The impact of higher education finance in the UK

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Abstract

The subject of how to finance Higher Education (HE) has been on the agenda of successive UK governments since the 1960s. The UK has moved from a situation where the taxpayer footed the entire bill for HE, to a system where students themselves must contribute part of the cost of their education. This so-called 'cost-sharing' has always been a subject of controversy, with fears that it would lower participation, particularly among poorer students.

This thesis is a quantitative analysis of the UK's system of HE finance (defined here as maintenance grants and upfront fees) and its impact on individual university participation decisions and Higher Education Institution funding levels. The thesis comprises two main strands.

The first is an econometric analysis of the causal relationship between HE finance and university participation. I use individual-level Labour Force Survey data over the period of 1992-2005, during which many major changes in HE finance policy took place, to estimate the impact of upfront fees and maintenance grants on individual participation decisions. I use a variety of econometric techniques exploiting variation in policy by income-group, over time, and by UK constituent country arising from Scottish devolution. I find a positive impact of maintenance grants on participation, and a negative impact of up-front fees.

In the second strand of the thesis, I draw on Scotland as a comparison group with the rest of the UK. I use HESA data on university funding and volumes of students, and Higher Education Funding Council of England / Scottish Funding Council funding formulae to analyze the impact of tuition fees in terms of relative funding per FTE in Scottish and English universities. I find English universities to have caught up with Scotland in terms of funding per head as a result of the increased income from fees.

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Declaration

I hereby declare that, except where explicit attribution is made, the work presented in this thesis is entirely my own*.

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*Chapter 7 is based upon joint work by Gill Wyness, Lorraine Dearden and Emla Fitzsimons; but represents predominantly Gill Wyness' analysis.
*Chapter 9 is based upon joint work by Gill Wyness, Alissa Goodman and Lorraine Dearden; but represents predominantly Gill Wyness' analysis.

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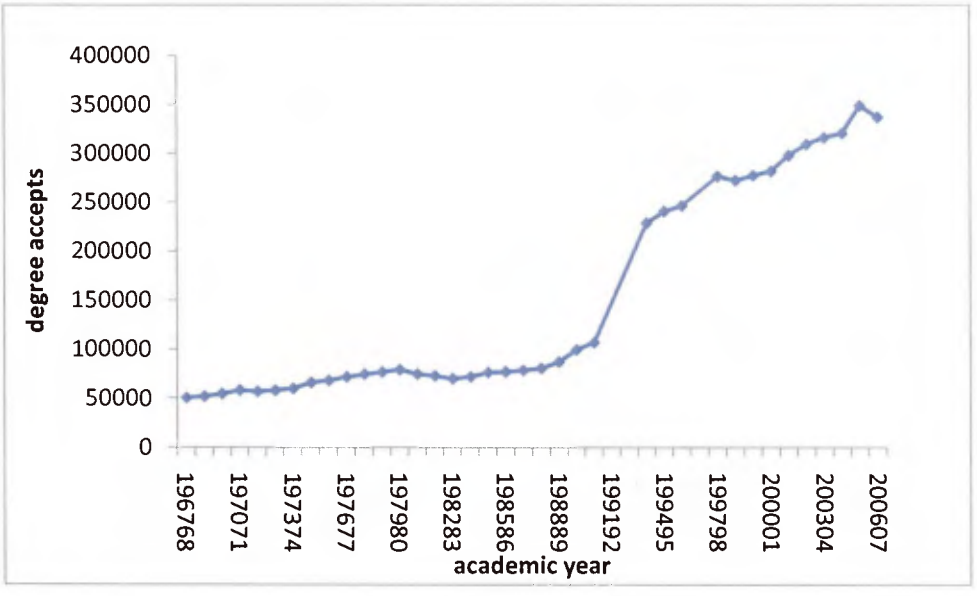
Chapter 1 Why investigate the role of higher education finance?

1.1 Introduction

This thesis is concerned with the impact of higher education (HE) funding on university participation in the UK. The specific focus is on the impact of upfront fees and maintenance grants on participation. The thesis presents evidence on the way that the HE funding reforms of the last decade, in particular the introduction of up-front tuition fees in 1998 and the abolition of grants in 1999 impacted on HE participation, and which types of students have been most affected by the reforms.

