

The distributional effects of public education in Greece in the era of depression

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Abstract

This paper examines the distributional effects of publicly provided education services in Greece during the tumultuous period of 2009-2013; that is before the crisis erupted and at its peak. We adopt two approaches in estimating the monetary value of public education transfers. The 'objective' distributional effects of public education are measured through static incidence analysis under the assumption that the value of public transfers to the beneficiaries is equal to the average cost of producing the corresponding public services. The 'perceived' distributional effects of public education are measured via demand analysis through which we derive a money metric of households' willingness to pay for public education. The juxtaposition of the two approaches yields empirical results which are valuable to policy makers.

Keywords: Public education, Income distribution, Demand analysis

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1. Introduction

The period of 2009-2013 in Greece is an extremely fertile ground for economic analyses but regrettably for unfortunate reasons. Unemployment increased from 9.6 in 2009 to 27.5 in 2013, GDP per capita sunk by 21.2 percentage points during the same period and public debt reached its zenith at 177.1 per cent of the GDP in 2014. The economic slowdown was triggered by an unprecedented fiscal consolidation program which resulted to an astonishing fiscal deficit reduction (from -10.2 per cent in 2011 to -3.5 per cent in 2014). These macroeconomic developments have been extensively discussed in the international political and academic fora. Yet, distributional issues have remained in the shadow. Nonetheless, there are at least two good reasons to worry about distribution. The first is that an allocation of resources which can be perceived as unfair by the public may impair - the already impaired- political stability giving rise to tensions whose risk should not be underestimated. Secondly, there is strong evidence that rising inequality can be detrimental for the long term growth prospects of an economy (OECD, 2014). In order to partly remedy this negligence our paper focuses on a distributional issue of utmost importance; namely the progressivity of the public education system and how it was affected during the time from 2009 to 2013.

Income studies, in particular, are especially interested in analysing the impact of publicly provided private goods (or what can be called in-kind redistribution). Compared to cash transfers, the impact of public services on the income distribution is far more complicated, challenging and nuanced. Who are the actual beneficiaries of these services? What is their real value to their recipients? To what extent do they contribute to equality or, perhaps, are disproportionately captured by the well-off? From a vast literature we discern the contributions of (Evandrou et al. 1993; Smeeding et al. 1993; Selden and Wasylenko 1995; Tsakloglou and Antoninis 1999; Garfinkel et al 2006; Aaberge and Langørgen, 2006; Callan et al 2008; Paulus, et al 2010, Aaberge et al. 2010, Andreou et al, 2014) and the meta-studies of (Marical et al., 2006; Verbist et al., 2012, 2013). Still, all the current literature refers to the pre-crisis period when the allocation of resources was not distorted by the unanticipated shocks of the economic recession. Therefore, nowadays we are confronted with the question whether and to what extent the shrinkage of economic resources has

affected the distributive capacity of in-kind welfare programmes. Apparently the Greek context is appropriate for such examination.

The paper deviates from the norms of the literature in methodological terms, too. The vast majority of the bibliography – with a few exceptions, for example; Andreou et al, 2015- utilises the production cost approach for measuring the monetary value of in-kind benefits, (Verbist et al, 2013). This method has many virtues (as witnessed by its popularity) but it is not free of shortcomings either. Verbist et al (2013), in their meta-analysis, point out *“that this approach neglects differences within and across countries in the quality and efficiency in the provision of these services. Moreover, this approach does not necessarily reflect the user’s value of the service, as the public service cannot (easily) be exchanged for other goods”*. Indeed, as Andreou et al (2014) demonstrate in a specific country case the production cost approach may overestimate the distributional impact of publicly provided services. Following their approach, we employ a consumer demand model for deriving a money metric of a money metric for valuing consumers’ willingness to pay for substituting public for private education. This money metric is used to obtain the perceived distributional effects of public education. On the other hand, the size and structure of public outlays in modern societies is not determined in an ad hoc fashion, but is the outcome of a complex political process that takes into account many factors (demography, social externalities, long-run planning, etc.) and on that basis the production cost approach can be construed as delivering the objective¹ distributional effects of public education.

The structure of the paper is simple; after providing an overview of the Greek educational system, we describe, in Section 3, our methods and data. Section 4 presents the results of the empirical analysis. Conclusions follow.

2. A short overview of the Greek Educational System

The Greek Educational System consists of the three typical levels of primary, secondary and tertiary education. Compulsory education consists of the primary and lower secondary (all children from the age of 6 to 15 years old) levels. Pre-school

¹ Albeit ‘objective’ does not imply some type of optimum or an efficiency standard but rather the very fact that collective decisions iron out personal prejudices and in this sense they contain an element of impartiality.

education is optional and consists of crèches and kindergartens. Primary education is provided by primary schools (private or public), lasts six years and children can be admitted from the age of six. The enrolment in a public school is free of charge.

