The Redistributive Effects of British Subsidies to Higher Education

An honors thesis for the Department of Economics

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Tufts University, 2010

Table of Contents

Tables and Figures

Abstract

Like many forms of government spending, higher education subsidies redistribute income by using tax revenues to reduce the cost to students of attending college or university. Such subsidies are desirable because they make higher education affordable for students from lower income backgrounds, with important implications for equity and social mobility. However, when non-financial constraints deter low-income students from enrolling in college or university, untargeted higher education subsidies largely benefit individuals who are not only from higher income backgrounds, but whose degrees will likely provide them with above-average earnings in the future. This effect is particularly significant in countries like the United Kingdom, characterized by high income inequality, low social mobility, and enormous untargeted subsidies to higher education.

Following a 2006 analysis by William Johnson for the United States, this paper explores the redistributive properties of British subsidies to higher education. Focusing on the income of graduates and their non-graduate peers rather than of their parents, the experience-earnings profiles of a cohort of English and Welsh 17- to 25-year-olds are projected. From this information, the average net present value of the taxes paid and education benefits received is calculated for each lifetime income decile in order to provide a picture of the redistributive effects of the current system of higher education funding in the UK. The results show that, within this cohort, lifetime income deciles seven, eight, and nine are net beneficiaries of the higher education finance system, while the bottom six deciles, along with decile ten, pay more in taxes to higher education than they receive in direct benefits.

Chapter 1: Introduction

The purpose of this paper is to determine which income groups are net beneficiaries of the current system of higher education finance in the United Kingdom. Virtually all British universities are publicly funded, and as a result the government is able to set a limit on the fees each university can charge its students.[1] Since these fees cover only a portion of the costs of their education, those individuals who attend university receive a government subsidy during each of their years in higher education. Additionally, all students are entitled to government fee and maintenance (cost of living) loans, which carry an implicit subsidy through a zero real interest rate. The British system of higher education finance therefore involves a transfer of income from society at large, in the form of taxes, to students and graduates, in the form of fee and loan subsidies.

Higher education subsidies can be both efficient (in the sense of inducing the output-maximizing number of individuals to participate in higher education) and equitable (in the sense of improving educational outcomes for disadvantaged individuals and transferring income from high- to low-income groups). Without subsidies, education tends to be underconsumed, particularly by low-income individuals. However, subsidies can have adverse effects on efficiency and equity when they are too large or poorly designed. This paper will explore only the equity ramifications of British subsidies, specifically, the direction of redistribution among income groups generated by subsidies to higher education. The income groups under consideration are formed from a constructed cohort of English and Welsh individuals between the ages of 17 and 25 in 2008. These individuals are divided into deciles based on the net

[1] The exception to the rule is the University of Buckingham, Britain's only private university. With fewer than 1,000 students enrolled, this university is typically excluded from discussions of the UK higher education system.

present value of their projected lifetime earnings, and the costs and benefits of the current system of higher education finance are estimated for each decile.

Chapter 2 surveys the extensive literature on theories of equity and efficiency in higher education and how subsidies can be used to meet these goals. The chapter will also touch on attempts to measure the redistributive effects of public higher education subsidies in the United States, and provide a brief overview of the British higher education funding system. Chapter 3 describes the data sets used in the analysis: these include the Quarterly Labour Force Survey and the Student Income and Expenditure Survey. Chapter 4, Methodology, enumerates the steps taken, including the projection of lifetime earnings of the members of the cohort, and the estimation of taxes paid towards higher education and benefits received by students. The analysis concludes by dividing this cohort into deciles of lifetime income and calculating the average net benefits received by individuals in each decile. Chapter 5, Results, presents and discusses the outcome of this analysis. Chapter 6 concludes the paper by reflecting on the relationship between current UK higher education subsidies and theories of equity in education.

In brief, this paper finds that British higher education subsidies have the effect of redistributing income from the lowest six deciles and the top decile of lifetime income towards lifetime income deciles seven, eight, and nine. In other words, the average individual in decile seven, eight, or nine receives more in higher education subsidies than s/he pays in taxes towards higher education, while the opposite is true for members of lifetime income deciles one through six and ten. This results from the fact that graduates principally fall into the top four income deciles, yet benefit from the taxes paid by non-graduates in all deciles. Even under quite optimistic projections of graduate earnings profiles, this paper finds that nearly 90 percent of graduates never pay as much in taxes towards higher education as they received in benefits

through fee and loan subsidies. This outcome, coupled with the fact that graduates are typically high earners, produces a regressive subsidy system, involving a substantial transfer of income from low- to high-income individuals. Therefore, this paper concludes that the current system of higher education finance in the United Kingdom is inequitable and demands reform.

Chapter 2: Literature Review

I. Equity in higher education

The notion of an equitable higher education system is a subjective one, and each nation's government will decide what measures need to be taken in order to bring about equity. One general criterion is that socioeconomic status, race, gender, or other factors unrelated to ability should not play a role in an individual's educational outcomes. Specifically, "if two people have identical abilities and identical tastes, they receive the same education irrespective of factors which are regarded as irrelevant such as parental income." (Barr 2005a, 212) There are many levels of subtlety beyond this, however. Aamodt (2006) notes three such levels: the first, formal equity, requires merely the absence of discrimination on the basis of gender, ethnicity, social class, or other similar factors; however, nondiscrimination often does little to improve outcomes for underprivileged groups, who may find themselves underrepresented in higher education for various other reasons. The relative disadvantage of particular groups gives rise to the second idea for equity, that of pursuing equality of results, namely by treating certain individuals differently in order to give special help to those prospective students who need it. A third type of equity to be pursued in higher education is equality of opportunity, which is perhaps what Barr (above) had in mind.

Achieving equity in higher education may mean different things to different societies, so the policies of different countries will vary in the extent to which they promote and make accessible higher education. Broadly, though, equity measures can be thought of as "practical steps introduced to redress the effects of broader social and economic inequalities and in the context of learning, to allow individuals to take full advantage of quality education, irrespective of their background and depending on their needs." (CEC 2006, 7) Although it is difficult to

define how and when equity is actually attained, it is worthwhile to first consider what inequity in education looks like, and what actions a government might take to remedy the failures.

As is starkly evident in most countries, higher education participation is substantially biased towards members of more affluent socio-economic groups, despite in many cases the existence of measures to promote equal access. Social disadvantage plays out in two ways: first, students may not be eligible to enroll in university because of poor secondary school performance; second, some students may not attempt to gain a place even if they are qualified, either because of financial or social factors. Financial factors include liquidity constraints, as prospective students may find it difficult to secure a loan; alternatively, price- or debt-aversion may deter them from enrolling even if it were feasible. Callender (2006, 116) cites UK survey data suggesting that "[t]hose not going to university are most often lured by the 'pull' of economic independence offered by employment." For these individuals, free tuition is not enough of an inducement to pursue higher education, perhaps because they underestimate the economic rewards of postponing their entry into the labor market to pursue a higher degree.

Asplund et al (2008, 263) argue that liquidity constraints are less salient than previously believed, citing US and UK evidence suggesting that "the long-term consequences of better family resources in a child's formative years are far more important for subsequent higher education enrolment than are the short-term liquidity constraints facing families in a child's adolescent years." Thus, factors relating to a child's early development may ultimately prove more relevant than the specific financial circumstances when s/he makes the decision of whether or not to pursue higher education. At the point of decision, though, information problems are prevalent particularly among lower-income students: they are likely to know fewer people who have attended university, and they tend to attend secondary schools that are less equipped to

prepare them for higher education or help them with the university application process. (Callender 2006) By contrast, children from affluent families tend to consume more higher education because of "cultural capital" and a superior understanding of the benefits of higher education. (Johnstone 2006, 55)

II. Policy responses to market failures

In an effort to promote access for lower socioeconomic groups, many countries have in place substantial subsidies to higher education, even to the extent of free tuition and subsidized room and board in some cases. Such equity measures have implications for a nation's social and political character: G. Johnson (1984, 304) notes that promoting higher education can improve involvement in the arts and in politics, while excluding lower-income individuals from higher education via up-front fees "would lower the rate of social mobility and consequently increase class consciousness." Bevc and Uršič (2008, 236) name a few equity goals that can be pursued via government funding: "equality in access to education for different socio-economic groups, payment into the national budget for education in accordance with economic ability, payment into the national budget in accordance with the benefits (expenditure) received, and payment in accordance with the individual marginal benefits of education." The most obvious type of funding intervention is a blanket tuition subsidy (limiting the fees that universities can charge for tuition), usually financed through general tax revenues. Besides reducing the price of higher education, governments can also play an important role in mediating the risk inherent in educational investment by subsidizing and securing student loans, essentially insuring students (and lenders) against low returns to education. Subsidies can also come in the form of maintenance grants (means-tested or otherwise) and tax deductions or other benefits to students and their families.

However, such subsidies have thus far been unable to bring about equity in higher education enrollment and outcomes. Even with the most generous of subsidies, some potential students may still be hesitant to forego earnings while at university, or may not even consider applying for a place because of misconceptions about university life. Personal and family finances can also play a role in a student's success even after enrolling in university: Callender (2006, 125) shows that UK students engaged in part-time employment are demonstrably less likely to achieve a good (first or upper second) degree, and as financial returns to higher education vary with degree quality, "term-time working could contribute to lower graduate salaries and lead to a reduction in the wage premium they reap from their degree." Therefore, financial constraints while studying can have a long-term impact on the graduate's success in the workplace and hence on intergenerational income mobility. Empirical evidence confirms the shortcomings of higher education subsidies: Chapman's (2006, 93) review of data from Canada, Norway, the Netherlands, and Portugal demonstrates that "marked changes in the levels, incidence and nature of grant and loan support systems (and tax and other fiscal incentives) do not seem to affect significantly the proportion of enrolments of students from different family wealth backgrounds." Similar evidence from Europe confirms that higher education subsidies are necessary but not sufficient for widening access to higher education. (Asplund 2008) These findings should give pause to those proponents of free or heavily subsidized tuition who argue that these measures benefit students from lower-income backgrounds.

III. Efficiency in higher education

It is essential to note that higher education subsidies have efficiency, as well as equity, ramifications. Efficiency of the higher education sector can be measured in two dimensions: that of internal efficiency, or "the relationship between education inputs and outputs within the

education sector", of which indicators include the graduation rate and duration of study; and that of external efficiency, or the meeting of social goals outside the education sector, of which indicators include the employment rate of graduates, contributions of higher education to economic growth, and returns to investment in higher education. (Bevc and Uršič 2008, 234) Because of the positive externality effects of higher education, subsidies must be instituted to bring about efficiency. These externalities include tax dividends (higher-income individuals pay more in income taxes, and presumably in other taxes as well); productivity externalities (innovations developed by an educated elite, such as the personal computer, confer productivity gains on society as a whole); and social cohesion (participation in higher education is a socializing experience). When subsidies increase efficiency, they are desirable even to those who do not receive them directly: G. Johnson (1984) presents a model in which low-skill individuals, who cannot benefit from attending university themselves, are willing to finance higher education subsidies to the extent that the increase in the supply of high-skilled workers causes their wages to increase due to complementarities of labor. Improving access to higher education through subsidies also allows the most able and motivated students to receive a university education, rather than exclusively those students whose parents can afford to pay fees. An accessible higher education system also has long-term benefits in terms of improved intergenerational mobility and reduced income inequality, likely translating into higher average incomes over time.

While such social benefits are difficult to quantify, it is generally agreed upon that they do exist. However, it is obvious that individuals also enjoy sizeable private benefits from education. These private benefits include the enjoyment of the education process itself (consumption utility) as well as returns to educational investment in the form of "greater

productivity and, connected, higher pay, greater job satisfaction and increased enjoyment of leisure." (Barr 2005a, 215) Given that private benefits exist in addition to the social benefits, efficiency dictates that individuals make contributions to their own educational expenses. Otherwise, excessively subsidized higher education can be "either over-consumed…or can be consumed with insufficient academic effort." (Johnstone 2006, 55) In other words, inefficiently large education subsidies create an artificially high private rate of return on higher education that induces individuals to participate even if the private and social benefits do not justify the expenditure. García-Peñalosa and Wälde (2000) model the extreme case of a perfectly equitable subsidy, that is, one that equalizes net lifetime wages of skilled and unskilled workers by increasing the supply of skilled workers until both wages are equal. The efficiency-equity tradeoff is very apparent here, as in this instance increasing enrollment to the extent of equal wages means that the marginal product of the last skilled worker is lower than the total cost of his/her education plus wages foregone while studying. This is an extreme example though, and in the long run, "efficiency and equity objectives can, in fact, be mutually reinforcing because of the positive effect of investing in social policies on wider economic, social, and financial outcomes" with a moderate higher education subsidy. (CEC 2006, 8)

IV. Cost sharing in higher education

The inefficiency consequences of overly generous subsidies to higher education point towards the need for some form of cost sharing between taxpayers, students, and parents. The burden can be shifted from taxpayers to students and their parents in a number of ways. These include the introduction or increase of tuition fees or other student services charges; charges for lodging or food expenses through the elimination or reduction of maintenance grants; and the reduction of subsidies on student loans, through more effective collection methods or removal of

interest rate subsidies. (Johnstone 2006) This type of cost sharing can have many desirable outcomes. For instance, by increasing the private resources available to the higher education system, public resources can be freed up and used in a variety of alternative ways: to improve the quality of universities, to expand the capacity of the higher education system, to target subsidies more heavily towards underrepresented groups, or even to reduce taxes, particularly on lower-income individuals and households. This ideally would create a higher education funding system that is progressive or, at worst, distributively neutral.

The clear way to improve the financial position of a university system without creating an up-front obstacle to access is to offer government-sponsored student loans. Loans can be originated from the public or private sector; repayments may follow the mortgage model, or may be related to income; and the interest rate they carry may be the market rate, a subsidized rate, or even income-contingent. These options provide substantial flexibility: the repayment structure and interest rate can theoretically be manipulated such that "individuals pay for the private benefits of their university education, but are subsidised to the extent of the external benefit conferred on others." (Barr 2005b, 30) Loans also serve the purpose of freeing students from dependence on their parents, as certain students may not qualify for a grant based on their parents' income, even though their parents do not intend to support them financially. Finally, the existence of a loan scheme can in fact improve access relative to a grant scheme as the additional funding may allow for the creation of additional university places, creating opportunities for more students to enroll.