The UK Higher Education sector has undergone several major expansions in recent decades. Student volumes have more than quadrupled, rising from around 100,000 full time equivalent students in the 1960s to just under 2 million by 2007[1]. The increase in student numbers accepted at UK institutions is shown in Figure 1.1.

Figure 1.1 - UK domiciled degree students accepted at UK institutions, 1963-2006, (Figures compiled by Carpentier, V, Institute of Education)



[1] All UK domiciled Higher Education students (HESA)

The dramatic increases in participation illustrated above have prompted debate about the nature of HE funding in the UK. In particular, the questions of how the HE sector should be funded, who should pay and who benefits and loses from different funding arrangements have become more urgent. The next two sections (1.2 and 1.3) of this chapter outline the historical changes in HE funding and participation and the economic principles on which these have been based. Sections 1.4 and 1.5 summarize the existing empirical evidence on the impact of these reforms on HE participation and university funding levels, respectively. The final section (1.6) gives an overview of the rest of the thesis.

1.2 Higher education funding reform and participation in the UK 1960-present

The massive increase in university attendance discussed above occurred intermittently and for complex reasons. In the 1960s the recommendations from the Robbins Report[2] (1963) led to a dramatic expansion of the sector as all colleges of technology were reclassified as universities and 17 new universities were built. Further increases in participation occurred during the 1980s as the economy shifted towards the service sector and relative wages for graduates improved. The establishment of the GCSE in 1988 led to significant improvements in exam results, which also encouraged more youths to enroll in university courses, as discussed in Blanden et al (2003).

By the end of the 1980s the higher education sector was in financial crisis. The rise in numbers had brought with it an increasing taxpayer burden; the Government was entirely responsible for funding university entrants at a cost of around £8000[3][4] per student. Furthermore, despite the significant expansion in numbers, the UK's higher education participation rate, at 19% of 21-30 year olds,[5] was still one of the lowest in any advanced industrial country and participation among the working classes was extremely low. The Government wanted to address both these problems, and to respond to the climate of rapid technological advancement, by growing the HE sector even further.

[2] Officially known as "*Report of the Committee Appointed by the Prime Minister under the Chairmanship of Lord Robbins*"
[3] Source: Carpentier, Institute of Education, University of London.
[4] All figures that follow are in 2006 prices unless otherwise stated
[5] Age Participation Index (IFS)

However, given the level of investment required, this was no easy task. Increasing university places would result in the taxpayer facing a growing financial burden, both in order to fund universities and also because of the costs of paying maintenance grants to students.

The Government's response to the problem was to begin the process of examining ways in which students themselves could contribute to the cost of their education. After much debate (for a summary see Barr and Crawford, 2005), the first student loan system was introduced in 1990, and the UK Higher Education finance system has been in a state of change ever since.

The introduction of maintenance loans was followed quickly by the major reclassification of HE institutions in the first years of the 1990s. Polytechnics were given university status and with it, additional funding. This led to a huge increase in the supply of university places which were filled by the rapidly growing demand.

By 1997 the sector was once again in financial crisis. University funding had not been maintained by the Government, so that funding per FTE (full-time equivalent) student had fallen to a historic low of £4,850. The Dearing report (2007)[6] was at this time commissioned to recommend ways to tackle the funding crisis as well as look at the additional issue of widening participation; despite the huge increases in enrolment, participation of the poorest groups had not improved. The gap between rich and poor was still extremely wide in comparison to other developed countries. Rather than narrowing, it was in fact widening (Blanden et al, 2005).

As well as highlighting these concerns, the principal recommendation of the Dearing report was the introduction of upfront tuition fees of £1200, which were introduced in 1998. This was accompanied with the complete replacement of grants with maintenance loans, fully realized in 1999 (Barr, 2004). This reignited the debate concerning the under representation of lower social classes. Those worried about widening participation opposed the introduction of tuition fees and

[6] Formally known as "*The National Committee of Inquiry into Higher Education*"

the replacement of grants with maintenance loans, claiming that these changes would serve to put off lower class children who might otherwise have gone to university.