Pupils continue their studies in the secondary education which is divided into two levels: the lower secondary (which is compulsory) and upper secondary (which is not compulsory). The upper secondary level is divided into the unified lyceum and the technical vocational educational school. The duration of studies is three years for both types and free of charge². The post-compulsory secondary education also includes the vocational training institutes (IEK), which provide work-oriented studies which are not classified in the educational pyramid. After completing the upper secondary education level, pupils can take part in the nationwide examinations to compete for a position in a tertiary institution. Tertiary education is provided by the universities (henceforth AEI) and the technological education institutes (henceforth TEI). The prospective students are admitted to these institutions according to their performance at the national examinations³. Universities aim at a high level of scientific studies while TEI are orientated towards applied research. It is important to note that the enrolment in AEIs and TEIs is provided free of charge to all students without exception. Textbooks are also provided at no cost. Finally, many tertiary institutions offer the possibility of master or doctoral studies at subsidized prices.

2.1 Public education and egalitarianism

The Greek educational system is overly state regulated, highly centralised and bureaucratic. The role of private sector is limited and supplementary. The enrolment rates in private schools fluctuated around 6% of the student population until 2009 and thereafter they reduced considerably. In the tertiary sector, the degrees offered from private institutions are not officially recognized as equivalent to those of public institutions. The initial aspiration of these high levels of state intervention was

² In parallel operate other types of special schools such as music schools, ecclesiastical schools, athletic schools, intercultural schools for foreigners, minority schools and schools for children with special needs.

³ Graduates of vocational schools may enter in TEIs (by participating in the general examinations and on the basis of their school certificate record) but they cannot enroll in AEIs.

egalitarianism, but the result was egalitarianism in appearance (especially as regards tertiary sector).

The zero price of tertiary studies altogether with the absence of private market creates a distorted economic environment whereas the demand for higher education far exceeds its supply. In the absence of prices, the only available rationing mechanism is the national examinations. The well-off families cannot purchase the amount of education they desire from the market; however they can spend large amounts on private tuition in order to increase their offspring' probability of performing well in the national examinations. In this context, the association between the probability of enrolling in a university and family's income⁴ damages the progressivity of the system, (Patrinos 1995; Psacharopoulos and Tassoulas 2004; Psacharopoulos and Papakonstantinou 2005). On the contrary, the parallel function of a private market may increase the overall progressivity system under certain assumptions, (Besley and Coate, 1991).

How are these particularities of the education system reflected to progressivity/inequality indices? Tsakloglou and Antoninis (1999) and Antoninis and Tsakloglou (2001), analysing data of the late 1980s and early 1990s show that the observed progressivity of public education subsidies is due exclusively to the effect of primary and secondary education transfers. Koutsampelas and Tsakloglou (2015) separate the distributional effects of lower and higher cost tertiary institutions and show that the latter exert a more regressive effect than the latter. They suggest a graduate tax for partly remedying the inequities of the system. These results do not deviate substantially from the findings of the international literature, (see for example, Callan et al, 2008). Overall, a public education system cannot be but progressive and its progressivity fades away as we move up the educational pyramid. Simply stated, the higher the educational level the stronger the link between income/wealth/social status and the probability of dropping out.

Nonetheless, the post-2010 economic slump changed profoundly the educational landscape. Families' income plummeted and consequently their ability to afford costly private tuition. The demand curves for public and private schooling moved in opposite directions with the latter change resulting to a severely dwindled private

⁴ Furthermore the poor may be more likely to drop out of school (non-participation in upper secondary education (Lyceum) is negatively related with income.

sector. Studying abroad became an unaffordable choice for an increasing number of prospective students, for whom public universities (and the prerequisite national examinations) remain the only route. Meanwhile, public spending on education was slashed; leaving the question of whether and to what extent these cutbacks impaired the efficiency and equity aspects of the system. What is the combined outcome of all these separate forces on the progressivity of public education?

3. Dataset and methods

3.1 The dataset

The empirical analysis is based on two micro-datasets; the 2009 and 2013 Greek Household Budget Survey (HBS). The 2009 dataset carries information about the situation of the household just before the eruption of the crisis and the 2013 dataset is the most recent source information regarding the impact of the ensuing economic cataclysm on households' income and consumption. The HBS is carried out annually by the National Statistical Service of Greece. The survey covers all the private households of the country and its sampling fraction was 1/1000 (3,524 households) in 2009 and 1/1000 (3,468 households) in 2013.

The HBS collects detailed information on households' income, consumption, composition, employment status and living conditions. The main purpose of the HBS is to monitor household expenditure patterns in order to revise the Consumer Price Index. The dataset consists of a representative random sample⁵ of all private households of the country (which means that population groups such as homeless or institutionalised persons, illegal economic immigrants and Roma are excluded). The household expenses are encoded using the COICOP-HBS classification (Classification of Individual Consumption by Purpose), proposed to EU Member States by Eurostat. The classification is structured into the following 12 main categories⁶. All calculations in the analysis were conducted using the sampling weights provided with the survey.

⁵ A two-stage stratified sampling is used. Primary Sampling Unit (PSU) are areas consisting of one or more building blocks and the final sampling unit is the household and its members.

