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Distributional effects of public education transfers in seven European countries

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Distributional Effects of Public Education Transfers in Seven European Countries

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Abstract: Empirical studies of inequality and poverty are usually based on disposable cash incomes, disregarding incomes in-kind (non-cash incomes). Since individuals also derive utility from the consumption of goods and services provided in-kind monetary income is not always a good indicator of an individual's utility or "command over resources". Thus, distributional analysis based on cash incomes may be seriously biased. Inclusion of non-cash incomes (arising from private sources or from public provision of services such as health, housing and education) may allow for better targeting and allocation of resources in fighting poverty and social exclusion. The present paper focuses on non-cash incomes arising from publicly provided education in seven European countries (Belgium, Germany, Greece, Italy, Ireland, the Netherlands and the UK), as part of a broader research project (AIM-AP Accurate Income Measurement for the Assessment of Policy) investigating the distributional implications of including elements of non-cash income in the measurement of wider resources.

In all countries under examination public education transfers account for a considerable proportion of the total transfers of the state to the citizens. The paper uses static incidence analysis under the assumption that public education transfers do not create noticeable externalities, combining the information of existing nationwide income surveys with external information on spending per student in particular levels of the education system. In all countries public education transfers are found to reduce aggregate inequality. These effects are driven by the impact of primary and, especially, secondary education transfers at the time of their receipt and assuming benefits are valued at cost by recipients. In a static framework, transfers in the field of tertiary education appear to have a small distributional impact while the size and the sign of this impact depend on the treatment of tertiary education students living away from the parental home.

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Distributional Effects of Public Education Transfers in Seven European Countries

1. Introduction

Cross-national national analyses of welfare state transfers and their effects on inequality find large differences amongst OECD nations. They find that most of the differences in inequality at the bottom of the income distribution --as measured by relative poverty rates--are due to cross national differences in levels of earnings and especially in 'welfare state transfers' [Atkinson, Rainwater and Smeeding (1995), Hacker, Mettler and Pinderhughes (2005), Kenworthy (2004)]. Scandinavian and Nordic countries like Denmark are big spenders in cash terms and reduce inequality the most; the English speaking countries, including Ireland and the UK, spend the least and reduce inequality the least; and the continental European countries spend a lot, but achieve less equality than the Scandinavians. Southern European nations like Greece and Spain spend the least and have the highest inequality [Heady, Mitrakos and Tsakloglou (2001), Dennis and Guio (2003), Förster and Mira d'Ercole (2004)].

These cross national differences support the proposition of some welfare state theorists such as Titmus (1958) and Esping-Andersen (1990) that there are distinct welfare state regimes, or as Esping-Andersen puts it, "three worlds of welfare capitalism." A major limitation of the research on the effects of the welfare state on poverty and other distributional outcomes is that the analyses of transfers and their effects on inequality are restricted to cash or near cash transfers only.[1] Yet in all of these rich countries, about half of welfare state transfers consist of in kind benefits such as education, health insurance, child care, elderly care and other services. In kind as well as cash transfers reduce inequalities in standards of living as documented in research within selected countries but only occasionally cross nationally and never for a large set of European Union nations.

Most importantly, 'welfare state ' theorists, including Esping-Andersen, Titmus and others cited above, fail to include education in their analyses of the welfare state. This tendency is strengthened by the institutional stances of the OECD and other bodies which publish annual series of 'Social Welfare Expenditures' that explicitly exclude

[1]. Most cross national analyses of inequality are based on cash incomes only; see, for example, Gustafsson and Johansson (1999), Alderson and Nielsen (2002), Moller et al (2003), Kenworthy (2004).

education , leaving it to another entirely different annual series. It is as if health and cash benefits are the only ways in which the state supports the needs of families for basic wants and building of human capabilities. But of course, in the 21st century, education is likely the most sought after and most productive method of building human capital and strengthening the economic position of nations and their citizens. This leads to a high demand for good quality schools, especially for institutions of higher learning.

The theoretical and empirical importance of valuing in kind benefits has been understood for nearly a quarter century [Smeeding (1977, a)]. Conceptually it is clear that these benefits are worth some nontrivial amount to beneficiaries. Thus, from a theoretical point of view, a measure that counts in kind transfers is superior to the conventional measure of cash disposable income as a measure of a household's standard of living [Atkinson and Bourguignon (2000), Atkinson et al (2002), Canberra Group (2001)]. The first cross national study of inequality to incorporate health and education [Smeeding et al (1993)] found only small changes in cross national differences, with the exception of Great Britain. However, these researchers used data from the 1980s when health care played a much smaller role than it now does, and included only 7 nations in total, with just three from the EU (Germany, Netherlands, UK) and no southern European nations.

A number of more recent studies using cross-national information and employing a variety of techniques to examine the distributional effects of in-kind public transfers suggest that public education transfers reduce aggregate inequality. [Whiteford and Kennedy (1995), Steckmest (1996), Harding, Lloyd and Warren (2006), Garfinkel, Rainwater and Smeeding (2006), Marical et al (2006)] or national surveys [James and Benjamin (1987), Lampman (1988), Evandrou et al (1993), McLennan (1996), Huguenenq (1998), Tsakloglou and Antoninis (1999), Harris (1999), Antoninis and Tsakloglou (2001), Sefton (2002), Lakin (2004)][2] In quantitative terms, cross-country differences seem to be substantial, but it is not always clear whether such differences are genuine or can be attributed to methodological choices made by the researchers

[2] Some studies focus exclusively on education, others examine the impact of several in-kind transfers including education

(detail of information available, treatment of tertiary education students, treatment of taxes, etc.).

The purpose of this paper is to extend previous analyses of the distributional effects of welfare state programs in rich countries by taking into account the effect of education transfers of all types on economic inequality in seven EU countries (Belgium, Germany, Greece, Italy, Ireland, the Netherlands and the UK), in a strictly comparable framework. In doing so we examine whether the current image of large differences in the equalizing effects of welfare state programs in rich countries is essentially correct or whether taking account of in kind benefits in the form of education benefits substantially shrinks cross national differences in inequality and alters country rankings. Moreover we use a very broad and deep definition of education, including elementary/primary, secondary and tertiary education spending by all levels of government.

As far as we know, our study is among the first to focus on tertiary education and its distributional consequences . Indeed as the world demand for labor turns increasingly to high skill workers, the tertiary education system and tertiary education reform will be high in the EU agenda for decades to come (for instance, see Jacobs and van der Ploeg, 2006)

2. Education Systems

The distribution of the benefits from public expenditure on education depend on the scale and structure of the educational system. The systems in the seven European countries considered here have much in common. Broadly speaking, schooling is free3 and compulsory for primary and lower secondary education, and also free of tuition fees for second level education. At third level, there is more variation in whether or not fees are charged, but there is still a substantial public subsidy in all countries, including direct subsidies to students to cover living expenses as well as subsides for instruction per se.

A number of cross-country differences that are likely to influence the results reported below have to do with the incidence of private education and the possibility of within-country differentiation of the size of the transfers to students of particular levels of

[3].That is, school is free in the sense that there are no tuition fees; ancillary costs of participation (such as books or school uniforms) may fall on parents in some countries.

education (for example, due to the existence of federal funding systems). However, the most significant cross-country differences are likely to emanate from differences in non-compulsory levels of education. Where participation in education is compulsory, or close to universal even if not compulsory, the distribution of the benefit from public expenditure will tend to flow equally to the relevant age cohort.[4] But where participation is neither compulsory nor complete, as in third level education (and in some countries, in upper secondary level), then socio-economic differences in the pattern of participation can have a significant influence on the distributive impact of state expenditure.

In order to clarify this, Table 1 shows how countries vary in the age at which compulsory schooling ends, and the age range over which participation in education is more than 90 per cent of the cohort. Three countries have a "school leaving age" (the age at which compulsory education ends) of 18, whereas the others have a school leaving age close to 15. However, looking at actual participation in education we find that with one exception, the number of years for which more than 90% of the cohort are enrolled in school is either 12 or 13. The exception is Belgium, where the pre-school phase has been included in the OECD analysis. Here, however, we focus on the benefits deriving from public expenditure on primary, secondary and tertiary education.[5]

There is much greater variation across the countries in the level and composition of third-level enrolment, as seen in Table 2. Third level entry rates vary from about 50 per cent (Germany and Greece) to rates of 70 to 80 per cent (Belgium and the UK). Furthermore the composition of the third level sector, as between university-type education and more specialised technical or vocational qualifications is quite different. Differences in third level participation may arise from several sources, including differences in the structure of the earlier levels of education e.g., whether specialisation in more academic type of education tends to take place at an earlier or later stage. A further crucial factor is the differences in public spending per student on primary, secondary and third level, to which we turn in the next section.

[4] Where different forms of schooling are on offer to an age group, with differing costs of provision, differences can emerge depending on the pattern of participation across school types.

[5] A separate analysis of the distributional effects of pre-schooling expenditures is planned in the framework of the current project for two countries where the existing data allow this exercise; namely, Belgium and Germany.

The above differences combined with cross-country demographic differences result in substantial cross-country diversity in the total (private and public) education related expenditures in GDP. As the evidence of Graph 1 shows, this share varies between 4.2% in Greece and 5.7% in the UK. In fact, these figures do not include expenses incurred outside educational institutions. Naturally, the main driving force in all countries are public expenditures. However, substantial cross-country differences can be observed regarding the contribution of private expenditures, especially in pre-tertiary education; in Greece and Germany these expenditures are as high as 0.6% of GDP. Likewise, Graph 2 reports the functional distribution of these expenditures (this time including expenditures incurred outside educational institutions). The largest item in all countries consists of core educational expenditures for primary and secondary education, followed by the corresponding item expenditures for tertiary education. Nevertheless, the most significant cross-country differences are observed in the remaining categories (ancillary services, private payments on instructional services/goods outside educational institutions and, particularly, Research and Development at tertiary education institutions). Our analysis includes sensitivity analysis with respect to the treatment of R&D expenditures).

3. Data and methods

The estimates derived in the next section rely on static incidence analysis under the assumption that public education transfers do not create externalities. No dynamic effects are considered in the present analysis. 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). Moreover, it is assumed that the value of the transfer to the beneficiary is equal to the average cost of producing the public education services in the corresponding level of education. Similar assumptions are standard practice in the analysis of the distributional impact of publicly provided services [Jones (2006), Marical *et al.* (2006), Smeeding *et al* (1993)].

For the purposes of our analysis information on spending per student in primary, secondary and tertiary education derived from OECD's "Education at a glance 2006" is combined with micro-level information from nationwide income surveys. Each student in a public education institution (or a heavily subsidized private education

institution) in the nationwide income survey is assigned a public education transfer equal to the average cost of producing these services in the corresponding level of education. Then, this benefit is assumed to be shared by all household members. In other words, it is implicitly assumed that in the absence of public transfers the students and their families would have to undertake the expenditures themselves.

