Project no: 028412

AIM-AP

Accurate Income Measurement for the Assessment of Public Policies

Specific Targeted Research or Innovation Project

Citizens and Governance in a Knowledge-based Society

Deliverable 1.5a: The distributional impact of non-cash incomes in Greece

Due date of deliverable: April 2008
Actual submission date: January 2009

Start date of project: 1 February 2006 Duration: 3 years

Lead partner: CERES

Revision: first draft

Aggregate distributional effects of non- cash incomes in Greece

Christos Koutsambelas[1]

Athens University of Economics and Business and CERES

and

Panos Tsakloglou [2]

Athens University of Economics and Business, IZA and CERES

[1] Department of International and European Economics Studies, Athens University of Economics and Business, Pattision Str 76, Derigny Wing,, 5th floor, Athens 10484, Greece. E-mail: ckouts@aueb.gr
[2] Corresponding author: Department of International and European Economics Studies, Athens University of Economics and Business, Pattision Str 76, Athens 10484, Greece. E-mail: tsaklog@aueb.gr

1. Introduction

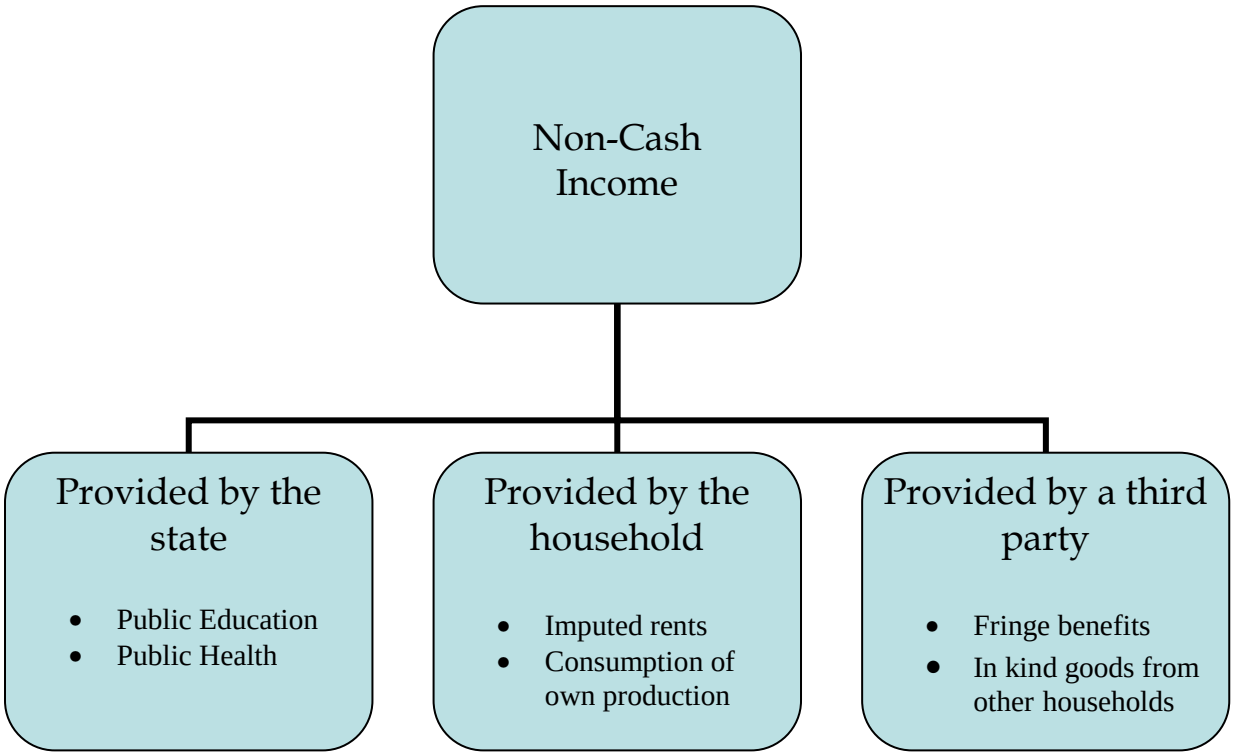
In the previous reports of the AIM-AP project, it was emphasized the bias of many empirical income studies that usually rely on distributions of financial resources thus disregarding non-financial sources. It was also highlighted the importance of accurately measuring non-cash income, not only in improving the international comparability of income studies, but also in correcting possible bias in the measurement of inequality and poverty. In the same spirit, but in a more holistic fashion, the present study is a synthesis of the distributional impact of all non-cash incomes that were assessed in previous parts of the project. Thus, the distributional effect of all non-cash incomes in Greece is defined as the aggregate result of the separate effects of both public non-cash components and private one.

The remainder of the paper discusses our results regarding the distributional impact of non-cash income in Greece and summarizes our empirical approach to measuring their impact and size. The analysis is restricted to non-cash incomes related to education, health, imputed rents, fringe benefits provided by the employer and consumption of own farm and non-farm production. The structure of the paper goes as follows: chapter 2 very briefly describes the methodologies adopted in the estimation of each of the non-cash components, chapter 3 introduces the reader in a variety of statistics that describe the incidence of non-cash incomes in Greece, chapter 4 contains all the inequality and poverty analysis, chapter 5 includes a short discussion of the Greek particularities regarding non-cash income and finally chapter 6 concludes.

2. Methods and concepts.

Ideally, we would like to include in our analysis the incidence of all types of public and non-public benefits and assign in cash equivalent terms their value to each household. Theoretically the range and types of possible non-cash incomes are vast (from public schooling to job satisfaction or leisure time) so such a task would be daunting the least. Thus our analysis is limited by practical reasons and guided by our goals and criteria. Primarily we are interested in upon improving the measures of economic well-being within Greece by adding important and practically

measurable components of in kind income to the income distribution and at the same time facilitate international comparisons. Three broad classes of non-cash incomes were included in our study (choosing as a criterion the source of the component) ; non-cash incomes can be provided either by the state or by the household itself or by a third party. Schematically our analysis deals with the following in kind benefits:



Non-cash incomes provided by the state include public education and health services, imputed rents and consumption of own farm and non-farm production are provided by the household itself and finally there are cases where a third party, for example the employer, provides certain types of in kind benefits. For the sake of convenience and because of their relatively small size non-cash income of own farm and non-farm production and fringe benefits were grouped into a general category under, the not very self-explaining, title "other non-cash incomes".

The basis of all calculation is the 2004-2005 Household Budget Survey (henceforth HBS), which was carried out by the National Statistical Service of Greece. This household survey covers all the private households of the country using a sampling fraction of around 2/1000 (that amounts to a sample containing 6555 households and

17386 individuals) and contains rich information about the consumption, income and socioeconomic characteristics of each of the household and each of the members. The concept of income used here, includes monetary incomes from all sources (such as wages, self-employment earnings, pensions, rents, interest payments, dividends, cash benefits, etc. It is noteworthy that the income variables were provided by the National Statistical Service net of direct taxes, something that makes them more appealing for a distributional study. Thereafter some adjustments were made to the data. All incomes were expressed to constant mid-2004 prices in order to remove the impact of inflation. Also, as it is standard in the literature, distributions of disposable income were equivalized in order to deal with the comparability problem of households of different size. The equivalence scales used are the "modified OECD equivalence scales" (Haagenars, de Vos, Zaidi, 1994), which assign a weight of one to the household head, a value of 0.5 to each of the remaining adults and 0.3 for each child. Finally the time unit is the month and the income unit is the individual in the context of his/her household.

The analysis follows some general principles similar by the one proposed by Smeeding et al (1983), namely whenever it is possible we estimate net imputed values (related cost are deducted from gross imputed values), the value of a public benefit is assumed equal to the amount of money the government spends on it (including both operating and capital outlays) and finally any social externalities are disregarded.

The attribution of the publicly provided education services required the matching of Greek Ministry of Education cost data with the distribution of equivalized disposable income contained in the BHS. Each of the beneficiaries in the sample is identified and imputed to him/her the value of the benefit. The assumption that public education transfers do not create externalities underlies the analysis, also no dynamic effects are considered. In other words, it is assumed that the beneficiaries of the public transfers are exclusively the recipients of the public education services (and the members of their households) and that these services do not create any benefits or losses to the non-recipients (i.e. the taxes that finance the transfers are already there). Regarding the estimation of the monetary value of the transfer it is assumed that it is equal to the average cost of producing the public education services in the corresponding level of education. We also assume that the benefit is shared by all household members (not only the direct beneficiary); in other words, we implicitly

assume that in the absence of the public transfer the burden of financing the provision of education services would be born by the household. Thus the per beneficiary education transfer for educational level i is:

$$b_i^e = \frac{c_i}{n_i}, \quad (1)$$

Where c_i is the total production cost of educational level i and n_i is the number of enrolled students in the corresponding levels. Similar assumptions are standard practice in the analysis of the distributional impact of publicly provided services, [for example Jones(2006), Marical et al (2006), Smeeding et al (1983)]

Similar is the treatment of public health services. Again the value of the transfer is defined as a the per capita cost of the public good. However an important difference is that, in contrast with the case of public education, there is not any distinction between beneficiaries and non-beneficiaries, every member of a household is assumed to enjoy an in kind health transfer, irrespective if he or she did use public health services (Insurance-based approach)[3]. The value of the health transfer is not the same across beneficiaries, but actuarially adjusted according to age so as to account for differences in the need-related value of being covered by health insurance. The utilization of OECD health data[4] yielded tables of public health costs per capita per age group, which form the basis of our calculations. The formula of the per capita health transfer is exactly analogous to (1).