⁶ These categories are food and non-alcoholic beverages, alcoholic beverages and tobacco, clothing and footwear, housing, water, electricity, gas, and other fuels of main and secondary residence, health, transport, communications, recreation and culture, education, hotels, cafes and restaurants and miscellaneous goods and services.

3.2 Methodology: Income distribution analysis

The HBS provides information on each household's income net of social insurance contributions and taxes. Thereafter, this disposable income is equivalised disposable income by applying the 'modified' OECD equivalence scales that assign weights of 1.00 to the household head, 0.50 to each of the remaining adults and 0.30 to each child aged below 14.

The empirical analysis relies on standard tools of inequality measurement; namely simple quintile-based statistics and two inequality indices; the Gini and the Atkinson index. The former is a measure of statistical origin, the latter derives explicitly from a social welfare function but both satisfy the basic axioms of inequality measurement (symmetry, scale invariance, population invariance and the principle of transfers). The Atkinson index captures a variety of distributional preferences. By increasing the value of the inequality aversion parameter we simulate a social planner who is more and more averse to income disparities.

3.3 The production cost approach

The rationale of the production cost approach is to allocate per unit public spending (for example, expenditure per student in our context) according to the individual utilization rates of the corresponding public services. Let Q be the quantity of a public good accrued to a consumer and C the constant unit cost of the public good. Then if there are n individuals consuming the good the per capita unit cost is $c=C/n$. The value of the benefit to each beneficiary is simply cQ .

Thus, the value of in kind transfers to their beneficiaries is assumed to be equal to the average cost of producing the corresponding services, (Smeeding et al., 1993). Simply stated, the analysis assumes that one euro spent by the government equals exactly one euro worth to the recipients of the corresponding good. Brennan (1976) in a much appreciated theoretical paper paved the way for the popularity of this method stated that: *'The measure suggested here has the incidental virtue, quite apart of its conceptual superiority, of being computationally trivial'*, (Brennan, pg. 397). Applications of this method in the context of public education are met in (Smeeding et al., 1993; Tsakloglou and Antoninis, 1999; Garfinkel et al., 2006; Callan et al., 2008; Paulus et al. 2010).

The soundness of allocating public spending to households is grounded on the premise that the provision of public services more or less adheres to norms of operational and allocative efficiency⁷. That is to say output is produced at the lower cost and at the desired level/quality in the sense of the well-known textbook condition for the optimal production of public goods⁸. Deviating from optimality would mean that for each euro of public spending, less than one euro reaches its beneficiaries. In distributional terms, ignoring this fact will result to a tendency to overestimate the redistributive effect of progressive transfers.

3.4 The consumer demand approach

In our context primary and secondary public education is provided free of charge to all. However, households which are not satisfied with the quantity/quality of public education may either substitute public with private schooling or supplement public schooling with private tuition purchased from the market⁹. The households that enrol their children in state education derive a certain benefit the monetary value of which we aim at estimating. The general idea is to utilise the informational content of a demand system on how state schooling affects the consumption patterns of households. In doing so, we assume that private schools operate in a relatively competitive market. This is a plausible assumption for primary and secondary education but completely untenable for the tertiary level (due to certain country-specific institutional rigidities). This means that our model is confined to primary and secondary education.

The analysis is based on a two-stage budgeting framework for modelling household consumption decisions. At the first stage, total expenditure is allocated between non-durables and durables. At the second stage, the budget of non-durables is allocated among commodities of this group. Thus, each household decides how much to consume of non-durables commodities conditional on various household characteristics and the priorly determined consumption level of durables. The underlying notion here is that durables represent less flexible demands. In this

⁷ See Barr (2012) for a specification of operational and allocative efficiency in the context of welfare state.

⁸ Formulated by Samuelson (1954); the sum of individuals' marginal rate of substitution and the marginal rate of transformation between the public good and the private good are equal.

⁹ Households may buy private lessons from tuition centers or hire individual tutors outside state school hours.

context, the choice between state and private education is assumed to be decided at the first stage so that the cost incurred by those opting for private education is estimated at the second budgeting stage from parameters capturing observed shifts in consumer behaviour attributed to this cost. This budgeting framework is typically used in empirical demand analysis (Blundell et al, 1993). Its empirical validity is tested via the separability test. The two-budgeting stage framework requires the existence of implicit (or quasi-) separability and a preference structure which is compatible with the following general form of cost function, (Deaton and Muellbauer, 1980):

$$C(p, U) = [c_1(p_1, U), \dots, c_k(p_k, U), U] \quad (1)$$

where $c_i(p_i, U)$ is the sub-function reflecting the prices (unit cost) of the i^{th} commodity group and is increasing in U and linearly homogeneous in prices.