The national databases used in the analysis and the corresponding reference years are shown in Table 3. It should be noted that the detail of educational information of the population members varies considerably across countries. However, since the aim of the present paper is to provide a comparative analysis, a "least common denominator" approach was adopted; that is, the educational classification used was restricted to ensure compatibility across countries. As a result, we focus exclusively on three levels of education (primary, secondary and tertiary), thus leaving aside other levels such as pre-primary and non-tertiary post-secondary education and suppressing the distinction between general and technical secondary education as well Type-A and Type-B tertiary education and the distinction between undergraduate and postgraduate studies in tertiary education.[6]

Estimates of public spending per student in primary, secondary and tertiary public education institutions were derived as follows. Figures from Table X2.5 (p. 434) of OECD's "Education at a glance 2006" (*Annual expenditure on educational institutions per student for all services (2003) in equivalent euros converted using PPP, by level of education based on full-time equivalents*) were multiplied by the estimates of the share of public expenditures in total educational expenditures (separately for tertiary and non-tertiary education) reported in Table B2.1b (p. 206) (*Expenditure on educational institutions as a percentage of GDP by level of education (1995, 2000, 2003) from public and private sources by source of funds and year*) and euro PPP conversion rates as reported in Table X2.2 (p. 431) (*Basic reference statistics (reference period: calendar year 2003, 2003 current prices*). Then, in order to derive the corresponding estimates for years other than 2003, these estimates were inflated or deflated using country specific nominal GDP per capita conversion factors derived from the data of the on-line OECD database (using real GDP growth rates,

[6].The interested reader is encouraged to look at the national reports sited in the reference list of the paper in order to check for differences between the estimates of this paper and the estimates of these reports that are derived using finer educational classifications. In almost all cases the differences between the two sets of estimates are relatively small.

GDP deflators and population growth rates). The estimates in current national prices are shown in Table 4.[7]

In all countries public spending per secondary education student is higher than the corresponding figure for primary education students. However, in some countries such as Germany, Ireland and Belgium the differences are quite large, while in others, such as Italy and Greece, the differences appear to be relatively small. Comparisons of spending per student in secondary and tertiary education depend on the treatment of public R&D expenditures. It is very likely that activities financed by such expenditures have positive spillover effects to the students; however, their main beneficiaries are not the students. For this reason, in the following analysis we present estimates derived from public transfers to tertiary education students net of R&D public expenditures. As a check of the robustness of our findings, Appendix I reports results derived from estimates of public transfers to tertiary education students that include R&D spending. When spending per student in tertiary education institutions is net of R&D expenditures, this spending is generally similar to the level of spending on secondary education students (with the exception of Italy, where third level spending excluding R&D is below expenditure per student in second level education).[8]

Apart from the treatment of R&D expenditures, in the case of tertiary education students living away from their parental homes there is the broader question of whether the equivalised household income per capita is a good approximation of their standard of living. Typically, in most empirical studies, such students who do not live in collective households are treated as independent units. However, in our case this treatment may lead to misleading results regarding the distributional effects of public education subsidies to tertiary education students since in most countries the majority of the students who live with their parents appear to be in the top half of the income

[7].Due to lack of detailed information, we take no account of within country inequality in expenditures for children's education. In the case of the US, Duncombe and Yinger (1997), Card and Payne (1998), Wilson (2000), and Wilson, Lambright and Smeeding (2006) find that public school spending may differ by up to 50 percent between rich and poor districts. The sensitivity of our results points to the need to undertake research on differences in expenditures on education within countries by income class because public expenditures on schooling may also differ by income class in other countries besides the United States and we have no evidence of by how much.

[8].It should be noted that these figures are influenced by the particular way used by the OECD in order to calculate the average number of years of studies and, consequently, the number of full-time equivalent students in each country.

distribution while the majority of those who live alone are disproportionately located close to the bottom of the distribution, even when stipends for living expenses are taken into account.

Analyses which simply looks at all students , risk attributing an unwarranted benefit to low income groups, simply because students moving away from high income homes, have temporarily low incomes during their student years; while the literature on the returns to education indicates that their likely positions in the earnings distribution will be towards the top. Moreover, the living arrangements of tertiary education students differ substantially across countries, while their treatment in the national surveys in not always the same. For example, most of tertiary education students in Greece live with their parents whereas this is the case of relatively few such students in the Netherlands, whereas in Belgium and Italy, students living in collective households (such as student accommodation) are treated as members of their parental households. Moreover, as 'students' move into their late 20's, it may well be that they are financially independent of their parents, in which case the student alone or with partner may be a more the appropriate unit. While tertiary school enrollments have increased substantially over the past two decades, tertiary students are taking increasingly long period to complete their studies (Fitzpatrick and Turner, 2007). Thus the issue of the economic independence of tertiary students will continue to grow in coming decades (see also Bell, Burtless, Gornick and Smeeding, 2007) .

As a result, the distributional effects of public transfers to tertiary education students are not always strictly comparable across countries and the next section reports results both for all tertiary education students (including those living away from their parents, when the student's income position will be determined purely by his or her own student income) and for tertiary education students living with their parents, with the income of the parental household being taken into account when measuring the distributional impact of public education subsidies

Radner (1997) points out that in standard analysis of the distribution of cash income, equivalence scales are used to adjust for the differing needs of households of different size and composition. When health or education services are included in the measure of resources, he argues that differing needs for health and education services should also be taken into account. Just as the welfare of an elderly person can be overstated by including the insurance value of publicly provided health cover (Smeeding, 1982b)

the welfare of a family with children can be overstated by including the value of non-cash education benefits, without taking account of the educational needs of the children.

We consider two variations on the standard approach to take account of these points. In Appendix 1, we look separately at the impact of compulsory education and non-compulsory education. It is for compulsory education that arguments concerning the existence of educational needs, precisely corresponding to the publicly-provided services, are strongest. The analysis of the distribution of benefit from non-compulsory education can be regarded as an alternative focus, less susceptible to the arguments concerning corresponding educational need. We have also undertaken some sensitivity analysis which focuses on groups with identical educational needs – specifically, those with exactly one child of an age to participate in primary, secondary or third level education. While at present this analysis is confined to one country, the results are suggestive.

A final methodological point relates to the fact that when dealing with taxes and cash transfers it is standard practice to regard as progressive a policy or set of policies which yield higher proportionate gains for lower income groups, and proportionate gains declining with income. In the present framework, non-cash benefits are "cashed out" and aggregated with cash income, and the same criteria for progressivity apply – higher proportionate gains for the lower income groups, raising their share of total income or resources. By this criterion, an education policy can be progressive even if it gives much greater absolute value to higher income groups (in line with the greater income share of high income groups). An alternative and perhaps more widely accepted benchmark for a neutral education policy would be that it gave the same absolute value to all. Nevertheless, in the context of an analysis of income or resource distribution, it is necessary to use the standard applied in the case of cash incomes. Expectations of what might constitute an appropriate impact on relative inequality may, however, be informed by the "equal value to all" benchmark.

4. Empirical results

This section presents the main empirical findings of the paper. We start by reporting the position of the beneficiaries of public education subsidies in the income

distribution when the population is grouped in quintiles according to their equivalised disposable income. Then, we proceed to the examination of the size of these transfers per quintile and their proportional impact vis-à-vis the disposable income of each quintile. Finally, we analyse their impact on aggregate inequality. The distributions used are distributions of equivalised household disposable income per capita and they are derived using the "modified OECD equivalence scales" (Hagenaars et al, 1995) that assign weights of 1.00 to the household head, 0.50 to each of the remaining adults in the household and 0.30 to each child (person aged below 14) in the household. *Since there are, literally, thousands of figures that are reported below, the results are mainly presented in graphs. The figures behind the graphs are available from the authors on request*.[see covering email]

Graph 3 presents the position of the beneficiaries of public education subsidies in the distribution of equivalised household disposable income per capita for primary, secondary and tertiary education. Bars higher (lower) than 20% indicate that the quintiles under consideration contain proportionally more (less) beneficiaries than their population shares. The top left graph depicts the situation regarding primary education. In Belgium, the beneficiaries of public primary education transfers appear to be fairly evenly distributed across quintiles, while in the rest of the countries they seem to be disproportionately concentrated in the three bottom quintiles and substantially underrepresented in the top quintile. A similar picture emerges in the top right graph which shows that in all countries there is a negative relationship between the share of beneficiaries and the location of the quintile in the income distribution. This pattern may be attributed to the combined effect of two factors. The first is demographics; households with children are less likely to have reached the top of their earnings capacity and/or have a lower share of earners and, hence, are more likely to be concentrated in the lower quintiles. The second has to do with private education. Although in all of the countries under consideration the overwhelming majority of the students attend public schools, private education appears to be a (very) high income elasticity commodity and the students who attend private schools can be found almost exclusively in the top two quintiles of the distribution (especially the top).

The two graphs at the bottom examine the location of public tertiary education beneficiaries in the income distribution. The graph on the left shows the location of all such beneficiaries, while the graph on the right focuses exclusively on those who

live with their parents. For the reasons described in the previous section, it is the latter group that provides a better picture of the short-rum distributional effects of public transfers in tertiary education. For two countries – Belgium and Italy – the two sets of estimates are identical since in these countries the great majority of tertiary education students living away from their parents were classified as members of the parental household.[9] Further, it should be stressed again that the share of tertiary education students living with their parents differs substantially across countries and this is likely to have a strong influence on cross-country comparisons. No clear cross-country pattern emerges from the bottom left graph. In some countries, the beneficiaries of public tertiary education are more likely to be found around the middle of the income distribution whereas in the Netherlands they are strongly overrepresented in the bottom quintile and in the UK there is a clear positive association between the share of the beneficiaries and the quintile of the income distribution to which they belong to. However, in the graph at the bottom right, where the focus is exclusively on the sub-group of tertiary education students who live with their parents, the picture that emerges in all countries apart from the Netherlands is broadly similar: the higher the quintile, the higher the share of beneficiaries. In Netherlands, most of the (relatively small group) of beneficiaries are located in the second and the third quintile.

Graph 4 is similar to Graph 3 but instead of disaggregating by education level, it shows the position of the beneficiaries of all levels of public education in the income distribution. Once again, results are provided for all population members and all population members apart from students living away from their parents. The results are quite similar in both cases, although slightly less pronounced in the latter. In all countries, the beneficiaries are underrepresented in the top and, in most cases, the fourth quintile, while they are overrepresented in the three lowest quintiles.

However interesting, the results of Graphs 3 and 4 provide only partial indirect evidence on the progressively redistributive role of public education subsidies, since they may be driven primarily by demographics. Graphs 5 and 6 attempt to isolate this factor. More specifically, Graph 5 reports the relative ratio of actual beneficiaries to potential beneficiaries per quintile for each of the three levels of education. For the

[9].For this reason, in all the graphs and tables where a distinction is made between tertiary education students as a whole and tertiary education students living away from their parents, the estimates for Belgium and Italy do not change.

construction of this indicator, first the number of the quintile's children who benefit from public education transfers in a particular level is divided by the total number of children in the corresponding age bracket. The age brackets are country specific and correspond to the typical age brackets that population members attend primary, secondary and tertiary education. In the next stage, the resulting ratio of each quintile and educational level is divided by the corresponding national ratio. As a result, figures above (below) one imply that the children of the corresponding quintile are overrepresented (underrepresented) among the beneficiaries of public education transfers.