As mentioned above, mortgage-style loans with fixed repayments both deter certain students from pursuing higher education and severely burden low-earning graduates. For these reasons, an income-contingent repayment structure is considered more equitable. Vandenberghe

and Debande (2007, 422) highlight the two equity obstacles addressed by such a system: "[d]eferred payment is generally justified by the fear of *liquidity constraints,* while making payment conditional on graduates' level of income—and thus partially ensuring human capital investment—is justified by *risk aversion* among prospective students." In an income-contingent loan scheme, loan repayments are calculated as a function of income, and repayments may also only be collected on a graduate's income above a minimum level. Upon an individual's retirement or after a set number of years, if the loan has not been paid off in full the debt is forgiven, with the effect being that low lifetime earners receive the largest subsidies. Such a scheme offers many advantages over a fixed repayment system. Most significantly, income-contingent repayments appear much less daunting to a prospective student, and so the system enhances demand-side access. Each individual's repayments are by their very definition affordable, and additional provisions can be made for graduates in socially useful but low-paid occupations in order to encourage these career choices.

In order to avoid distortions, an income-contingent loan scheme must follow several criteria. For example, if a modest but positive real interest rate is used, this will reduce the unnecessary subsidy given to those graduates who earn enough to eventually pay off the full value of the loan—an unsubsidized interest rate will help bring in more revenue without increasing the burden on a graduate in any given year. For the lowest earners, who never complete repayments, the interest rate is irrelevant because the size of each payment, and hence the sum of lifetime repayments, is unaffected. The lifetime effects of the removal of such a subsidy are heaviest for graduates in the middle ranges of the income distribution, as the highest earners pay off their loans the fastest and so their loans are subsidized over fewer years. (Dearden et al 2008) Therefore, the choice of interest rate will be a matter of the government's

discretion as to which segments of the income distribution ought to be receiving a subsidy on their student loans.

Distortions of an income-contingent loan system are also minimized when the scheme is piggybacked onto income tax or national insurance collections. Even if private funds are used for start-up, the government must collect repayments in order to effectively track individual income, so it follows logically that the repayment scheme can be administered along with existing payroll withholdings. While leakage will inevitably be created by emigration, the burden of repayments is presumably not large enough to cause emigration; for the same reason, neither will the repayments distort job choice or create work disincentives. Collecting loan repayments alongside social security contributions highlights the fact that it helps individuals redistribute their own income over their lifetimes; for this reason, Barr (2005d, 58) compares the system to an "up-front pension."

V. Redistributive effects of public subsidies to higher education

While larger-than-efficient subsidies are frequently rationalized on equity grounds, such subsidies may largely fail to benefit the intended individuals as a result of the social and information-related barriers described above. For example, in the UK in 1993, prior to the introduction of tuition fees, degree acquisition by age 23 was 9 percent for young adults with parental income in the lowest 20 percent of the distribution, as compared to 37 percent for those in the highest 20 percent of the parental income distribution. (Blanden and Machin 2004, 237) Therefore, the enormous subsidy funded through general taxation was in this case clearly being lavished on members of the middle and upper income brackets. Because of the nature of participation rates, depending on the progressivity of a country's tax structure and degree of income inequality, blanket subsidies to higher education may in fact redistribute income from

lower to higher income segments of society. Put bluntly, where universal higher education subsidies exist, "[t]axpayers' money, collected from all socioeconomic groups within the country, is transferred to students among whom the most well off are over-represented, and who regardless of social origin will obtain positions with higher income than average in the future." (Aamodt 2006, 333) This paper will proceed by surveying methods of and attempts at measuring the redistributive effects of higher education subsidies, then will turn to a specific analysis of the British funding system as it exists today.

The net effect of education subsidies can be thought of as the difference between the transfer away from (in the form of taxes levied for the purposes of higher education funding) and the transfer towards (in the form of subsidies received) different groups in society. The sum of the net subsidies to all groups must equal zero; the sign on the net subsidy of a particular group represents whether it is a net beneficiary of or contributor to subsidies. If the net subsidy to each group were equal to zero, then the system would be perfectly proportional; if not, then some groups are making transfers to other groups. For the purposes of this paper, a subsidy that generates a transfer from higher to lower income groups will be described as progressive; a subsidy that redistributes from lower income groups to higher income groups will be described as regressive.

One often-cited analysis of the redistributive effects of higher education subsidies is Hansen and Weisbrod (1969) which studies the California public higher education sector, including the University of California (UC), State College (SC), and Junior College (JC) systems. In this order, the institutions range from highest to lowest in terms of both academic caliber (of instruction and students) and per-student subsidy size—that is, UC students receive the largest subsidies, JC students the lowest, and SC students an amount between the two. The

authors use this three-level system to highlight the effects of parental income on not only higher education participation, but also on the quality of institution attended and hence the size of subsidy received. Higher-income individuals were overrepresented in all institutions, but to the greatest degree in the UC system; in other words, median family income across all institution types exceeded median family income of the entire population, and median family income by institution type increased with the quality of the institution. Moreover, the per-student subsidy as a percent of median family income was also found to be increasing along these same lines. This enrollment pattern was strongly explained by the positive correlation between outstanding high school achievement (qualifying the student for the UC system) and family income, as well as the increased propensity of wealthier eligible students to enroll in the UC system.

Hansen and Weisbrod continue with the analysis by measuring the size of tax payments and the effective tax rate on each of nine income brackets. From a selection of state and local taxes (including income, sales, property, and other assorted taxes) the authors find that the combined effect of these taxes is regressive below $8,000 in annual income and roughly proportional over the rest of the income distribution. Comparing the taxes levied on the median family income in each institution type with the subsidy received by students in that institution, the subsidy exceeded taxes paid in all instances, and most relevantly, the size of the net subsidy increased with the quality of institution (and hence with median income). Hansen and Weisbrod (1969, 191) conclude from these findings that "the current method of financing public higher education leads to a redistribution of income from lower to higher income families" because of the larger net subsidies received by the wealthy students in the best institutions.

Coming close on the heels of this publication was Pechman (1970), which called attention to deficiencies in both the data selected and methodology used by Hansen and

Weisbrod (hereafter HW) to come to this conclusion. Specifically, HW base their claim of reverse redistribution on a regressive subset of taxes and the fact that families with children in the higher education system tend to have higher incomes, even though the authors admit that "the distributions of students by parental income are so wide for each type of system—University of California, State College, and Junior College—that any strong conclusions about the 'class-serving' nature of the entire system of higher education in California cannot be drawn." (186) By merely measuring the net transfers to the median (in terms of family income) student in each institution category, the authors fail to present convincing evidence on the direction of transfers across income brackets.

To reach a more definitive conclusion, Pechman uses the data presented by HW but instead measures the net subsidy to each of the nine income brackets. He begins by comparing the revenue generated by the taxes included in HW with the total value of subsidies offered by each of the three systems, using the per-student subsidies provided by HW. For example, he notes that total annual subsidies to students in the UC system (funded exclusively through state taxes) were equal to seven percent of the 1965 revenue from the state taxes selected by HW; he therefore assumes that seven percent of each household's state taxes were directed towards the UC system. To calculate the average subsidy per family in a particular income bracket, Pechman multiplied the proportion of families in that bracket with a child in the UC system by the subsidy per UC student. This calculation was repeated for the SC and JC systems, and the subsidies and tax burdens summed.

When the total higher education tax burden was subtracted from the total average subsidy, it emerged that, from lowest to highest, brackets one, six, eight, and nine were net subsidizers of the higher education system, brackets two through five were net beneficiaries, and

bracket seven broke even—in other words, the highest and lowest income groups essentially subsidized the lower-middle class. Pechman also went one step further by adding self-supporting students, omitted by HW, to the analysis, with the new calculations producing a net subsidy to the lowest five income brackets and a negative transfer from the top four brackets. This result is explained by the fact that self-supporting students tend to come from lower-income families, and so the inclusion of these students in the analysis accounts for more subsidies towards lower-income families. Pechman also notes that the choice by HW of a subset of state and local taxes could also have an effect on the net distributive nature of the system: HW chose to exclude particularly progressive taxes such as corporation income taxes and estate and gift taxes, hence if the entire tax burden were estimated, the progressivity of the redistribution would likely be even more pronounced. Due to data imperfections like these, Pechman notes that the exact magnitudes of the transfers calculated do not carry much weight, but his findings still generally contradict Hansen and Weisbrod's conclusion.

Blaug (1987) provides a useful outline of these and subsequent studies, which contained similar analyses for Florida, New York City, and Hawaii, to varying conclusions. In doing so, he points out a critical issue which none of the studies mentioned thoroughly addressed: "the inherent ambiguity of the classification by income classes" due to the intergenerational and intertemporal nature of the redistribution. (211) A serious consequence of using cross-sectional family data, as Hansen and Weisbrod and Pechman did, relates to the fact that the families receiving the higher education subsidies are headed by individuals who tend to be in their peak earning years. As a result, viewed in cross-section it appears that transfers are being made from lower to higher income groups, even if lifetime transfers balance out to zero. To determine the

true direction of redistribution, it is necessary to account for the relationship between net subsidies and lifetime income, either of the student or the parent.

W. Johnson (2006) explores this relationship for the United States as a whole, using National Longitudinal Survey of Youth data on young adults in the 1980s and 1990s, who were born between 1957 and 1964. Much like Pechman, he calculates net higher education subsidies to various income groups, but he improves on the analysis by extrapolating life-cycle income patterns for the young people and their parents in the data set. He begins by using institution-level data to estimate the subsidies received by those young adults in the sample who participated in higher education, namely "the difference between the costs attributable to that person's attendance and the student's (or parent's) payment of tuition and fees to the college or university." (296) Due to a lack of student-level data on financial aid, Johnson attributes to each student the average subsidy provided by their institution, including an equal share in the total financial aid granted. He also accounts for an indirect public subsidy through tax benefits received by private colleges and universities, estimated as forty cents on the dollar of private institution spending. On the cost side, he assumes that the effective burden is proportional, and finds that a flat ten percent income tax would fund the subsidies of the higher education sector.

First using current parental income of young adults in the sample, Johnson divides the sample into deciles and computes the average net direct and indirect public subsidy to each decile. Although gross subsidies were strongly increasing in income, net direct and indirect subsidies were mainly progressive: the top two deciles were seen to pay much more than they received, while the opposite was true for the bottom five deciles; the pattern was less clear for deciles six through eight. Acknowledging the flaws in cross-sectional data, as described by Blaug, he then goes on to estimate life-cycle parental earnings patterns based on current income

and other household characteristics, and calculates the net present value of these earnings with a three percent real discount rate. Additionally, he adjusts lifetime income for transitory effects, as "transitory fluctuations in income imply that the dispersion of current income overstates the dispersion of permanent income"; failing to perform this adjustment could overstate taxes paid by high-income households and make the redistribution appear more progressive than it is in actuality. (301) While these adjustments compress the income distribution, the calculation of net subsidies by income decile still yields a progressive pattern.

Johnson also considers redistribution with respect to dynastic income, or the sum of parent and child lifetime income. Again extrapolating from observations of the parent's income while the child is seventeen and eighteen, and the child's income when s/he is an adult, Johnson finds that "while high-income dynasties enjoy greater public subsidies than lower-income dynasties, the distribution of mean subsidies is not as unequal as the distribution of mean dynastic income", and so the top decile is the primary subsidizer of the subsidy system, while all other deciles experience positive or only slightly negative transfers. (305) When the parent's income is removed and only the child's lifetime income is considered, the structure remains mildly progressive. Having investigated subsidies with respect to all these measures of income, Johnson concludes that in the US in the 1980s, "[h]igher education subsidies benefit[ed] upper-income households more than lower-income households, but when the taxes that finance the subsidies are accounted for, the net effect is somewhat progressive or at least not regressive." (313)

VI. A brief history of the UK higher education finance system

Compared to the United States, the British university system is extremely heavily subsidized—in fact, before 1998, students paid no tuition fees at all. Up until 1990, students

were awarded means-tested maintenance grants for living expenses; the parents of those students who did not qualify for the full grant were expected to contribute to their child's living expenses to make up the difference between the maximum grant and the amount awarded. In 1990, the Conservative government introduced non-means-tested maintenance loans which were to gradually supplant the grant system. The loans were available to all students, hence providing living support for the first time to students from higher-income backgrounds. They carried a zero real interest rate, and repayments were not collected unless the graduate was earning at least 85% of the average national income. Meanwhile, maintenance grants were frozen at their nominal levels, so by 1996 the maximum loan and grant were equal in size (Figure 1).

In 1998, the Teaching and Higher Education Act passed by the Labour government introduced tuition fees for the first time. The fee was means-tested and paid up front: roughly one-third of students were not required to pay anything, one-third were assessed for only a portion of the fee, and the remainder paid the full amount of £1,000 per year, to be indexed for inflation. Simultaneously, maintenance grants were abolished and maintenance loans were expanded and made means-tested on parental income; all students were eligible to receive at least 75 percent of the maximum loan. The repayment threshold for the loan was reduced to earnings of £10,000 per year, and for the first time, repayments were collected in line with income—9 percent of a graduate's earnings (on top of other taxes) were collected until the loan had been repaid in entirety, or the graduate retired.

In 2004, the Higher Education Act made tuition fees variable, to be set by each university up to a ceiling of £3,000, annually adjusted for inflation. Effective from the 2006-07 academic year through the present, these new fees differ from the old scheme in two important ways: first, they are no longer means-tested on parental income; second, they need not be paid up front, as

every student is eligible for an income-contingent loan in the full amount of his/her fees. The means-tested maintenance grant was reintroduced, and the repayment threshold for loans was raised, this time to earnings of £15,000 per year. Repayments are collected as 9 percent of income above the threshold, with the additional provision that all of a graduate's outstanding debt is written off after 25 years. In addition, universities charging the full tuition fee were required to provide bursaries of at least £300 per year to low-income students.

While bursaries and maintenance grants are targeted at students from lower socioeconomic backgrounds, every student still receives a subsidy equal to the difference between his/her fees paid (at most £3,225 per year in the 2009/10 academic year) and the costs attributable to his/her education. The subsidy only grows larger when the implicit interest rate subsidy on student loans is taken into account. Because of the intertemporal nature of loans and taxes, a thorough analysis of the redistributive effects of the system must assess the lifetime costs and benefits of the higher education finance system, both to students and non-students. The following sections will do so, loosely following W. Johnson's (2006) methodology for lifetime earnings of students and their non-student peers. Since parents are not expected to contribute to their child's tuition costs, this analysis will not consider parental income in the measurement of redistribution.

