School 2011 and European Public Choice Society Conference 2011 are also much appreciated.

†Corresponding author: Department of Economics, University of Macedonia, 156 Egnatia Street, GR-540 06 Salonica, Greece. Tel: +30-2310-891-775, Fax: +30-2310891-705. E-mail addresses: kammas@cc.uoi.gr (P. Kammas), alitina@cc.uoi.gr (A. Litina), tpalivos@uom.gr (T. Palivos).

# 1. Introduction

The debate on whether education must be only public or both public and private is a long-lasting one. Taking into account that one option usually excludes the other, i.e. parents can choose either the private or the public scheme, this decision is becoming even more important. Evidence around the world indicates that public schooling is one of the most prevailing social policies and that especially at early stages (elementary, secondary schooling) the fraction of students participating in public schools is very high, i.e. in the US it is above 85% and in Canada it is above 95% (Statistics Canada, Digest of Education Statistics: United States). Additionally according to World Bank data most countries spend approximately 9%-15% of total government expenditure on education (Greece- 9.2%, France-10.6, Germany-9.7%, US-14.1%). Still though private schooling spending seem to comprise a significant part of GDP, ranging from 0.1-3% in OECD countries (Busermeyer, 2007).

The funding scheme differs in each country. In some countries public and private education coexists but public education is self-financed, as is the case in the US, in some other countries private universities are partially financed by government (i.e. in Belgium), whereas in other countries public education is prevalent (which is more or less the case of Greece for the time being where private universities are not state-recognised). Our main focus is on the case where both private and public education coexist. Crucially we want to examine the interaction between these two modes of education and find out how they interact with each other in terms of quality. To use the exact words of De La Croix & Doepke (2009, henceforth DLC&D), the question we investigate is "how is the funding level of public education affected by the presence of private schools for the rich?". However in doing so we take into account an additional factor, namely the extend of corruption and the level of institutions in each country.

The problem of corruption is prevalent in many countries and affects them in multiple, mostly harmful, ways. A low level of institutions, often associated with extensive corruption can have detrimental effects in public expenditure, as claimed by Mauro (1995, 1998) and confirmed by Gupta, Davoodi and Rosa (1998), by affecting the allocation of the government budget at the expense of social spending (such as education and health). It can also reduce the tax revenue and alter the tax structure (Barreto and Alm; 2003) and it can negatively affect the size of the shadow economy (De Soto; 1989). Therefore it

is reasonable to assume that since public schooling is being funded from the government budget, the more corrupt a country is the more harm will be done to public education. This bad quality of public education will also affect the choice between private and public schooling on the part of rich parents. Eventually this trade-off between the two regimes will affect through voting the desired tax and consequently the desired quality of public education.

Evidently all these aspects must be accounted for in a collective manner. Therefore to rephrase the question of DLC&D, and thus to define the exact question of our paper "how is the funding level of public education affected by the presence of private schools for the rich, in societies with weak and strong institutions?". In the presence of weak institutions, that allow for greater corruption, how is the quality of public schooling evolving? How do parents optimally choose between private and public education when the option to evade is a feasible one?

The literature has explored many aspects of the decision between public and private schooling, without examining though institutional parameters. As Stiglitz (1974) claimed, public provision of education was originally desirable for its redistributive effects, however at some point its role as an equalizer of incomes had been doubted. Glomm and Ravikumar in a series of papers (1992; 1998; 2001; 2003) have first verified that coexistence of public and private education is an equilibrium outcome. They have also found that while in the short run public education may not act as an income equalizer, however in the long run, public education is desirable since it is works towards closing the income gap between the rich and the poor. Still though, unless the original inequality is sufficiently high, private education is associated with higher per capita incomes. Finally they have verified theoretically the empirical finding for Canada and the US, stating that the share of public expenditures as a fraction of GNP are increasing over time as well as that quality of education is increasing over time.

Another crucial question treated by the relevant literature is how inequality affects the choice of public education and public goods in general. As there is a vast number of papers and results on this topic we will focus mostly on education spending. Glomm and Ravikumar (1992) find that in societies where the majority of agents have incomes below average will choose public schooling. Besley and Coate (1991), find that public provision in the presence of inequality, favors those with low income but involves greater deadweight loss. Epple and Romano (1996) have formulated the "ends against the middles" hypothesis

that reduces public school spending. Most of these results have been empirically tested (Poterba; 1997, Harris, Evans and Schwab; 2001) and the common outcome is that the support for public education is closely related, among others, to the income distribution of the voters.

All these issues and questions are treated in DLC&D (2004; 2009) who endogenize fertility choices and try to find out how the presence of private schools affects public schooling. They also examine the effect of inequality and they find that higher inequality reduces participation in public schooling but improves its quality since per capita spending is increasing. Motivated by Besley and Coate (1991) who state that their results should be related to the cost of the government on observing citizens' incomes, we introduce in the DLC&D setting the option of tax evasion and the role of institutions.

Interestingly we find out that the DLC&D results hold only in the presence of strong institutions, i.e. in more developed countries. When assuming that institutions are not very strong and therefore corruption and tax evasion is widespread, which is the case for most developing countries, we find that their results are reversed. Analytically increased inequality increases participation in public schooling. This results combined with the fact that a significant part of the tax revenue is lost due to evasion implies a deterioration in the quality of public schooling. The intuition behind our results is that when the option of tax evasion is introduced in the model there is one additional channel that affects the tax revenue associated with public education. Under the presence of strong institutions this effect is minimized and hence the DLC&D results hold, despite the revenue lost due to tax evasion. In the presence of weak institutions though the effect introduced by tax evasion is stronger. This loss of revenue makes redistribution more desirable and therefore citizens vote for higher taxes and therefore for more public education. However due to increased participation and a large extend of lost revenue, public schooling quality deteriorates.

In Section 4 we examine the empirical validity of the predictions of our theoretical model. We use data for a total of 21 OECD countries over the period 1970-2005 and we examine whether there exist a relationship between the quality of public education and income inequality. Then, we place the spotlight on an important issue not previously examined by the relevant literature and we examine whether this relationship is affected by the size of shadow economy and the corresponding degree of tax evasion within each country. Our findings provide strong empirical evidence in favour of our theoretical predictions. More precisely, we find that increased income inequality reduces the quality of

public education and that this result appears to be stronger in countries with relative large shadow economies and consequently more severe tax evasion problem.