The top left graph depicts the situation regarding primary education. In three countries – Belgium, Italy and the Netherlands - the ratio for all quintiles fluctuates very close to one. In Greece and the UK the ratio is lower than one in the top two quintiles and higher than one in the three bottom quintiles. Most probably, these results are driven primarily by the differential incidence of private education across quintiles. The top right graph reports the values of the indices for secondary education. In most cases, he pattern is similar to that of primary education. In the case of secondary education, though, apart from private education the results may also be driven by differential dropout rates across quintiles. The most interesting results, though, are reported in the lower panel of Graph 5. When all tertiary education beneficiaries are lumped together, in most countries differences across quintiles are not dramatic, although in most cases the ratio is below one in the lower quintiles and higher than one in the top quintiles. The exceptions are the Netherlands where the ratio declines monotonically as we move up the income distribution and Germany where the reverse sequence is observed. However, when we focus exclusively on tertiary education beneficiaries living with their parents, the evidence in most countries shows that the ratio of actual to potential beneficiaries is substantially higher at the top than close to the bottom of the income distribution. This pattern is particularly pronounced in Germany, Greece, Ireland and, to a slightly lesser extent, the UK. The only country where the evidence points to the opposite direction is the Netherlands.

In the next stage, we examine the differential magnitude of the public education transfers per quintile. Graph 6 depicts estimates of the size of the relative mean transfer per capita for each quintile for every level of education. For its construction we first calculated the sum of public education subsidies separately for each educational level to all beneficiaries in a particular quintile of the distribution of

disposable income. Then, we divided this figure by the number of individuals in the quintile (all quintile members; not only the direct beneficiaries, i.e. the students or their household members). Finally, we divided this figure by the corresponding figure for the entire population. Thus, figures higher (lower) than one denote that the corresponding public transfer per head to the members of the quintile are higher than the national average. In the cases of primary and, especially, secondary education, public transfers to the average member of the three bottom quintiles are higher than those received by the average member of the two top quintiles in all countries under examination (with the exception of Belgium in the case of primary education). In the case of tertiary education the evidence is not that clear when all students are put together, whereas when the group of students living with their parents is isolated the evidence shows that in most countries the benefits per capita are higher in the top than in the bottom quintiles. Graph 7 is similar to Graph 6 but instead of taking public transfers per education level separately it lumps them all together (once for the entire population and once excluding tertiary education students living away from the parental home). Unsurprisingly, taking into account the evidence of Graph 6, in almost all countries and irrespective of including or excluding tertiary education students living away from their parents, members of households located in the bottom half of the distribution appear to benefit more in absolute terms than members of households belonging to the two top quintiles (particularly the top).

The results so far clearly imply that public education subsidies benefit the poorest segments of the population by more than they benefit middle and upper income families. Graph 8 confirms this finding by reporting the value of the public transfers as a share of the aggregate quintile disposable income separately for each level of education and taking all of them together. A warning is needed before we proceed to the discussion of the results of Graph 8. Since the denominator in these calculations is, effectively, the income share of the corresponding quintile, *ceteris paribus*, transfers of equal size will translate into larger proportional increases in the cases of quintiles with smaller shares in aggregate disposable income. The size of the distributional impact of the education system depends, therefore, not just on the size and structure of the education system, but also on the pre-existing distribution of disposable income. Similar education systems in two countries would have a greater impact in the more unequal country.. Hence, cross-country comparisons should be interpreted with caution. In all countries, the largest increases can be attributed to

secondary public education transfers and the smallest to transfers to tertiary education students. The differences between primary and secondary education are partly due to the fact that annual transfers per secondary education student are higher than the corresponding transfers per primary education student and partly to the fact that in some countries secondary education lasts longer than primary education (demographic factors and differential incidence of private education across educational levels play an important but secondary role, too). The relatively low impact of tertiary education transfers should be attributed to the fact that, despite the high value of the annual transfer per tertiary education student, unlike the other two educational levels, participation in this educational level is far very from universal and further, tertiary education studies are usually shorter than those in either primary or secondary education.

The estimates of the top left graph show that primary education transfers to members of the bottom quintile in Ireland are as high as 14.6% of the quintile's disposable income. The corresponding increase in the rest of the countries varies between 3.1% in Germany and 9.7% in Italy. The proportional impact of these transfers declines as we move up in the income distribution and in the case of the top quintile they account for increases between 0.5% (Germany and Italy) and 2.1% (Belgium). Public education transfers to secondary education students belonging to the bottom quintile are higher than 15% of the disposable income of this quintile in Ireland, Italy, Belgium and Germany, but less than 10% in Greece and the Netherlands. Once again, the proportional impact of these transfers declines as we move up in the income distribution and in the case of the top quintile they account for increases between 0.9% (Netherlands) and 2.5% (Belgium). As noted above, the proportional impact of transfers to tertiary education students is not as large as those to primary and secondary education students, but they also seem to cause larger proportional increases in the incomes of the poorer rather than the richer households (especially in the cases of the Netherlands and Germany).[10] Finally, when transfers to all educational levels are added together, their value in the case of the bottom quintile varies between 18.4% in Greece and 33.7% in Ireland, declining gradually as we

[10]. Due to space limitations, increases in quintile disposable income as a result of transfers to tertiary education students living with their parents only are not reported in Graph 6 but are available from the authors on request. They are less progressive than the results reported in the bottom left graph, but due to their relatively small size they do not affect substantially the overall increases in the quintile disposable income reported in the bottom right graph.

move to higher quintiles and reaching levels between 2.2% (Greece) and 5.8% (Belgium). Naturally, such large and differentiated proportional increases are likely to produce significant distributional effects.

A first glimpse at the distributional effects of public education transfers is provided in Graph 9. This graph compares the changes in the shares of the quintiles as we move from the distribution of disposable income to a distribution of a broader concept of resources that includes disposable income as well as the value of public education transfers.[11] Qualitatively, the results are very similar in all countries. The three bottom quintiles increase their share at the expense of the two top quintiles (especially the top). Quantitatively, there are some differences. In Ireland, the Netherlands and the UK it is share of the second quintile that increases the most, while in the rest of the countries the largest increases are observed in the share of the bottom quintile. In Italy, Ireland and the Netherlands the share of the top quintile declines by more than two percentage points as we move to the new distribution, while the corresponding decline in Germany is less than 1.5%, with intermediate values for the remaining countries .

Graph 10 shows the impact of public education transfers per level of education 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 public transfers of the corresponding educational level. 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).

The evidence of Graph 10 illustrates very clearly that public education transfers reduce aggregate inequality quite substantially. In all cases the recorded effects are

[11].For the derivation of the second distribution, the public education transfers received by all household members were added to the disposable income of all household members and the sum was divided by the household's equivalence scale. The resulting figure was attributed to all household members. Naturally, the composition of the quintiles changes when we move from the distribution of disposable income to the new distribution due to re-rankings.

larger when the Atkinson index is used, irrespective of the value of the inequality aversion parameter. In all countries and irrespective of the index used the strongest redistributive effects appear to stem from secondary education transfers, followed closely by primary education transfers. Transfers to tertiary education students produce only modest reductions in inequality – with the possible exception of the Netherlands – and in most cases they almost disappear when the sample is restricted to tertiary education students living away from the parental home (in Germany they produce a marginal rise in inequality).

We undertook a sensitivity analysis for Ireland designed to examine the impact on inequality within groups having the same educational needs, as discussed in Section 3. The groups examined were households with exactly one child of an age to participate in first, second or third-level education. The results indicated a reduction in the Gini coefficient for the relevant group of about 7% for first and second-level, and about 2% for third-level education. These are in line with the findings of our main analysis.

The evidence of Graph 11 shows that the aggregate distributional effect of all public education transfers taken together is very substantial in all countries under examination. As a consequence of these transfers, inequality declines according to Gini between 6.6% (Greece) and 11.1% (the Netherlands). The corresponding declines recorded by the Atkinson index are between 10.7% and 20.5% (for the same countries). When tertiary education students living away from their parents are left out of the sample, the picture changes a little and the recorded declines in inequality appear to be more modest (between 5% and 10% according to Gini and between 10% and 19% when either of the Atkinson indices is utilized.

Does the change in the concept of resources affect the relative ranking of the countries under examination regarding their level of aggregate inequality? An answer to this question is provided in Table 5 and it is largely negative. No re-ranking takes place when the Atkinson index is used, while some re-rankings are observed when the Gini index is used as an indicator of inequality (Ireland/Germany and Italy/UK).[12] What is

[12].The results reported in Table 5 are comparable with the estimates of the Gini index before and after education transfers reported in Table A.4 of Marical et al (2006), that have been derived using micro-data from different sources and reference years than those of the present paper (and, further, their imputation method is a little different than the one used here). Like the results of the present paper, their results show large declines in inequality and country re-rankings after the impact of the public benefit is accounted for, but they report substantially lower baseline inequality estimates for Germany and Italy and higher Belgium, while the impact of the public education transfers on aggregate inequality according to their estimates is considerably higher than that reported in Table 5.

interesting to note, though, is that the ranking of the countries changes when we change the index of inequality – a clear indication of intersecting Lorenz curves.

5. Summary and Conclusions

In this paper we have investigated the effects of including in-kind public education transfers on estimates of cross national differences in inequality and poverty. Most of the existing comparative studies of inequality and its determinants have either ignored in-kind transfers or have only dealt with limited amounts of public education transfers. Theoretically, full income, which counts in kind transfers is a superior measure of a household's command over resources than is the conventional measure of cash disposable income. And the inclusion of education transfers is one step in this direction.

We estimated only the private market benefits from education at government cost. The spillover benefits of education, which may be as large or larger than the direct effects, are not counted [Dee (2005), Haveman and Wolfe (2003)]. Positive externalities arising from research and development benefits from education enterprise are also not counted. In both cases, external and "R&D" benefits accrue to the entire populations and therefore might be considered distributionally neutral. The private benefits of education accrue mainly to the individuals and their families and her we look only at the value of inputs, capital and operating expenses per pupil, not at their future value to the individual who receives them.

We find that valuing in kind education benefits at government cost increases disproportionally the real income of low income households and narrows substantially differences in inequality within and across countries. At the bottom of the income distribution, when all subsidies for education are added disposable incomes increase up to 33 percent in Ireland, almost 30 percent in Belgium and at least by 15 percent in Italy. The Gini coefficients decrease by 5 to 11 percent. The bottom three quintiles all gain income shares relative to the top two quintiles. The largest effects are from secondary education transfers, though primary education also has a relatively large effect. The effects of tertiary education are large per pupil, but accrue only to a minority of children. Further, they are most difficult to value and distribute because students counted as independent units have low incomes, while the parental

households from which tertiary students come are relatively rich. The results of sensitivity analysis for tertiary education only, suggest that attributing the corresponding public transfers to students living with their parents only rather than all students, alters the results concerning the distribution of third-level expenditures significantly, but alters aggregate results only marginally.