Despite these concerns there was still very little evidence on the impacts of these major financial changes on participation and the gap between rich and poor, and further major reforms soon followed in 2006 when the £1200 up-front fee was replaced with a so-called "top up fee" of £3000 which was accompanied with a loan to the same value, meaning repayment could be deferred until graduation. Grants were also increased for poorer students at this time (Goodman and Kaplan, 2003; Dearden et al, 2008).

Thus, the UK has moved from the system of the 1960's – where only a small number of youths went to university and the taxpayer footed the entire bill for a students' education, to the current system of cost-sharing, where contributors to higher education include taxpayers, parents, institutions and students themselves.

As a result of devolution, Scotland (in 1999) and Wales (in 2004) have been granted powers to decide their own Higher Education finance legislation, and both countries have done so, with Scotland in particular departing from the rest of the UK by abolishing tuition fees in 2000. The impact is that where the UK once had a single, free for all, HE finance system, there are now three separate, evolving, and quite different systems in England and Northern Ireland, Wales and Scotland, all of which require some kind of contribution from the students themselves.

1.3 The economic principles behind the reforms

The subject of how to finance Higher Education has been debated by economists for many years. The government policies described above have largely focused on increasing the financial contribution made by students – so called "cost sharing", with the aim to increase university funding per student. As mentioned above, this continues to be a pressing matter – by 2006 government expenditure had reached £8709m and projected expenditure for 2007 is £9179m[7].

[7] (DIUS departmental report, 2007)

There are a number of economic and social reasons why governments may want or need to intervene in the HE market (Johnstone, 1972; 1991; 2003, Barr 2004, Goodman and Kaplan, 2003, Barr and Crawford, 20054). These different reasons are discussed below:

1. Capital market failures. With no intervention in the market for HE, all students would have to bear the full cost of their higher education. Given their age, most students would be unable to pay for themselves and would have to turn to their parents, or to capital markets to raise the money. While banks may be willing to loan students the money to pay for their education, they may not operate efficiently – banks do not know what individuals' future earnings will be and therefore may not want to loan them money or may only do so at a cost that is prohibitive to the student. Consequently, the government may wish to intervene to help those who cannot afford to pay for their education (particularly those from low-income backgrounds) by offering fee remissions or loans. Further intervention may be required if particular groups of students are debt-averse, and so do not wish to take out loans to pay for their education. Low income students may again be more likely to fall into this category (Callender, 1998).
2. Information inequalities. Certain groups of people lack information about the benefits of higher education, both as an experience and in terms of the likely wage return. They may choose instead to go straight into employment if they believe the costs of university are high compared to the benefits. Again, such individuals tend to be from poorer backgrounds (Goodman and Kaplan, 2003) and will therefore be under-represented in HE. The government may wish to intervene to encourage such people to attend university by providing them with incentives such as maintenance grants and loans, and by offering fee loans or remissions, as well as by providing them with additional information about the benefits of university.
3. Social returns. While there is a good deal of evidence that individuals gain personally from participating in HE (Blundell et al, 2000) there might also be social returns – such as improving economic growth and international competitiveness through a more educated workforce, improving the nations health or reducing crime (Dolton, Greenaway and Vignoles, 1997; Wossman and

Schultz, 2006). Therefore it may be in the interests of the government to encourage university attendance even at a high cost to the taxpayer.

4. Inequality in costs incurred and benefits received. Despite the gradual move towards sharing the cost of universities with students, public expenditure on the HE sector has continued to grow. Thus, there is a sizeable cost to the taxpayer, but not all taxpayers reap the benefits of HE. As described in Section 1.2 the majority of those attending universities are from upper or middle class backgrounds, but taxpayers are from all backgrounds. Thus, those from low socio-economic groups are contributing taxes for a service they are less likely to use than those from other groups, meaning providing free education in this way is economically regressive. One way of improving this situation would be to make changes to the tax system so that poorer or non-university educated taxpayers contribute less. Another way would be to ask those attending HE to contribute to the cost of their education.
5. Other equity reasons. Finally, and related to point 4, the government may want to intervene to encourage certain groups of people to go to university who are under-represented. Indeed the UK Government remains committed to increasing participation rates across the board, and in 2003 the Labour Party set themselves a target of achieving participation of 50% of young (18-30 year olds) people by 2010. A key factor in achieving this goal is clearly to understand how to increase participation, and in particular to encourage attendance among low income groups, who make up a large proportion of society.