The next step involves the specification of the form of the cost function by assuming that the allocation of consumer expenditures at the second stage is determined by an integrable demand system based on the Quadratic Logarithmic (QL) cost function. The use of QL cost function has been established in the empirical literature on the basis of two reasons. Firstly, the QL is among the most general (rank-3) integrable demand systems (Banks et al, 1997). Integrability is mandatory for the derivation of welfare metrics from observed consumer behaviour. Secondly, several influential empirical studies have shown that demand systems of lower rank [e.g. the Almost Ideal Demand System of Deaton and Muellbauer (1980)] may not be proper for demand analyses based on individual household data due to the existence of nonlinear income effects. The QL cost function has the following general form:

$$C(p, z_h, U) = a(p, z_h) + \frac{\beta(p, z_h)U}{1 - \lambda(p, z_h)U} \quad (2)$$

where $a(p, z_h)$, $\beta(p, z_h)$ and $\lambda(p, z_h)$ are linearly independent and homogeneous in price functions. Also $z_h = z_{1h}, z_{2h}, \dots, z_{kh}$ is a vector which includes k variables describing personal and household characteristics. Within this vector, the variables z_{1h} and z_{2h} are especially relevant to our analysis since they denote the number of children in public and private schools, respectively, for the household h. From (2), we derive the Marshallian demands in accord with the following well known steps: (a) obtain the indirect utility function (by inverting the cost function), (b) obtain the

Hicksian demands (by applying the Shephard's Lemma) and (c) substituting the indirect utility function into the Hicksian demands.

Thus, the second stage demand for i^{th} group expenditure has the form:

$$\omega_i = a_i(p_i, z_h) + \beta_i(p_i, z_h) \left[\frac{U}{1 - \lambda(p_i, z_h)U} \right] + \lambda_i(p_i, z_h) \beta(p_i, z_h) \left[\frac{U}{1 - \lambda(p_i, z_h)U} \right]^2 \quad (3)$$

where, ω_i denotes the budget share of consumption group i , and $a_i(p_i, z_h) = \partial a(p_i, z_h) / \partial p_i$, $\beta_i(p_i, z_h) = \partial \beta(p_i, z_h) / \partial p_i$ and $\lambda_i(p_i, z_h) = \partial \lambda(p_i, z_h) / \partial p_i$.

Note that U is the household utility level obtained from the total expenditure as defined at the top stage of budgeting. Therefore to obtain the Marshallian demands for nondurable goods we substitute U in (3) from the indirect utility function and we obtain that:

$$\omega_i = a_i(p_i, z_h) + \beta_i(p_i, z_h) [\ln C_h - a_i(p_i, z_h)] + \lambda_i(p_i, z_h) \beta(p_i, z_h) [\ln C_h - a(p_i, z_h)]^2 \quad (4)$$

Where C_h denotes the total expenditures of the household (durables and nondurables). In the absence of price variation and assuming Independence of Base (IB) and linear effects for the household characteristics, (4) can be written as

$$\omega_i = a_i + \sum_k \delta_{ik} z_h + \beta_i [\ln C_h - \varepsilon_0 - \varepsilon_1 z_{1h} - \varepsilon_2 z_{2h}] + \lambda_i [\ln C_h - \varepsilon_0 - \varepsilon_1 z_{1h} - \varepsilon_2 z_{2h}]^2 \quad (5)$$

where the parameters: a_i are constants; δ_{ik} show the effect of the k^{th} household characteristic; β_i and λ_i show the effect of (logarithmic) expenditure and expenditure squared, respectively; ε_0 is subsistence expenditure (fixed to the logarithm of average expenditure of the poorest 1% of households); ε_1 is the cost per child attending state school; ε_2 shows how ε_1 is modified by private school choice; and z_{1h}, z_{2h} are the number of children in state and private school, respectively. This budget share equation can be estimated and their parameters can be readily interpretable. Model estimation is conducted using nonlinear SUR under the integrability restrictions which in the absence of price variation become: $\sum_i \delta_i = 1$ and $\sum_i \beta_i = \sum_i \lambda_i = 0$ for adding-up.¹⁰

¹⁰ Homogeneity and symmetry are also imposed when there is price variation.

Once the parameters of the Marshallian demand system, described by (5) are known, welfare derived from the consumption of the public good can be computed by the money metric:

$$E = \frac{C(z_{2h} = 1, z_{1h} = 0; U, z)}{C(z_{2h} = 0, z_{1h} = 1; U, z)} = \varepsilon_2 - \varepsilon_1 \quad (6)$$

This expression measures the relative cost of a household with children in private education to reach the same utility level as an otherwise identical household with children in state education. As such (6) is a measure of the compensation a household would accept in order to give up its entitlement to free state schooling and enrol its child in a private school. Furthermore, equation (6) resembles an equivalence scale¹¹ except for the fact that it shows the additional cost of children in private education, rather than the cost of children themselves. As such it is an index of welfare comparisons, and thereby, subject to the usual Independent of Base (IB)¹² restriction (Lewbel, 1989) required to make such comparisons meaningful - at least for utility levels above zero. In general, for a given household characteristic z^h IB holds when the cost function $C(z^h, p, U^h)$ can be written in the multiplicatively separable form $C_1(p, z^h) * C_2(p, U^h)$, implying that $\partial \ln C(.) / \partial U^h$ does not depend on the household characteristic in question.