As it is explained in the previous paragraphs, the estimation of the public transfers depends on the cost structure of the respective public goods, this made necessary the use of non-BHS information (Ministry of Education and OECD data). Howver, regarding private non-cash incomes the source of information is the budget survey. In order to estimate the imputed income derived from homeownership we used a price determination model. The utilization of information from the actual rental market (subsample of renters) yielded a hedonic model which estimate the rent is a function of housing characteristics. Afterwards the model is applied on the sub-sample of homeowners, thus generating a prediction of the fictitious rent the owners would

[3] in Greece, 95% of the population has social insurance and the other 5% of the uninsured population, at least in principle, can receive treatment in a public hospital.

[4] OECD, Health at a glance (2006).

pay, weren't they owners. In order to avoid a possible overestimation of the welfare the homeowners enjoy, we also deducted any owner specific costs[5].

$$B^r = r - c$$

Where r is the gross fictitious rent of the household and c are the sum of owner specific costs (mortgage interest payments, repairs etc).

Finally the case of the other non-cash income was very simple, for Greek household budget survey contains explicit monetary estimates of the value of the fringe benefits, consumption of own farm and non-farm production. All four types of non-cash income were estimated, they were added up and attributed to the household members (according to our attribution rules), so as to build the post-benefit income distribution. This augmented distribution, together with all the minor distributions that isolate each in-kind transfer separately, are the basis of the inequality and poverty analysis that follows.

3. The size and impact of non-cash incomes in Greece.

Table 1 depicts estimates of the mean transfer per capita for each quintile for every type of non-cash income plus an aggregate category which examines the total impact of non-cash incomes from private sources (column C), one for the total impact of non-cash incomes from public sources (column F) and finally one that includes all types of estimated in-kind goods (column G). The average value of the per capita imputed rent gets higher as we move up to higher quintiles (from 62.2 euros for the poorest quintile to 102.7 euros for the richest). This reflects the fact that richer households have more expensive houses. Other non cash incomes are concentrated more to the tails of the distribution and as a consequence the lower mean other non-cash income is enjoyed by the middle classes (lowest value is 18.2 euros for the third quintile). As far as non-cash incomes from public sources are concerned we observe a declining pattern of mean health transfers (lower mean values as move up the income distribution) and an almost declining for education transfers. The aggregate mean in-kind transfers exhibit a pattern of type U, that is mean transfers initially decline (215.6 euros for poorest quintile, 205.1 for the second quintile and lowest value for third quintile at 191.5) but from third quintile and afterwards increase

[5] The most important owner specific cost are the mortgage interest payments.

(193.8 for the fourth quintile and finally 213.4 for the fifth). However it is important to note that these estimates alone serve only as a description of the size of the mean non-cash income enjoyed by each quintile and no definitive conclusions can be extracted about their redistributive impact, for these estimation neglect the relative importance of the non-pecuniary income to disposable income.

This is done in Table 2, which depicts proportional increases of disposable income. Across all columns of the table it is apparent a declining pattern of proportional increases of disposable income. As we move up the income distribution, the relative importance of non-cash income withers. This is an important finding, for it shows that the average rate of the non-cash income enjoyed by an income unit declines with income. Definitely this is a clear sign of progressivity. Proportional increases due to public non-cash income is higher than those induced by private non-cash incomes, mainly because of the strong effect of non-cash health transfers (health transfers alone increase disposable income by almost 11%). When we examine each non-cash income separately imputed rents cause an increase to disposable income by about 25% for the poorest quintile which gradually declines to 8.3% when we move to the upper part of the income distribution (richest quintile), the corresponding numbers for other non-cash income are milder: 12.3%-1.7%. It may be the case for other non-cash incomes that are concentrated to both tails of the distribution, however they really matter only for the low-income households. Corresponding numbers for public education and health transfers are 21.8%-2.9% and 33.2%-5% respectively. Again impact on poor quintiles is disproportional strong. Finally when we estimate the aggregate proportional effect of all non-cash incomes we note a very significant change in the disposable income of all quintiles (increase by about 34%), especially for the poorest quintile which disposable income nearly doubles (92.6%).

4. Inequality and Poverty Analysis.

4.1 Changes in the level of inequality and poverty

This sub-section is primarily devoted to the examination of the impact of non-cash income to aggregate inequality and poverty. Table 3 examines the impact of each of the non-cash components on aggregate inequality; that is, it reports the proportional change in a number of inequality indices when we move from the distribution of

disposable income to the distribution of disposable income augmented by the in-kind transfers. As inequality indices we chose the widely used Gini index and two members of the parametric family of Atkinson (1970) indices. The value of the inequality aversion parameter in the latter is set at (e=0.5 and e=1.5). Both indices satisfy the desirable properties for an inequality index (anonymity, mean independence, population independence, transfer sensitivity). Higher values of e make the Atkinson index relatively more sensitive to changes closer to the bottom of the distribution while, in practice, the Gini index is relatively more sensitive to changes around the median of the distribution [Cowell (2000), Lambert, (2001)]. Given the results of table 2, it is not surprising that we observe a significant decline in inequality for all types of non-cash incomes. The highest decline in inequality is due to public health transfers (Gini index declines by about -11% and the two Atkinson indices by about -21% and -23% respectively), on the contrary other non-cash income exhibits the least contribution to inequality decline (Gini index is reduced only by about -3.4%, Atkinson for e=0.5 is reduced by about -7% and Atkinson for e=1.5 by about -8.5%) mainly because of its small size. The changes in inequality induced by the inclusion of public non-cash is clearly higher than the corresponding changes induces by the inclusion of non-cash incomes from private sources (Gini index is reduced by -17% due to public non-cash incomes vs. a -8.3% reduction due to private non-cash incomes, the corresponding numbers for Atkinson e=0.5 is -16.6% and -31% and for Atkinson e=1.5 is -19.3% and -32.7%). As far as aggregate effects are concerned and given the size of all measured non-cash incomes, it comes as natural that the estimated decline in inequality is very significant. Inequality indices decline from -22.2% for Gini index to -42% for the Atkinson, e=1.5 index. Graphs 1-6 depict differences between the Lorenz curve for the augmented distribution and the baseline distribution. The Graphs are in accordance with the quantitative results of Table 3. The curves are always positive for all non-cash income, that is Lorenz curves for augmented distributions always dominate the Lorenz curve for baseline distribution. This is a strong result whose interpretation is that inequality is unambiguously reduced whatever the choice of the index of relative inequality we make and whatever the value of the social aversion inequality parameter. Also the grey area around the line of a curve is a graphical depiction of the confidence interval of the difference between the coordinates of the

two Lorenz curves into question. As it is apparent from the graphs, the cases of Lorenz dominance we cases we found are clearly statistically significant.

Last three rows of Table 3 focus on the effects of non-cash incomes on relative poverty. More specifically, it reports the changes in the values of a number of poverty indices when we move from the distribution of disposable income to the "augmented" distribution of resources that includes disposable income as well as the value of in-kind transfers. We adopted the approach of Eurostat and set the poverty line equal to 60% of the median of the corresponding distribution (that is the line moves with the median of the distribution). The poverty indices selected belong to the parametric family of Foster et al (1984) (FGT). When the value of the poverty aversion parameter is set at a=0, the index becomes the widely used "head count" poverty rate, that is the share of the population falling below the poverty line. When a=1, the index becomes the "normalized income gap ratio", while when a=2 the index satisfies the axioms proposed by Sen (1976) (anonymity, focus, monotonicity and transfer sensitivity) and is sensitive not only to the population share of the poor and their average poverty gap, but also to the inequality in the distribution of resources among the poor. The results reported in Table suggest that poverty is reduced according to all versions of FGT index after the inclusion of non-cash income in the concept of resources. Moreover the poverty reducing effect of non-cash income is enhanced for higher values of the poverty sensitivity parameter alpha (public education is an exception where the proportional change of normalized income gap ratio is lower than the proportional change of the headcount ratio). Also it is noteworthy that the bulk of poverty reduction can be attributed to the non-cash incomes provided by the state [FGT (a=2) is reduced by -61.4% due to publicly provided health and education transfers when the corresponding figure for the combined effect of imputed rents and other non-cash incomes is -43.2%]. The overall poverty reduction is quite impressive, headcount ratio is reduced by almost -50%, the normalized income gap ratio by -67% and the most poverty-sensitive measure FGT (a=2) by -77.5% indicating that non-cash income not only reduces significantly poverty but also reduces inequality of resources among the poor.