In the next section we introduce our model with the addition of tax evasion and corruption. We analyze the political equilibrium and we show how the standard results are reversed. Section 3 analyzes the occuring educational regimes. In Section 4 we empirically examine our theoretical prediction for a sample of 21 countries. The last section summarizes the paper.

## 2. The Model

### 2.1. The Household Behavior

We assume a continuum of agents of measure 1. Each agent is endowed with a different amount of human capital $y$, which corresponds to the wage obtained in the labour market. Agents maximize their utility over consumption, $c$, the number of children $n$ and the education of their offsprings, $h$. The utility function of the agents is given by:

$$\ln(c) + \gamma[\ln n + \eta \ln h] \tag{2.1}$$

Each agent decides over the number of his offsprings as well as on the offspring's quality of education. The relative weight of educational quality is given by the parameter $\eta \in (0, 1)$ whereas $\gamma \in \mathbb{R}_+$ denotes the overall weight attached to children.

The educational procedure follows closely the DLC&D model, i.e. children, in order to obtain human capital, are being educated by teachers, whose wage is normalized to unity (as is the case with the wage of all agents in the economy). Parents can choose between two systems of education, namely a public schooling system and a private schooling system. In the public schooling system, the educational quality obtained, $s$, is uniform for all students. Public education is being financed through an income tax $v$, imposed on all adult agents in the economy, no matter which mode of education they choose for their children. No other cost is associated with this option. The quality $s$ and the tax rate $v$ are determined through voting, a procedure that will be described below.

The second option available to parents is to opt out of the public system and choose private education. Specifically they can choose an education quality equal to $e$, for which

they pay out of their own income and at the expense of their consumption. Private education $e$ is measured in units of time of the average teacher whose wage is normalized to unity, therefore the total cost for private education also equals $e$. Still though these expenses are assumed to be fully deductible. Even though the extend of tax deductibility differs in each country, full deductibility is not an implausible assumption.

Our main difference in terms of modelling with respect to the DLC&D model is the introduction of tax evasion as an option for agents. All agents that pay taxes have the option to evade a fraction $(1-\mu)$ of their taxable income or to put it differently they only declare a fraction $\mu$ of their taxable income. The budget constraint for an agent with wage $x$ is given by:

$$c = (1 - v\mu)(x(1 - \phi n) - ne) - PF \tag{2.2}$$

where $P$ denotes the probability of detection and is given by $y(1-\mu)$. Parameter $y \in [0, \infty)$ can be interpreted as an institutional parameter denoting the effectiveness of the auditing mechanism. Notice that detection is endogenous on the rate of declared income, i.e. the less one evades the less likely is to get caught and vice versa. $F$ is the fine imposed on evaded tax given by $\pi v(1-\mu)(x(1-\phi n)-ne)$ where $\pi$ denotes the expected fine imposed on evaded tax, $v(1 - \mu)(x(1 - \phi n) - ne)$, in case of being caught, and we assume that $\pi > 1$. Fines imposed on evaded tax are more common in several countries, i.e. the US and Israel, and they give more clear results with respect to the effect of taxes on tax evasion (Yitzhaki, 1974). In our model this choice significantly simplifies the analysis without altering our main results. As in DLC&D $\phi \in (0, 1)$ denotes the fraction of time required by an adult to raise a child.

We assume that each agent can choose only public, $s$, or private, $e$, education, therefore parents choosing public education choose $e = 0$. Effective education is expressed as the maximum of the two i.e. $h = \max\{e, s\}$.

Substituting the budget constraint (2.2) into agent's utility function (2.1), as well as the equations for $P$ and $F$ and denoting $p = y\pi$ the expected penalty rate we obtain:

$$u(y, \tau, e, s) = \ln((1 - v\mu - pv(1 - \mu)^2)(x(1 - \phi n) - ne)) + v \ln \max\{e, s\}$$

We employ standard assumptions about production, i.e. a production function linear in effective units, with labour being the only input. The wage is therefore fixed and

normalized to unity.

The sequence of events goes as follows. Initially agents make choices over the rate of declared income ($\mu$) and education ($e$) and then vote for $v$, which implicitly determines the level of public education. At the time of decision making all agents have perfect foresight over the outcome of the voting process.

Parents choosing public education maximize their utility with respect to the number of children and rate of declared income $\mu$ and they all choose the same rate of declared income:

$$\mu^s = 1 - \frac{1}{2p} \tag{2.3}$$

$$n^s = \frac{\gamma}{\phi(1+\gamma)} \tag{2.4}$$

As in DLC&D fertilityy is constant since the two effects concerning the number of children and the opportunity cost of raising them (income and substitution) exactly offset each other. Note that the rate of tax evasion is constant and does not depend on the tax rate. Therefore all agents evade at the same rate which implies that in absolute amounts the rich evade more than the poor. The constant evasion rate is driven by the assumption that fines are imposed on evaded tax and therefore the tax rate and the evasion rate are multiplicatively interrelated[1]. Even though the tax rate does not affect the evasion rate it is evident that if we set $\tau = 0$ in the initial setup of the problem no evasion would occur. What seems to affect the rate of declared income is the expected fine $p$, which depends on the quality of institutions, $y$, and the expected fine in case of being caught, $\pi$. The higher the expected fine, the less agents evade and vice versa. Since $0 < \mu^s < 1 \Rightarrow 2p > 1$. Concavity with respect to $\mu^s$ always holds for given policy variables $v$ and $s$.

Parents choosing the private education regime chose:

$$\mu^e = 1 - \frac{1}{2p} \tag{2.5}$$

$$e[x] = \frac{\eta\phi x}{1-\eta} \tag{2.6}$$

[1]We could easily relate the tax rate to the evasion rate assuming that fines are imposed on evaded income, still though this would further complicate our analysis without qualitatively altering our main results.

whereas the equation for fertility after replacing eq. (2.6) is:

$$n^e = \frac{\gamma(1-\eta)}{\phi(1+\gamma)} \tag{2.7}$$

As expected the optimal rate of declared income remains the same. Private spending on education on the contrary positively depends on the wage $x$. The higher is the income of parents the more they can educate their children (Moav, 2005). Moreover we notice that spending on private education is not affected by the rate of evasion. Noticeably agents optimally choose the rate of tax evasion over their available income and the same goes for their educational choice without one decision interfering with the other. This simplifying setup is sufficient to partially alter the results of DLC&D. A more complex setup that would interrelate these two variables in the private education regime would further strengthen our arguments.