3.4.1 Econometric estimation

Consumer behaviour at the lower stage budgeting is modelled on three categories of nondurable goods: "Food and Catering", "Services" and "Other Goods". The data used come from the 2009 and 2013 Greek Family Expenditure Survey which contain information about expenditure on a detailed commodity breakdown and a large number of demographic and other household characteristics which are usually found to be statistically significant on empirical studies of consumer behaviour. The sample drawn consists of two-adult (non-retired) households without children or with children up to 16 years old attending either private or state pre-primary,

¹¹ In general, an equivalence scale is used to compare the welfare of households with different demographic characteristics, e.g. different number of adults and children in various age groups

¹² The IB rule said that any monotonic transformation of utility must be independent of the household characteristics.

primary or secondary education.¹³ This result in 912 and 824 observations in 2009 and 2013 respectively, 39.43% (2009) and 40.36% (2013) of which correspond to households without and 60.57% (2009) and 59.64% (2013) to households with children in the specified age group; about 7% (2009) and 5.5% (2013) of the latter group has children only in private schools and 2.85% (2009) and 1.20%(2013) has children in both private and state schools.

Table 1 reports the parameters of interest, ε_1 and ε_2 and the results of relevant diagnostic tests.¹⁴ The results suggest that, on average, a child in freely provided state education accounts for about 20% of total household expenditure; and this cost becomes 28% and 33% for households opting for paid out-of-pocket private education in 2009 and 2013 respectively. This translates to household willingness to pay €2,182 (annually, in 2009 prices) in 2009 and 2,517 (annually, in 2013 prices) in 2013 per school-age child for substituting state for private education. The corresponding figures for government cost per school-age child is €4,339¹⁵ and €3,707¹⁶ or 2009 and 2013 respectively, suggesting that from the consumers' point of view the public provision of education in Greece might be inefficient.

The results of testing separability (two stage budgeting) and non-IB are also reported in Table 1. Separability is tested as the joint significance of first stage commodity expenditures (housing, durables, education etc.) in the second stage budget shares; and non-IB as the disparity of the (utility) parameters β and λ between households with children in private and state schools. Separability is strongly rejected, yet this does not affect the size and significance of the parameters determining the value of public provision; while non-IB can be rejected at 1% significance.

¹³ This was motivated by the need to limit heterogeneity among households to demographic characteristics of interest, i.e. the number of children of schooling age. Extending the sample to include other household categories, for example households with more than two adults, households with household reference person over 65 or households with children also in higher education level, would introduce further heterogeneity and require the inclusion of additional parameters in the demand system. Thus, it is important to point out that the empirical results in this study may not hold for types of households substantially different from those in the selection considered.

¹⁴ The full results are available on request.

¹⁵ This is not the actual figure but rather an estimation based on the premise that public spending on education changed proportionally to total public spending. This means that all results presented in this manuscript are tentative and will be revised in the future using actual data.

¹⁶ Ibid.

Table 1: Estimates of the consumer benefit from opting for state schooling

	2009		2013	
	Coefficient	t-ratio	Coefficient	t-ratio
Cost per child for public schooling (ϵ_1)	0.20	7.51	0.21	7.51
Cost per child for private schooling (ϵ_2)	0.28	3.85	0.33	3.51
Separability test	LR= 23.85 (<0.000)			
Non-IB	LR= 29.49 (0.003)		LR= 64.95 (<0.000)	
Willingness to pay (in €)	€2,182		€2,517	

Source: Authors' calculation using 2009 & 2013 HBS.

4. Empirical Analysis

The progressivity of public transfers is the combining outcome of two factors: the position of the beneficiaries in the income ladder and the size of the transfers relative to their income. Figures 1a and 1b focus on the first factor showing the distribution of the direct beneficiaries of public education (i.e. pupils/students) per income quintile. The five quintiles (starting from the poorest 20 per cent to the richest 20 per cent) have been constructed using the distribution of equivalized disposable income. The evidence shows that the pupils studying in primary and secondary education schools are mostly concentrated in the lower half of the income distribution. This is because households with children are less likely to have reached the top of their earnings capacity and/or have a lower share of earners. Crucially, this phenomenon seems to have intensified during the 2009-2013 period. Indicatively, in 2009 23.8 per cent of the total number of secondary school pupils was found in the poorest quintile. In the 2013, this figures increases at 30.3 per cent. As regards tertiary education, we find important differences between AEI and TEI students. TEI students are mostly found in low quintiles, while AEI students are concentrated in the middle and upper part of the income distribution. It appears that access to higher education implies a social gradient; the higher the income of the family the higher the probability of enrolling in a AEI institution. The last column reports the distribution of all beneficiaries, irrespectively of the educational level they participate in, and shows that the beneficiaries of public education are generally over-represented in the lower half of the income distribution. This pattern became even more intense in 2013.