As it was stated above, regarding poverty measurement we adopted the approach of Eurostat , that is we set the poverty line equal to 60% of the median of the distribution. However such an ad hoc methodological choice, no matter how

convenient for international comparisons is, it may be open to criticism. Graphs 7-9 attempt to address these critics by plotting the FGT curves of the income distribution before and after the inclusion of each of the non-cash incomes. These curves associate the value of the poverty index with different poverty lines. The alpha sensitivity parameter take the value 0,1 and 2 in Graphs 7,8 and 9 respectively. In every case the FGT curves of the augmented distributions lie wholly above the FGT curve of the baseline distribution. In the literature of poverty measurement these are cases of restricted first, second and third degree stochastic dominance [the order of dominance depends on the values of the alpha parameter, Atkinson (1987)] that enables us to conclude that our estimated poverty reductions are not sensitive to the choice of the poverty line.

4.2 Decomposition Analysis.

Decompositions of aggregate inequality and poverty attempt to answer the question "how does the inclusion of non-cash income in the broader concept of resources affect the structure of inequality and poverty?". This is primarily accomplished by the decompositions of inequality and poverty by population sub-groups that are presented in Tables 4 and 5. Table 4 reports the results of inequality decomposition analysis by population subgroup using as index of inequality the mean logarithmic deviation (Theil (1967), Shorrocks (1984)), which is a member of the Generalized Entropy Family. Its algebraic formula is:

$$I = \frac{1}{n}\sum_{i=1}^{n} \log\left(\frac{\bar{y}}{y_i}\right)$$

Mean logarithmic deviation (MLD) not only satisfies the mean independence axiom and the principle of transfers, but also it is strictly additively decomposable. A property which is more relevant to this section, where the population is partitioned into mutually exclusive and exhaustive groups according to household type, socioeconomic group and educational level of the household head and age of the population member. Finally compared with other inequality measures such as the

Gini index, MLD is considered as more sensitive to changes at the lower part of the income distribution.

After the inclusion of non-cash incomes aggregate inequality (as it is measured by the mean logarithmic deviation) declines by almost -42%. When decomposing MLD inequality within each subgroup always declines irrespective of the partitioning of the population, as well as the within and between inequality. As far as the contributions of each subgroup to aggregate inequality is concerned (columns E and F), the induced changes are rather small, however it is noteworthy that the contribution of the households headed by a white collar worker or a tertiary educated person rises in contrast with the group of households headed by a "primary or less" educated person or a blue collar worker and the group of elderly, whose contribution to aggregate inequality declines. Such changes are the reflection of the fact that the inequality within the latter group declines faster than the aggregate inequality.

Table 5 performs poverty decomposition by subgroups exploiting the property of additive decomposability the FGT index possess. The differentiation of population was done by the same criteria as in the preceding inequality decomposition analysis. Also different values of the parameter alpha are used (as was the case in table 4), that is sensitivity parameter gets the values 0,1 and 2. The results suggest that poverty risk declines in all population subgroups especially in groups vulnerable to poverty such as the elderly (headcount ratio declines by about -61%, normalized poverty gap by -81.5% and FGT2 by -90.4%), pensioners (by -55.5%, -76.7% and -86.6% respectively), mono-parental families and families managed by a low-educated head. Regarding the significant decline in elderly poverty reductions we observed, our results confirm previous findings of the literature that highlight the role of non-cash income in redistribution across the life course of the individuals [Smeeding et al (1993), Frick and Grabka (2003)].

4.3 Decomposition by factor components and the elasticity of inequality.

In this section we disaggregate the full income of individuals (that is the equivalized income of individuals after the inclusion of non-cash income) in the following factor components; disposable income and non-cash income derived from imputed rent,

education, health and other non-cash to assess the contribution of these sources to total inequality. Following Pyatt et all (1980) Gini index can be written as:

$$G = \sum_{k=1}^{K} \frac{m_k}{m} R_k G_k \qquad (1)$$

where m_k and m are the mean of component k and total income respectively. R_K is the relative correlation coefficient of component k (that is the ratio of the covariance of component k with the total income rank and the covariance of component k with its own rank) and finally G_K is the Gini index for the component k. (1) can be rearranged (divide both parts of the equation by G) so as to yield:

$$\Sigma_{k=1}^{k} w_k g_k = 1 \qquad (2)$$

where w_k is the share of component k in total income and g_k is the relative concentration coefficient of component k in aggregate inequality. From the estimation of g_k we can detect whether an increase in the income component k will increase or decrease aggregate inequality. In fact if $g_k > 1$ then inequality will increase and if $g_k < 1$ inequality will decrease. Furthermore from (1) we can calculate the elasticity of inequality with respect to a proportional change in component k.

$$e_k = \frac{dG}{dm_k} \frac{m_k}{G} = w_k g_k - w_k \qquad (3)$$

The elasticity of inequality has a very appealing interpretation. Its sign reveals the progressive or regressive impact of a marginal change of the component. If elasticity of inequality is negative, then an increase in the mean value of the income source will cause a decline in inequality and vice versa. Furthermore the value of the index contains also a quantitative information in that it can be interpreted as the proportional change in inequality due to an proportional increase in the mean value of the source. This may indeed by very useful for the assessment of public policies which target, among other goals, to inequality elimination. As it is reported by table 6 , elasticity of inequality is always negative for all types on non-cash incomes confirming again their strong progressive characteristics. As far as the marginal impact of a potential increase in the mean value of non-cash income component, as one would expect, non-cash income derived from public sources (health and education transfers) exhibit the largest absolute values of the elasticity of inequality (

0.093 and 0.045 for in kind health and education transfers vs. 0.212 and 0.192 for imputed rents and other non-cash income respectively).

5. The Greek context

Understanding the distributional consequence of non-cash incomes would be facilitated if the institutional surroundings and the particularities of the Greek case are highlighted. Across countries, also, there are important differences in the mechanisms of the distributions of non-cash income, either there are publicly provided such as public education services or privately ones such as the imputed rents. Thus important particularities are noteworthy because can not only explain the distributional impact of a non-cash income at the national level, but also help us understand the differential impact of non-cash income in cross-national comparisons.

And Greece is not short of such particularities. Some of them stem from the interactions of private and public sector, as it is the case for education. In all European countries public and private education sector coexist. In Greece this is done only for primary and secondary level. At the tertiary level degrees offered from private institutions, which are treated as commercial enterprises rather than educational institutions, are not officially recognized as equivalent to those of public institutions. Also according to the Greek constitution, education is provided free of charge at all levels and students entrance operates on a numerus clausus rule. Whether a student will enter in the tertiary institutions depend upon his or hers performance on the general examinations that take place annually. Thus from an economic point of view, tertiary education in Greece is a quantity rationed public good. Its high demand remains unsatisfied, a fact that has two consequences:

a) As a result of the households' keen interest in the general examinations a very large number of private, costly crammer schools assisting the candidates have sprouted, operating in parallel with the official education system but, in fact, substituting it in many respects.

b) A large number of Greeks chose to study abroad[6].

[6] OECD estimates suggest that over 50,000 Greek students study abroad, most of them in British Universities, and Greece's number of tertiary education students studying abroad is the sixth in the OECD (behind South Korea, Germany, Japan, France and Turkey), but by far the first when it comes to tertiary students studying abroad per capita.

The first has implicit distributional implications in that private tuition may increase the probability of a student of succeeding in general examinations. If we assume that poor households cannot finance such an educational instrument or if they can it will have a disproportional impact on their disposable income, then we can deduct that widespread *parapaedia* (as the institution of private crammer schools, rather derogative, is called in Greece) is a source of regressivity. Regarding the second point, no clear distributional implications can be detected, however it has important political, social and economical ones that definitely affect the public debate on tertiary education issues.

Regarding public health, a serious concern are horizontal inequities that have detected in the Greek Health Care system. A major inequity stems from the widespread informal payments that are directed to National Health System (NHS). There is a lot of anecdotal evidence that many patients bribe the NHS stuff in order to jump the long waiting lists, have access to better facilities, or have treatment by doctors of their choice. Whichever the form of informal payments, it is straightforward that they create severe inequities in access, supply and quality of provided medical services. The presence of out of pocket payments definitely violates the underlying principles of our analysis, that is fair distribution of benefits (patients of equal need receive equal treatment). So if we reasonably assume that the distribution of out of pocket payments is skewed towards the upper part of the income distribution, one can claim that the progressivity of in kind health transfers ,as it was estimated in our context, is overestimated.

Moving to non-cash income privately provided a significant particularity of the Greek house market is the prevalence of homeownership across population and especially in the rural areas. This characteristic which has traditional and cultural explanations (for example house is a very common form of intergenerational transfer) shapes the results and proves that at least in the Greek context housing income reduces the poverty risk of vulnerable social groups such as rural households or the elderly. The latter groups also benefit from auto-consumption of both non-farm and farm productions. Greece has still a large agricultural sector which explains the non-monetization of some kinds of household production we observed.