Chapter 3: Data

The main source of student data used in this paper is the 2007/08 Student Income and Expenditure Survey, carried out by the National Centre for Social Research and the Institute for Employment Studies on behalf of the Department for Innovation, Universities and Skills and the Welsh Assembly Government. (DIUS et al 2009) A sample of 3,432 full- and part-time students in selected English and Welsh higher education institutions were interviewed in January 2008, with data collected on their course (duration, subject of study, etc.), finances (fees paid, student support received, and other income and expenditures) as well as some personal details (dependent/independent status; household arrangements; parental education, occupation and earnings). In addition, the students surveyed were asked to fill out spending diaries detailing itemized expenses within a seven-day period. For the purposes of this paper, which focuses on the current finance system (in place since the 2006-07 academic year), the sample is limited to students who enrolled under this system by taking up a non-deferred place in or since 2006 or a deferred place in or since 2007.[2]

Details on graduates' labor force participation were obtained from the Destinations of Leavers from Higher Education Institutions longitudinal survey, conducted by the Higher Education Statistics Agency. (HESA 2009a) The survey occurs in two stages, six months and three and a half years after the relevant students received their degrees. The most recent report, published in 2009, gives data on the cohort of students who completed their course in 2004/05. 319,260 students, or 74% of the eligible cohort of graduates, responded to the first survey, and a subset of these students were recontacted for the longitudinal portion, eliciting a sample of 41,395 students. The data referenced in this paper come from the 2009 longitudinal report, as well as from HESA statistics republished on the website of The Complete University Guide, a

[2] See appendix for summary statistics on this and other data sets.

privately-published guide compiling facts and statistics on the British university system. HESA data on university expenditure and enrollment were also used to estimate the costs of the higher education sector. (2009b, 2009c, 2009d)

Another key data set is the Quarterly Labour Force Survey, a household survey organized by the Office for National Statistics in Great Britain and the Department of Enterprise, Trade, and Investment in Northern Ireland. (ONS 2007) The survey was carried out biennially from 1973 to 1983, annually from 1984 to 1991, and quarterly since spring 1992; currently, each quarterly sample includes roughly 50,000 households in Great Britain and 2,000 households in Northern Ireland, representing about 0.1% of the respective populations. Households are surveyed in overlapping waves, each of which is composed of interviews in five consecutive quarters. The questions asked provide extensive detail on personal and household characteristics; employment, employment history, and earnings; benefits; education; and health status. The quarter referred to in this paper is July-September 2007.[3]

[3] This quarter, while not the most recent for which data are available, was selected in order to obtain statistics unaffected by the recession beginning in 2008.

Chapter 4: Methodology

I. Overview

While an equitable subsidy is difficult to define, subsidies that redistribute from low-income to high-income individuals are certainly inequitable. This paper explores the direction of redistribution of Britain's current higher education finance system in order to assess its equitability as defined by this measure. The lifetime redistributional effects will be measured for a constructed cohort of English and Welsh individuals who were aged 17 to 25 in 2008, and who therefore enter the labor market roughly simultaneously.[4] This cohort includes individuals who have completed a first (bachelor's) degree, and individuals who have not attended university and hence receive no direct benefit from the higher education system.[5] Meanwhile, all of these individuals pay taxes, some fraction of which can be attributed to the costs of funding the university system. The difference between these taxes paid over each individual's lifetime and the benefits (zero or positive) received by each individual is defined as the net subsidy.

This methodology was chosen based on the rationale that the earnings of these individuals, rather than their parents, are of primary relevance to a discussion of redistribution, since it is this group who directly pays for (in the form of taxes and fee payments) and benefits from (in the form of subsidies received and, implicitly, greater lifetime earnings) the higher education system. Unlike in the United States, where parents of college students frequently pay some or all of their children's educational expenses, in the United Kingdom students bear a much larger portion of the costs. In fact, this is institutionalized through the system of income-contingent loans, through which loan repayments are directly assessed on graduates, not their

[4] The study is limited to English and Welsh individuals because these are the only groups included in the Student Income and Expenditure Survey.

[5] As stated earlier, indirect benefits in the form of externalities are assumed to exist, but as they are difficult to quantify and assign to individuals, they are excluded from this analysis.

parents. Therefore, while an analysis of higher education participation by socioeconomic background is absolutely relevant to certain discussions of equity, in this instance it is more pertinent to measure redistribution within a single cohort in order to assess the lifetime impacts of the higher education funding system.

The first step of the analysis will be to determine how much each individual in the cohort earns over his/her lifetime. Assuming that each of these individuals work until age 65, graduates who enter the labor market around age 21 will have a 44-year career, and non-graduates who enter the labor market around age 17 will have a 48-year career. The trajectory of graduate and non-graduate earnings can be estimated based on existing data on earnings by experience level and education, drawn from the Quarterly Labour Force Survey. The 44 or 48 years of projected earnings then can be summarized into one statistic by computing the net present value of the stream of earnings. Rather than dividing the cohort into income deciles based on any one year of earnings, they will be divided based on lifetime earnings in order to account for different patterns of earnings growth for different education levels and sexes.

On the taxation side, the taxes paid by each individual in each year can be estimated by applying the appropriate "effective" tax rate to their annual income. This "effective" rate, which varies with income, takes account of not only the income tax rate, but also the percentage of an individual's income that will go towards indirect taxes in a typical year. Next, the annual costs of the higher education sector to the government will be calculated. This so-called base subsidy is equal to the difference between fees assessed and the total expenditure of the university sector. In addition, the annual resource cost to the government of subsidized loans is computed. The sum of these two amounts is divided by tax revenues in order to determine the percentage of tax payments that is directed towards the higher education sector. If we assume that the university

system is funded proportionally out of all types of tax revenue, then an equal percentage of each individual's taxes will go towards funding higher education. After the share of each individual's taxes that is paid towards higher education is determined for each year of his/her career, the stream of payments can be summarized as the net present value of the total. Computing the average of this amount for each lifetime income decile will therefore provide a picture of the resources each decile contributes to the higher education sector.

On the benefits side, in order to assess the higher education benefits accruing to each lifetime income decile, it is necessary to know the size of the average higher education subsidy a student receives per year. This is equal to the base subsidy divided by the total number of UK and EU students—students from outside these areas pay unsubsidized fees.[6] For each graduate, this amount is multiplied by the number of years of study s/he has undertaken. From each graduate's stream of earnings, the pattern of loan repayment is calculated as 9 percent of earnings above £15,000 each year until the loan is paid off or 25 years have passed. Each graduate therefore receives a loan subsidy equal to the difference between the initial amount of the loan and the net present value of the discounted stream of repayments. The total of these two (base plus loan) subsidies is then averaged across each lifetime income decile, including the zero subsidies received by those members of the decile who did not attend university. The difference between taxes attributable to higher education and subsidies received will yield the average net benefit/cost of the higher education system to each decile.

II. Building the lifetime earnings model

To predict the lifetime earnings of the cohort of labor market entrants, a quartic in experience was estimated using data from the June-September 2007 Quarterly Labour Force

[6] Ideally graduates would be assigned university-specific or even course-specific subsidies, but in the data set used (Student Income and Expenditure Survey), the students' institutions are not identified.

Survey. This choice of model was made based on the findings of Murphy and Welch (1990) that a quartic specification of earnings in experience substantially improves on a quadratic specification. Murphy and Welch use 1964 to 1987 Current Population Survey data, from which they selected a sample of white men classified by age and education. Performing separate regressions for each group in each year, the authors found systematic biases in every quadratic regression, as the models understated early career wage growth and overstated late career earnings declines. The bias was significantly reduced by adding cubic and quartic experience terms, a finding that was confirmed in Robinson (2000) for British male and female earnings by analysis of 1974 to 1996/7 General Household Survey data. Therefore, the model used in this paper takes the form

$$lngrsswk_t = lngrsswk_0 + \alpha\, exper_t + \beta\, exper_t^2 + \gamma\, exper_t^3 + \delta\, exper_t^4$$

where $lngrsswk_t$ is the natural logarithm of gross weekly earnings in period t, α, β, γ, and δ are parameters, and $exper_t$ is the number of years of work experience at the beginning of period t.

First, for the purposes of estimating earnings of university graduates, the regression was limited to members of the Quarterly Labour Force Survey who held a first degree or higher. Not all members of the sample are questioned about their income in every quarter, so the data used were again restricted to those who were asked about, and provided, information on their gross weekly earnings in either their main or secondary job. 3,075 observations met these criteria, weighting to a total of 5,472,802 individuals. Experience was approximated to be the respondent's age minus 21, or the number of years since leaving full-time education for individuals younger than 21.[7] Variables equal to the square, cube, and quartic of experience

[7] Experience was not calculated as the number of years since leaving full-time education for individuals 21 or older because many respondents gave their school-leaving age to be in their 40s, 50s, or even later, and it was deemed implausible for these individuals to have been in full-time education to this age. Allowing experience to accrue from age 21 is a more reasonable assumption for an individual with a university education. While some sample

were also generated. The log of gross weekly earnings (the total from both the main and secondary job) was regressed against these four experience variables separately for men and women, using the survey's person income weight, *piwt07*. The regression results are provided in Table 8.

While the explanatory power of the model is limited, this is unsurprising as a wide variety of factors unrelated to experience, such as natural ability, quality of degree, and market value of skills also play a major role in determining earnings. However, the coefficients on the experience variables included are all highly significant, providing persuasive evidence for the relationship between earnings and experience, holding other factors constant. Additionally, the shapes of the earnings profiles generated by these coefficients are broadly similar to those estimated by Robinson (2000): both sexes see the most wage growth in the first ten years of their career, while women see a more pronounced flattening-off or even a slight decrease in earnings during the middle years of their career, attributable to time taken out of the labor market in their 30s to raise children (see Figures 2 and 4).

In order to apply these estimates for career wage growth to the students sampled in the Student Income and Expenditure Survey, it was next necessary to obtain estimates of the starting salaries these students were likely to receive, based on their subject of study at university. These were calculated using two pieces of data. First, HESA statistics on average earnings by subject for new graduates employed in "graduate" (requiring a degree) and "non-graduate" (not requiring a degree) positions were obtained from The Complete University Guide. Then, overall average earnings were calculated as a weighted average of these two figures, using probabilities by subject of an individual engaging in graduate, non-graduate, or mixed employment within the

members would certainly have been in higher education past the age of 21, the labor market experience sacrificed in these years is traded off against the additional education received by these individuals, so assuming that earnings have grown from the age of 21 is not unreasonable.

first five years after graduation. (HESA 2009a) Starting salaries were found to range from £16,006 for graduates with degrees in music studies, to £28,784 for graduates in medicine and dentistry (see Table 9 for complete results).

These initial salaries and gender-specific experience-earnings profiles were then applied to each of the 1,211 new-system (2006 entry or later) students between ages 17 and 25 in the Student Income and Expenditure Survey for whom complete data were available (including subject of study and gender).[8] In this model, graduates with higher starting salaries, particularly males, experience markedly greater earnings growth in the first half of their careers than those with more modest earnings coming out of university. It should be noted that all figures are in 2009 British pounds, so these profiles do not include any projections of inflation. This is particularly relevant when calculating the net present value of the earnings stream, as will be performed in a later section; such a calculation requires the use of only a real discount rate, with no adjustment for inflation. To illustrate the variety in earnings patterns, Figure 2 presents the experience-earnings profiles of four graduates, each with a different subject of study.

Earnings profiles for non-graduates were calculated with a similar technique: this time, the sample of Quarterly Labour Force Survey data was restricted to individuals who did not hold a first degree or higher. This subsample included 11,272 observations, which weighted to a population of 19,887,168. Experience was estimated to be the respondent's age less 17, or the number of years since leaving full time education if the respondent was younger than 17.[9] Once again, regressions were weighted using *piwt07*, and were run separately for men and women. Regression results are presented in Table 8. All coefficients were once again significant at the 1

[8] This model admittedly contains several flaws: in particular, it is assumed that every student is employed immediately after graduation; no account is taken of unemployed graduates or those who delay labor market entry to pursue higher degrees. However, given that the estimation of the effects of early-career unemployment on future wage growth is a research topic unto itself, this model is accepted as an unavoidable simplification.

[9] This method of calculation is chosen for the same reason as noted in footnote 7.

percent level, and R^2 values were roughly double those in the graduate regressions, indicating that these models were highly representative of the patterns of earnings growth experienced by individuals without college degrees.

As a suitable data on earnings of non-graduate labor market entrants were not available, the regression results were instead used to estimate the starting salaries of each of the sample members. These starting salaries would then roughly reflect the distribution of initial earnings across the non-graduate population. Where α_i, β_i, γ_i, and δ_i are the gender-specific coefficients on experience (i = male, female), the following calculation was performed for each individual in the sample:

$$lngrsswk_0 = lngrsswk_t - \alpha_i\, exper_t - \beta_i\, exper_t^2 - \gamma_i\, exper_t^3 - \delta_i\, exper_t^4$$

using the log of the respondent's reported current gross weekly earnings, $lngrsswk_t$, current years of experience, $exper_t$, and the appropriate coefficients. The starting salaries produced were then used to represent an artificial cohort of non-graduates entering the labor market, assuming that broad patterns of income distribution had not changed from previous generations. The initial earnings calculated varied very widely, with a weighted mean of £5,643 and standard deviation of 3,522. The gender-specific non-graduate coefficients on experience were then combined with these starting salaries in order to simulate the incomes of the non-graduates over their 48-year careers. See Figure 3 for a graphical depiction of these experience-earnings profiles for four selected individuals, and Figure 4 for average male and female profiles.

III. Lifetime tax burdens

In order to determine the cost to each individual of financing the higher education sector, it is necessary to first determine how much s/he pays in taxes over his/her lifetime. Taxes are estimated using results from Barnard (2009) of effective cash benefits and tax burdens by income

level. In his analysis, Barnard uses the Office for National Statistics data set "Effects of taxes and benefits on household income, 2007-2008", which provides household-level data on income, benefits, and direct and (estimated) indirect taxes, based on demographic characteristics (such as household composition) and stated expenditure. The data are used to measure the transformation of original income (income from employment and investments) to final income via the tax and benefit system. Households are then ranked into quintiles of equivalized disposable income, which adjusts income to account for the effect of differences in household size and composition on resources needed to achieve the same standard of living.