The assumption of endogenous fertility ensures constancy of the tax base.Therefore parents choosing private education only pay their taxes on declared income ($v\mu x$) while parents choosing private education pay both for private education and taxes on declared available income ($x(1-\phi n)-ne$).

**Lemma 2.1.** *(Opting-out decision): There exists an income threshold:*

$$\tilde{x} = \frac{1-\eta}{\phi\delta\eta}E(s) \tag{2.8}$$

*such that households strictly prefer public education if and only if* $x > \tilde{x}$.

Continuity of incomes implies that all people with income above $\tilde{x}$ will choose private education whereas all people with income below $\tilde{x}$ will choose public education. $E(s)$ denotes expected quality of public schooling.

To simplify our analysis we will use a uniform distribution of human capital which implies that over the interval $[1-\sigma, 1+\sigma]$ the density function is $g(y) = 0$ for $x < 1-\sigma$, $x > 1+\sigma$ and $g(x) = \frac{1}{2\sigma}$ for $1-\sigma \leq x \leq 1+\sigma$. If $\Psi$ is the fraction of children participating in public education then we have the following C.D.F:

$$\Psi = \begin{array}{cc} 0 & if \quad \tilde{x} < (1-\sigma) \\ \frac{\tilde{x}-(1-\sigma)}{\sigma} & (1-\sigma) \leq \tilde{x} \leq (1+\sigma) \\ 1 & if \quad \tilde{x} > (1+\sigma) \end{array} \tag{2.9}$$

### 2.2. Voting

The government provides a unique public good, public education, which is funded by the collected tax revenue. The budget rule must be balanced i.e. the total spending on public education must equal the tax revenue collected by agents choosing public education and the tax revenue collected by agents choosing private education. To put it analytically:

$$\int_0^{\tilde{y}} n^s s g[x]dx = \int_0^{\tilde{y}} v\mu(x(1-\phi n^s))g[x]dx + \int_{\tilde{y}}^{\infty} v\mu(x(1-\phi n^e) - ne^e)g[x]dx \tag{2.10}$$

When replacing eqs. (2.5), (2.6) and (2.7), i.e. the optimal values of the rate of declared income, amount of private education and fertility rates, our constraint reduces to the following one dimensional tax policy choice:

$$v = \frac{\Psi}{\phi\mu}s \tag{2.11}$$

The level of public spending and taxes is chosen through probabilistic voting. We assume that there are two political parties A and B that compete in order to come in office and that the political equilibrium is determined through a probabilistic voting mechanism. Each party proposes a policy platform sA (or alternatively $vA$) and sB (or alternatively $vB$). Each voter i compares the utility gain if party A wins the elections instead of party B and if and only if the difference is positive votes for party A. Instead of assuming that voters vote with probability 1 party A if this difference is positive (that is the standard Downsian electoral competition model (Downs (1957)), probabilistic voting theory assumes that this vote is uncertain and that the probability that a person votes for party A is given by:

$$F(u_i(x, v, \mu, e, s_A) - u_i(x, v, \mu, e, s_B))$$

where F is an increasing and differentiable cumulative distribution function.

Party A maximises its expected vote share, which is given by $\int_0^{\infty} g[x]F(.)dx$. Party B acts symmetrically and in equilibrium we have $s = s^A = s^B$. Assuming that voters are characterised by identical responsiveness of the change in utility (that is there is no "ideological bias") and that all groups in the population have the same political power,

the maximisation problem of each party implements the maximum of the following social welfare function:

$$\Omega(s) = \int_0^{\tilde{y}} u[x, v, \mu^s, 0, s]g[x]dx + \int_{\tilde{y}}^{\infty} u[x, v, \mu^p, e[x], 0]g[x]dy \tag{2.12}$$

subject to the government budget constraint (2.11).

Maximizing the objective function (2.12) and solving for $s$ we obtain:

$$s = \frac{\eta\phi\mu}{1 + p(1-\mu)^2 + \eta\gamma\Psi(\mu + p(1-\mu)^2)} \tag{2.13}$$

Using eq. (2.11) and solving for the equilibrium values of $s$ and $\tau$ we obtain:

$$v = \frac{\Psi}{\phi\mu} \frac{\eta\phi\mu}{1 + p(1-\mu)^2 + \eta\gamma\Psi(\mu + p(1-\mu)^2)} \tag{2.14}$$

and

$$s = \eta\phi \frac{2(2p-1)}{4p + 1 + \eta\gamma\Psi(4p-1)} \tag{2.15}$$

The quality of public education depends negatively on the rate of tax evasion, $\mu$, and positively on the expected fine, $p$, i.e. on the level of intitutional quality.

On the contrary $\Psi$ reduces $s$, due to the fact that increased participation reduces spending per child. This result holds even without holding the taxable income constant. This result is attributed to the fact that the total tax revenue increases more slowly than the number of children entering public education, as was the ratioanl behind the DLC&D result which is now enhanced by the fact that now a larger part of their income is evaded (recall that the fraction of income evaded is constant and thus in absolute amounts the higher is the taxable income the more they evade).

On the other hand increases in participation increase taxation. The same rational as in DLC&D applies here, i.e. the marginal benefit from increases in participation in public schooling must be equated with the marginal cost of reduced consumption due to increased taxation.

### 2.3. Equilibrium

In equilibrium all decisions must be optimally made. Specifically all agents must decide both whether they will choose private or public schooling and the optimal tax rate for

every level of schooling. Since the schooling choice positively and monotonously depends on income $\tilde{y}$ we can define the equilibrium in terms of this threshold income.