6. Conclusion

This paper attempts to estimate the aggregate the distributional impact of all non-cash income by combining the separate effects of in kind public education and health transfers, imputed rents, consumption of own farm and non-farm production and fringe benefits (the three later were categorized as "other non-cash income"). We found extremely strong redistributive effects due to the inclusion of non-cash income. Significant drops in inequality and poverty were observed irrespective of the choice of the index or the choice of the sensitivity parameter. The effect of the publicly supplied in kind goods contribute more to inequality and poverty reduction than the privately provided ones. However the contribution of the latter is also very significant. If want to classify non-cash incomes according to their progressivity, first place definitely belongs to in-kind health transfers, the second place to public education transfer, next to imputed rents and finally other non-cash income exhibit the mildest progressivity mainly because its relatively small size. However when we broke each non-cash component into its subcomponents results are less monotonous. For example tertiary education level transfers are of negligible distributional impact but the aggregate distributional impact of public education is clearly redistributive because of primary and secondary education level transfers. The same for imputed income derived from homeownership which progressivity is the combination of the strong progressivity of outright owners' imputed rents and the mild regressivity of the housing income of homeowners who are still on mortgage. Also auto-consumption from own farm and non-farm production are concentrated on low part of the income distributions in contrast with fringe benefits which are found in the upper part of the income distribution, however the larger size of the former dictates their aggregate distributional impact.

Also important is the identification of the specific subpopulation groups who benefit more from non-cash incomes. We found that groups such as the elderly, people who live in rural areas, household's which are managed by low-educated, blue collar workers or pensioners enjoy a lower poverty risk due to non-cash incomes.

The results confirm previous literature which has highlighted the importance of including non-cash income in income studies [for example Smeeding et al (1993),

Evandrou et al (1993), Steckmest (1996) etc] and the serious biases that can be caused by their omission. Cross-national or inter-temporal comparisons definitely should attempt to exploit their informational resources in order to estimate and thereafter incorporate non-cash income in their analysis.

Nevertheless measuring non-cash income is not a task without methodological, and interpretative problems and limitations.

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Appendix-Tables

Table 1 : Mean Non-Cash Income per Capita

Quintiles	A	B	C	D	E	F	G
1	62,2	29,7	91,9	43,4	80,3	123,7	215,6
2	63,9	24,4	88,3	44,5	72,4	116,8	205,1
3	64,5	18,2	82,7	44,0	64,8	108,9	191,5
4	72,9	19,9	92,8	41,0	60,0	101,0	193,8
5	102,7	20,7	123,4	30,4	59,5	90,0	213,4
Total	73,2	22,6	95,8	40,7	67,4	108,1	203,9

Column A: Imputed Rents, B: Other non-cash income, C: Imputed rents plus other non cash income, D: Education transfers, E: Health transfers, F: Education and Health transfers, G: All

Table 2 : Proportional Increases in Disposable Income

Quintiles	A	B	C	D	E	F	G
1	25,3	12,3	37,6	21,8	33,2	55,0	92,6
2	15,6	6,1	21,7	13,2	18,1	31,3	53,0
3	12,4	3,5	15,9	9,8	12,5	22,3	38,2
4	10,5	2,9	13,5	6,8	8,7	15,5	29,0
5	8,4	1,7	10,1	2,9	5,0	7,9	18,0
Total	11,7	3,6	15,4	7,7	10,9	18,6	34,0

Column A: Imputed Rents, B: Other non-cash income, C: Imputed rents plus other non cash income, D: Education transfers, E: Health transfers, F: Education and Health transfers, G: All

Table 3 : Changes in Inequality and Poverty

	A	B	C	D	E	F	G	H
Gini	0,3217	-5,3	-3,4	-8,3	-6,5	-10,9	-16,9	-22,2
Atkinson0.5	0,0849	-11,1	-7,1	-16,6	-12,2	-20,8	-30,9	-39,6
Atkinson1.5	0,2406	-13,3	-8,5	-19,3	-11,2	-23,3	-32,7	-42,0
FGT0	0,1979	-14,0	-10,2	-22,3	-13,4	-27,3	-37,7	-49,1
FGT1	0,0534	-20,5	-14,2	-31,9	-11,7	-38,3	-51,6	-67,2
FGT2	0,0230	-29,8	-19,9	-43,2	-14,5	-47,7	-61,4	-77,5

A: Value the index for baseline distribution, B: proportional change due to imputed rents, C: proportional change due to other non-cash income, D: proportional change due to private non-cash income, E: proportional change due to public education transfers, F: proportional change due to public health transfers, G: proportional change due to public transfers, H: proportional change due to all non-cash incomes.

Table 4 : Inequality Decomposition by subgroups

Characteristic of household or household head	A	B	C	D	E	F	G	H	I
Household type									
Older single persons or couples (at least one 65+)	7.8	0.1391	0.0666	-52.10	6.06	5.08	71.4	82.7	15.8
Younger single persons or couples (none 65+)	18	0.2271	0.1253	-44.84	22.84	22.04	98.4	98.8	0.4
Couple with children up to 18 (no other HH members)	33.6	0.1793	0.1038	-42.07	33.65	34.08	103.5	104.8	1.3
Mono-parental household	1.5	0.2109	0.0910	-56.87	1.77	1.33	82.0	93.2	13.7
Other household types	39.1	0.1512	0.0937	-38.03	33.03	35.80	104.3	100.2	-3.8
Within groups inequality		0.1742	0.1006	-42.22	0.97	0.98			
Between groups inequality		0.0048	0.0017	-64.53	0.03	0.02			
Socioeconomic group of HH head									
Blue collar worker	23.3	0.0949	0.0581	-38.83	12.36	13.22	88.5	88.1	-0.5
White collar worker	14.9	0.1024	0.0692	-32.38	8.52	10.08	137.1	129.2	-5.8
Self-employed	23.3	0.2698	0.1501	-44.37	35.12	34.17	108.0	107.9	-0.1
Unemployed	2.3	0.1387	0.0763	-45.01	1.78	1.71	71.2	75.1	5.5
Pensioner	27.9	0.1675	0.0884	-47.23	26.11	24.10	89.5	92.8	3.6
Other	8.4	0.1750	0.0874	-50.04	8.21	7.18	86.7	90.6	4.5
Within groups inequality		0.1646	0.0925	-43.82	0.92	0.90			
Between groups inequality		0.0144	0.0099	-31.35	0.08	0.10			
Educational level of HH head									
Tertiary education	20.4	0.1368	0.0973	-28.91	15.59	19.38	146.9	136.6	-7.1
Upper secondary education	27	0.1465	0.0847	-42.16	22.09	22.34	101.2	101.6	0.4
Lower secondary education	13	0.1490	0.0817	-45.19	10.82	10.37	89.0	90.6	1.9
Primary education or less	39.5	0.1599	0.0781	-51.15	35.28	30.14	78.6	83.1	5.8
Within groups inequality		0.1502	0.0842	-43.93	0.84	0.82			
Between groups inequality		0.0288	0.0181	-37.04	0.16	0.18			
Age of population member									
Below 25	27	0.1713	0.0963	-43.78	25.84	25.41	95.9	98.6	2.9
25-64	52.5	0.1741	0.1085	-37.69	51.07	55.65	109.2	105.0	-3.8
Over 64	20.6	0.1720	0.0853	-50.40	19.79	17.17	82.2	89.3	8.7
Within groups inequality		0.1729	0.1005	-41.91	0.97	0.98			
Between groups inequality		0.0061	0.0019	-68.64	0.03	0.02			
ALL		0.1790	0.1024	-42.82					

A: Population Share. B: Mean Log Deviation (Disposable Income). C: Mean Log Deviation (Disposable Income + non-cash incomes). D: % Change in Inequality. E: % Contribution to Aggregate Income Inequality (Disposable Income). F: % Contribution to Aggregate Income Inequality (Disposable Income + non-cash incomes). G: Relative Income Position (Disposable Income). H: Relative Income Position (Disposable Income + non-cash income). I: % Change in Relative Position