For each of these quintiles he then calculates average taxes and benefits as a percentage of gross (post-cash benefit but pre-tax) income (see Table 11). These tax rates include burdens from direct taxes (income tax, employees' National Insurance contributions, council tax); taxes on final goods and services (VAT; tobacco, alcohol, vehicle excise and hydrocarbon oil duties; television licenses; stamp duties on house purchases; customs duties; betting taxes; insurance premium taxes; air passenger duties; and Camelot National Lottery Fund); and intermediate taxes (rates on commercial and industrial property; employers' National Insurance contributions; motor vehicle duties; duties on hydrocarbon oils). Barnard notes that for taxes on goods and services purchased by industry, "[o]nly the elements attributable to the production of subsequent goods and services for final consumption by the UK personal sector are allocated in the analysis, being assumed to be fully shifted to the consumer." (2009, 36)

It is assumed for the purposes of this paper that an individual's original income quintile mirrors that of his/her household's equivalized disposable income—in other words, someone with earnings in the lowest fifth of the distribution of individual income will belong to a household whose equivalized disposable income is in the lowest fifth of household income, and

so on. Based on this assumption, the quintile-specific household tax rates can also be applied to individual income by quintile. Of course, the cohort in this study is not representative of the population as a whole—their earnings will likely be less than average in the early years of their career, then greater than average once they reach their peak earnings in their middle ages. Therefore, the income information used to determine where individual income deciles fall must be based on a sample of the population as a whole. The breakpoints are defined using weighted earnings data from the July-September 2007 Quarterly Labour Force Survey. Without a reasonable method of predicting shifts in the income distribution, and since inflation is ignored, these real earnings brackets are assumed to remain stable throughout this cohort's lifetime. The ranges of annual income by decile are presented in Table 12 in the appendix. From these data, an individual can be assigned to an individual income decile in each year of his or her career, and so his/her tax rate and hence tax payments can be inferred for each year.

The only major category of taxation excluded from Barnard's analysis is corporation tax, which accounted for about ten percent of tax revenue in 2007/08. (HMRC 2010) Barnard states that these revenues would be too difficult to attribute to households. Corporate taxes may render the taxation system more progressive to the extent that the burden falls on (wealthy) owners of capital; however, some of the burden is likely to fall also on consumers (in the form of higher prices) and workers (in the form of lower wages). (Gruber 2010, 713) For lack of more certain information, the analysis for this paper will proceed under two different sets of assumptions. In the first, or "proportional", scenario, the burden of corporate taxes is assumed to be proportional to original (pre-tax, pre-benefit) income. As 2007/08 corporate tax revenues represented 6.6 percent of total earned personal income in that year, corporate taxes will be assessed as 6.6 percent of each individual's original income, in addition to the taxes estimated using Barnard's

rates. In the second, or "progressive", scenario, the burden of corporate taxes is assumed to fall only on the top three deciles of earners in a given year, approximately corresponding to those individuals with total personal income over £30,000. Total corporate tax revenues represented 11.0 percent of the earned personal income of those individuals in 2007/08, so in this scenario taxes in the amount of 11.0 percent of original income will be assessed on individuals in the top three income deciles in each year. In both scenarios, the net present value of the sum of corporate and non-corporate taxes paid in each year will be calculated for each individual.

IV. Subsidies to students in higher education

All UK and EU students at higher education institutions in the UK receive implicit subsidies because of the government-mandated cap of £3,225 for annual fees. The total base subsidy offered by the higher education system is equal to the difference between the total expenditure of the system and the cost borne by students (fees assessed).[10] According to HESA (2009c), in the 2007-2008 academic year the total expenditure of the higher education system was £22,884,979,000. In that same year, a total of 2,306,105 students were enrolled in higher education, 2,076,456 of whom were domiciled in the UK or another EU country. (HESA 2009d) The remainder, who originated from outside the EU, are assumed to be unsubsidized by the UK, as there is no limit to the fees that universities can charge these students, and the UK government does not reimburse universities for costs incurred by overseas students. HESA (2009c) gives tuition fee and education contract receipts in 2007/08 as £6,253,998,000, leaving a subsidy of £16,630,981,000 (expenses minus fees assessed).[11] The subsidy is distributed among UK and EU students only, providing a per-student subsidy of £8,009 per year.

[10] Although many students do not pay these fees up front, subsidies on fee loans are calculated separately and are not considered as part of the "base" subsidy.

[11] Other income sources include funding body grants, research grants and contracts, and endowment and investment income.

In addition, many UK and EU graduates benefit from loan subsidies each year because a zero real interest rate is applied to both fee and maintenance loans from the government. The size of the subsidy each student receives depends on the total debt accumulated and the number of years it takes him/her to repay the loans. The Student Income and Expenditure Survey provides data on the value of maintenance and fee loans taken out by each student in the 2007/08 academic year; the sum of these two types of loans for each student is multiplied by the number of years in the student's course to approximate total debt accumulated. Based on this projection, the average student (including those students who took out no loans) takes out a total of £14,492 in loans over the course of his/her time in higher education.[12] Secondly, the earnings projections described in Section II make it possible to predict how long it will take each graduate to repay his or her student loans. After graduation, graduates pay 9 percent of their income above £15,000 each year until their balance has been paid off, or until 25 years have passed. The real balance outstanding never grows, as a zero real interest rate is applied. Based on the earnings projections used, all students are able to pay off their loans in full. In fact, the average graduate pays his/her loans off in less than nine years.

The subsidy on each student's loan is then calculated as the difference between the net present value of the student's stream of repayments and the face value of the debt issued. This essentially represents the opportunity cost to the government of loaning these funds at a zero real interest rate, as opposed to investing them for a profit. The discount rate used here, as elsewhere, is the official UK government discount rate of 2.2% for subsidized loans. (Rammell 2005) Even though all the students in this model repay their loans in entirety, lower earners receive larger subsidies, as they repay their loans more slowly and hence benefit from the interest subsidy over a longer period of time. The average loan subsidy across all students, including those who chose

[12] The average among only those students who took out loans is £17,743. These are weighted averages.

not to take out loans, is £2,207, or 15.2% of the original loan.[13] It is important to note that the subsidies expressed as percentages can be used to extrapolate annual costs to the government of issuing loans, but the absolute numbers reflect the average debt incurred by a student across his or her entire academic career and may not be used when estimating annual subsidies in the higher education sector.

V. Cost to society of the higher education sector

The total "base" subsidy to higher education in 2007/08, in terms of total expenditure less fees assessed, was £16,630,981,000 (from Section IV). From the Student Income and Expenditure Survey, the average fee and maintenance loans taken out per student in 2007/08 were £2,203 and £2,369 respectively, for a total of £4,572. With an average rate of subsidy of 15.2% on each year's worth of loans (from section IV), the average loan subsidy per student per year of enrollment is calculated to be £695. This figure is multiplied by the 2,076,456 UK and EU students to yield a subsidy additional to the base of £1,443,020,638. This brings the total annual higher education subsidy to £18,074,001,638. Meanwhile, total tax receipts in 2007/08 were approximately £451,053 million. (HMRC 2010) Total higher education expenditure therefore represented 4.01 percent of tax revenues in 2007/08. It can then be inferred that, if all types of tax revenue are equally likely to be put towards higher education, then 4.01 percent of the taxes each individual paid in 2007/08 are attributable to higher education expenditure.

For the purposes of analyzing the system as it currently exists, it is assumed that this pattern of enrollment and government expenditure will remain the same for the near future, and that tax rates remain constant. The population can be expected to grow, and it will be assumed

[13] This figure is somewhat lower than the 21% subsidy on maintenance loans and 33% subsidy on fee loans estimated by Rammell (2005). The difference is attributable either to overly optimistic earnings growth projections used in this paper, or to the failure to account for several causes of non-repayment, including unemployment, tax evasion, or premature death.

for simplicity that the proportion of individuals who participate in higher education remains constant, yielding a constant per capita burden for the higher education sector. Therefore, 4.01 percent of each individual's taxes in each year, and hence 4.01 percent of the net present value of each individual's tax payments, will be spent on higher education, and we can consider this last amount to be the lifetime cost to each individual of the current system of higher education finance.

VI. Scaling the sample up to cohort population levels

From ONS (2008), the 2008 population of 17- to 25-year-olds in England and Wales was 6,628,274. This represents the cohort among whom redistribution will be measured. DIUS (2009b) gives the higher education initial participation rate for English-domiciled individuals (which "roughly equates to the probability that a seventeen year old will participate in higher education by age 30 given the age specific participation rates") as 43 percent. Individuals participating in higher education later in life are ignored for simplicity, as they form a small minority of society and would experience earnings patterns unlike either group. Corver (2005) shows that higher education participation rates have historically been similar in England and Wales, so the initial participation rate of 43 percent is applied to Welsh individuals as well, for lack of more precise data on Welsh participation. In addition, HESA (2009b) gives the UK average of the "percentage of full-time first degree starters expected to gain a degree" in 2006/07 (the most recent year for which data are available) as 77.3 percent. From these two pieces of information, it can be inferred that approximately 33 percent of this cohort—2,187,330 individuals—will obtain a first degree or higher.

The existing weights in the Student Income and Expenditure Survey and Quarterly Labour Force Survey were then altered to reflect these population sizes. The original Quarterly

Labour Force Survey weights were designed to make the sample representative of the UK population in terms of age, sex, and region of residence. Respondents from Scotland and Northern Ireland were dropped from the analysis at this point, along with all individuals holding a first degree or higher; the remaining weights were all reduced in equal proportion so that instead of summing to the total English and Welsh population, the weights for this data set now sum to the number of 17 to 25 year olds in England and Wales who *did not* attend university (4,440,944).

In the Student Income and Expenditure Survey, the original weights were based on the probability of the institution/student being selected, the probability of the student agreeing to be followed up by an interviewer, and the probability of the student taking part in the main interview. Extreme weights were trimmed and the resulting weights were adjusted so that the weighted sample mirrored the student population (based on HESA data) in terms of age and sex. Since only students from England and Wales are included in the data set, bringing the sample up to the population level required only multiplying each weight by a constant in order to make the weights sum to the total number of students/graduates determined to be in the cohort (2,187,330). Once the respondents from each survey were weighted to their correct population sizes, the two data sets were pooled into one, representing the entire population of 17 to 25 year olds in England and Wales in 2008. The final step was to calculate new deciles based on the lifetime earnings of these (weighted) individuals. The mean net present value of lifetime earnings ranged from £134,852 in the lowest decile to £1,486,863 in the top decile (see Figure 5 for other deciles). Finally, the average net subsidy—direct higher education benefits minus taxes paid towards higher education—was calculated for each lifetime income decile. These results of these calculations are presented in the next chapter.

Chapter 5: Results

The final result depends upon the average benefits received and average higher education taxes paid by the members of each lifetime income decile. Based on the earnings projections applied, no graduates end up in lifetime income deciles one through six. However, many non-graduates are projected to earn as much or more than graduates—in fact, non-graduates formed 29 percent of decile seven, 6.5 percent of decile eight, 11 percent of decile nine, and 21 percent of decile ten.[14] Unsurprisingly, the three lowest lifetime income deciles were dominated by female non-graduates, while the two highest were principally composed of male graduates. However, female graduates created a bulge in deciles seven and eight, as the earnings levels represented in these brackets were typically above male non-graduate earnings and below male graduate earnings (see Figure 6).

Any decile that contains no graduates will receive no direct higher education benefits, but will still make contributions towards the system in the form of 4.01 percent of the taxes they pay. Therefore, it is inevitable that given these assumptions about earnings, the bottom six deciles will receive negative net subsidies—that is, no taxation system could be progressive enough to reverse the direction of redistribution, given that no members of these deciles receive direct benefits from the higher education system. In both the proportional and progressive corporate tax scenarios (in which corporate taxes fall proportionately on all individuals, and

[14] While it is completely reasonable to see non-graduates in the top earnings deciles, the unusually large proportion of the tenth decile who did not attend college is probably a factor of the decision to have all graduate earnings follow a fixed trajectory. Graduate earnings profiles therefore do not include any outliers, although non-graduate outliers could have been picked up from the QLFS data set. As a result, any unusually high-earning non-graduates will appear to outpace the entire graduate population, whereas in reality, extremely high earners would certainly exist among graduates as well. It is also worth noting that in this model, non-graduates work four years longer than graduates (having begun work at age 17 rather than age 21), which has the effect of increasing their lifetime earnings relative to a graduate with identical annual income. Elements of selection bias, where individuals with valuable artisanal or entrepreneurial skills elect not to pursue a degree and go on to earn a substantial income, are likely to exist as well.

proportionately on the top three deciles of earners only, respectively), only deciles seven, eight, and nine receive positive net subsidies.

In both scenarios, members of the top decile of lifetime earners on average pay more in taxes than they receive in higher education benefits; not surprisingly, the net subsidy to this decile is more negative under the progressive corporate tax assumption. However, compared to the (perhaps unrealistically) large proportion of the top decile in this model who did not attend college, a top lifetime income decile composed more heavily of graduates would in actuality receive net subsidies closer to zero. The average net present value of lifetime tax payments to higher education in this decile is £24,945 under the proportional scenario and £27,440 under the progressive scenario, while the average higher education subsidy received by a graduate is £27,009.[15] These numbers illustrate that, while top lifetime earners appear to be net subsidizers of the system, it is in fact the non-graduates among these who are bearing the vast majority of this burden, as they pay enormous amounts in taxes towards higher education yet receive no direct benefits. 79.1 percent and 68.6 percent of graduates in the top lifetime income decile are net beneficiaries of higher education subsidies under the proportional and progressive corporate tax assumptions, respectively. Therefore, while in both scenarios the top decile is a net subsidizer of the higher education system, less than a third of graduates in either case actually pay more in taxes than they receive in benefits.