Moreover, there are a number of limitations to our analysis. First, due to data limitations, we assumed equal distribution of education expenditures per education level across all children, irrespective of their household's income level something that existing evidence from other countries seems to refute. Second, there are good reasons for believing that the value of education benefits in kind to recipients might be either higher or lower than government cost to produce these services. Future research should explore alternative valuation methods of in kind benefits as well as examine in a more detailed manner the distribution of education benefits within countries. Last but not least, the distributional effects of in kind benefits of public education should be analysed in combination with other in kind incomes from both public and private sources.

Assuming that the findings hold up, what are the policy implications? We argue that our findings both raise several provocative, policy related questions about the mix of cash and in kind benefits which are highly relevant to current policy issues. Direct education benefits accrue wholly to families with children, whereas most health benefits and social retirement accrue mainly to the elderly. We know that demographic change already has and will continue to put great pressure on expenditures for the elderly, possibly at the expense of benefits accruing mainly to children, such as education [Kane and Orszag (2003)]. This raises the question of what kind of mixture best promotes overall well-being—something on which there is little research evidence at present.

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Appendix 1. Distributive Impacts of Compulsory and Non-Compulsory Schooling

How much of the reduction in inequality is due to compulsory education, and how much to non-compulsory? This issue is of particular interest for a number of reasons. First, the fact that all children of a given age benefit from compulsory education makes it quite different from higher levels of education, where rates of participation are lower, and the extent of participation may be structured by social background. Second, the fact that education is made compulsory is a very clear indication that it is seen as an essential need for children of that age. Like most other analyses of income distribution issues, our approach has relied on a standard equivalence scale (the modified OECD scale) to take account of differences in need between households of different sizes and age compositions. But such scales have been constructed, and results interpreted, in the knowledge that the need for compulsory education has already been met by its provision as a free service. It could be argued, therefore, that in looking for a wider measure of resources standardised for household needs, it would be appropriate to exclude the value of free compulsory education on the grounds that the extra resources provided to such families are counterbalanced by an equal need. On this basis, our focus would shift to the distribution of resources from non-compulsory education.

Table A1 addresses these issues, by identifying the proportionate reduction in the Gini coefficient due to compulsory and non-compulsory education. For all countries except Germany, the reduction in inequality due to the value of free compulsory education is at least two-thirds of the total reduction; for Belgium, Ireland and the UK the compulsory component amounts to more than 80 per cent of the total reduction in inequality, as measured by the Gini coefficient. Focusing on the impact of non-compulsory education, we see that the impact varies from a reduction in the Gini coefficient of just over half of one per cent in Greece, to a maximum of 3.7 per cent in the Netherlands. These values contrast with total reduction in the Gini coefficient, when compulsory education is included, of between 5 and 11 per cent.

Table A1. Impact on inequality of compulsory and non-compulsory education

Country	*% reduction in Gini coefficient due to:*		
	All	*Compulsory*	*Non-compulsory*
Belgium	-7.1	-5.7	-1.6
Germany	-6.7	-3.7	-3.1
Greece	-6.6	-4.6	-0.6
Ireland	-9.6	-7.9	-2.0
Italy	-8.9	-6.0	-3.1
Netherlands	-10.7	-7.1	-3.7
UK	-8.0	-6.4	-1.7

Appendix 2: Estimates of the impact on inequality of educational expenditures excluding and including R & D components of third-level spending

For all of the countries examined here, a significant element of the public subsidy to the third-level education sector is directed towards expenditure on R&D, rather than directly at teaching services for students. OECD figures indicate that at least a quarter of the total expenditures, and in some countries as much as 40 per cent, are attributable to R&D activities. In the body of the paper, the analysis excludes these resources on the basis that they are not primarily directed at benefiting third level students. However, at least some of these expenditures do benefit students – for example, improving the quality of teaching (by facilitating the research activities of university lecturers); or by facilitating the access of students, particularly at postgraduate level, to research infrastructures. As identification of the correct proportion of this expenditure to attribute to students is not possible, in this appendix we compare results based on the inclusion of *all* R&D expenditures with the base case which includes none.

We focus here on the analysis for all students; very similar results are obtained when students living away from the parental home are excluded. Table A2 shows the impact of including R&D expenditures on the inequality reduction brought about by third level educational expenditures. For most countries, the results including R&D expenditures are rather similar to those in the base case, when R&D is excluded. In Belgium, the results indicate that with the inclusion of R&D expenditures, the impact of educational expenditures is somewhat less equalising; this arises from re-ranking. In Italy, by contrast, the inclusion of R&D expenditures leads to a more equalising impact.

Table A3 shows the impact of including R&D expenditures on the inequality reduction brought about by *all* educational expenditures. Here, for all countries, the results are very similar whether R&D expenditures are included or excluded. While this issue may be of considerable importance for other issues, it makes little difference to the impact of educational expenditures on the distribution of resources.

Table A2. Impact on resource inequality of exclusion/inclusion of third-level R&D expenditures

Country	*Index of inequality*		
	Gini	*Atkinson (0.5)*	*Atkinson (1.5)*
R&D excluded			
Belgium	-0.6	-1.4	-0.7
Germany	-0.6	-1.3	-1.3
Greece	-0.5	-0.9	-0.7
Ireland	-0.7	-1.1	-0.4
Italy	-0.9	-1.9	-2.0
Netherlands	-1.3	-3.1	-4.1
UK	-0.8	-1.7	-2.7
R&D included			
Belgium	-0.3	-0.9	-0.1
Germany	-0.6	-1.4	-1.1
Greece	-1.2	-2.3	-2.2
Ireland	-0.7	-1.2	-0.4
Italy	-0.8	-1.6	-1.7
Netherlands	-1.3	-3.1	-4.1
UK	-0.8	-1.8	-2.7

Table A3. Impact on resource inequality of exclusion/inclusion of third-level R&D expenditures

Country	*Index of inequality*		
	Gini	*Atkinson (0.5)*	*Atkinson (1.5)*
R&D excluded			
Belgium	-7.1	-14.1	-13.0
Germany	-6.7	-12.3	-12.4
Greece	-6.6	-12.3	-11.4
Ireland	-9.6	-16.8	-11.6
Italy	-8.9	-16.7	-18.0
Netherlands	-11.1	-20.5	-20.4
UK	-8.0	-14.0	-12.9
R&D included			
Belgium	-6.8	-13.7	-12.5
Germany	-6.7	-12.4	-12.3
Greece	-6.7	-12.4	-11.5
Ireland	-9.6	-16.9	-11.5
Italy	-9.2	-17.6	-18.4
Netherlands	-11.1	-20.5	-20.4
UK	-8.0	-14.1	-12.8

Table 1. School-leaving age and participation in education, 2004

Country	*Ending age of compulsory education*	*No. of years for which over 90% of population are enrolled*	*Age range at which over 90% of population are enrolled*
Belgium	18	16	3 to 18
Germany	18	12	6 to 17
Greece	14.5	12	6 to 19
Ireland	15	12	5 to 16
Italy	15	13	3 to 15
Netherlands	18	12	5 to 16
UK	16	13	4 to 16

Source: OECD (2006) *Education at a Glance*, Table C1.2

Table 2. Entry rates into tertiary education, 2004

Country	*Tertiary type A (mainly University) %*	*Tertiary type B (mainly technical/vocational) %*
Belgium	34	35
Germany	37	16
Greece	33	26
Ireland	44	17
Italy	55	1
Netherlands	56	m
UK	52	28

Source: OECD (2006) *Education at a Glance*, Table C1.2

Table 3. National income data sets used in the analysis

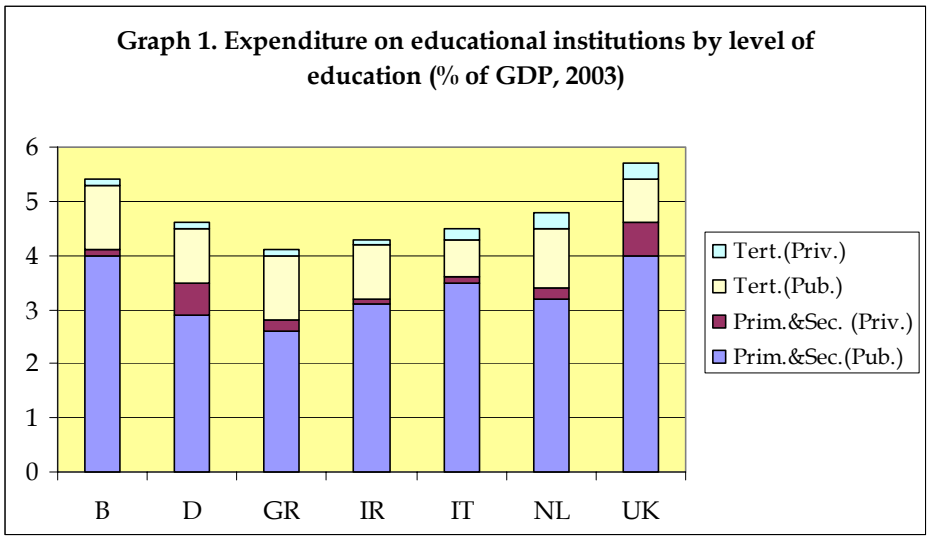
Country	Dataset	Reference year
Belgium (BE)	European Union - Statistics on Income and Living Conditions (EU-SILC)	2003
Germany (D)	German Socio-Economic Panel Study (SOEP)	2001
Greece (GR)	Household Budget Survey	2004
Ireland (IR)	Living in Ireland Survey	2000
Italy (IT)	European Union - Statistics on Income and Living Conditions (EU-SILC)	2003
Netherlands (N)	Socio-Economic Panel Survey	2001
United Kingdom (UK)	Family Resources Survey	2003

Table 4. Public spending per student in three educational levels (in current euros)

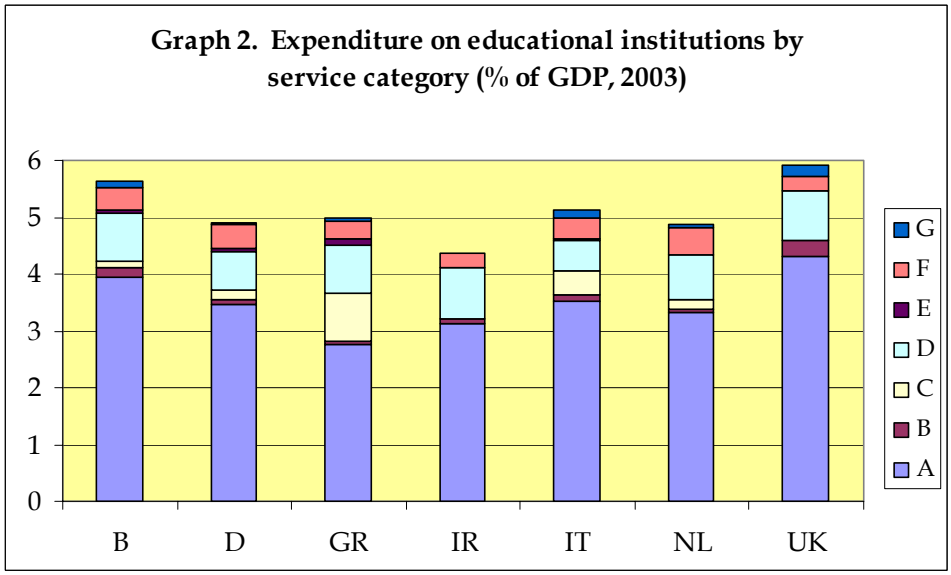
Country	Level of education			
	Primary	Secondary	Tertiary (with R&D)	Tertiary (without R&D)
Belgium 2003	4662	5814	8440	5809
Germany 2001	3131	4857	8613	5410
Greece 2004	2541	2984	3634	2772
Ireland 2000	3291	4407	6060	4687
Italy 2003	5310	5723	5055	3264
Netherlands 2001	4250	5095	8174	5069
UK 2003	2804	3495	4757	3660