Table 5: FGT Decomposition by Population Subgroups

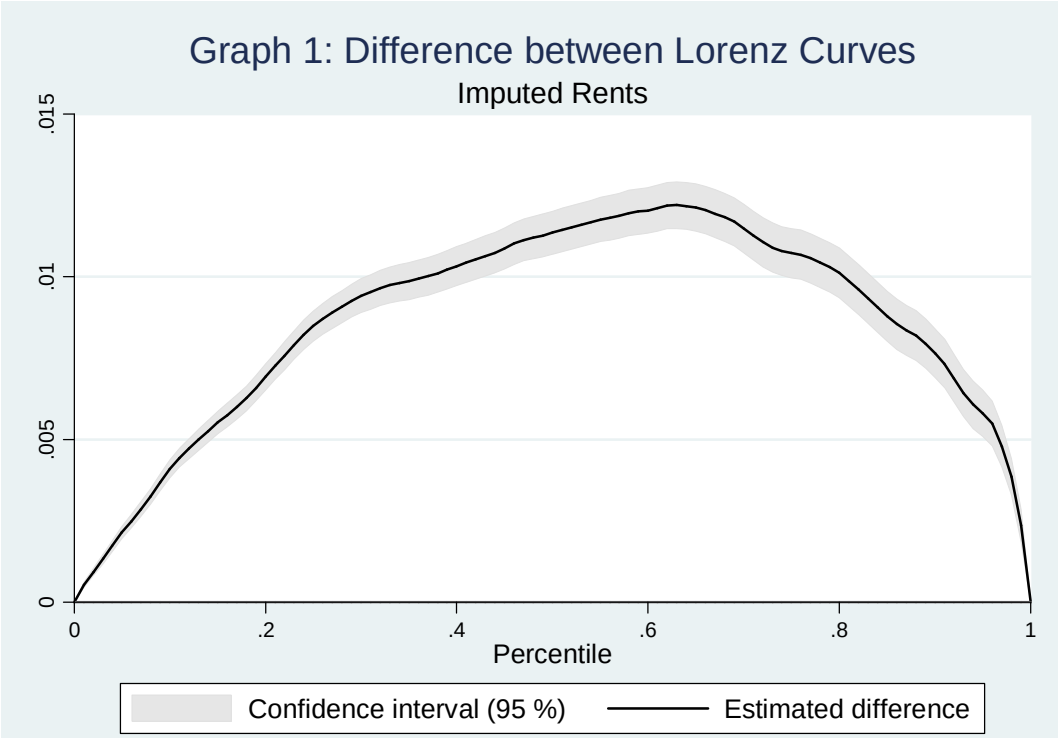
Characteristic of household or household head	Popul. Share	FGT0				FGT1				FGT2			
		A	B	C	D	A	B	C	D	A	B	C	D
Household type													
Older single persons or couples (at least one 65+)	7.8	0.379	-67.9	14.9	9.4	0.092	-87.3	13.5	5.2	0.033	-93.9	11.1	3.0
Younger single persons or couples (none 65+)	18.0	0.238	-46.8	21.7	22.7	0.075	-66.8	25.3	25.6	0.036	-77.9	28.1	27.7
Couple with children up to 18 (no other HH members)	33.6	0.186	-48.0	31.5	32.2	0.050	-65.7	31.4	32.8	0.022	-75.7	31.8	34.3
Mono-parental household	1.5	0.288	-69.8	2.2	1.3	0.088	-78.6	2.5	1.6	0.049	-86.5	3.2	1.9
Other household types	39.1	0.150	-40.9	29.7	34.5	0.037	-58.2	27.3	34.8	0.015	-71.1	25.8	33.1
Socioeconomic group of HH head													
Blue collar worker	23.3	0.159	-34.9	18.7	23.9	0.034	-55.0	14.8	20.3	0.012	-68.6	12.1	16.9
White collar worker	14.9	0.035	-50.5	2.6	2.6	0.005	-50.2	1.3	1.9	0.001	-52.5	0.6	1.3
Self-employed	23.3	0.243	-46.9	28.6	29.9	0.079	-66.0	34.5	35.7	0.039	-75.7	39.4	42.6
Unemployed	2.3	0.305	-46.4	3.5	3.7	0.083	-55.1	3.6	4.9	0.037	-66.2	3.7	5.6
Pensioner	27.9	0.253	-55.5	35.6	31.2	0.066	-76.7	34.5	24.5	0.026	-86.6	32.0	19.0
Other	8.4	0.259	-58.8	11.0	8.9	0.073	-63.4	11.5	12.9	0.034	-73.0	12.3	14.7
Educational level of HH head													
Tertiary education	20.4	0.043	-44.0	4.4	4.9	0.009	-52.3	3.6	5.2	0.003	-59,0	2.8	25.9
Upper secondary education	27.0	0.152	-48.3	20.7	21.1	0.043	-62.0	21.7	25.1	0.019	-69,8	22.3	30.0
Lower secondary education	13.0	0.221	-47.0	14.5	15.1	0.053	-62.0	13.0	15.0	0.025	-76,2	13.9	14.7
Primary education or less	39.5	0.302	-50.2	60.2	58.8	0.083	-70.9	61.6	54.5	0.035	-81,5	60.9	50.1
Age of HH member													
Below 25	27.0	0.205	-50.0	27.9	27.4	0.057	-66.7	28.7	29.2	0.025	-76.5	29.5	30.9
25-64	52.5	0.152	-38.7	40.4	48.6	0.041	-56.5	40.5	53.6	0.018	-69.5	42.0	56.9
Over 64	20.6	0.305	-61.4	31.8	24.1	0.080	-81.5	30.9	17.4	0.032	-90.4	28.6	12.2
All		0.198	-49.1			0.053	-67.2			0.023	-77.5		

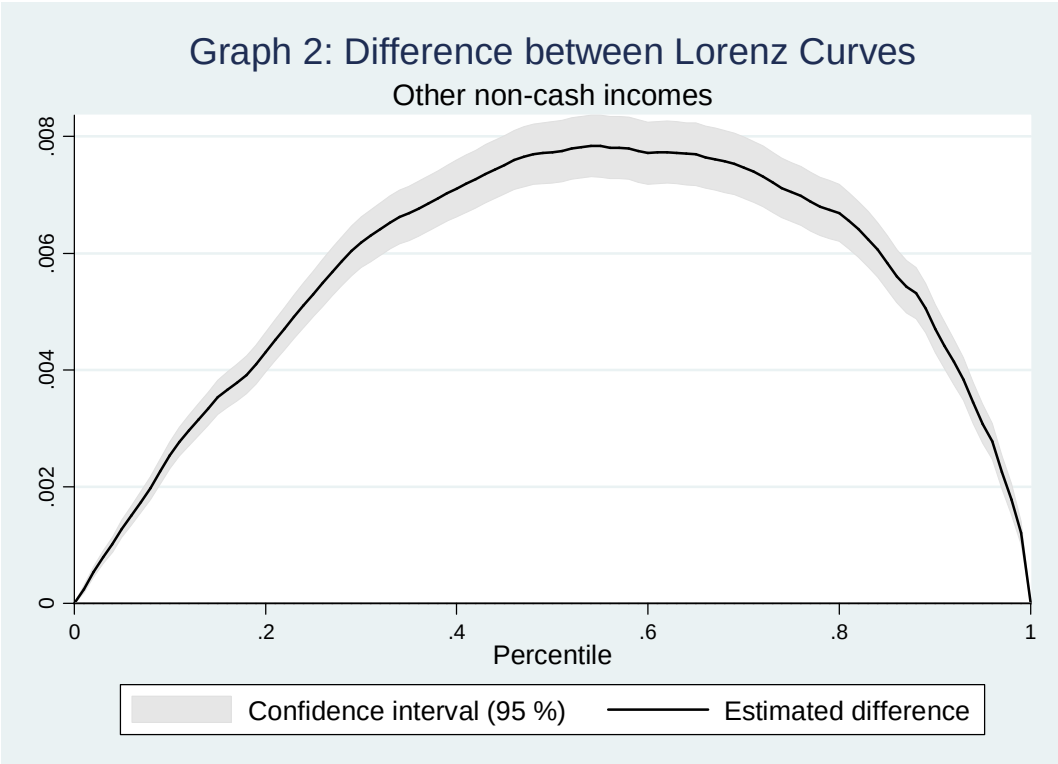
A: Value of the index (baseline distribution). B: change in poverty (after the inclusion of non-cash income). C: contribution to aggregate poverty (baseline distribution). D: contribution to aggregate poverty (after the inclusion of non-cash income)

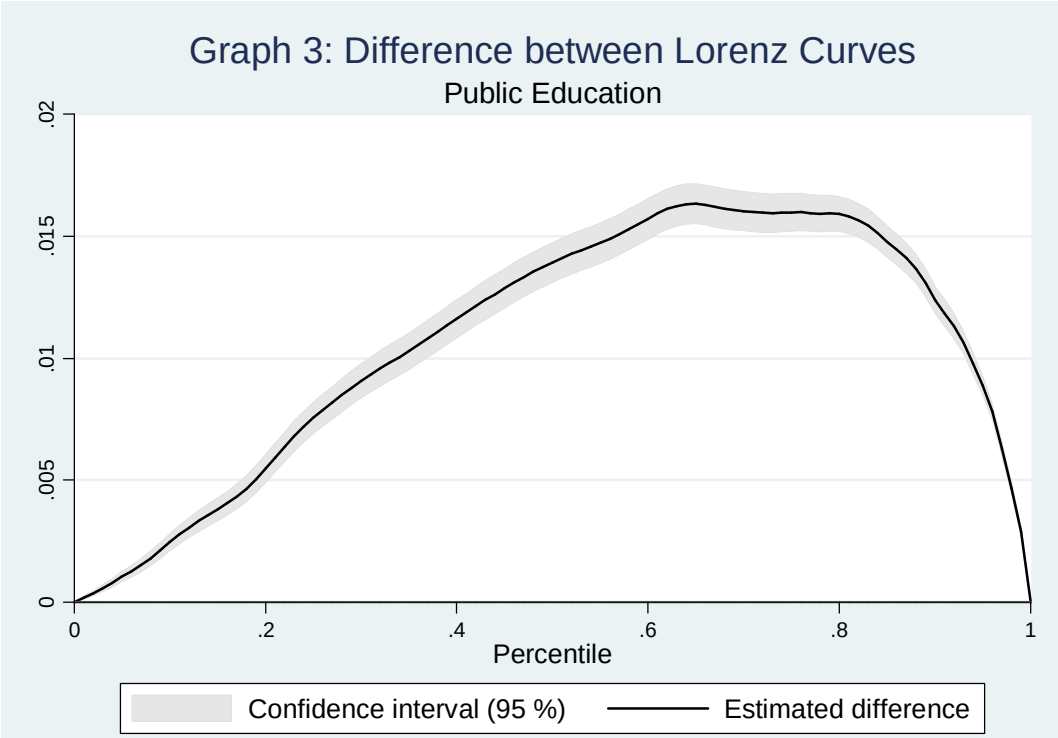
Table 6: Inequality Decomposition by sources