**Proposition 2.2.** *An equilibrium exists and is unique. The equilibrium consists of an income threshold $\tilde{x}$ as defined in eq. (2.8), an evasion rate $(1-\mu)$ with $\mu = 1 - \frac{1}{2p}$ for $x \lessgtr \tilde{x}\tilde{y}$, a private education decision $e = 0$ for $x < \tilde{x}$ and $e = e[\tilde{x}]$ for $x > \tilde{x}$ and aggregate variable $(\Psi, v, s)$ given by equations (2.9), (2.14) and (2.15) such that the perfect foresight condition holds $E[s] = s$.*

*Proof*: To prove this result we use the Brouwer fixed point theorem. Using (2.15) both the actual public schooling quality $s$ and the expected schooling quality $E[s]$ lie in the interval $E(s), s \in \left[\eta\phi\frac{2(2p-1)}{4p+1+\eta\gamma(4p-1)}, \eta\phi\frac{2(2p-1)}{4p+1}\right]$.

Initially we define a mapping $\Delta$ from $E(s)$ into $s$. In equilibrium we must have $E(s) = s$ therefore for uniqueness the mapping must have a unique fixed point. Using Lemma 1 and eq. (2.9) the fraction of families participating in public education is given by:

$$\Psi[E[s]] = \max\left\{\min\left\{\frac{1-\eta}{\phi\delta\eta}\frac{1}{2\sigma}E[s] - \frac{1-\sigma}{2\sigma}, 1\right\}, 0\right\} \tag{2.16}$$

Evidently whenever an interior exists it is increasing in $E[s]$ which denotes that the higher the quality of the public education the more agents it attracts.

Then we define a mapping from $E[s]$ into $s$ assuming that a fraction $\Psi(E[s])$ participates in the public education regime. This quality $s = \Delta(E[s])$ is given by:

$$\Delta[E(s)] = \eta\phi\frac{2(2p-1)}{4p+1+\eta\gamma\Psi[E[s]](4p-1)}$$

$$\Delta[E(s)] = \eta\phi\frac{2(2p-1)}{4p+1+\eta\gamma\max\left\{\min\left\{\frac{1-\eta}{\phi\delta\eta}\frac{1}{2\sigma}E[s] - \frac{1-\sigma}{2\sigma}, 1\right\}, 0\right\}(4p-1)} \tag{2.17}$$

The fixed point $\Delta[E(s)]$ where $s = \Delta(s)$ i.e. where the expected schooling quality is identified with the one imposed by the political process, is an equilibrium. It is evident from (2.17) that $\Delta$ is a continuous decreasing function and thus crosses only once the $45-$degree line, i.e. there is uniqueness of equilibrium. ■

Intuitively since participation in public schooling is continuously increasing in schooling quality as can be seen from (2.8) and (2.9) actual schooling quality is decreasing in

participation as can be seen from eq. (2.15) we can make a mapping from expected to actual schooling quality with a unique fixed point. Even though the tax base is no longer constant, since we have not incorporated any fertility decisions, the actual schooling level is still decreasing in participation and therefore uniqueness still holds. The intuition behind this result is attributed both to the fact that since we have constant evasion rate when parents choose public education, they may have a larger fraction of taxable income still though they evade a larger ratio of that income. Therefore the evaded taxes decrease the tax base and thus the schooling quality.

## 3. Education Regimes

According to the assumptions of our model three regimes may occur: i) A fully private education regime ($\Psi = 0$), ii) A fully public education regime ($\Psi = 1$) and iii) Segregation ($\Psi \in (0,1)$). While in the two corner cases either all children go to private or public school, in the Segregation case the children of the most skilled parents (i.e. of those who earn the higher income) choose private schooling while the rest choose public schooling.

For each education regime to be an equilibrium certain assumptions must be made as described in the following proposition.

**Proposition 3.1.** *All three regimes can be an equilibrium.*

*i) For fully private education to be an equilibrium the condition* $\frac{1-\eta}{\delta}\frac{2(2p-1)}{4p+1} < 1-\sigma$ *or* $p < \frac{\delta+2(1-\eta)}{4(1-\eta-\delta)} \equiv \acute{p}$ *must hold.*

*ii) For fully public to be an equilibrium the conditions*$\frac{1-\eta}{\delta}\ \frac{2(2p-1)}{4p+1+\eta\gamma(4p-1)} > 1+\sigma$ *or* $p > \frac{\delta(1-\gamma\eta)+2(1-\eta)}{4(1-\eta-\delta-\eta\gamma\delta)} \equiv \acute{p}$ *must hold.*

*iii) If* $p < \tilde{p} = \frac{1}{4}\frac{\delta(1-\gamma\eta)+2(1-\eta)}{4(1-\eta)-\delta(2+\eta\gamma)}$ *then the full public regime can never occur and in this case we have segregation with* $\Psi < \frac{1}{2}$. *If* $p > \tilde{p} = \frac{1}{4}\frac{\delta(1-\gamma\eta)+2(1-\eta)}{4(1-\eta)-\delta(2+\eta\gamma)}$ *and* $\sigma$ *is sufficiently large, then segregation occurs with* $\Psi > \frac{1}{2}$.

*Proof*: *i)* For fully private equilibrium to be feasible $\tilde{x} < 1-\sigma$ must hold. Using eq. (2.15) for the optimal $s$ and setting $\Psi = 0$ we obtain $\tilde{x} = \frac{1-\eta}{\delta}\frac{2(2p-1)}{4p+1}$. Therefore the inequality $\frac{1-\eta}{\delta}\frac{2(2p-1)}{4p+1} < 1-\sigma$ must be satisfied. In the DLC&D paper the fully private outcome was precluded because the term $\frac{1-\eta}{\delta}$ (which denoted the threshold income for $\Psi = 1$) was greater than unity. However in the presence of tax evasion, hte threshold income for $\Psi = 1$ is denoted by $\frac{1-\eta}{\delta}\frac{2(2p-1)}{4p+1}$ whereas $\frac{2(2p-1)}{4p+1} < 1\ \forall p$ and thus the fully private regme cannot be precluded.INTUITION?????

ii.) For fully public equilibrium to be feasible $\tilde{x} > 1 + \sigma$ must hold. Using eq. (2.15) for the optimal $s$ and setting $\Psi = 1$ we obtain $\tilde{x} = \frac{1-\eta}{\delta} \frac{2(2p-1)}{4p+1+\eta\gamma(4p-1)}$. Therefore the inequality $\frac{1-\eta}{\delta} \frac{2(2p-1)}{4p+1+\eta\gamma(4p-1)} \geq 1 + \sigma$ must be satisfied. If $p > \tilde{p} = \frac{1}{4} \frac{\delta(1-\gamma\eta)+2(1-\eta)}{4(1-\eta)-\delta(2+\eta\gamma)}$ there can be found a value of $\sigma$ sufficient to ensure that the previous inequality holds.

iii) If $\frac{1-\eta}{\delta} \frac{2(2p-1)}{4p+1+\eta\gamma(4p-1)} < 1$ then the fully public equilibrium cannot be attained. This outcome solely depends on $p$ and not on inequality $\sigma$. In this case segregation occurs. What we want to find is the extend of segregation, namely the value of $\Psi$. To find the value of $\tilde{p}$ we have set $\Psi = 1$, i.e. $\tilde{x} = 1$ and have solved for $p$. In this case the equilibrium is segregated. It is easy to find that $\frac{1}{2} < \acute{p} < \tilde{p} < \acute{\tilde{p}}$.