Overall, 89.5 percent of graduates in the proportional scenario and 86.4 percent of graduates in the progressive scenario are net beneficiaries of the higher education finance system—in other words, the lifetime tax contributions of these graduates never cover the higher education costs they incurred as students. The roughly £59 billion subsidy this cohort received

[15] In fact, graduates in the top lifetime income decile on average receive a slightly larger subsidy than this: £27,812. This results from the higher proportion of graduates in medicine and dentistry in this decile, who spend more years in university and hence receive larger total subsidies.

as students (at an average of £27,009 per student) is only partially covered by lifetime higher education tax payments of £44 billion (£20,091 per graduate) in the proportional scenario and £48 billion (£22,015 per graduate) in the progressive scenario. It is inevitable that any sort of higher education subsidy financed through general taxation will result in a transfer from non-graduates to graduates. However, the direction of the transfer with respect to lifetime income is of key relevance to a discussion of the equity of the finance system. Table 13, along with Figures 7, 8, 9, and 10 illustrate this direction: in both tax scenarios, the effect of the subsidies is to transfer income from deciles one through six and ten to deciles seven, eight, and nine. Net subsidies are positively related to the net present value of lifetime income as well: the weighted correlation is 0.2665 in the case of proportional corporate taxes, and 0.1519 in the case of progressive corporate taxes.

Given the admittedly optimistic projections of graduate earnings, it is worth considering what the redistributive picture might look like if some graduates fell into the first six lifetime income deciles. More precisely, it can be determined what fraction of each of the six lowest lifetime income deciles would have to have participated in higher education in order for these deciles to "break even" with zero net subsidies. In other words, how many subsidies could each decile's higher education tax payments fund as a percent of the number of members in the decile? Table 14 presents the net present value of total lifetime taxes attributable to higher education paid by each decile (column b) as well as the number of students this amount could fund, at an average per-student cost of £27,009 (column c). Finally, this number of students is divided by the number of members in this decile to obtain the participation rate necessary by decile for the average net subsidy to be equal to zero.

Assuming the ranges of income and tax payments are identical to their current state for each decile, then under the progressive scenario, the first decile would have received a positive net subsidy only if more than 13.8 percent of its members had attended university (assuming each received the average subsidy). Similarly, 20.4 percent of decile two, 24.9 percent of decile three, 29.8 percent of decile four, 38.7 percent of decile five, and 53.5 percent of decile six would need to have participated in higher education in order for these deciles to on average "break even", with average taxes paid equaling average benefits received. These figures are a far cry from the zero percent participation rates this paper predicts for these deciles. Therefore, while it is likely that at least some graduates will in actuality find themselves in lifetime income deciles one through six, it is highly improbable that these numbers would be large enough to reach the participation rates necessary to swing the net subsidies received by these deciles from negative to positive.

Deciles seven, eight, and nine are somewhat more sensitive to changes in their participation rates. Under the progressive scenario, participation would have to fall in each of these deciles by one, seventeen, and six percentage points, respectively, in order for the net subsidies to change from positive to negative. The necessary changes are larger under the proportional scenario. It must be noted that as the estimated higher education tax burden exceeds the total subsidies received by this cohort, it is not possible for every lifetime income decile to receive a zero or positive net subsidy without changing the assumptions about total participation for the cohort. Therefore, slight readjustments in the participation rate would still yield net subsidies that are more negative in the lower deciles than in the middle deciles, even if the subsidies to deciles seven, eight, and nine became negative.

Finally, the tax payments in the top decile are such that the participation rate would have to rise above 92 percent (from the 79 percent estimated in this paper) in the proportional scenario in order for this decile to receive a positive net subsidy; under the progressive scenario, this decile's tax payments exceed the total costs of educating all of them (assuming an average subsidy for each member), and so the net subsidy could not be positive unless some portion of individuals received larger-than-average subsidies. Even so, the average net cost to members of decile ten is on par with the higher education taxes paid by decile two in the progressive scenario (Figure 10) and lower than those paid by decile one in the proportional scenario (Figure 8). When this cost is compared with the average lifetime incomes of individuals in these deciles (Figure 5), it is clear that the relative burden falls much more heavily on the lower income deciles.

It can therefore be concluded that, even admitting fairly substantial changes in the distribution of graduates and non-graduates along the income spectrum, higher education subsidies as they currently exist have the effect of redistributing income away from the lowest six and tenth income deciles, probably to the effect of offering a positive net subsidy to deciles seven, eight, and nine. Moreover, the direction of redistribution holds even after the inclusion of a fairly substantial tax (an additional 11 percent) on the top thirty percent of earners in the progressive corporate tax scenario. While ignoring unemployment in the earnings projections is likely to produce an upward bias in the calculations of lifetime earnings, the existing earnings distribution is such that even a major shift of graduates from higher to lower income deciles is unlikely to reverse the direction of redistribution of higher education subsidies.

Chapter 6: Conclusion

In order to assess the British higher education funding system on a normative level, it is important to remember what a subsidy ought to be achieving. Starting again from economic theory, subsidies may be justified either as a response to market failures, or to correct for inequality by bringing about redistribution from high- to low-income groups. These two actions are motivated by the goals of efficiency and equity, respectively. In the absence of government intervention, higher education is likely to be consumed at a level below the social optimum. In other words, market failures may prevent students from participating in higher education whose participation could increase total economic output. Only students whose parents are wealthy enough to pay unsubsidized tuition fees, or have sufficient collateral (i.e. a house) against which to take out a loan from a private source, are likely to participate in higher education in this scenario. This is an inefficient result for society, as well as for the individuals who are unable to participate due to financial constraints. The government has the potential to increase society's total output by providing students with reasonably-priced loans, essentially removing the liquidity constraint and helping students borrow against the higher future earnings they will likely receive as college graduates. The existing system of higher education funding in the UK has certainly reduced financial barriers to participation by eliminating up-front fees and providing loans to cover students' living costs. However, this paper does not assess the efficiency effects of the British higher education finance system.

Subsidies can also be used to remedy inequity in higher education. While efficient subsidies in general enable middle- and upper-class students to participate in higher education, students from low-income backgrounds may still find the direct (including loan repayments) and indirect (earnings forgone while studying) costs daunting. For this reason, a government may

find it desirable to increase subsidies beyond the efficient level, even reducing direct costs to zero and offering maintenance grants to low-income students. If designed and executed well, these subsidies can have the effect of transferring income from society as a whole to low-income students, in order to improve their odds of participating and succeeding in university.

One outcome of equitable subsidies should then be an increase in the rate of participation among young people from low-income backgrounds. These subsidies may be inefficient in the short run in the sense that the earnings premium these graduates reap may be less than the cost of inducing them to participate in higher education. However, if these graduates later go on to encourage their children to participate in higher education, then the initial subsidy can have positive long-term implications for both social mobility and economic growth. Additionally, equitable loan subsidies should have the effect of transferring income from society to low-earning graduates by reducing the burden of repayments—essentially insuring graduates against the risks inherent in taking on the debt necessary to pursue a degree.

Participation rates before and after the introduction and increase of tuition fees in the UK provide a useful natural experiment. If the pre-fee subsidies were strictly necessary to generate a given level of low-income participation, then the introduction (in 1998) and subsequent tripling (in 2006) of fees should have reduced participation among individuals from disadvantaged backgrounds, as well as overall participation. However, this was not the case. Figure 11 shows that young English participation has increased fairly consistently over the last 15 years, and "after taking the population changes into account, the cohort-to cohort patterns do not suggest any substantial reduction in young participation coincident with changes to HE tuition fees and student support arrangements." (Corver 2010, 16) Moreover, disadvantaged young people have not suffered any particular consequences in terms of enrollment: "young people from the 09:10

cohort living in the most disadvantaged areas [defined by likelihood of participating in higher education] are around +30 per cent more likely to enter higher education than they were five years previously…and around +50 per cent more likely to enter higher education than 15 years previously." (Corver 2010, 6) By comparison, the relevant figures for young people from the most advantaged areas are just +5 percent over 5 years earlier and +15 percent over 15 years earlier. This means that not only has overall participation increased since fees were introduced, but a growing proportion of new entrants are from historically disadvantaged areas. In other words, costs do not appear to be the limiting factor with respect to low-income participation.

If costs cannot be held responsible for depressing low-income participation, what else can explain the shrinking but persistent gap in participation between the top three and bottom three socioeconomic classes (Figure 12)? Barr (2010) shows that participation is strongly explained by secondary school performance. Among individuals with the best A-level results, there was virtually no difference in participation between the top three and bottom three socioeconomic classes. The same was true of slightly lower-scoring individuals, again categorized by A-level performance (see Figure 13). Confirming the relationship between secondary school results and higher education participation, recent increases in low-income participation are matched by improvements in GCSE attainment among these individuals, suggesting that better secondary school performance is enabling more low-income students to attend university. (Corver 2010) These findings have strong implications for the (in)efficacy of tuition subsidies in widening access to higher education. If secondary performance is such a strong predictor of higher education participation, then at least some fraction of tuition subsidies would be much better spent on improving secondary school outcomes for low-income individuals.

The trends in participation rates by relative advantage and disadvantage suggest that the extra £3,000 per student per year that the government spent in 1997 compared to 2006 had no perceptible positive impact on participation rates of disadvantaged young people. It may also be true that the government could spend less than it does now without damaging access. With a transparent income-contingent loan scheme in place, along with maintenance grants and loans for students whose parents cannot support them, no student would face up-front financial barriers to higher education, regardless of the size of the fee that was assessed. However, the knowledge that even a moderately high earner could spend decades repaying his/her debt might prove to dissuade debt-averse students from enrolling, should fees be raised too high. This raises a particular equity issue if students from low-income backgrounds tend to be more debt-averse than others.

Besides simply failing to improve access, too-large tuition subsidies can actually be inequitable. One big reason is that making the higher education sector heavily dependent on public finance limits the number of places universities can offer when budgets are cut, as they have been for the 2010-2011 academic year. (Richardson 2010) Fewer places mean that the marginal students—often those from lower socioeconomic backgrounds—are excluded from higher education. By contrast, drawing in resources from the private sector (i.e., charging fees) means that universities have the resources to open places up for students they would not otherwise be able to admit. In this sense, therefore, increasing fees may in fact improve equity by providing more opportunities for individuals from disadvantaged backgrounds.

The other big reason why too-large subsidies may reduce equity is the one described in the results above: large higher education subsidies redistribute taxes from the population at large towards university students—individuals who almost always go on to earn more than they would

have without obtaining a degree. Even ignoring the bias of higher education participation towards individuals from higher socioeconomic backgrounds (as the analysis in this paper does), the results presented in the previous chapter demonstrate that higher education expenditure equal to over 4 percent of tax revenues places a substantial burden on low-earning non-graduates. This paper also showed that nearly 90 percent of graduates never pay as much in taxes towards higher education as they received in benefits from the higher education system. As a result, lifetime income deciles seven, eight, and nine, heavily composed of these graduates, are net beneficiaries of higher education subsidies, while deciles one through six and ten pay more in taxes than they receive in direct benefits.

Regardless of the overall progressivity/regressivity of the UK tax and benefit system, a subsidy scheme that redistributes income from low-income to high-income individuals cannot help but render the entire system less progressive. The redistribution would certainly be less egregious if the size of the public subsidy were reduced. The subsidy could theoretically even be shrunk to the size of the externality produced by educating these individuals. In this case, even non-graduates in lower income deciles could benefit from the existence of higher education subsidies—either because they profit from the productivity externalities (as discussed in the literature review) or because the reduction of barriers to participation could eventually allow their own children to attend university.

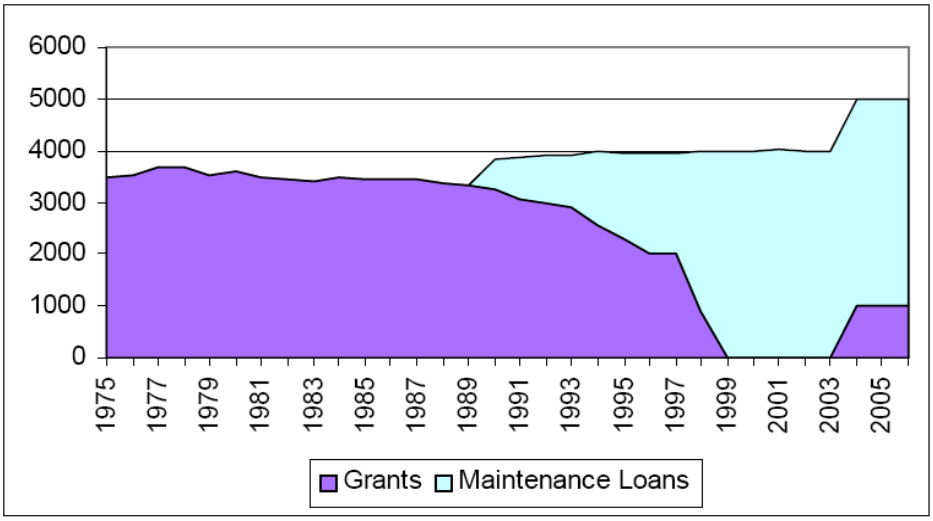
Unfortunately, political considerations mean that reducing subsidies, or rather increasing fees, is difficult to execute. Much of this reluctance to reform results from the fact that until relatively recently, higher education was entirely free in the UK, and had come to be expected as a right. The up-front fees introduced in 1998 therefore came as a shock to parents of university-aged children who, unlike many American families, had not been in the habit of saving for

tuition. As Barr (2005c, 204) points out, though, education's status as a basic right—which he supports—does not preclude the existence of fees, as "[w]e all agree that adequate nutrition is a basic right, but are happy for food to be supplied by profit-maximising private producers." Therefore, any effective approach to reform will likely include efforts at increasing transparency and improving students' and parents' understanding of the system of fees and loans—not only how the system works, but why they are being charged to attend university. Until the negative consequences of excessive blanket tuition subsidies become widely understood, popular opinion is unlikely to support fee increases beyond the inflation adjustments currently in place.

This paper has demonstrated that the subsidies to higher education currently in place in the United Kingdom have the effect of transferring income from low lifetime earners to high lifetime earners, with the exception of the top ten percent of earners, who on average pay more than they receive in direct benefits. Unless the lifetime costs to low-earning non-graduates—ranging from on average £4,000 in the lowest decile to nearly £14,000 in the sixth decile—are compensated for with positive externalities of the same magnitude, the subsidy system is necessarily regressive. Moreover, subsidies on the order of £27,000 per student do not seem to be necessary for ensuring participation of individuals from low-income backgrounds, given that reductions in subsidies up to this point have not negatively impacted participation. Therefore, this paper concludes that British subsidies to higher education are regressive and hence inequitable.