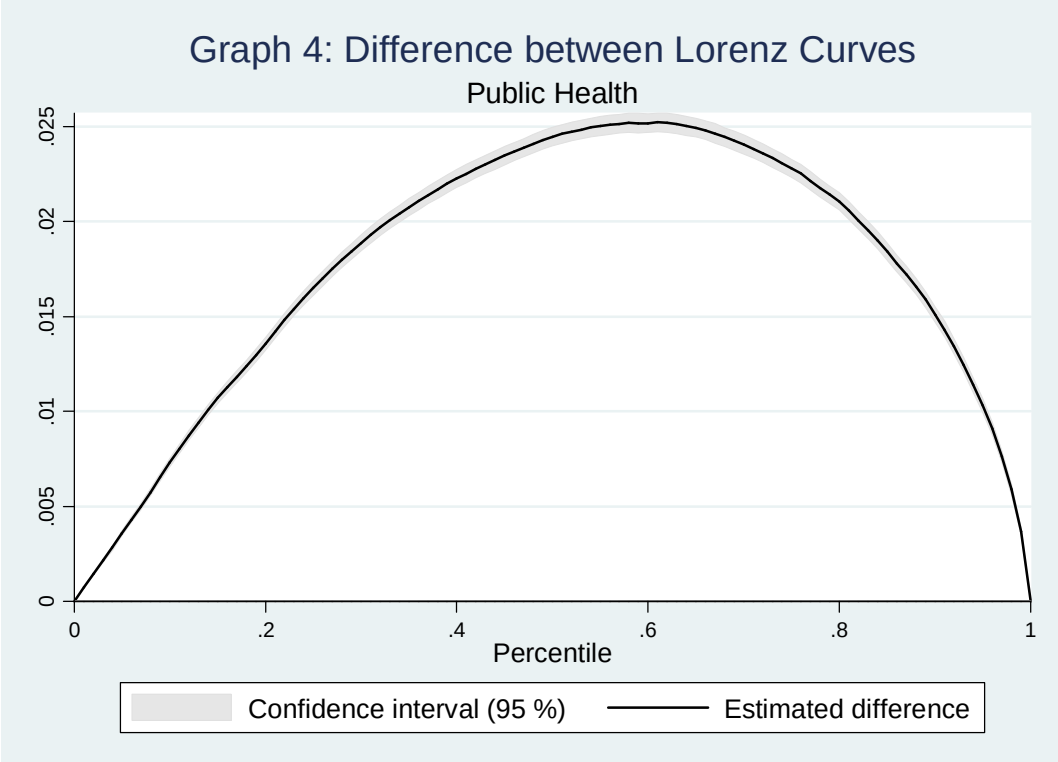
	A	B	C	D	E	F
Baseline	0,7464	0,9644	0,3217	0,2316	0,9254	0,1790
Education Transfers	0,0574	0,0779	0,6809	0,0030	0,0122	-0,0452
Imputed Rents	0,0877	0,4159	0,4565	0,0166	0,0665	-0,0212
Health Transfers	0,0814	-0,1573	0,2370	-0,0030	-0,0121	-0,0935
Other non-cash Income	0,0272	0,0986	0,7492	0,0020	0,0080	-0,0192
Total	1,0000	1,0000	0,2503	0,2503	1,0000	0,0000

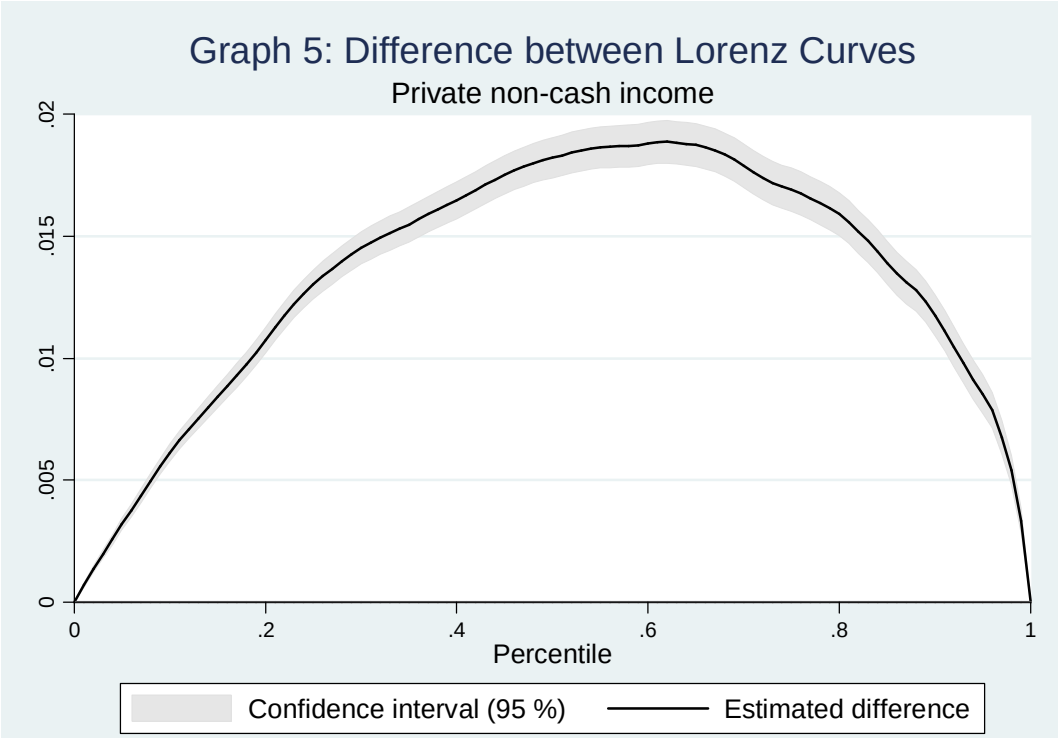
Column A: Income shares, Column B: Gini Correlation (the ratio of concentration coefficient to Gini index), Column C: Gini index, Column D: Absolute Contribution (the product of income share, Gini correlation and Gini index, Column E: Relative Contribution (the ratio of Absolute Contribution to Total inequality) and Column F: Elasticity of Inequality.

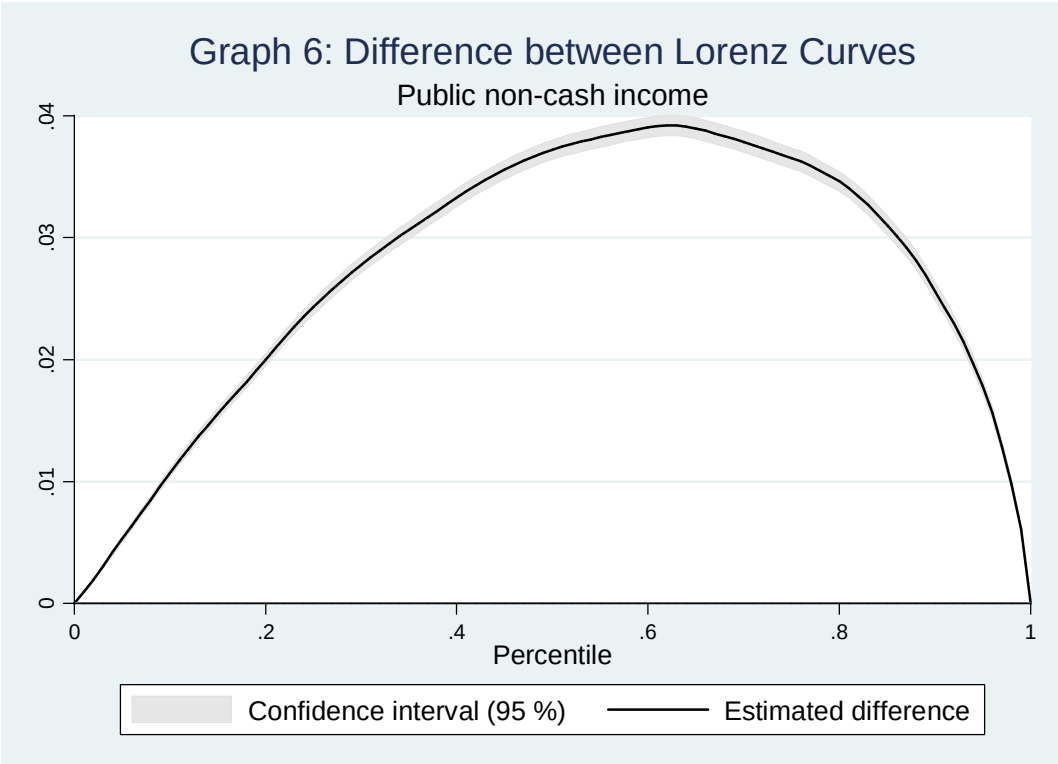

Graph 1: Difference between Lorenz Curves
Imputed Rents
.015
.01
.005
0
0
.2
.4
.6
.8
1
Percentile
Confidence interval (95 %)
Estimated difference