One of the most important aims of the UK Government's interventions is to increase funding to universities and to reduce the taxpayer burden, which is seen as economically regressive, by making individuals contribute to cost of their education through fees and loans. However, this must be achieved without sacrificing the desire to increase absolute numbers of students and improve relative participation by under-represented socio-economic groups.

This thesis focuses on these issues in particular, examining whether the introduction of up-front fees in 1998 and the abolition of grants has impacted HE participation, and which types of students are most impacted by the reforms.

1.4 How has Government intervention impacted HE participation?

Despite years of debate, there is little empirical evidence that maintenance grants encourage students towards higher education, or that tuition fees dissuade them. Research for the UK in this area has been limited, partly because the reforms themselves have only been in place for a short time, but also because of a lack of detailed data on participants and non-participants.

As was evident from Figure 1.1, growth in overall numbers of students has apparently continued, despite the increases in costs faced by students as described in Section 1.1. The only obvious response to the reforms are the peaks in the rate of acceptances (and by inference, applications) in the years immediately before the 1998 and 2006 major reforms, both of which increased costs of going to HE, presumably as students who may have postponed their start at university for a year or more, enrol on courses early to avoid the increase costs (it certainly implies some sort of aversion to the reforms). While Figure 1.1 illustrates the continuing growth in university participation over time, it says nothing about the distribution of participation among rich and poor or the differing rates of participation of individuals of differing socio-economic status, an issue which, as mentioned, has been firmly on the Governments agenda for several years.

In order to understand how the reforms have impacted the relative participation of youths from rich and poor backgrounds, it is useful to examine how the proportion of students from different socio-economic groups has changed over time. A small number of UK studies have focused on this question, such as Glennerster (2001) and Blanden and Machin (2004).

Unfortunately, UK socio-economic status has been subject to two major re-classifications, the first in 1978 when the four major classes of unskilled or manual workers (I-XX), skilled workers (XXI-XXIII), administrators and managers (XXIV) and professional, technical workers and artists (XXV) were reclassified into six new classes of Professional (I), Managerial (II), Skilled non-manual (IIIN), Skilled Manual (IIIM), Part Skilled (IV) and Unskilled (V). A further re-classification was carried out in 2001, so that there are now seven classifications – Higher Managerial and Professional (1), Lower Managerial and

Professional (2), Intermediate (3), Small Employers and Account Workers (4), Lower Supervisory and Technical (5), Semi-routine (6) and Routine Occupations (7). This has resulted in two series breaks which make analysis of the time series problematic.

Nevertheless, it is apparent that there is a distinct gap in participation between those from high and low socio-economic groups. In general those from professional and managerial backgrounds are disproportionately represented among the student population, with those from routine and unskilled backgrounds under-represented. This trend appears to have continued up to the present. Table 1.1 illustrates this.[8]

Table 1.1 - Socio-economic status of UK domiciled HE students accepted at English institutions, with working population 1970-2006, (UCAS)

		Year:			
Socio-economic status:		**1969/70**	**1980/81**	**1999/00**	**2005/06**
1. Higher managerial & professional	Acceptances	30%	21%	13%	18%
	Population	9%	5%	5%	11%
2.Lower managerial & professional	Acceptances	14%	48%	39%	26%
	Population	7%	20%	25%	22%
3.Intermediate	Acceptances	28%	10%	14%	12%
	Population	21%	10%	20%	10%
4.Small employers & account workers	Acceptances	28%	13%	12%	6%
	Population	62%	40%	17%	8%
5.Lower supervisory & technical	Acceptances		7%	7%	4%
	Population		18%	14%	9%
6.Semi-routine	Acceptances		1%	2%	11%
	Population		7%	5%	13%
7.Routine	Acceptances				4%
	Population				9%

Note: in 1999 and 2005, working population statistics include long-term unemployed, making up 14% and 18% of the population respectively. Note also, that since 1999 the proportion of students whose background is unknown has risen.