Figure 1a: Distribution of pupils/students (2009)

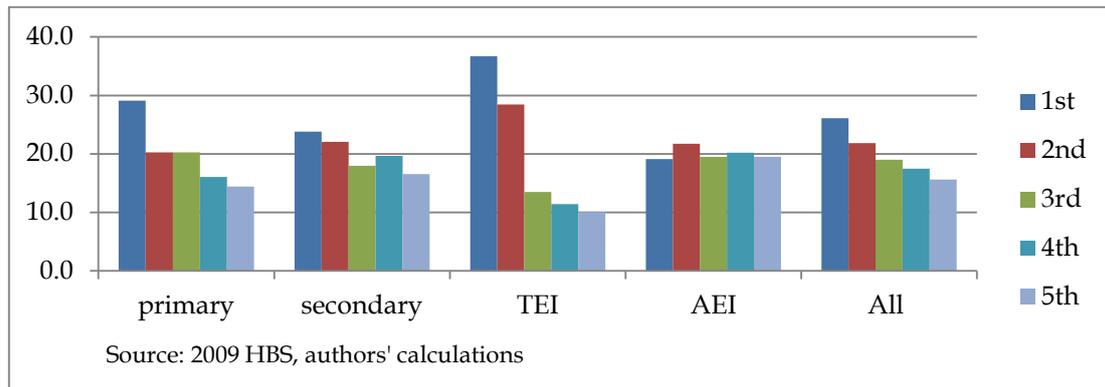
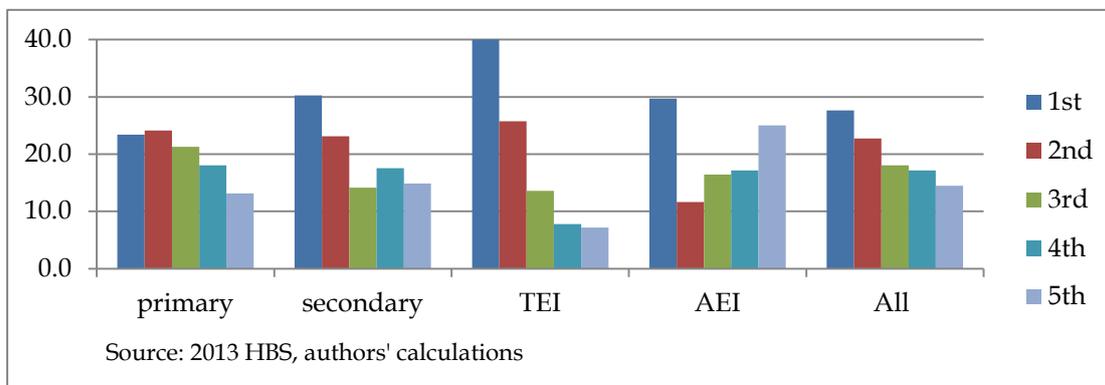


Figure 1b: Distribution of pupils/students (2013)



Figures 2a and 2b report the relative size of the transfers which is defined as the ratio of (i) sum of transfers accrued to a quintile to the (ii) sum of household disposable income of each quintile multiplied by 100. The relative importance of in-kind education transfers is higher for the low income quintiles (as it could have been expected). Their share declines as we move up to higher quintiles indicating their progressivity. The impact of secondary education transfers is the strongest followed by primary education. The comparison between the two approaches shows that the production cost approach tends to overestimate the impact of transfers on households' income. Finally, it is noteworthy that the relative size of transfers has grown between 2009 and 2013 especially for the low income quintiles. This is a finding of certain distributional significance which will be discussed in more detail later.

Figure 2a: (Relative) size of transfers per quintile (2009)