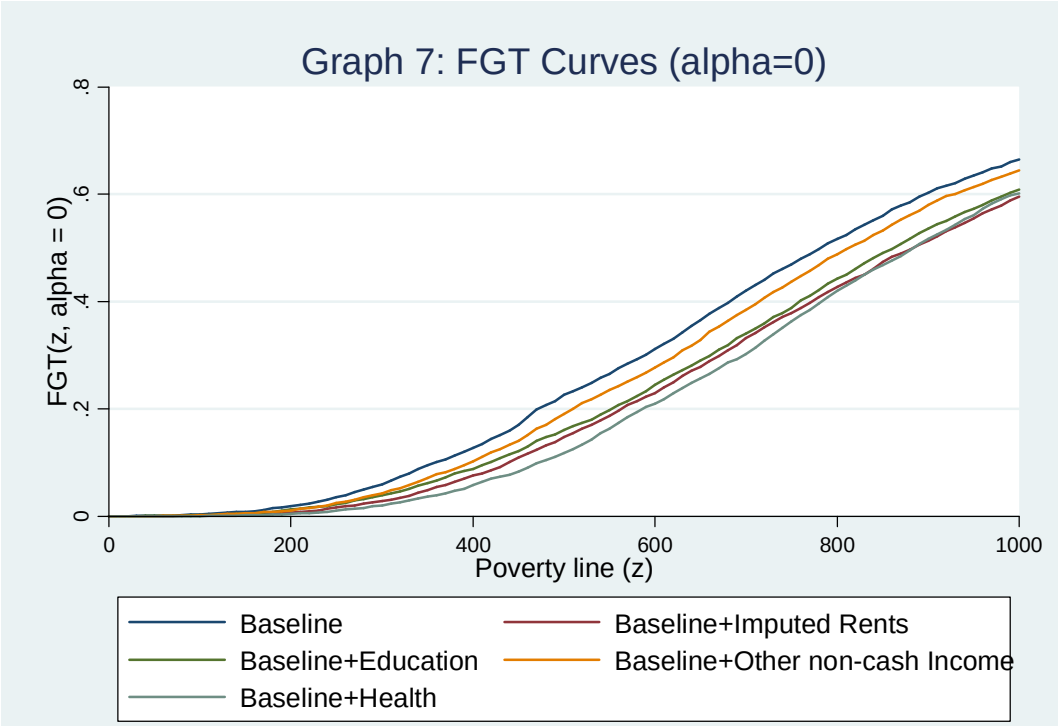

Graph 2: Difference between Lorenz Curves
Other non-cash incomes
.008
.006
.004
.002
0
0
.2
.4
.6
.8
1
Percentile
Confidence interval (95 %)
Estimated difference

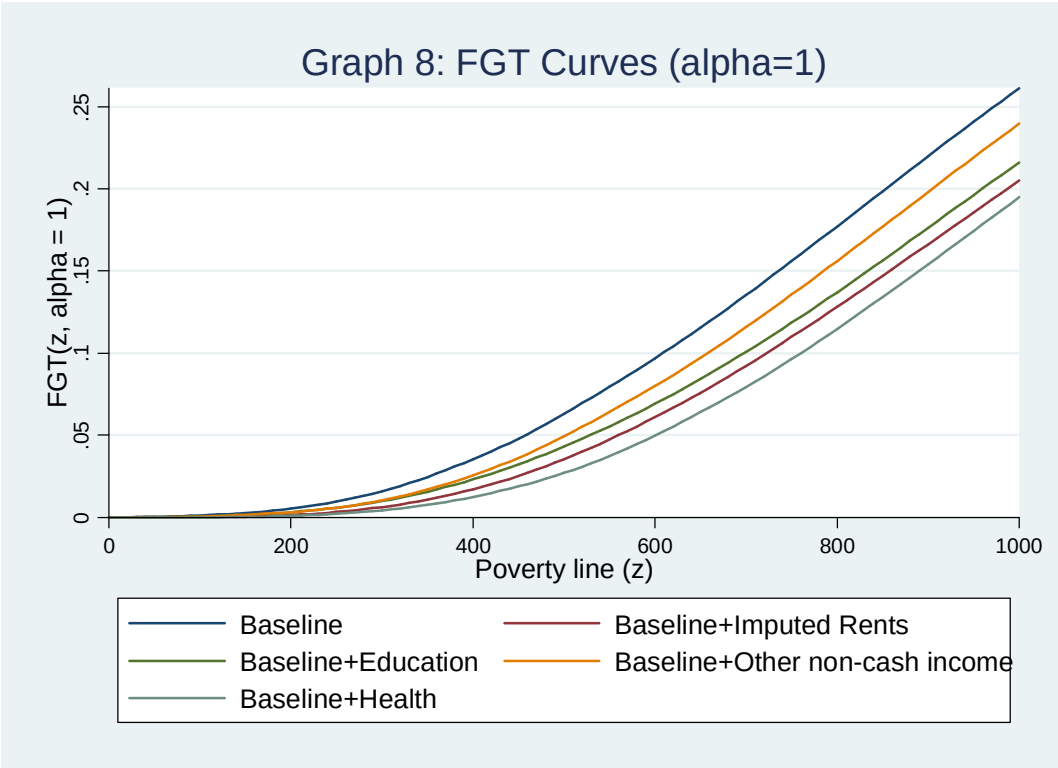

Graph 3: Difference between Lorenz Curves
Public Education
0
.005
.01
.015
.02
0
.2
.4
.6
.8
1
Percentile
Confidence interval (95 %)
Estimated difference

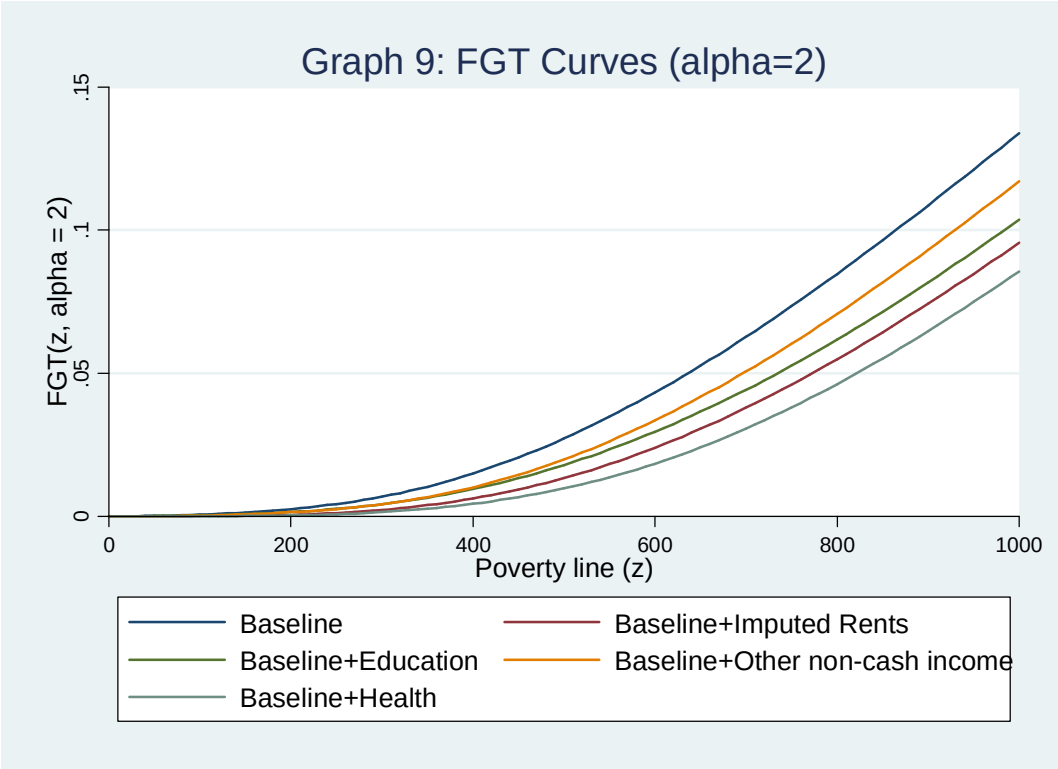

Graph 4: Difference between Lorenz Curves
Public Health
0
.005
.01
.015
.02
.025
0
.2
.4
.6
.8
1
Percentile
Confidence interval (95 %)
Estimated difference


Graph 5: Difference between Lorenz Curves
Private non-cash income
0
.005
.01
.015
.02
0
.2
.4
.6
.8
1
Percentile
Confidence interval (95 %)
Estimated difference


Graph 6: Difference between Lorenz Curves
Public non-cash income
0
.01
.02
.03
.04
0
.2
.4
.6
.8
1
Percentile
Confidence interval (95 %)
Estimated difference


Graph 7: FGT Curves (alpha=0)
FGT(z, alpha = 0)
0
.2
.4
.6
.8
0
200
400
600
800
1000
Poverty line (z)
Baseline
Baseline+Imputed Rents
Baseline+Education
Baseline+Other non-cash Income
Baseline+Health


Graph 8: FGT Curves (alpha=1)
FGT(z, alpha = 1)
0
.05
.1
.15
.2
.25
0
200
400
600
800
1000
Poverty line (z)
Baseline
Baseline+Imputed Rents
Baseline+Education
Baseline+Other non-cash income
Baseline+Health


Graph 9: FGT Curves (alpha=2)
FGT(z, alpha = 2)
0
.05
.1
.15
0
200
400
600
800
1000
Poverty line (z)
Baseline
Baseline+Imputed Rents
Baseline+Education
Baseline+Other non-cash income
Baseline+Health

Conditional equivalence scales: an alternative approach.