Since $\Psi$ is a continuous function of $\tilde{x}$ and therefore of $\tilde{p}$ and since for values of $p > \tilde{p} \Rightarrow \Psi = 1$ (i.e. the fully public equilibrium) it is easy to infer that for $p > \tilde{p} \Rightarrow \Psi > \frac{1}{2}$ while for $p < \tilde{p} \Rightarrow \Psi < \frac{1}{2}$. In both these cases (and an additional condition on $\sigma$ for the case where $\gamma > \tilde{\gamma}$) a mixture of public and private education is the equilibrium outcome. ■

Intuitively our results differ from the DLC&D paper mainly due to the existence of tax evasion and the role of institutions. The first main difference lies in the provision of private education as the sole outcome. While in DLC&D a sufficiently qualitative education could be provided for low tax levels, this is not our case because the tax revenue is even further reduced due to tax evasion and this significantly reduces the quality of publicly provided education. Furthermore since agents have the option to evade, they increase their available income and can thus afford to buy a higher level of education if they choose the private education regime. Therefore a fully private regime is a viable equilibrium, for a sufficiently low $p$. As the level of evasion decreases due to better institutions the option of public education seems more attractive and the emergence of a segregated equilibrium seems more likely.

For the fully public regime to be an equilibrium we must focus our attention on the high end of the income distribution, i.e. on the richest person. If $\sigma$ is sufficiently low, i.e. if not much inequality prevails in society then the incomes of agents are rather compressed and thus they are more likely to all choose public education since the preferred level of education is rather similar. However as inequality increases, i.e. for high $\sigma$, there is a great variance in the level of education people want to buy and there is always some rich agent that can afford to choose a higher quality education in the private education regime. In this case segregation is a likely outcome and whether the majority of agents will choose

the private or the public regime will depend on the level of institutions related to tax evasion.

Evidently for a high level of institutions, $p > \tilde{p}$, more than half of the population goes to public education. This is a reasonable outcome since taxation increases, the quality of schooling is high and is not severely affected by tax evasion. On the contrary whenever $p < \tilde{p}$, i.e. whenever institutions are weak, tax evasion reduces taxation and schooling quality and therefore the majority of agents is seeking for a better quality of schooling in the private regime and thus $\Psi < \frac{1}{2}$.

We can now proceed to the main result of the paper concerning the effect of inequality on the choice between private and public schooling.

**Proposition 3.2.** *i) Under the assumption of strong institutions, $p > \tilde{p}$ we obtain the DLC&D result, i.e. an increase in inequality decreases participation in public schooling, increases quality of public schooling and lowers taxes:*

$$\frac{\partial \Psi}{\partial \sigma} \leq 0, \ \frac{\partial s}{\partial \sigma} \geq 0, \ \frac{\partial v}{\partial \sigma} \leq 0$$

*ii) Under the assumption of weak institutions, $p < \tilde{p}$ , the DLC&D results is reversed, i.e. an increase in inequality increases participation in public schooling, decreases the quality of public schooling and increases taxes.*

$$\frac{\partial \Psi}{\partial \sigma} \geq 0, \ \frac{\partial s}{\partial \sigma} \leq 0, \ \frac{\partial v}{\partial \sigma} \geq 0$$

*Proof*: From eqs. (2.8) and (2.9) we obtain:

$$\Psi = \frac{\frac{1-\eta}{\phi\delta\eta} s - (1-\sigma)}{\sigma}$$

which is the segregated educational regime.

Taking derivatives with respect to $\sigma$ we obtain:

$$\frac{\partial \Psi}{\partial \sigma} = \frac{1}{\sigma}(\frac{1}{2} - \Psi)$$

Whether $\Psi \gtrless \frac{1}{2}$ depends on whether $p \gtrless \tilde{p}$. ■

Interestingly all the DLC&D results are reversed in the presence of corruption and weak institutions. When the option of tax evasion is introduced in the model there is one

additional channel that affects the tax revenue associated with public education. Under the presence of strong institutions this effect is minimized and hence the DLC&D results hold, despite the revenue lost due to tax evasion. Analytically, increases in inequality lead to an increase in participation in public schooling since the income of the marginal person indifferent between the two regimes is moved and this person now chooses private schooling. Since there is lower participation in public schooling after an increase in inequality there is also a reduction in the tax rate since an increasing number of parents is opting out of the public schooling regime. However the reduction of the tax rate is less than analogous to the reduction of the children participating in public schooling and therefore the quality of schooling as denoted by $s$, is increasing after an increase in inequality.

The results are rather differentiated when we assume the existence of weak institutions, $p < \tilde{p}$. In this case $\Psi < \frac{1}{2}$ and there is less segregation since more parents are in the private schooling regime. Higher income inequality also leads to less segregation ($\Psi$ closer to 1/2) since the marginal person is now choosing more public education. The intuition behind this result is that even though the income of the marginal person has increased and could therefore buy more private education, as was the case with strong institutions, it will not do so since the trade-off between the quality of education in public schooling and the increased consumption due to evaded income, favors consumption. The more now people evade the less likely they are to be caught since $p$ is low. Therefore they will forego private education (that reduces their consumption up to $e$) and will choose public education. Consequently the higher participation is public schooling calls for higher taxes as more parents now choose public schooling. This result is also enhanced by the fact that due to tax evasion not being effectively treated, the collected revenue is significantly reduced. However the increase in the number of children is higher than the increase in taxation and therefore the overall level of education in public schooling is decreasing.