Table 5. Re-ranking of countries after the inclusion of educational transfers in the concept of resources

Country	Gini			Atkinson (0.5)			Atkinson (1.5)		
	Before	After	Rank	Before	After	Rank	Before	After	Rank
Belgium	0.266	0.247	2/2	0.060	0.052	2/2	0.241	0.210	3/3
Germany	0.295	0.275	3/4	0.076	0.067	4/4	0.228	0.200	2/2
Greece	0.326	0.305	7/7	0.087	0.076	5/5	0.243	0.215	4/4
Ireland	0.302	0.273	4/3	0.074	0.062	3/3	0.247	0.219	5/5
Italy	0.325	0.296	5/5	0.091	0.076	7/6	0.272	0.223	6/6
Netherlands	0.246	0.219	1/1	0.050	0.040	1/1	0.155	0.124	1/1
UK	0.325	0.299	6/6	0.089	0.077	6/7	0.281	0.245	7/7

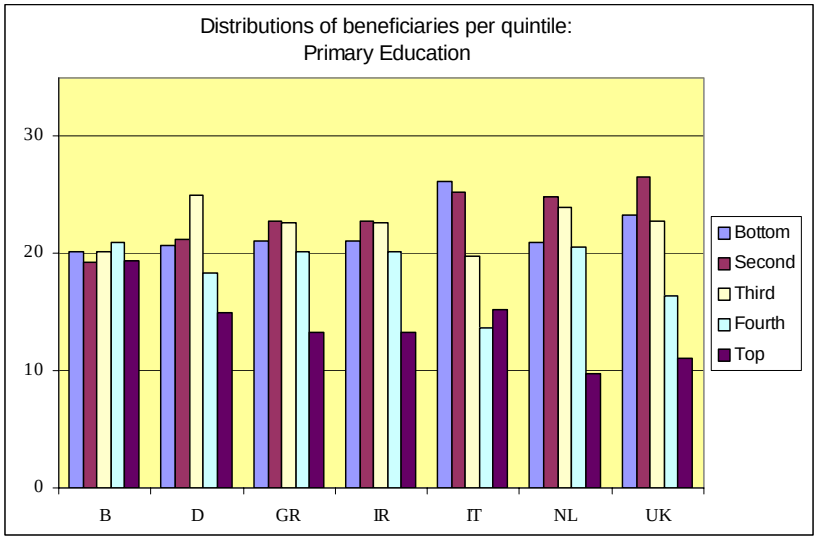


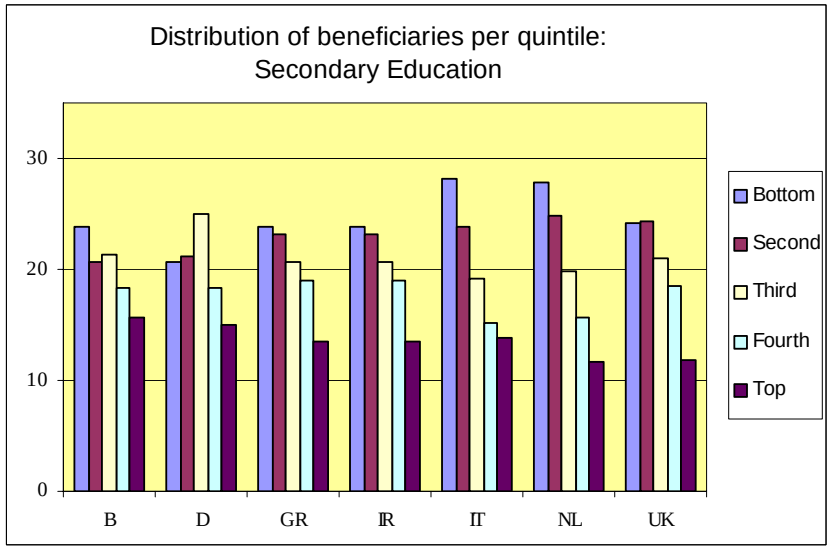
Source: OECD (2006, p. 206)

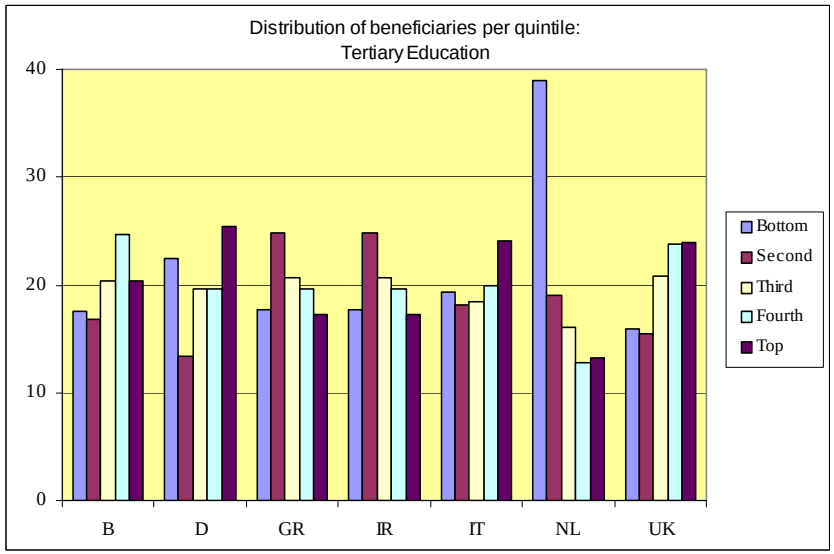


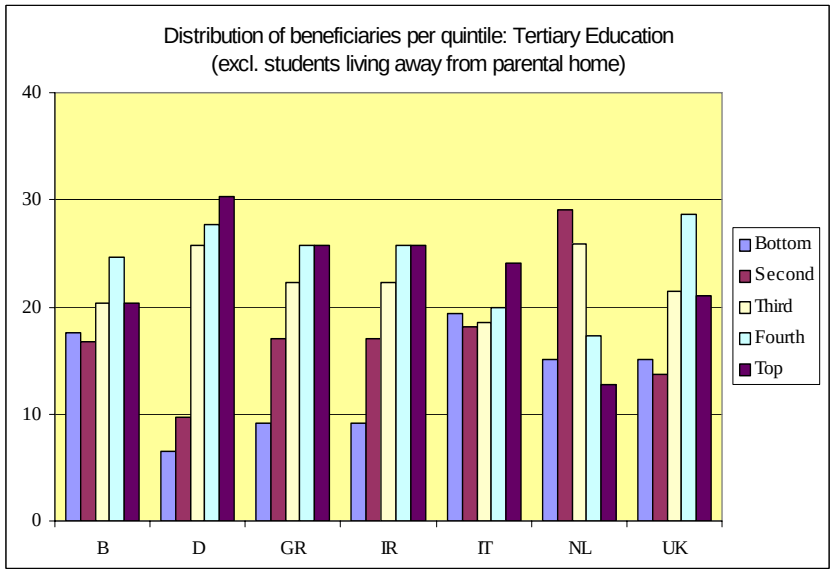
A: Core educational services (primary, secondary and post-secondary non-tertiary education)
B: Ancillary services (transport, meals, housing provided by institutions - primary, secondary and post-secondary non-tertiary education)
C: Private payments on instructional services/goods outside educational institutions (primary, secondary and post-secondary non-tertiary education)
D: Core educational services (tertiary education)
E: Ancillary services (transport, meals, housing provided by institutions - tertiary education)
F: Research and Development at tertiary education institutions
G: Private payments on instructional services/goods outside educational institutions (tertiary education)
Source: OECD (2006, p. 252)