For example, in 1969/70 30% of students were from professional backgrounds, though these occupations made up only 9% of the working population. Those

[8] Corresponding classifications Pre-1978 – 1.XXV; 2.XXIV; 3.XXI-XXIII; 4.I-XX
Corresponding classifications,1978-2000 – 1.Professional (I); 2. Managerial, technical (II); 3. Skilled non-manual (IIN); 4. Skilled manual (IIIM); 5. Part-skilled (IV); 6. Unskilled (V)
Equivalent data for Scotland not available

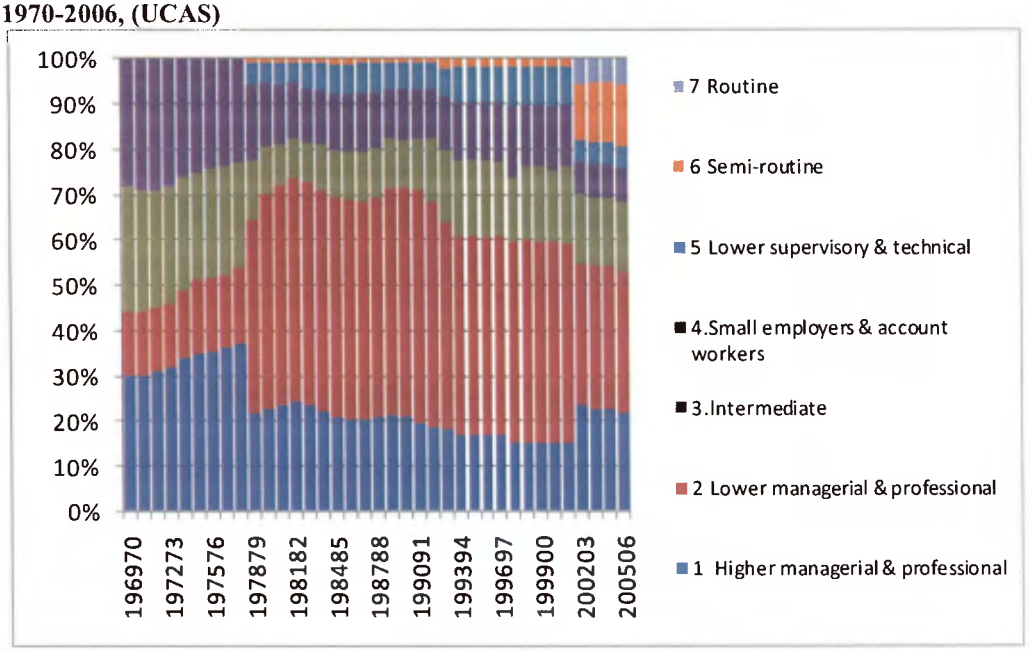
from unskilled backgrounds made up 62% of the working population, but only 28% of students were from such backgrounds. In 2005, the three highest socio-economic groups made up 56% of acceptances and 43% of the population, while those from the lowest socio-economic groups are under-represented, making up 31% of the population but only 19% of acceptances[9].

Figure 1.2 illustrates the changes in socio-economic status of UK domiciled HE students from 1968 – 2006 (again see Footnote 8, p 19 for previous classifications). The series breaks are immediately apparent from this chart.
This simple eye-balling of the data reveals no obvious visible impact of the introduction of the first student loans in 1990. The series between 1978 and 2001 does seem to show a decrease in the proportion of students coming from professional and managerial backgrounds, though, in favour of those coming from skilled non-manual backgrounds. There is little change in the proportion of students from part-skilled or unskilled backgrounds.

Looking at the most recent years, after the re-classification in 2002, the distribution seems more stable. Students from professional, managerial and technical parental backgrounds dominate acceptances while those from routine and unskilled parental backgrounds make up around 15% of acceptances. Again based on this raw data, the introduction of top-up fees in 2006 seems to have had little impact on the distribution of students, although interestingly the proportion of unclassified students (i.e. those whose parental backgrounds are unknown) has risen to 22% from only 7% in 1993 so there may well be a hidden impact in these figures.

[9] It is worth noting that the proportion of students whose socio-economic status is unknown has also risen (for reasons which are not apparent), now standing at 22%, making comparison with previous years even more difficult.