## 4. Empirical Specification and Data

In this section we examine: (i) whether there exists a relationship between the quality of public education and income inequality and (ii) whether this relationship is affected by the quality of governance and the corresponding degree of tax evasion within each country. To this end, we proceed by estimating the following econometric model employing the data described in details in a following subsection.

### 4.1. Econometric Model

Assuming that our benchmark equation is linear and allowing for country and time specific fixed effects the associated estimating equation can be written as:

$$\text{Public Spending on Education (per Capita)}_{it} = \alpha_1 Gini_{it} + \beta X_{it} + f_i + \varepsilon_t + u_{it} \quad (4.1)$$

where $\alpha_1$ and $\beta$ are coefficients (beta is a vector), $X_{it}$ is a vector containing country i's socio-economic characteristics, $f_i$ is country i's specific fixed effect, $\varepsilon_t$ is time t's specific fixed effect and $u_{it}$ is the error term.

Equation (4.1) implies that the quality of public education depends on income inequality in country i represented by Gini, as well as on country i's socio-economic characteristics, represented by a vector. Finding a non-zero and statistically significant $\alpha_1$ provides evidence that income inequality affects the quality of public education.

### 4.2. The Data

Our dataset consists of 21 OECD countries for the 1970-2005 period[2]. In Tables 1 to 3 we employ as dependent variable the per capita public spending on education (denoted as PublSpend). Data for PublSpend are obtained by Busemeyer (2007).

In order to capture household income inequality, we employ the GINI coefficient developed by the Inequality Project Database (2000) of the University of Texas.

Our core set of controls consists of standard explanatory variables employed in the empirical literature on Public Education Spending (see e.g. Harris et al. 2001; Busemeyer, 2007; Concoran and Evans, 2010). More precisely, we employ the proportion of population above 65 years old (denoted as old) and the proportion of population below 14 years old (denoted as young) in order to capture some important demographic characteristics that are expected to affect public spending on education. Poterba (1995; 1997) and Harris et al (2001) suggest that an increase in the fraction of elderly residents in a jurisdiction is associated with lower levels of education spending whereas variations in the size of school age population do not result in proportionate changes in education spending. Moreover, we employ the size of the population (population) and the population density (denoted

[2]The countries in our sample are: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Japan, UK, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and USA.

as density) in order to capture potential economies of scale in the provision of the public good. The larger and the more concentrated the population the lower the per capita cost of the public good (see e.g. Alesina and Wacziarg, 1998) and consequently the lower the per capita spending. On this basis, we expect both of these variables to enter with a negative sign in the estimated equation.

In addition, we control for international market integration (openness). This is because there are strong theoretical priors concerning the effect of globalisation on the pattern of public spending. More precisely, a large part of the relevant literature suggests that increased international market integration is associated with lower levels of social spending (such as public spending on education and health) and higher levels of public spending on infrastructure (see e.g. Keen and Marchand, 1997; Bretschger and Hettich, 2002)[3]. Following this rationale we expect openness to bear a negative and statistically significant coefficient in the estimated equation. Finally, we employ two political variables in order to control for partisan and opportunistic effects on public education spending (Castles, 1989; Busemeyer, 2007). Specifically, we employ the cabinet ideology index developed by Tavares (2004) (denoted as *ideotav*) and an election dummy (*elleg*). Tavares (2004) cabinet ideology index locate cabinet ideology on a 1 to 5 political spectrum with higher values denoting more extreme left-wing governments. Opportunistic effects are captured by a dummy variable (denoted as elections) which equals one in years in which a national election was held and zero in non-elections years. Data for *elleg* are also obtained by Tavares (2004) (for more details on data see Appendix A).

### 4.3. Results

In the following subsections we discuss the results obtained by working as described above. These are reported in Tables 1 to 3.

#### 4.3.1. Testing the effect of income inequality on per capita public education spending

We start by estimating equation (4.1) presented in section 4.1, using the data and the empirical methodology outlined in the previous section. The results are reported in Table 1.

[3]This is the so-called "efficiency effect" of international market integration on the pattern of government spending (see e.g. Keen and Marchand, 1997).

**Table 1:** The Effect of income inequality on public spending per capita (Full Sample)

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| gini | -1.786*** | -1.493*** | -2.023*** | -1.787*** | -1.786*** | -1.391*** |
| | (-3.481) | (-3.148) | (-3.716) | (-3.490) | (-3.481) | (-2.720) |
| old | -2.307*** | -2.513*** | -0.743 | -2.247*** | -2.307*** | -3.149*** |
| | (-2.964) | (-3.429) | (-1.197) | (-2.826) | (-2.964) | (-4.407) |
| young | 0.842 | 0.635 | 1.418** | 0.901 | 0.842 | 1.037** |
| | (1.511) | (1.156) | (2.559) | (1.638) | (1.511) | (2.012) |
| population | 0.001 | 0.001 | 0.001 | | 0.001 | 0.001 |
| | -0.779 | -1.602 | -1.513 | | -0.779 | -0.405 |
| density | -0.421*** | -0.415*** | -0.406*** | -0.419*** | -0.421*** | |
| | (-4.831) | (-5.203) | (-4.517) | (-4.750) | (-4.831) | |
| openness | -0.361*** | -0.366*** | | -0.366*** | -0.361*** | -0.341*** |
| | (-3.375) | (-3.533) | | (-3.525) | (-3.375) | (-3.201) |
| ideotav | 0.466 | | 0.402 | 0.5 | 0.466 | 0.321 |
| | (1.446) | | (1.304) | (1.591) | (1.446) | (0.97) |
| elleg | 0.239 | | 0.396 | 0.24 | 0.239 | 0.239 |
| | (0.249) | | (0.4) | (0.25) | (0.249) | (0.237) |
| obs | 422 | 442 | 422 | 422 | 422 | 422 |
| $R^2$ | 0.91 | 0.91 | 0.90 | 0.91 | 0.91 | 0.90 |

Note: *, **, *** denote statistical significance at 10%, 5% and 1% level of statistical significance respectively.