Graph 3. Distribution of beneficiaries per quintile

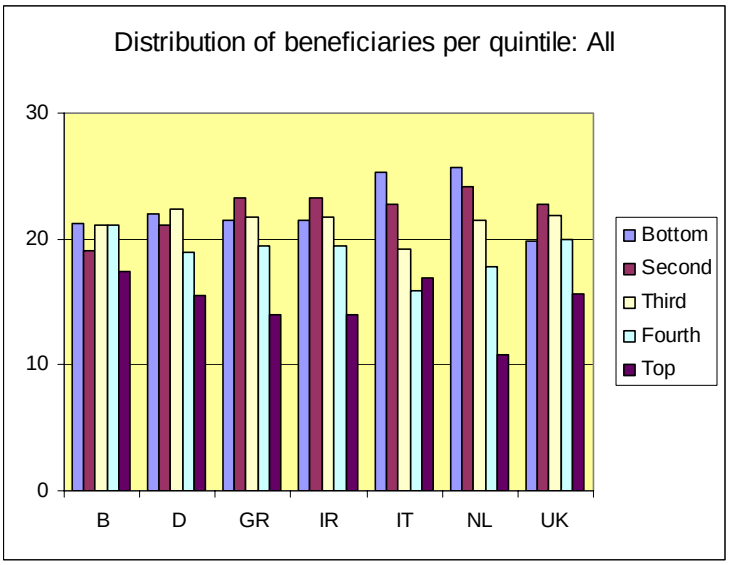


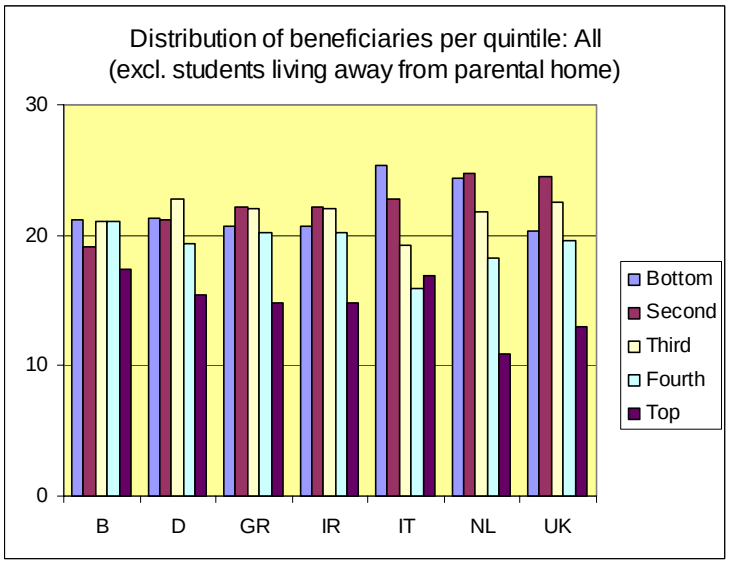




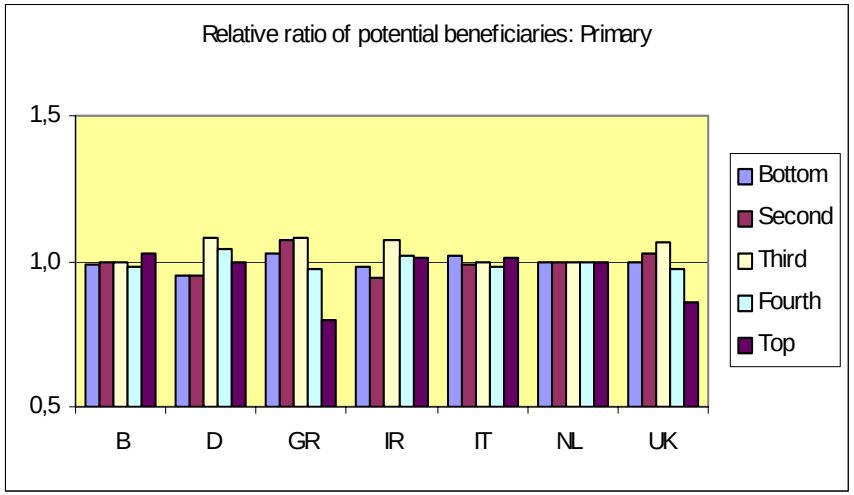


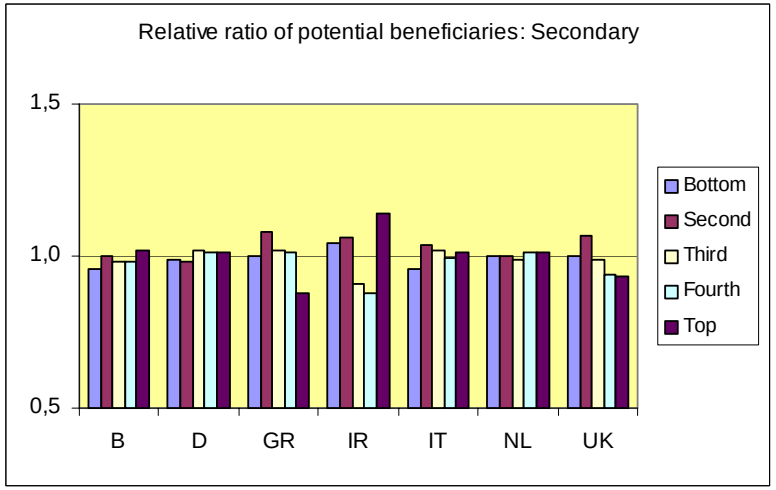
Graph 4. Distribution of beneficiaries per quintile (All)