Tables and Figures

Figure 1: Maximum value of maintenance grants and maintenance loans (£ p.a., 2003-04 prices)



Notes*:* These are the levels that apply for students with full eligibility for grants. Loan amounts are for a first-year student living away from home outside London. Statistics for 2004 onwards are 2003 projections of maintenance grants and loans only, not fee loans. All figures are expressed in the 2003-04 academic year's prices, using the RPI(X) price index and assuming 2.5 per cent annual inflation on this measure from 2003 onwards.

Source*:* Goodman and Kaplan (2003)

Student Income and Expenditure Survey 2007/08: Summary Statistics (new system students only)

Table 1: Student status

	Percent
Dependent	89.21
Independent	10.79

Table 2: Parental Income (dependent students only)

	Percent
Up to £15,000	19.13
£15,001-£20,000	8.88
£20,001-£25,000	11.05
£25,001-£30,000	11.05
£30,001-£40,000	15.26
£40,001 or more	34.62

Table 3: Loan take-up

	% of students	Average loan
Fee loans	0.740527	£2,725
Maintenance loans	0.723229	£3,330

Quarterly Labour Force Survey January-March 2007: Summary statistics

Table 4: National Statistics Socio-Economic Classification

Higher managerial and professional	9.19%
Lower managerial and professional	18.26%
Intermediate occupations	8.28%
Small employers and own account workers	6.85%
Lower supervisory and technical	7.18%
Semi-routine occupations	11.01%
Routine occupations	8.10%
Never worked, unemployed, other	31.12%

Table 5: Gross weekly earnings

Observations	Mean	Std. Dev.	Min	Max
13908	£414	366	£1	£17,308

Table 6: Educational / training qualifications

From school, college, or university	77.51%
Connected with work	6.96%
No qualifications	14.2%
No answer / don't know / other	1.33%

Table 7: Highest degree held among those with qualifications from school, college, or university

Higher degree	7.16%
First (bachelor's) degree	14.67%
Foundation degree	0.38%
Grad membership of professional institute	0.86%
Other / don't know	0.83%
None	76.1%

Table 8: Quartic earnings regressions

Male Graduates		R^2=0.1567
lngrsswk	Coef.	Std. Err.
exper	0.148577	0.0005282
exper2	-0.007421	0.000046
exper3	0.000171	1.50E-06
exper4	-1.67E-06	1.61E-08
_cons	5.527838	0.0018294

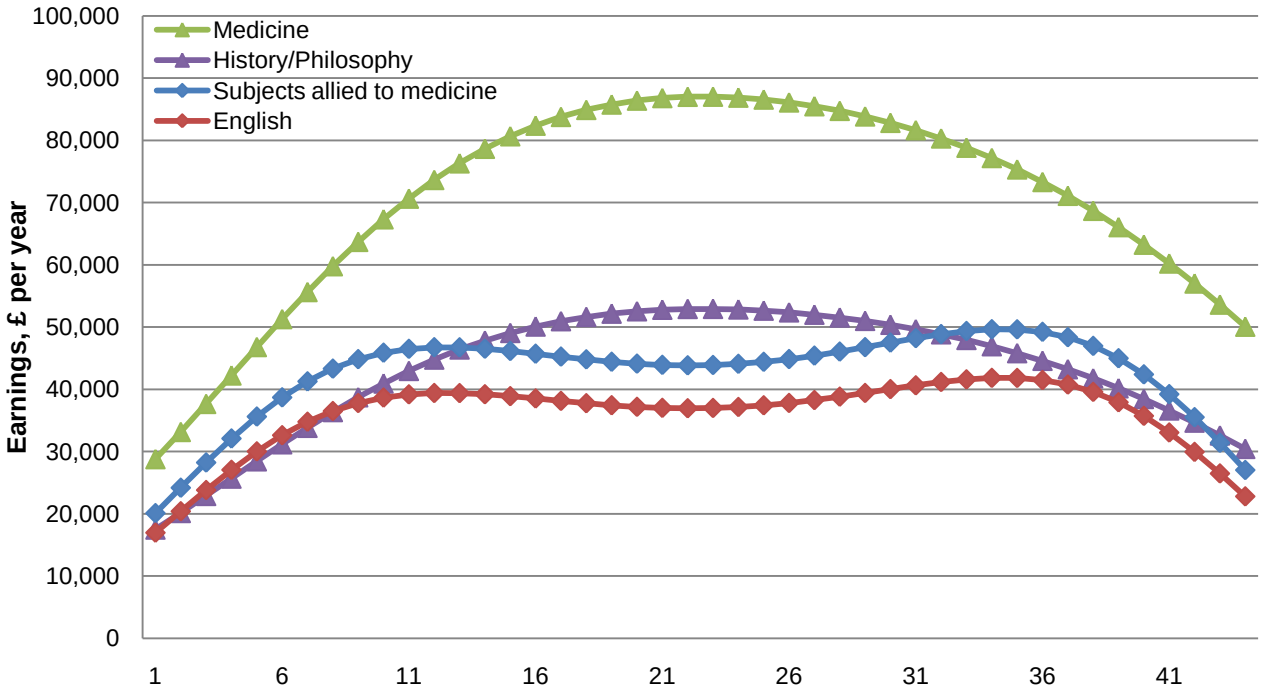
Female Graduates		R^2=0.0733
lngrsswk	Coef.	Std. Err.
exper	0.200779	0.0005773
exper2	-0.016554	0.0000568
exper3	0.000548	2.08E-06
exper4	-6.23E-06	2.52E-08
_cons	5.354434	0.0017674

Male Non-Graduates		R^2=0.3161
lngrsswk	Coef.	Std. Err.
exper	0.219135	0.000190
exper2	-0.011095	0.0000142
exper3	0.000246	3.93E-07
exper4	-2.09E-06	3.61E-09
_cons	4.587390	0.000740

Female Non-Graduates		R^2=0.1311
lngrsswk	Coef.	Std. Err.
exper	0.195034	0.000250
exper2	-0.011593	0.0000194
exper3	0.000282	5.56E-07
exper4	-2.48E-06	5.28E-09
_cons	4.432701	0.0009048

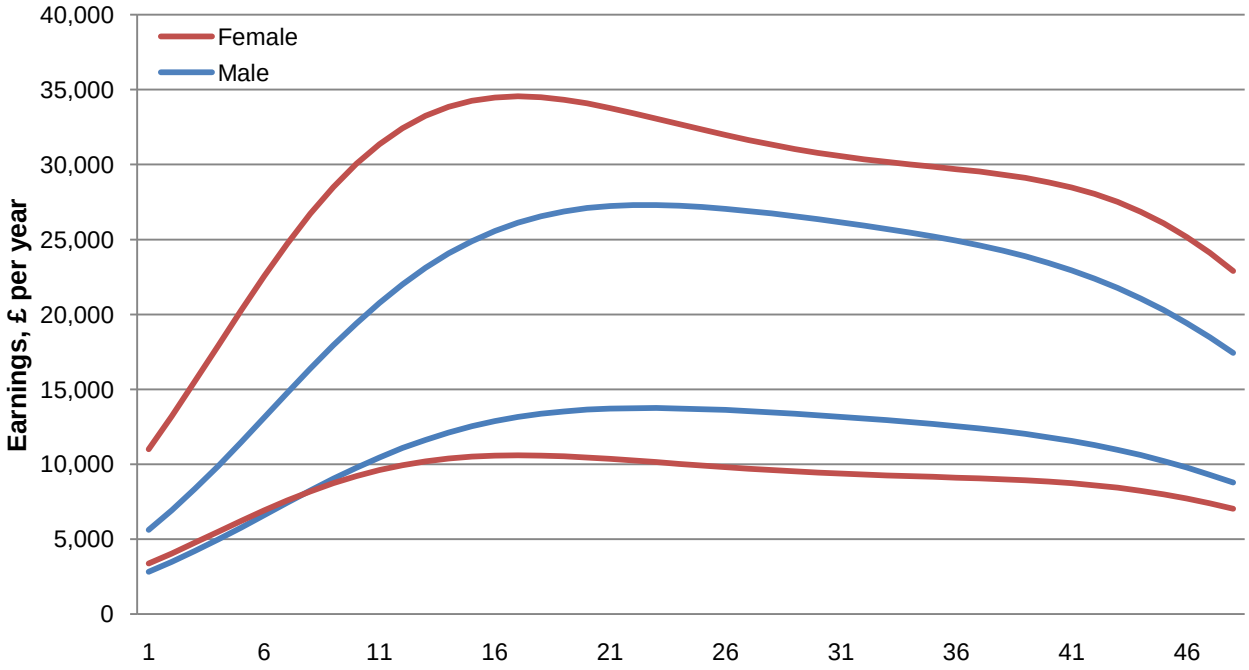
Note: All coefficients are significant at the 1% level
Source: Author's calculations.

Figure 2: Experience-earnings profiles of selected graduates



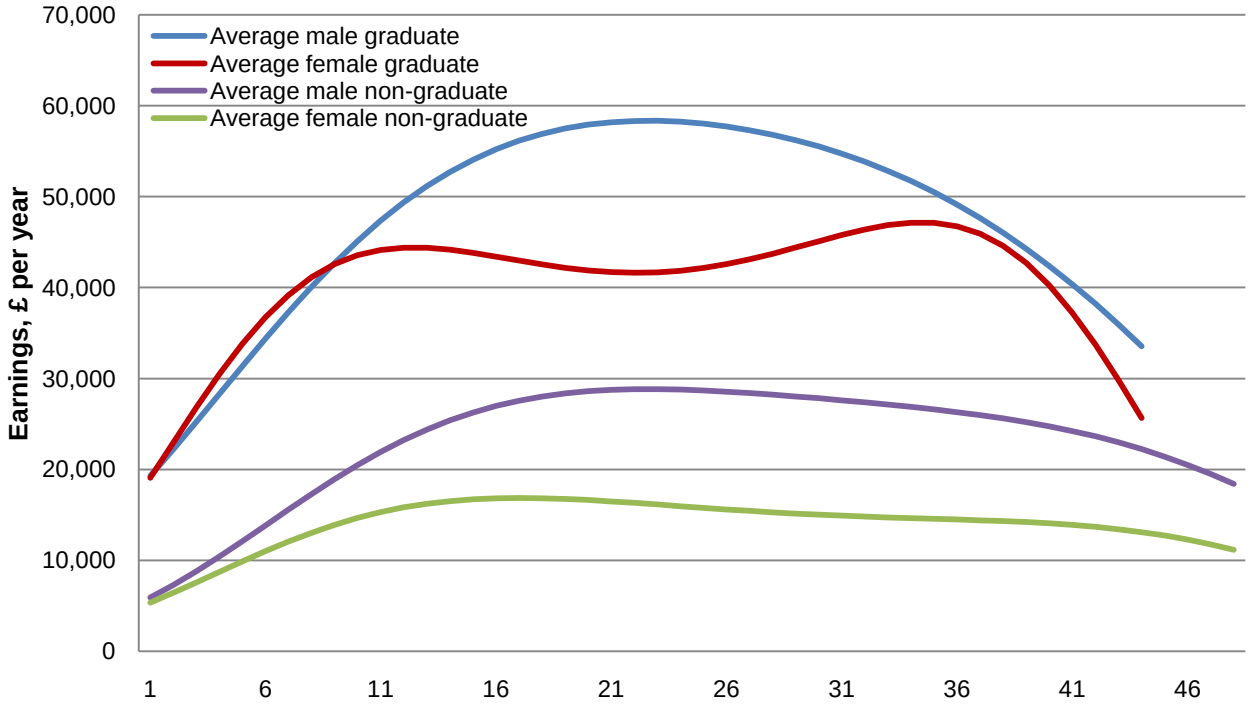
Source: Author's calculations.
Note: Triangles represent males, diamonds represent females.

Figure 3: Experience-earnings profiles of selected non-graduates



Source: Author's calculations.

Figure 4: Experience-earnings profiles of average male and female graduates and non-graduates



Source: Author's calculations.

Table 9: Graduate earnings by subject of study

Subject of study	Average starting salary, £
Medicine and dentistry	28,784
Subjects allied to medicine	20,108
Biological sciences	17,358
Veterinary science	24,185
Agriculture and related subjects	18,562
Physical sciences	18,901
Mathematical sciences	21,054
Computer sciences	20,212
Engineering and technology	20,987
Architecture, building, and planning	20,194
Social studies	19,066
Law	18,901
Business and administrative studies	19,443
Mass communications and documentation	17,456
Languages (including classics)	18,531
Historical and philosophical studies	17,502
Creative arts and design	16,724
Education	19,593
Combined	19,407
Counselling	20,122
Music studies	16,006
Psychology	17,786
English literature / language	16,950
Criminology / criminal justice studies	19,417
Sports science studies	17,410

Source: HESA 2009a, The Complete University Guide, author's calculations

Table 10: UK higher education institutions total income and expenditure by source of income and category of expenditure, 2007/08

	£ thousands	Percent of total
Total income	**23,439,626**	
Funding body grants	8,507,989	36.3%
Tuition fees & education contracts	6,253,998	26.7%
Research grants & contracts	3,721,881	15.9%
Other income	4,447,967	19.0%
Endowment & investment income	507,791	2.2%
Total expenditure	**22,884,979**	
Staff costs	13,135,202	57.4%
Other operating expenses	8,276,341	36.2%
Depreciation	1,187,706	5.2%
Interest and other finance costs	285,730	1.2%

Source: HESA 2009c.

Table 11: Taxes and benefits as a percentage of gross income[1] for NON-RETIRED households by quintile groups, 2007/08

		Quintile groups of NON-RETIRED households[2]					
		Bottom	**2nd**	**3rd**	**4th**	**Top**	**All non-retired households**
Cash benefits		44	18	8	4	1	8
Direct taxes	Income tax[3]	4.4	9.3	12.3	14.7	18.8	14.5
	Employees' NIC	2.6	4.9	5.9	6.2	4.7	5.2
	Council tax & NI rates[4]	4.5	3.5	2.9	2.5	1.7	2.5
	All direct taxes	11.6	17.7	21.1	23.3	25.2	22.2
All indirect taxes		27.1	17.7	15.4	12.8	9.6	13.5
All taxes		**38.7**	**35.4**	**36.5**	**36.1**	**34.8**	**35.7**

Notes:
[1] Gross income includes cash benefits.
[2] Households are ranked by equivalized disposable income.
[3] After deducting tax credits and tax relief at source on life assurance premiums.
[4] Council tax and Northern Ireland rates after deducting discounts, council tax benefit and rates rebates
Source: Barnard 2009, 63-64.