In every income study a necessary step is the transformation of per capita disposable income into equivalized disposable so as to enable income comparisons among heterogeneous households. Consequently the choice of the equivalence scales is a crucial one. In our analysis we used the modified OECD scales – for the distribution of disposable income as well as for the distribution of disposable income plus non-cash income components. This is fine in the cases of imputed rents and fringe benefits, but not so in the cases of public education and public health care. The reason is that these scales are "conditional" on existing external arrangements. In other words, they are conditional on the existence of free public education and free public health. By introducing the latter in the concept of resources we treat them like private commodities that the households need to devote resources in order to cover them. Therefore, an alternative idea is to modify the equivalence scales accordingly. Both public education and public health care have some rather unique characteristics. Their consumption is necessary for the individuals involved (more so for health, less so for education) and their consumption does not involve any economies of scale. Therefore, we can adopt a "fixed cost" approach, assuming that the per capita amounts spent by the state for age-specific population groups on public education and public health care depict accurately the corresponding needs. Then, the re-calculation of equivalence scales is very easy. Assume that y is household income, k is the amount of extra needs of the household members for health and education (or each of them separately), e the OECD scale **and e' the new scale**, the following should be valid for the household to remain in the same welfare level:

$$y/e = (y+k)/e'$$

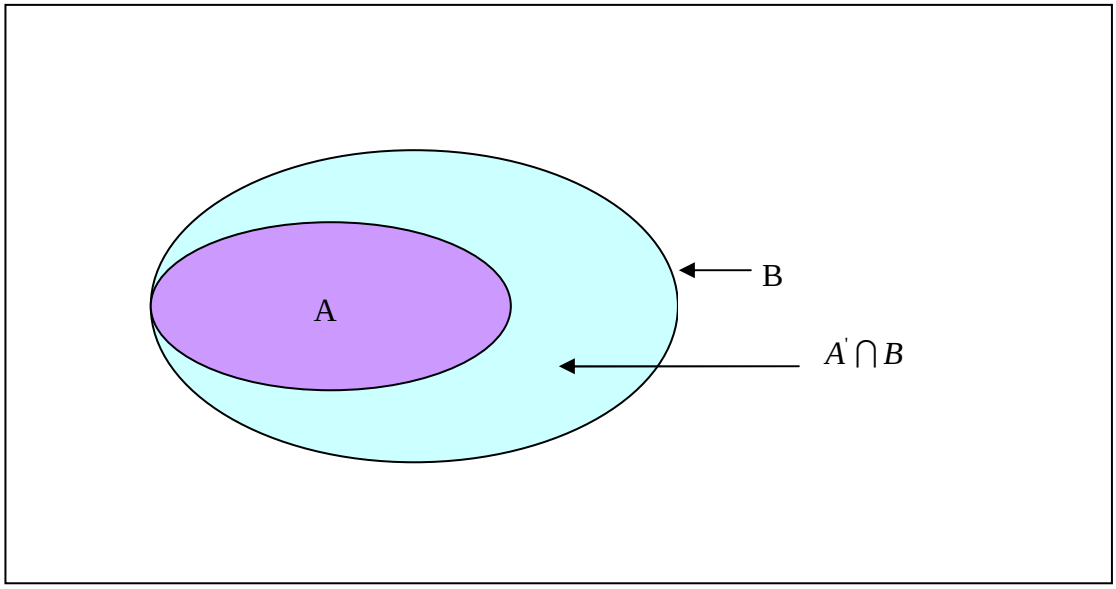
and e' should be equal to

$$e' = e(y+k)/y$$

Naturally, there will be no single equivalence scale for households with identical composition – the scale will be higher (smaller economies of scale) in poorer households and lower (larger economies of scale) in better-off households. This is an

old postulate of equivalence scales theory that was long abandoned in favour of simplicity and transparency (for comparative and policy purposes).

Implementing this approach of primary importance is the distribution of needs. For the distributional impact will be shaped by those groups that despite having the correspondent needs, they do not receive the benefit.



A includes the group of beneficiaries

B includes the group of population that has the corresponding need

$A' \cap B$ as a consequence includes the group of population that although has the corresponding need, does not receive the benefit

In the case of public education we tried six alternative scenarios. In the first scenario educational needs have all students irrespective if they are enrolled in a private or public institution, in the second scenario we add private IEK students, in the third the aged 5-11 that are not in education, in the fourth young people aged 5-17 that are not in school plus all aged 18-24 (graduates are excluded), in the fifth and sixth scenarios we also change the benefit attribution rule. Benefits are distributed according to age and every household member receives the education transfer that correspond to his or her age (aged 18-14 receive a weighted average of AEI and TEI transfer). Needs are distributed identically as in the fourth scenario and the only difference between scenarios five and six is the deduction of the wages of the people that receive the education benefit. Obviously the distribution that are produced from these last

scenarios are counterfactual. Finally the distribution of needs across scenarios is also presented in Table 7.

Regarding the case of health, if we assume that the health needs of the population are precisely equal to the public transfer then the results pose no interest, for inequality remains unchanged. However one possible differentiation from this completely neutral scenario is to assume that the holders of private medical insurance do not receive all the public transfer rather a part of it. Thus we tried the following four cases:

a) Private health insurance holders receive the 90% of the public transfer

b) Private health insurance holders receive the 75% of the public transfer

a) Private health insurance holders receive the 50% of the public transfer

b) Private health insurance holders receive the 0% of the public transfer

Under this approach public transfers should leave inequality unchanged in an counterfactual world. However the equivalence scales we constructed act like a tax on the disposable income of people that have the needs but do not receive the benefit. Consequently the impact of public transfers on inequality depends on the location of this group in the income distribution. As the Table 7 reports aggregate inequality slightly declines under scenario 1, for private education students are located mostly in the upper part of the distribution. In the Scenario 2 that includes primary education drop outs in the group of people that have educational needs, inequality again declines but the decline is milder than the estimated one of the first scenario. Scenario 3 that extends even more the latter group by including all people aged 5-17 not in school records an increase of inequality for the two Atkinson indices and a neutral change for the Gini index. The increase in inequality become even more larger when we consider the fourth scenario which assumes that all people aged 18-24 (excluding graduates) have needs for tertiary education. Finally the two counterfactual scenarios yield a neutral impact on inequality (whoever has the need, receives the benefit) and a mild increase of inequality when wages of benefit receivers are excluded. As far as public health is considered our approach yielded a moderate decline of inequality for all scenarios. Moreover the decline of inequality is higher (in absolute value) the lower is the assumed usage of the public good by the private insurance holder.

Table 7: Distributions of Educational Needs

Need for	Value	Primary educ. students (private and public)	Aged 5-11 not in school	secondary educ. students (private and public)	Aged 12-14 not in school	Aged 15-17 not in school	public IEK students	private IEK students	TEI students	AEI+Msc students	Aged 18-24 not in education excluding graduates
Primary	203	(1),(2),(3),(4)	(3),(4)								
Secondary	298			(1),(2),(3),(4)	(4)	(4)					
IEK	355						(1),(2),(3)	(2),(3)			
TEI	181								(1),(2),(3)		
AEI	562									(1),(2),(3)	
Weighted average of TEI and AEI	396								(4)	(4)	(4)

(1)=education scenario 1: needs have all students, (2)=education scenario 2: needs have all students plus private IEK students, (3)=education scenario 3 needs have all students plus private IEK students and aged 5-11 not in school, (4)=education scenario 4: needs have all students plus aged 5-17 not in school

Table 8 : Changes in Inequality

Index	Education scenario 1	Education scenario 2	Education scenario 3	Education scenario 4	Education scenario 5	Education scenario 6
Gini	-0,18	-0,14	-0,01	3,17	0,00	0,39
Atkinson0.5	-0,32	-0,25	0,09	6,86	0,00	0,72
Atkinson1.5	-0,23	-0,19	0,36	8,91	0,00	1,14

Education scenario 1: needs have all students, Education scenario 2: needs have all students plus private IEK students, Education scenario 3: needs have all students plus private IEK students and aged 5-11 not in school, Education scenario 4: needs have all students plus aged 5-17 not in school, Education scenario 5: needs and benefits according to age. Education scenario 6: the same as 5 but wages of benefit receivers are deducted.

Table 9: Changes in Inequality

Index		Health scenario 1	Health scenario 2	Health scenario 3	Health scenario 4
Gini		-0,019	-0,045	-0,077	-0,107
Atkinson0.5		-0,028	-0,063	-0,100	-0,088
Atkinson1.5		-0,011	-0,016	0,014	0,290

Health scenario 1: private insurance holders receive 90% of the public transfer, Health scenario 2: private insurance holders receive 75% of the public transfer, Health scenario 3: private insurance holders receive 50% of the public transfer, Health scenario 1: private insurance holders receive 0% of the public transfer