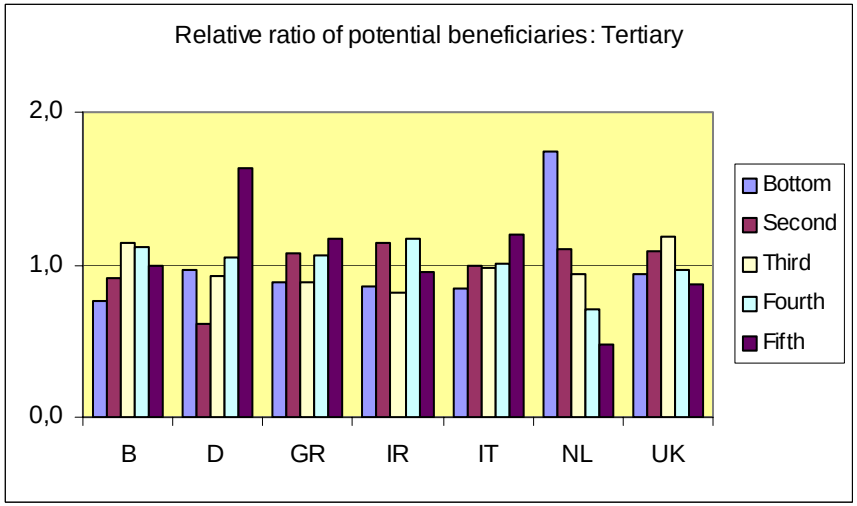


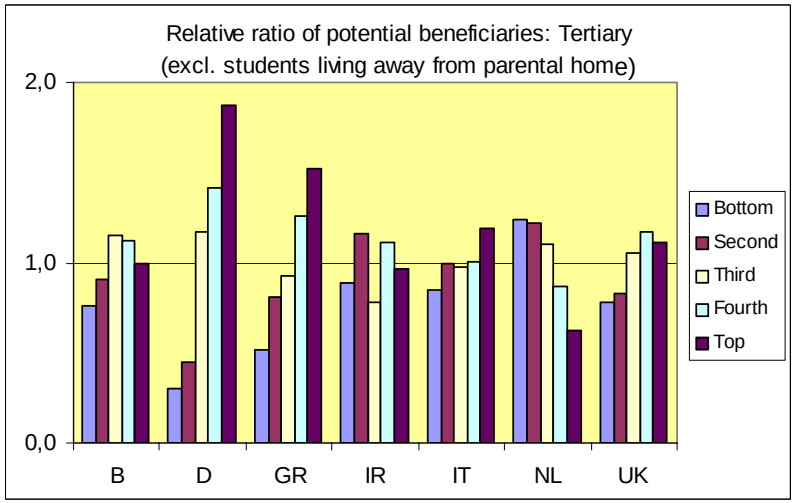


Graph 5. Relative ratio of potential beneficiaries

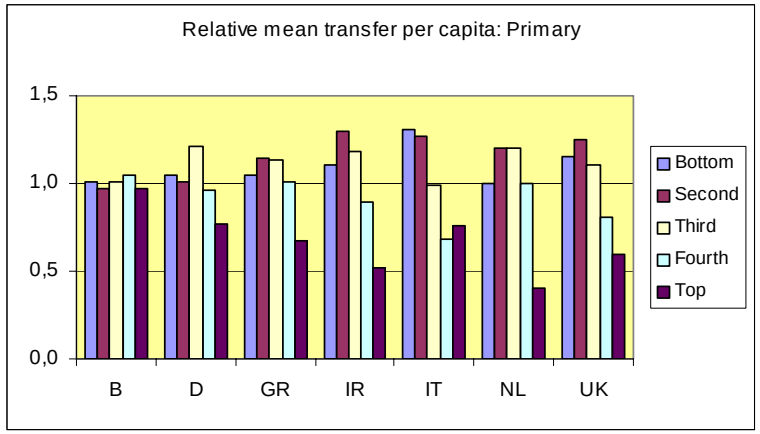


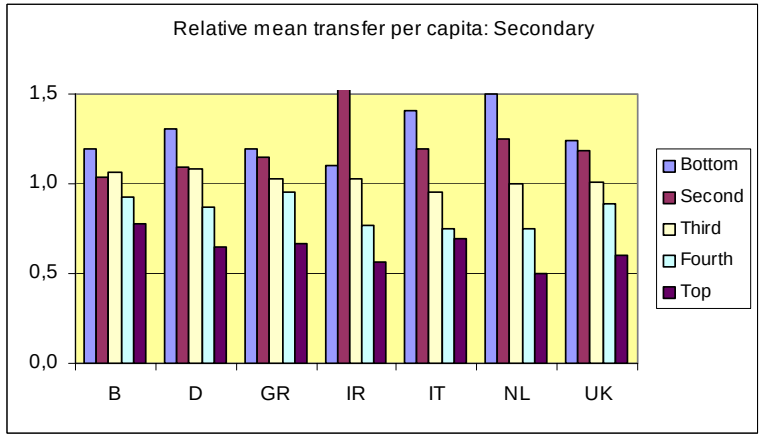


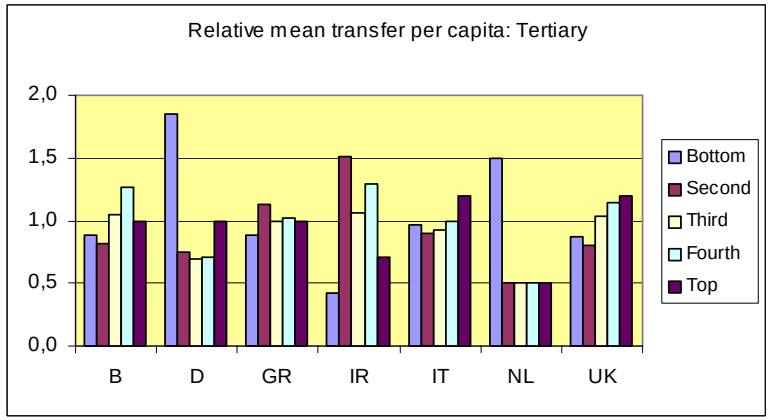


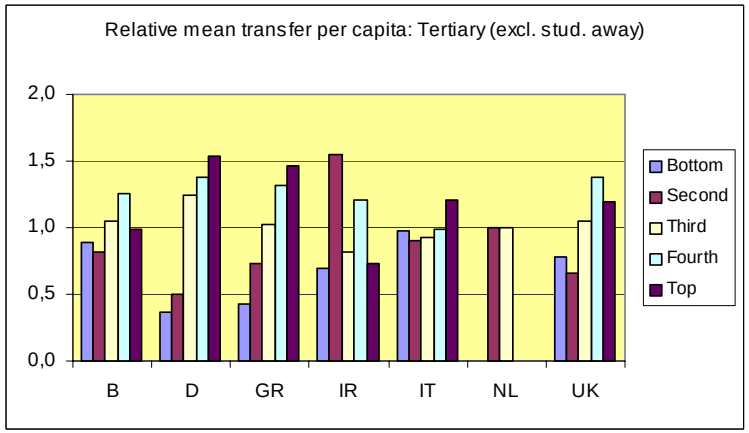


Graph 6. Relative mean transfer per capita

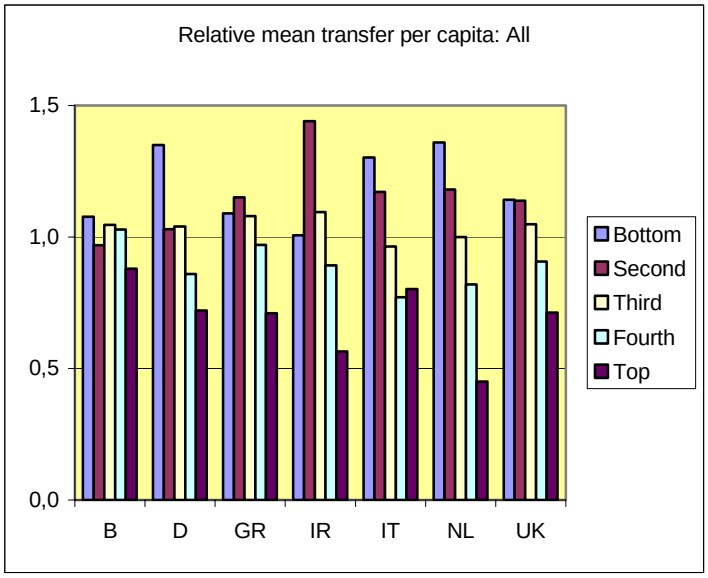


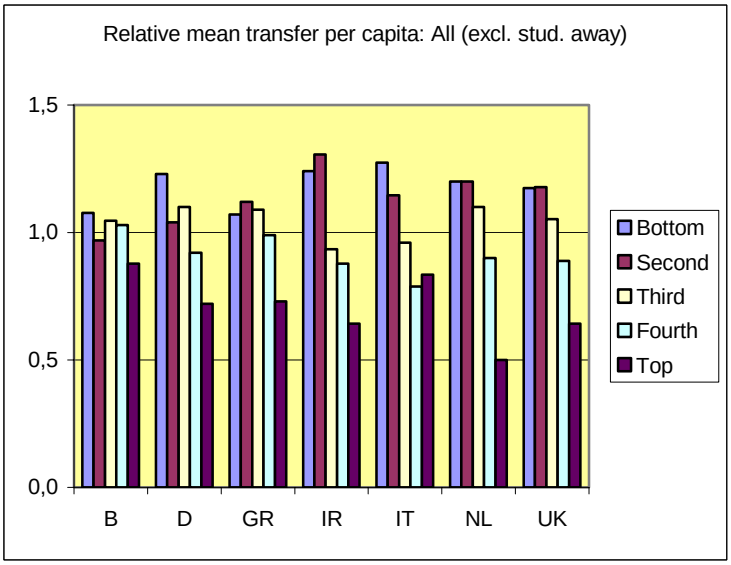




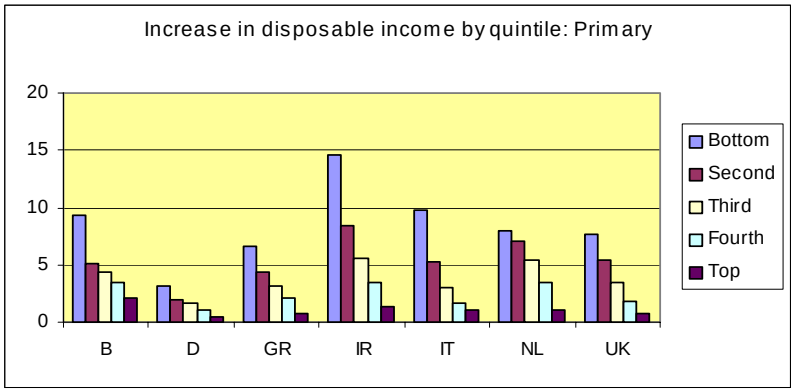


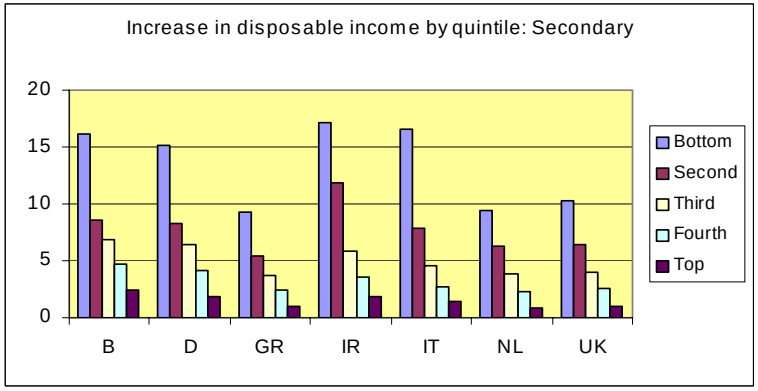
Graph 7. Relative mean transfer per capita (All)

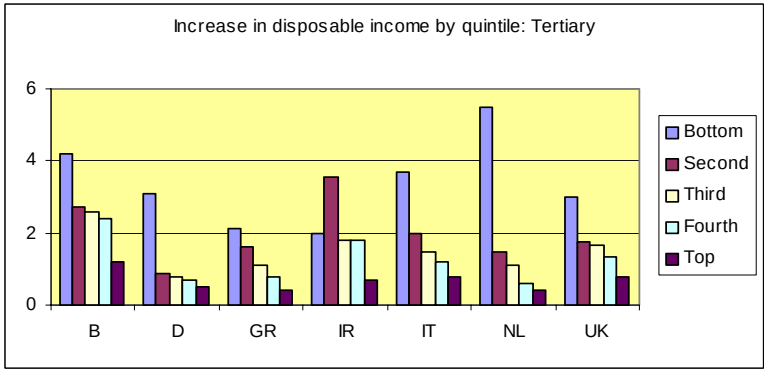


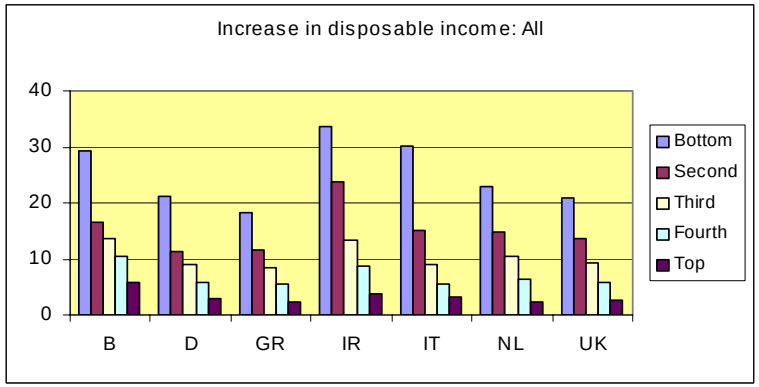


Graph 8. Proportional increase in disposable income per quintile

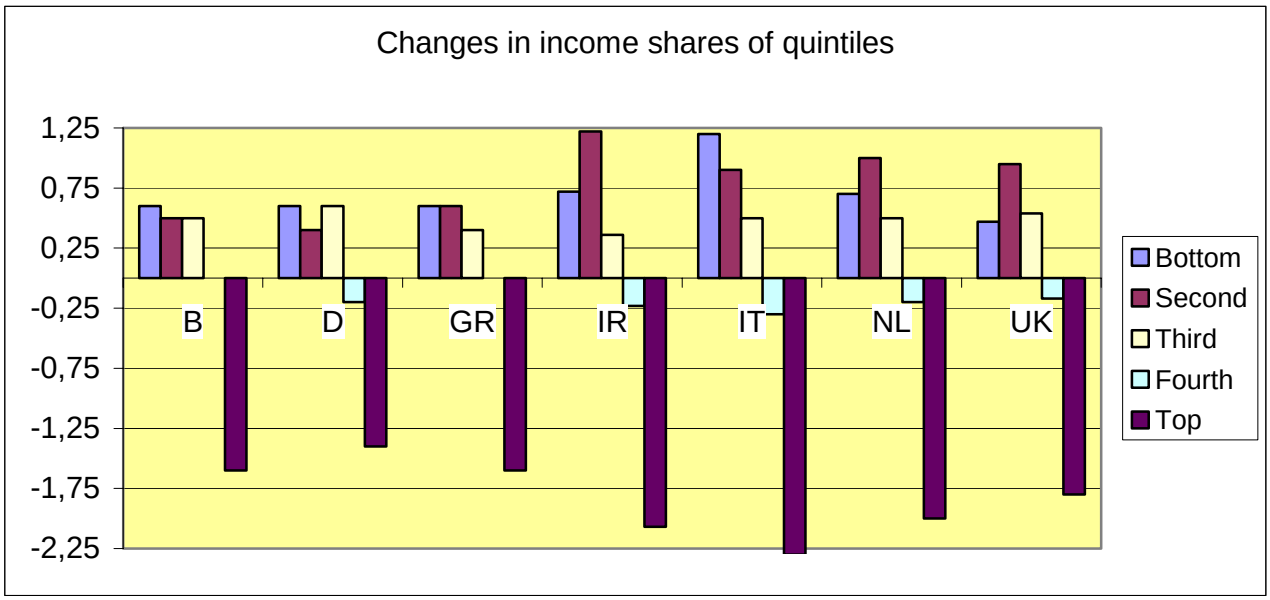




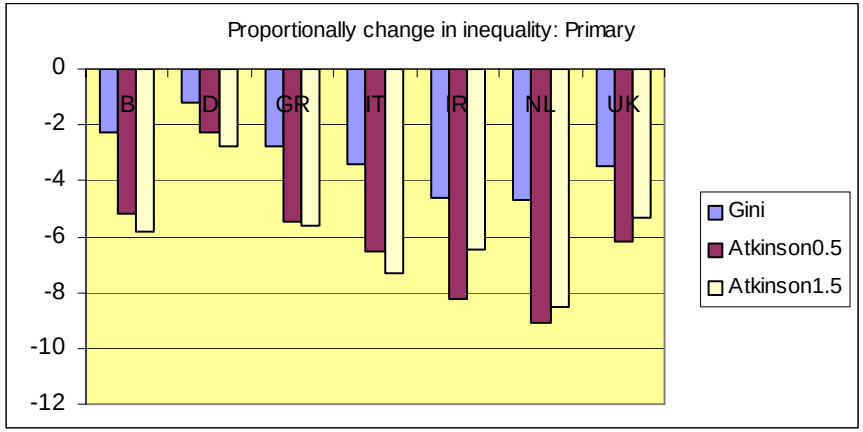


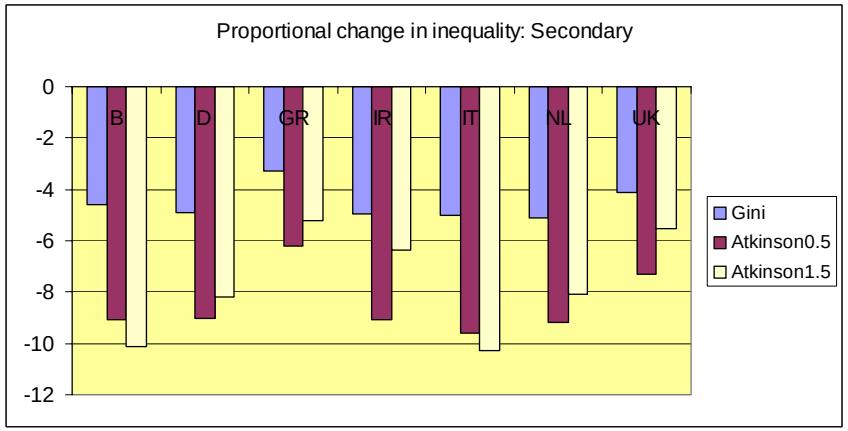


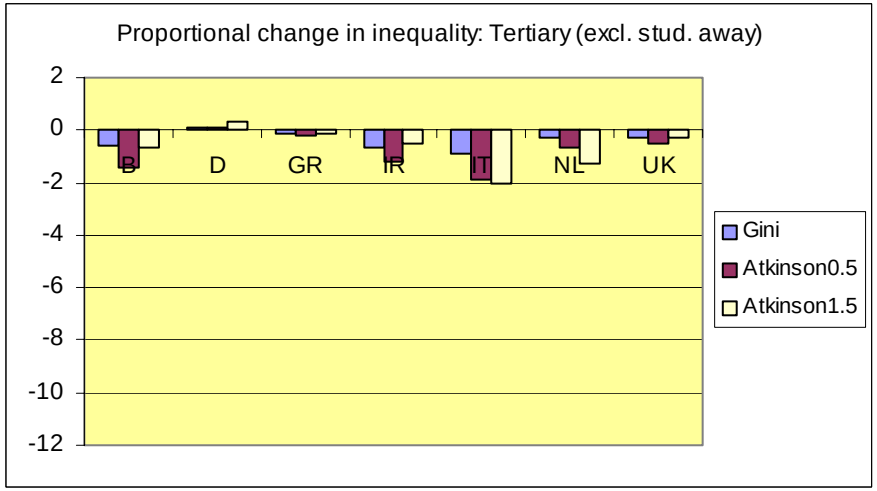
Graph 9. Changes in quintile income shares (disposable income + public transfers)