Table 12: Individual income deciles

Decile	Earned Annual Income (£ pre-tax, pre-benefits)
1	1 - 4,810
2	4,811 - 8,866
3	8,867 - 12,038
4	12,039 - 15,002
5	15,003 - 18,018
6	18,019 - 21,034
7	12,035 - 25,038
8	25,039 - 31,018
9	31,019 - 40,014
10	40,015 +

Source: Author's calculations.

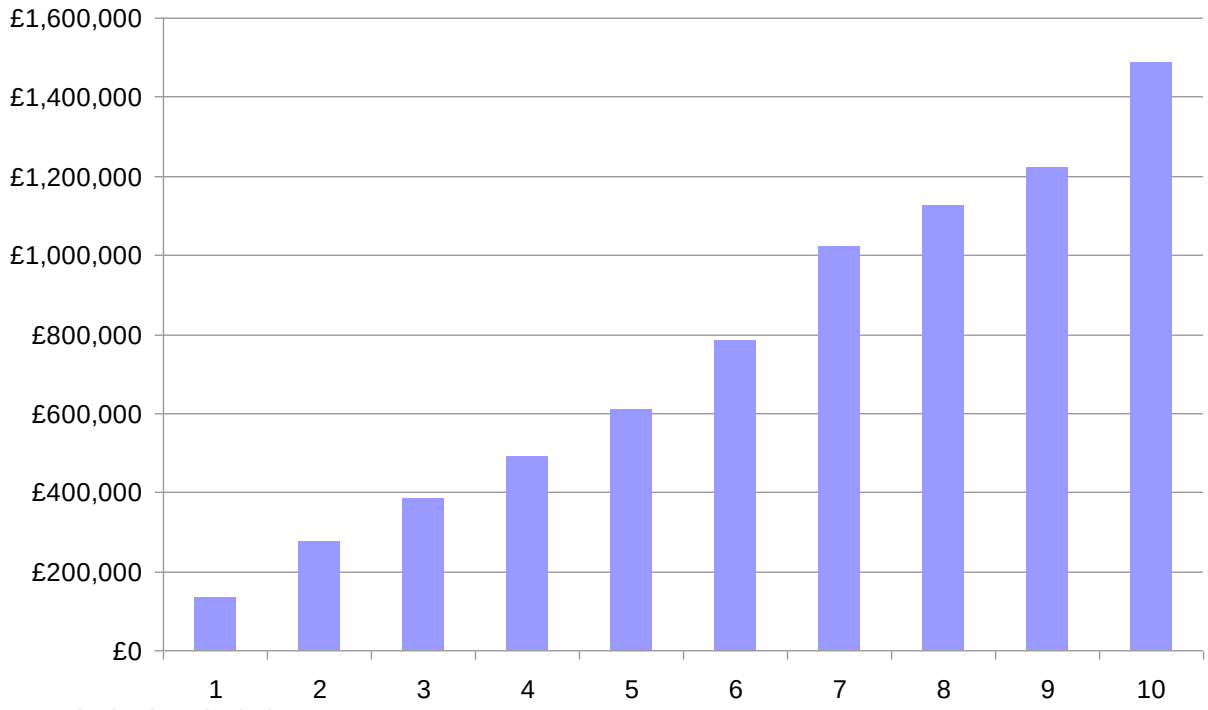
Table 13: Average higher education taxes and benefits by decile of lifetime income

Assuming proportional corporate taxes			
Decile	NPV of HE taxes, £	Total subsidy, £	Net subsidy, £
1	3,994.57	0	-3,994.57
2	6,077.79	0	-6,077.79
3	7,562.06	0	-7,562.06
4	9,126.92	0	-9,126.92
5	10,915.81	0	-10,915.81
6	13,444.06	0	-13,444.06
7	16,885.14	19,483.45	2,598.31
8	18,498.81	23,438.33	4,939.52
9	20,041.50	24,625.10	4,583.60
10	24,389.18	22,006.10	-2,383.08

Assuming progressive corporate taxes			
Decile	NPV of HE taxes, £	Total subsidy, £	Net subsidy, £
1	3,648.47	0	-3,648.47
2	5,376.77	0	-5,376.77
3	6,573.56	0	-6,573.56
4	7,869.99	0	-7,869.99
5	10,232.33	0	-10,232.33
6	14,120.08	0	-14,120.08
7	18,370.10	19,483.45	1,113.35
8	20,250.87	23,438.33	3,187.46
9	21,937.38	24,625.10	2,687.72
10	26,829.47	22,006.10	-4,823.37

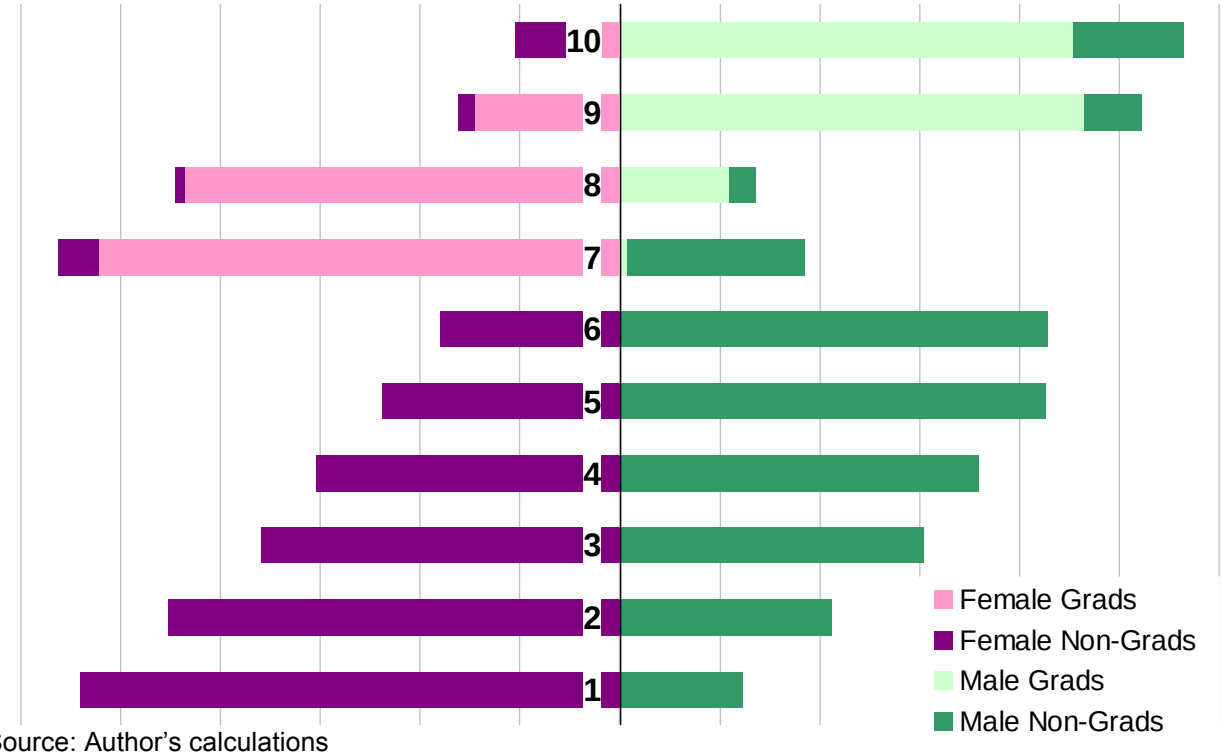
Source: Author's calculations

Figure 5: Average net present value of lifetime income by decile of lifetime income



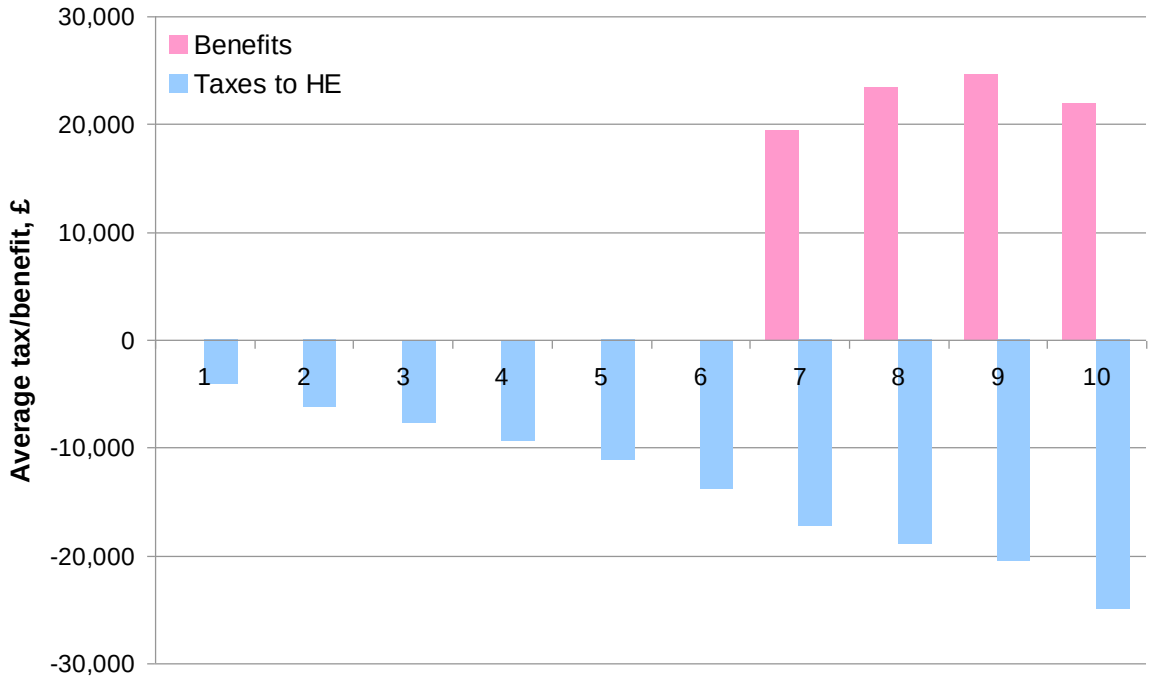
Source: Author's calculations

Figure 6: Proportion of each lifetime income decile by sex and education level



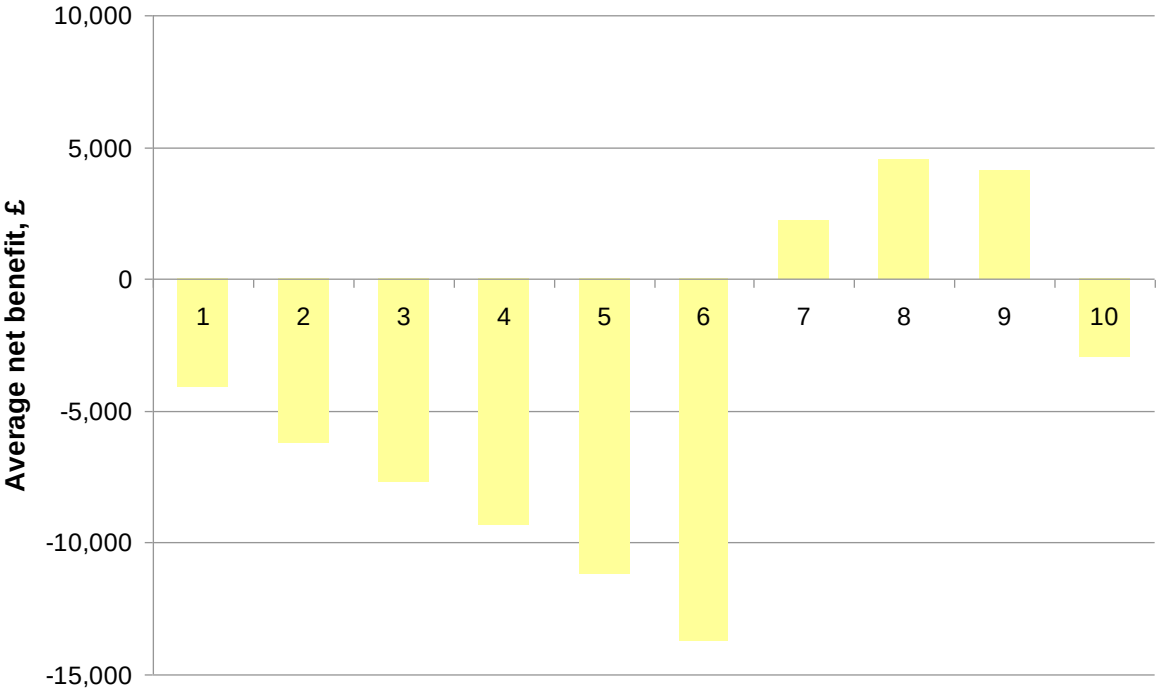
Source: Author's calculations

Figure 7: Average HE taxes and benefits by decile of lifetime income, assuming proportional corporate taxes