In columns 1 to 6 *PublSpend* is regressed on Gini as well as on a set of control variables (i.e. old, young, population, density, openness, ideotav, elleg) in a two-way error component fixed effect specification. Note that we present $t$-statistics based on clustered standard errors which are robust to both spatial and serial correlation (see e.g. Bertrand, Duflo and Mullainathan, 2004). As can be seen, the coefficient on Gini appears to be negative and highly significant in all six alternative specifications indicating the negative effect of increased income inequality on public education quality. This result appears to be in line with the findings of our theoretical model.

As far as the rest of the explanatory variables are concerned, we observe that all of them bear the expected –by the theory-sign. Old enter with negative and significant coefficient, indicating the negative effect of elderly people on per capita public education spending. This result is consistent with the hypothesis of Poterba (1995) -concerning the effect of elderly people on the per capita spending on education- and the empirical findings of Poterba (1997) and Harris et al (2001). Openness bears a negative and statistically significant coefficient, highlighting the negative effect of international market integration on per capita public education spending. This result is in line with our theoretical priors as well as the empirical findings of previous studies (see e.g. Winner, 2004). Finally density bears a coefficient with a negative and highly significant coefficient in all five alternative specifications. This finding provides empirical evidence in favor of our theoretical priors suggesting that increased population density ensures economies of scale in the provision of public good, lower per capita cost and consequently lower per capita education spending. On the other hand, young, population, *ideotav* and *elleg* appear to be non significant in most of the alternative specifications.

### 4.3.2. Is there a role for shadow economy?

Our next step is to examine whether the above established relationship between inequality and public education quality is affected by the size of shadow economy and consequently the level of tax evasion within a country. To this end, we proceed by splitting our sample into two alternative subgroups (one containing countries characterized by relative "small shadow economy" and one containing counties characterized by relative "large shadow economy") and we re-estimate equation (1) using the data and the empirical methodology outlined in the previous section.

Our criterion in order to separate our sample into the two alternative subgroups is

the size of the of shadow economy as a proportion of official GDP developed by Schneider (2005)[4]. Therefore, countries characterized by relative small shadow economies are included in the "small S.E" subgroup whereas countries that are characterized by relative large shadow economies are included in the "large S.E." subgroup[5]. Therefore, our first sub-sample consists of: Australia, Austria, Canada, France, Japan, UK, Germany, Ireland, the Netherlands, Switzerland and USA whereas our second sub-sample consists of: Belgium, Denmark, Finland, Greece, Italy, Norway, Portugal, Spain and Sweden.

**Table 2:** The Effect of income inequality on public spending per capita (when *Shadow*<17)

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| gini | -0.611 | -0.234 | -0.624 | -0.968 | -0.611 | -0.144 |
| | (-1.064) | (-0.421) | (-1.087) | (-1.640) | (-1.064) | (-0.267) |
| old | -3.497*** | -3.636*** | -3.035*** | -2.437*** | -3.497*** | -4.244*** |
| | (-3.769) | (-4.115) | (-3.867) | (-2.625) | (-3.769) | (-4.855) |
| young | 0.647 | 0.481 | 0.853 | 1.482** | 0.647 | 0.57 |
| | -1.037 | -0.759 | -1.463 | -2.411 | -1.037 | -0.907 |
| population | 0.001*** | 0.001*** | 0.001*** | | 0.001*** | 0.001*** |
| | (4.224) | (4.936) | (4.353) | | (4.224) | (4.649) |
| density | -0.149** | -0.147** | -0.145** | -0.199*** | -0.421*** | |
| | (-4.831) | (-5.203) | (-4.517) | (-4.750) | (-4.831) | |
| openness | -0.361 | -0.096 | | -0.123 | -0.082 | -0.067 |
| | (-0.934) | (-1.120) | | (-1.348) | (-0.934) | (-0.759) |
| ideotav | 0.316 | | 0.247 | 0.674* | 0.316 | 0.191 |
| | (0.837) | | (0.668) | (1.763) | (0.837) | (0.506) |
| elleg | 0.194 | | 0.223 | 0.179 | 0.194 | 0.185 |
| | (0.189) | | (0.219) | (0.168) | (0.189) | (0.179) |
| obs | 256 | 262 | 256 | 256 | 256 | 256 |
| $R^2$ | 0.90741 | 0.90325 | 0.907026 | 0.899542 | 0.90741 | 0.905194 |

Note: *, **, *** denote statistical significance at 10%, 5% and 1% level of statistical significance respectively.

In Table 2, we report results from the estimation of equation (1) when the sub-sample

[4]Our decision to focus on the size of the shadow economy is driven by the rationale of our theoretical model which examines the effect of tax evasion on the relationship between public education quality and income inequality.

[5]Note that the variable Shadow takes values from 8.7 to 28.6 and its mean value equals 17.12. (see Appendix A for more details on this). On this basis we included in the "large shadow economy" (respectively "small shadow economy" ) subgroup countries sharing a shadow economy that is larger (respectively smaller) of 17 per cent as a share of GDP.

**Table 3:** The Effect of income inequality on public spending per capita (when *Shadow*>17)

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| gini | -2.955*** | -2.906*** | -3.844*** | -2.456*** | -2.955*** | -2.645*** |
| | (-3.516) | (-4.131) | (-4.809) | (-2.983) | (-3.516) | (-3.124) |
| old | -6.968*** | -7.376*** | -7.508*** | -7.388*** | -6.968*** | -5.716*** |
| | (-3.819) | (-4.339) | (-4.028) | (-4.006) | (-3.819) | (-3.208) |
| young | -3.288*** | -3.267*** | -3.846*** | -2.923** | -3.288*** | -2.271** |
| | (-2.885) | (-3.086) | (-3.336) | (-2.550) | (-2.885) | (-2.106) |
| population | -0.001** | -0.001*** | -0.001* | | -0.001** | -0.001*** |
| | (-2.230) | (-2.697) | (-1.973) | | (-2.230) | (-3.994) |
| density | -2.178** | -1.556*** | -3.099*** | -3.230*** | -2.178** | |
| | (-2.400) | (-2.691) | (-3.566) | (-4.100) | (-2.400) | |
| openness | -0.409*** | -0.401*** | | -0.384** | -0.409*** | -0.536*** |
| | (-2.795) | (-3.073) | | (-2.594) | (-2.795) | (-3.860) |
| ideotav | -0.065 | | 0.434 | -0.058 | -0.065 | -0.443 |
| | (-0.103) | | -0.699 | (-0.090) | (-0.103) | (-0.713) |
| elleg | -0.122 | | -0.022 | 0.034 | -0.122 | -0.25 |
| | (-0.071) | | (-0.012) | -0.02 | (-0.071) | (-0.143) |
| obs | 166 | 180 | 166 | 166 | 166 | 166 |
| $R^2$ | 0.947628 | 0.954475 | 0.944248 | 0.945475 | 0.947628 | 0.945135 |