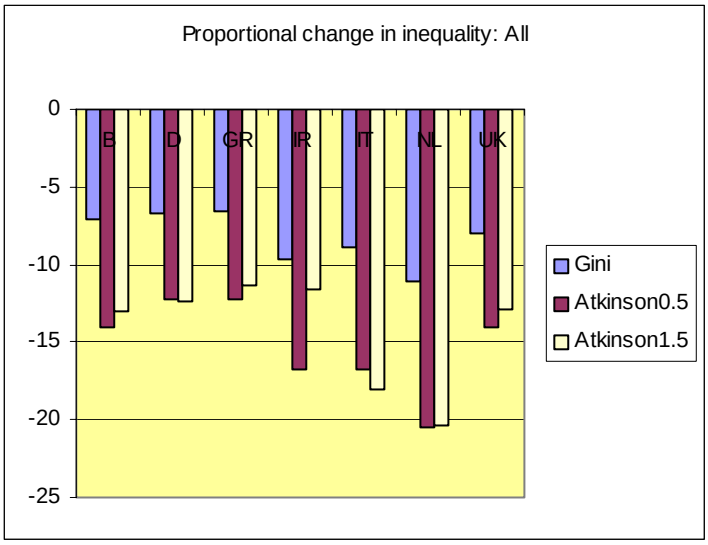
Graph 10. Changes in inequality due to public education transfers by level of education

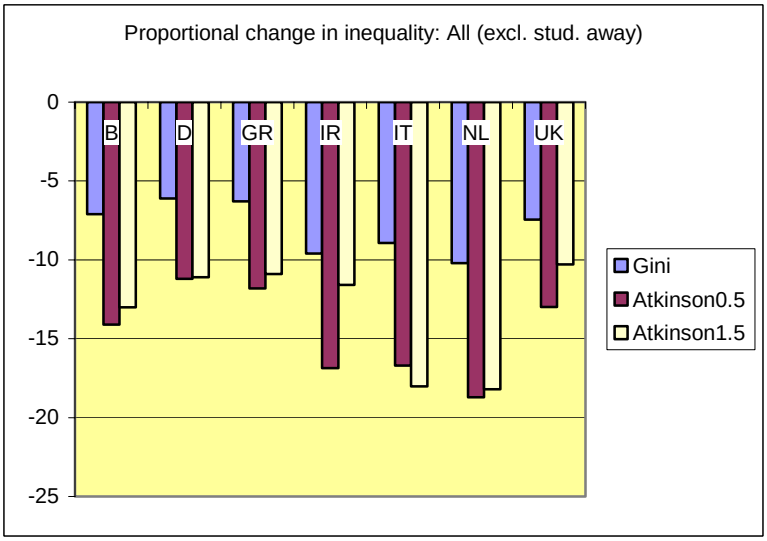




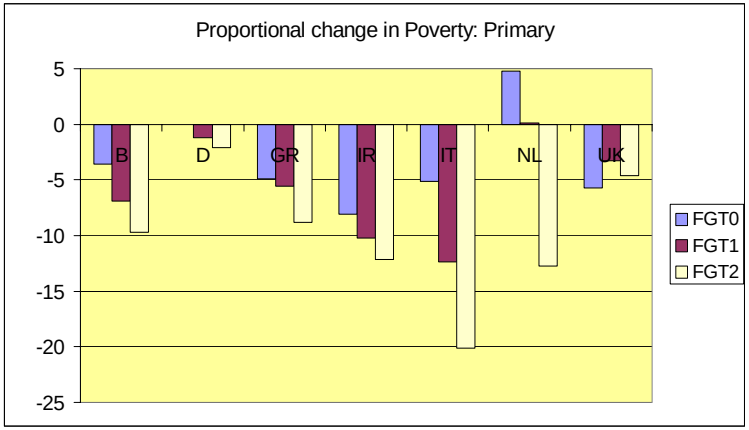


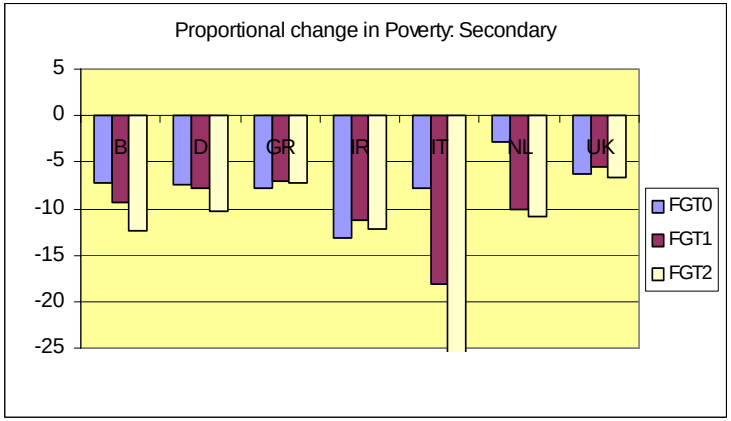
Graph 11. Changes in inequality due to public education transfers (all levels)

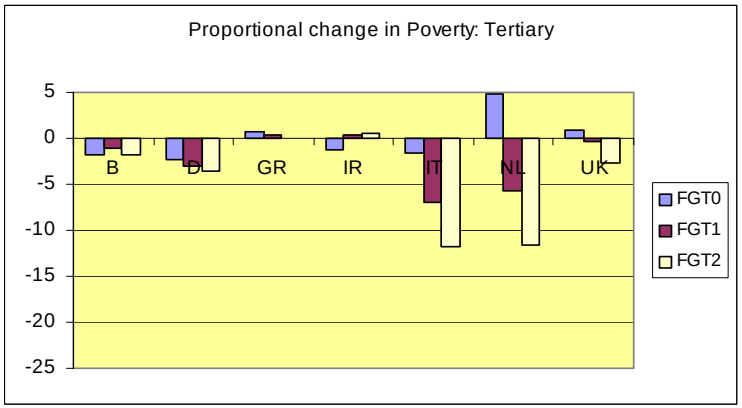


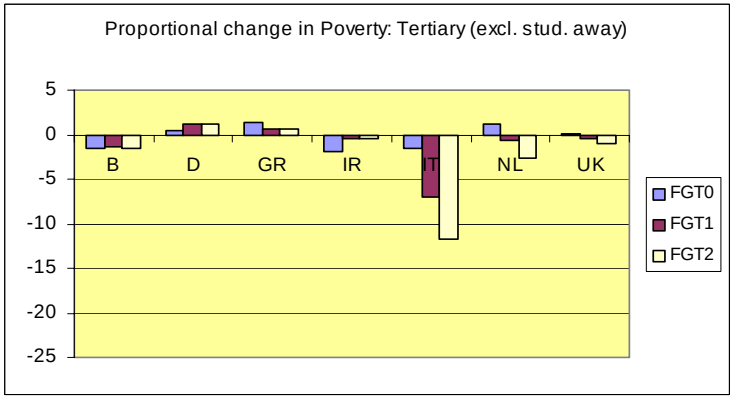


Graph 12. Changes in poverty due to public education transfers by level of education

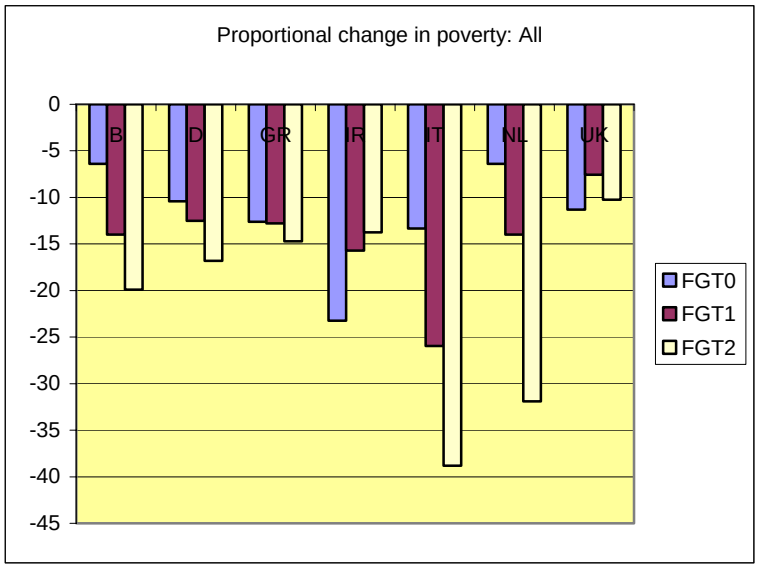


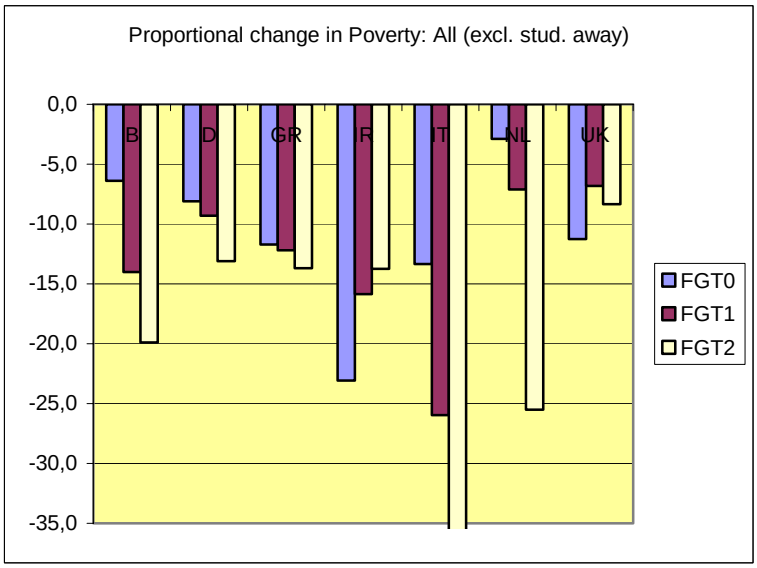






Graph 13. Changes in poverty due to public education transfers (all levels)





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David Duffy

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Karen Mayor and *Richard S.J. Tol*

186 Irish Sustainable Development Model (ISus) Literature Review, Data Availability and Model Design
Joe O'Doherty, Karen Mayor, Richard S.J. Tol