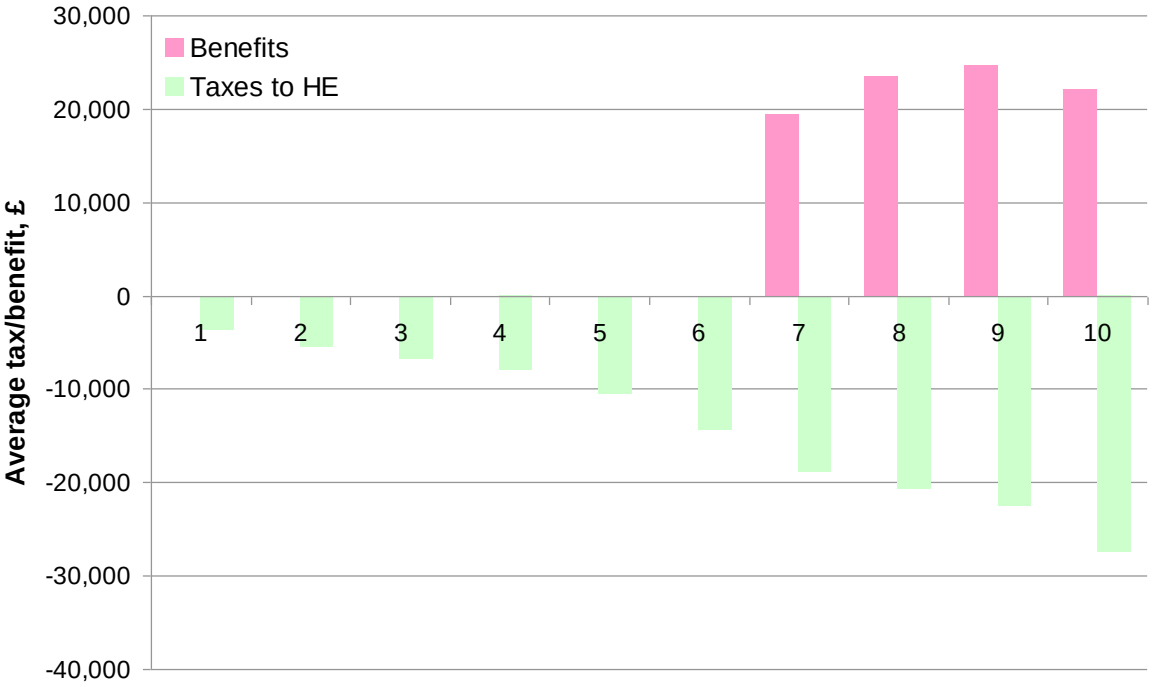
Source: Author's calculations

Figure 8: Average net benefits by decile of lifetime income, assuming proportional corporate taxes



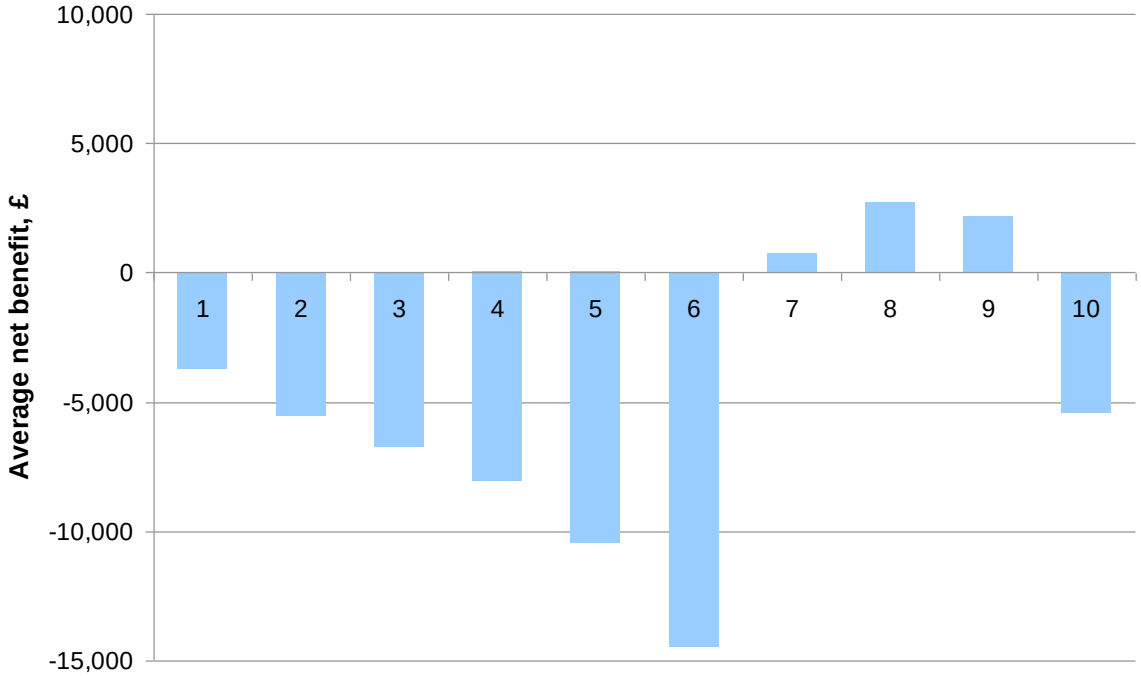
Source: Author's calculations

Figure 9: Average HE taxes and benefits by decile of lifetime income, assuming progressive corporate taxes



Source: Author's calculations

Figure 10: Average net benefits by decile of lifetime income, assuming progressive corporate taxes



Source: Author's calculations

Table 14: Break-even participation rates by decile of lifetime income

Assuming proportional corporate taxes

(a) Decile	**(b)** NPV of taxes paid to HE, £ millions	**(c)** Number of students paid for by column (b)[1]	**(d)** % of the individuals in this decile represented by column (c)
1	2,709	100,296	15.1
2	4,123	152,658	23.0
3	5,124	189,729	28.6
4	6,188	229,110	34.6
5	7,407	274,232	41.3
6	9,104	337,070	50.9
7	12,918	478,289	63.9
8	11,029	408,344	70.1
9	14,021	519,125	75.9
10	15,865	587,381	92.4
Total	88,488	3,276,235[(2)]	-

Assuming progressive corporate taxes

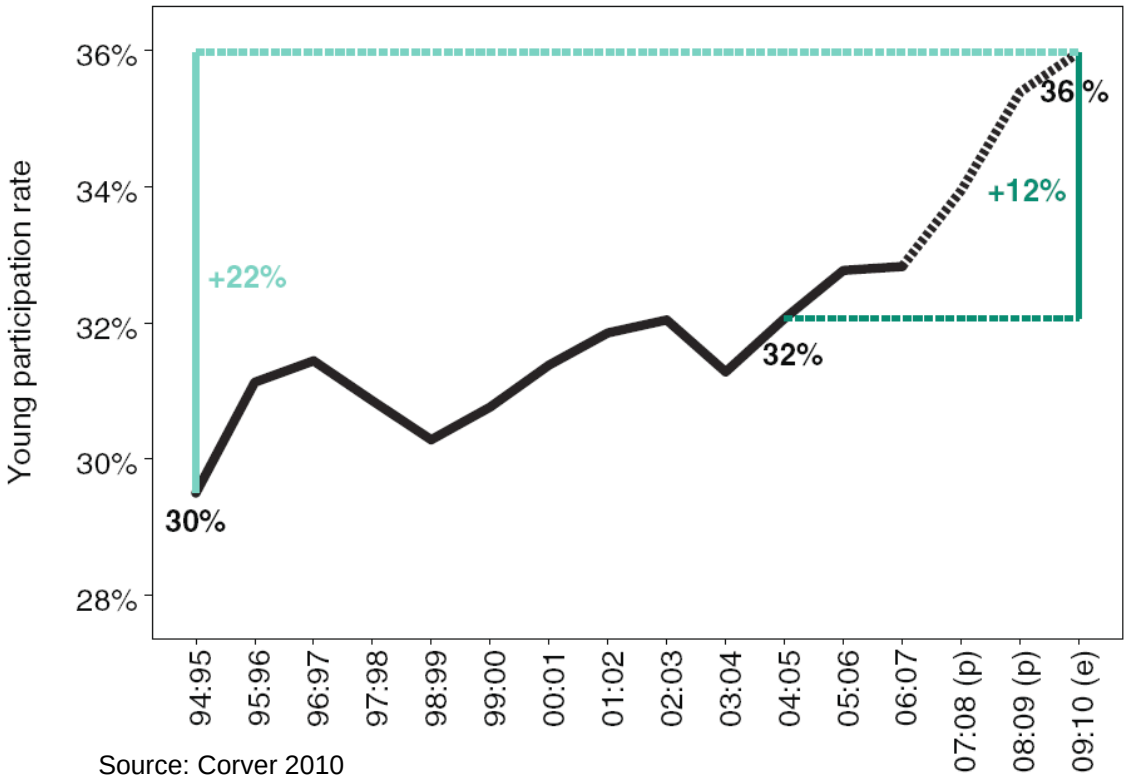
(a) Decile	**(b)** NPV of taxes paid to HE, £ millions	**(c)** Number of students paid for by column (b)[1]	**(d)** % of the individuals in this decile represented by column (c)
1	2,474	91,606	13.8
2	3,648	135,051	20.4
3	4,455	164,928	24.9
4	5,336	197,558	29.8
5	6,943	257,061	38.7
6	9,562	354,019	53.5
7	14,054	520,353	69.6
8	12,074	447,019	76.7
9	15,347	568,233	83.1
10	17,452	646,153	101.6
Total	91,344	3,381,979[(2)]	-

[1] Assuming a subsidy of £27,009 per student

[2] The taxes paid by this cohort more than fund their own educational costs because their tax burden was based on 2007/08 taxes and expenditures, while their total benefits were calculated from estimates of the subsidies received by each graduate.

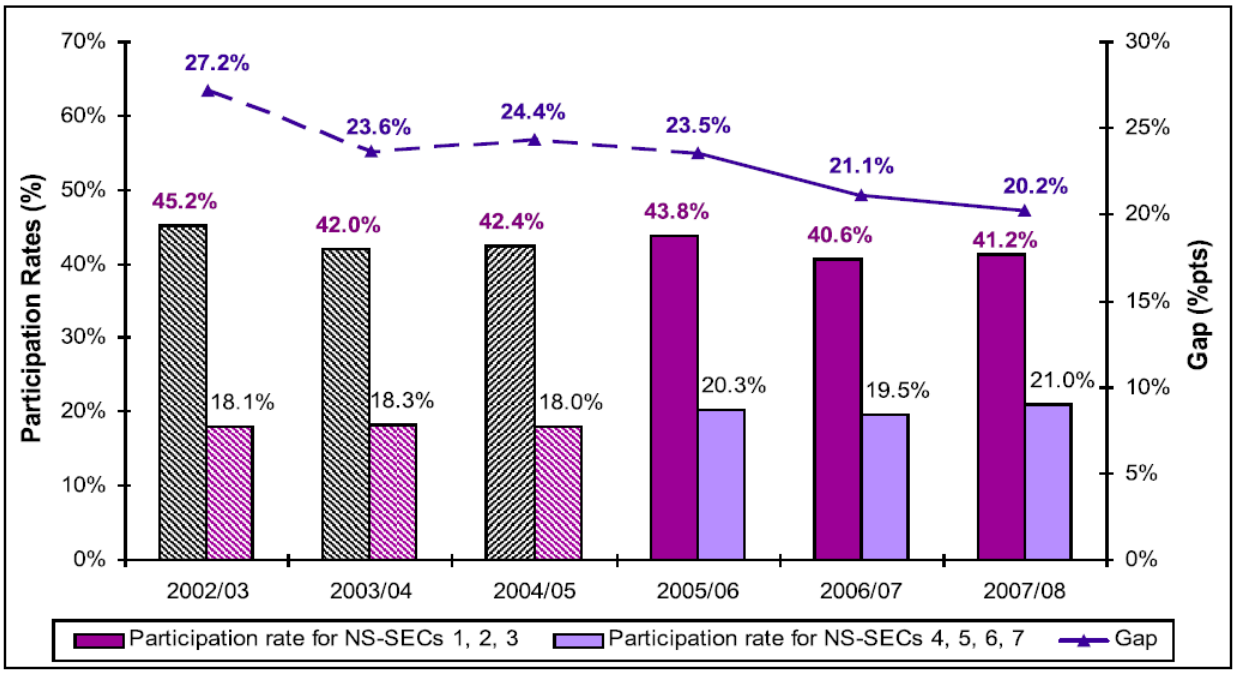
Source: Author's calculations.

Figure 11: Proportion of English young people entering higher education at age 18 or 19



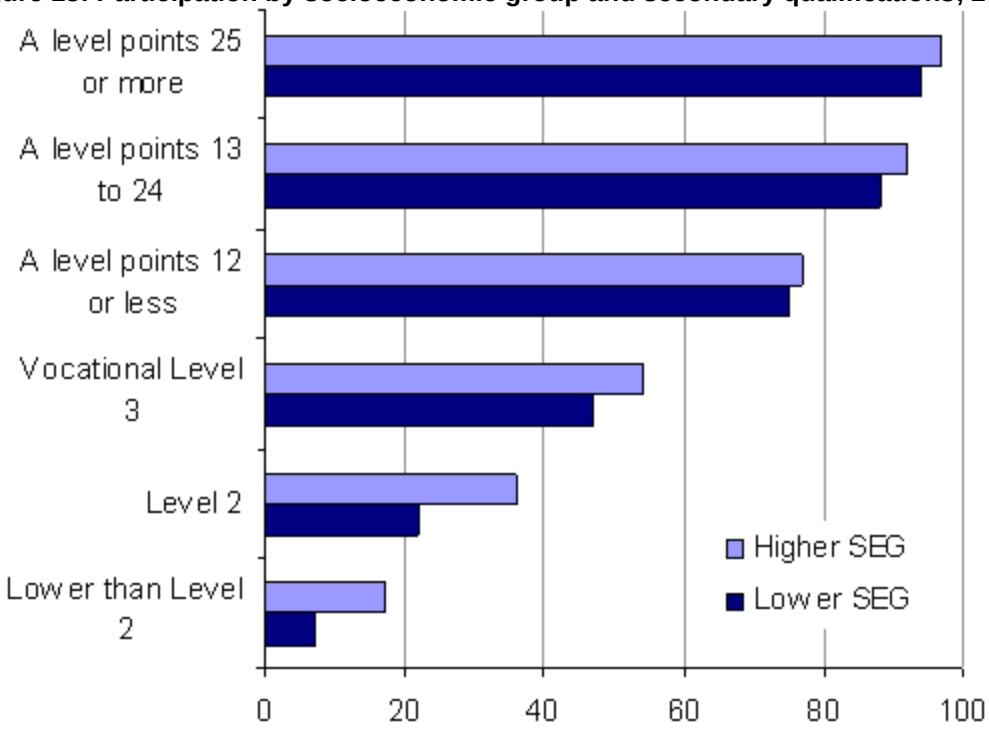
Source: Corver 2010

Figure 12: First-time participation of English-domiciled 18-20 year olds by socioeconomic class



Note: 2002/03-2004/05 data are grayed out to indicate lower levels of accuracy than more recent data.
Source: DIUS 2009a

Figure 13: Participation by socioeconomic group and secondary qualifications, 2002



Source: Barr 2010

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