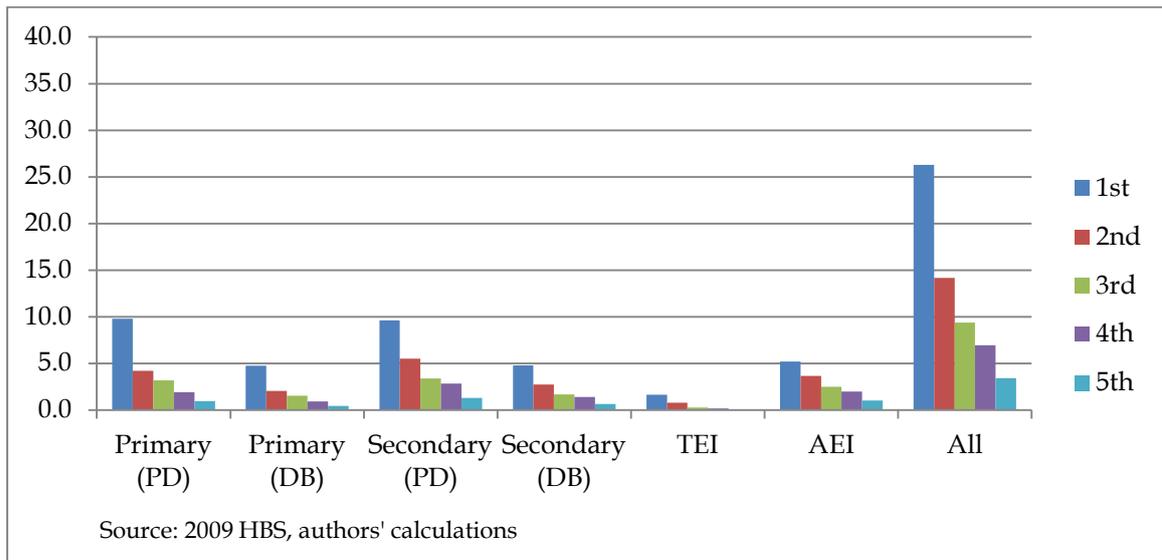
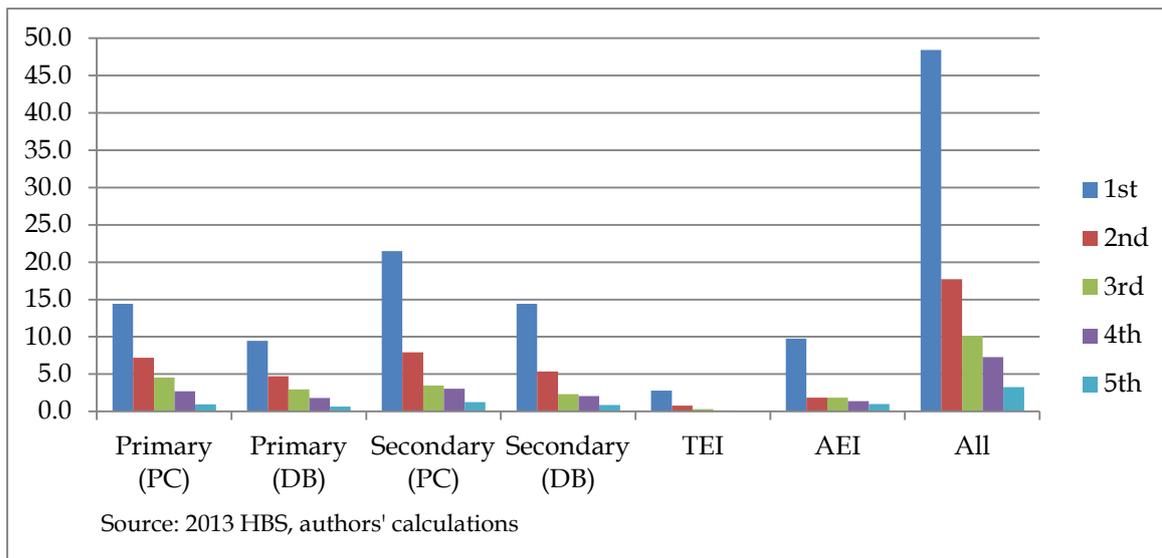


Figure 2b: (Relative) size of transfers per quintile (2013)



The redistributive effect of public education is quantified through the use of indices of inequality. Figures 3a and 3b report the percentage change in relative inequality when we move from the initial pre-benefit distribution to the post-benefit distribution. Starting from the 2009 income distribution, when all education transfers are added in the concept of income, Gini index declines by 7.2%. The decline in Atkinson index varies from 10.6% to 13.9% depending on the value of the inequality aversion parameter. Almost the entire inequality reducing effect is driven by the redistributive impact of primary and secondary education transfers, whereas transfers to TEI and AEI students have a marginal impact. The characterization of the effect of AEI transfers depends on the value of the inequality aversion parameter.

This implies that the Lorenz curve for the initial distribution intersects with the Lorenz curve for the post-benefit distribution. Consequently, AEI transfers exert an ambiguous effect on inequality. In the end, their characterization as progressive or regressive depends on social welfare function and the implied degree of inequality aversion. In Figure 3a we also present the distributional effects of public education when the value of the transfers has been measured via the demand based approach. In that case, the progressivity of primary and secondary education appears to be smaller. This indicates the possibility that the use of the production cost approach may produce results which show in-kind public transfers to be more progressive than their recipients perceive them to be.

Figure 3a: Distributional Effects of Public Education (2009)