Note: *, **, *** denote statistical significance at 10%, 5% and 1% level of statistical significance respectively.

under examination is the group with countries characterized by relative small shadow economies (*Shadow*<17). As can be easily verified, the coefficient of Gini appears to be non significant in all six alternative specifications indicating that income inequality does not affect the quality of public education in countries characterized by relative small tax evasion. This result appears to be in accordance with the prediction of our theoretical model suggesting that the relative strength of institutions do affect the relationship between income inequality and public education quality. As far as the control variables are concerned, our results remain qualitative similar to those reported in Table 1.

In Table 3, we report results from the estimation of equation (1) when the sub-sample under examination is the group with countries characterized by relative large shadow economies (*Shadow*>17). As can be easily verified, the coefficient of Gini bears a negative sign and now appears to be significant at the level of 99 percent in all presented regressions. This result highlights that the negative effect of income inequality on the

quality of public education appears to be stronger in countries characterized by relative large shadow economies and consequently more severe tax evasion. This result provides empirical evidence in favor of the prediction of our theoretical model suggesting that under the assumption of weak institutions and consequently more severe tax evasion an increase in inequality decreases the quality of public schooling. As far as the rest of the explanatory variables are concerned, our results remain qualitative similar to those reported in Table 1.

## 5. Summary

We introduce tax evasion and the quality of institutions in the De La Croix and Doepke model in order to examine the interaction between the quality of public education and the choice for private schooling. Interestingly we find out that the DLC&D results hold only in the presence of strong institutions whereas when assuming that institutions are not very strong and institutions are weak their results are reversed. The reason for this reversion lies in the additional effect introduced via tax evasion. While this effect is minimized in the presence of strong institutions, the opposite occurs when institutions are weak. Therefore increases in inequality in the presence of weak institution imply a deterioration in the quality of public schooling. Our empirical analysis verifies our theoretical predictions.

# Appendix A

Data Sources and Descriptive Statistics

## References


[1] Alesina, A. and Wacziarg, R., 1998. Openness, country size and government. Journal of Public Economics 69, 305-321.

[2] Barreto, P. and Alm, J., 2003. Corruption, optimal taxation and growth. Public Finance Review, 31, 207-240.

[3] Bertrand, M., Duflo, E. and Mullainathan, S., 2004. How much should we trust differences-in-differences estimates? Quarterly Journal of Economics 119, 249-275.

[4] Besley, T. and Coate, S., 1991. Public Provision of Private Goods and the Redistribution of Income. American Economic Review, 81, 979-984.

[5] Bretschger, L. and Hettich, F., 2002. Globalization, capital mobility and tax competition : theory and evidence for OECD countries. European Journal of Political Economy 18, 695-716.

[6] Busemeyer, M., 2001. Determinants of public education spending in 21 OECD democracies, 1980-2001. Journal of European Public Policy, 14, 582-610.

[7] Castles, F.G., 1989. Explaining public education expenditure in OECD nations. European Journal of Political Research 2, 225-258.

[8] De La Croix, D. and Doepke, M., 2009. To segregate or to integrate: Education politics and dDemocracy. Review of Economic Studies, 76, 597-628.

[9] De La Croix, D. and Doepke, M., 2004. Public versus private education when differential fertility matters. Journal of Development Economics, 73, 607-629.

[10] De Soto, H., 1989. The Other Path: The Invisible Revolution in the Third World. Tauris.

[11] Downs, A., (1957). An Economic Theory of Democracy. New York: Harper.

[12] Epple, D. and Romano, R., 1996. Ends against the middle: Determining public service provision when there are private alternatives. Journal of Public Economics, 62, 297-325.

[13] Glomm, G., and Ravikumar, B., 1992. Public versus private investment in human capital endogenous growth and income inequality. Journal of Political Economy, 100, 813-34.

[14] Glomm, G., and Ravikumar, B., 1998. Opting out of publicly provided services: A majority voting result. Social Choice and Welfare, 15, 187-199.

[15] Glomm, G., and Ravikumar, B., 2001. Human capital accumulation and endogenous public expenditures. Canadian Journal of Economics, 34, 807-826.

[16] Glomm, G., and Ravikumar, B., 2003. Public education and income inequality. European Journal of Political Economy, 19, 289-300.

[17] Gupta, S., Davoodi, H. and Alonso-Terme R.,1998. Does corruption affect income inequality and poverty?. IMF Working paper, 98/76.

[18] Harris, A.R., Evans W., N.and Schwab, R. M., 2001. Education spending in an aging America. Journal of Public Economics 81, 449-472.

[19] Keen, M. and Marchand, M., 1997. Fiscal competition and the pattern of public spending. Journal of Public Economics 66, 33–53.

[20] Mauro, P., 1995. Corruption and growth. Quarterly Journal of Economics, 2, 681-711.

[21] Mauro, P., 1998. Corruption and the composition of government expenditure. Journal of Public Economics, 69, 263-279.

[22] Moav, O., 2005. Cheap children and the persistence of poverty. Economic Journal, 115, 88-110.

[23] Poterba, J., 1997. Demographic structure and the political economy of public education. Journal of Policy Analysis and Management, 16, 48-66.

[24] Schneider, F., 2005. Shadow Economies Around the World: What Do We Really Know?, European Journal of Political Economy 21, 598 – 642.

[25] Stiglitz, J. E., 1974. The demand for education in public and private school systems. Journal of Public Economics, 3, 349-385.

[26] Tavares, J., 2004. Does right or left matter? Cabinets, credibility and fiscal adjustments. Journal of Public Economics 88, 2447-2468.

[27] Winner, H., 2004. Airports or Parks? The impact of fiscal competition on the composition of public expenditure, EUI Working Papers – RSCAS No. 2004/03.

[28] Yitzhaki, S., 1974. A note on income tax evasion: A theoretical analysis. Journal of Public Economics, 3, 201-202.