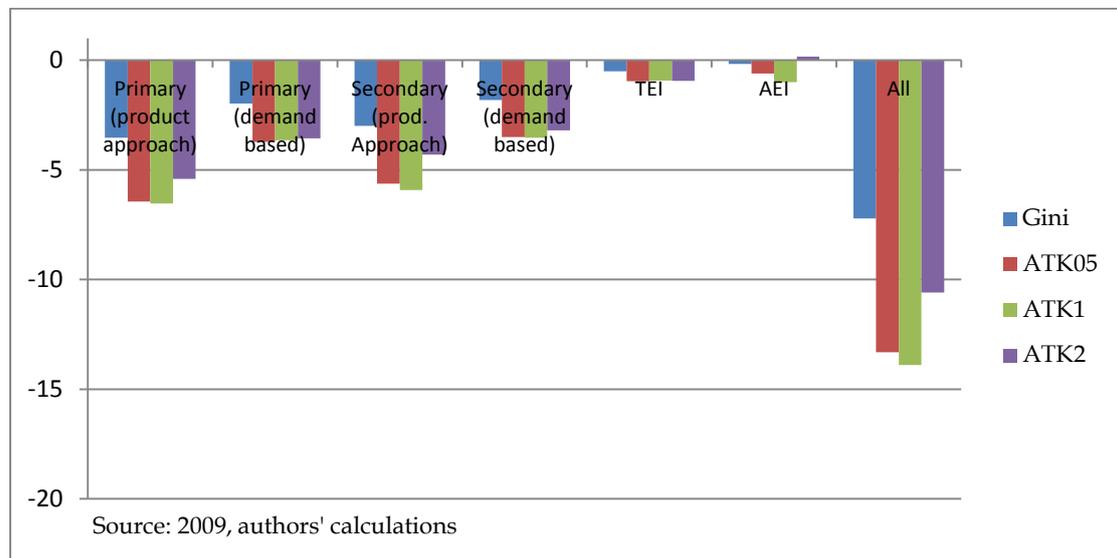
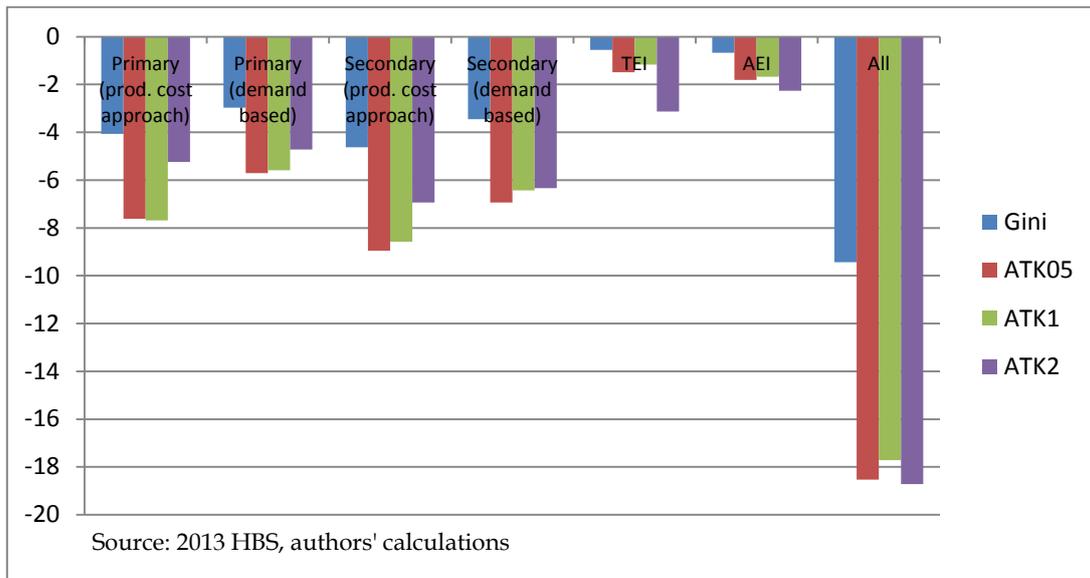


Figure 3b: Distributional Effects of Public Education (2013)



In Figure 3b, the calculations are iterated for the 2013 income distribution. An immediate finding is that the progressivity of education transfers across all levels has increased considerably. The total redistributive effect is found to fluctuate from -6.2% to 11.9% (according to the index and the value of the aversion parameter used) for 2009 and from -9.4% and -18.7% for 2013. This is a rather unanticipated and surprising result. During the 2009-2013 periods the percentage of children being enrolled in private schools decreased dramatically indicating the shrinkage of the private market which, in turn, was triggered by the fall in households' incomes. Intuitively, one could anticipate a deterioration of the progressivity of public education transfers since many relatively well-off households substituted the private good with the public good, (Besley and Coate, 1991). The explanation of this seemingly paradox can be found in the dramatic changes in the relative income positions of several population groups that took place in the 2009-2013 period. Despite that the economic well-being of all population groups dwindled, the impact of the crisis was harsher for families with children and milder (in relative terms) for the elderly and in general for households whose income does not stem directly from the markets (e.g. pensioners). As a relatively large number of families with children moved to lower income quintiles, each euro of public spending directed to it has now a larger inequality-reducing effect.

Conclusions

The scope of our paper is to assess how the progressivity of the Greek public education system changed in a turbulent period during which public spending and households' income plunged. In doing so we measured the progressivity of in-kind public transfers using two methods; the production cost approach which assumes that the value of the transfers is equal to its per capita cost and the demand based approach which yields the average perceived value of in-kind transfers. The demand based approach was not applied with respect to tertiary education transfers since no private market for universities studies exists in Greece. Its application on primary and secondary free state schooling showed that there is a gap between the per beneficiary production cost of the public and the perceived value of the consumers, albeit this gap was reduced between 2009 and 2013.

According to our findings, the progressivity of the education system was increased from 2009 to 2013. This is a rather counterintuitive result. For, the substitution of private with public schooling from a considerable number or relatively well-off families suggests the opposite. However, this regressive effect was completely eliminated by the large income reranking that took place during this period. In particular, a large number of households with children moved to lower income quintiles whilst the relative position of the elderly was improved. Overall, our results highlight that policies which promote intergenerational redistribution should be seriously enter the political agenda.

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