Figure 1.2 – Socio-economic status of UK domiciled HE students accepted at UK institutions, 1970-2006, (UCAS)



Research similar in nature to the above was carried out by Glennerster (2001), who reports Social Trends data on higher education participation and parental social class for the UK in the 1990s, showing a sharp increase in participation by those from higher social classes between 1991/2 and 1998/9, though he also finds an increase in participation of those from lower classes over the same time.

While this and the above research is informative of overall trends in participation, it can be misleading, given the multiple re-classification of social classes over the time period in question.

To overcome the problems associated with such official statistics, Blanden and Machin (2004) instead examine university participation rates by parental income, pointing out that "*this makes the metric much clearer, particularly as over decades the composition of social class groupings has significantly changed with coincident shifts in occupational structure.*"

They use survey data from the NCDS, BCS and BHPS to obtain data on youth's parental income and university participation. Looking at a simple measure of the difference in participation between the top and bottom income quartiles, they uncover a sharp increase in HE inequality throughout the 80s and 90s – with a

14% gap in 1981, through to 30% by 1993 and even further rises to the end of the 90s. They conclude that the rapid expansion of HE in the 80s and 90s was not equally distributed across people from richer and poorer backgrounds but instead those from richer families benefitted more than the poor.

However, this descriptive analysis does not provide evidence of the causal impact of the reforms on participation, rather it simply shows that at the same time as the reforms were taking place, inequality in participation between rich and poor youths was increasing. But the increases in participation among rich students documented by Blanden and Machin may have been caused by factors other than the HE reforms. For example, it is widely established that youths from rich backgrounds tend to achieve better scores at GCSE level or equivalent (see for example Chowdry et al, 2009) and it may be that this factor has driven faster increases in their university participation relative to youths from poorer backgrounds, rather than any changes in HE finance legislation. Similarly, it is well-known that youth's early years experiences are a key driver in their future educational attainment, including HE (Heckman and Carneiro, 2003; Gorard, 2006), so it may be the case that improvements in early child development, rather than changes in HE finance, are responsible for increases in university participation.

Blanden and Machin acknowledge this, pointing out that it is necessary to subject the analysis to more rigorous probing. They therefore go on to model the probability of having a degree with parental income as the explanatory variable of interest, controlling for a number of factors including youths' prior educational attainment, parental age and family composition. Their results show degree attainment becoming more closely linked to family income as participation in higher education has expanded between the 80s and late 90s.

Similar evidence from this nature comes from Galindo-Rueda et al (2004), who also look at changes in university participation by parental income. Their results are similar to those of Blanden and Machin, emphasizing the large gap in participation by income background during the past decades, and these studies remain the few to have explored this issue in the UK.

However, the studies carried out by Glennerster, Blanden and Machin and Galindo-Rueda et al, as well as the descriptive analysis above, are limited for a number of reasons.

1) Descriptive statistics and trends, while informative about absolute increases in participation, as well as the gap in educational attainment between rich and poor, do not provide information about the *causes* of the increases or this gap. Even if youths from rich backgrounds became more likely to attend university around the time up-front fees were introduced this cannot be taken as evidence that fees did not impact their likeliness to attend. Similarly, even if youths from poor backgrounds were less likely to go to university around the same time as grants were abolished, this cannot be taken as evidence that abolishing grants drove this shift. Other things may be changing at the same time as HE finance legislation, and driving the trends observed in the data. While the modeling techniques used in the literature discussed above go some way to uncovering the causal relationship between parental income and participation while controlling for such factors as parental education, there may be other characteristics which are more difficult to control for, such as youths inherent ability, early childhood development or changing tastes, which may be the main factors in participation changes. Furthermore, parental income is also directly related to the amount of grants received and fees payable, so interpreting coefficients in a causal way can be difficult.
2) Even if such factors could be controlled for in the models above, this does not help to isolate the separate impact of grants and fees on participation. As described, the majority of the UK reforms involved simultaneous changes in grants and fees, alongside increases in maintenance loans. So even if participation was found to have increased among certain income groups, controlling for all other possible factors, it is not possible to ascertain whether this increase was driven by changes in fees, grants or loans, or some combination. In 2007, estimated spend was £918m on maintenance grants, £349m on student fee loans and £564 on maintenance

loans, as well as a further £509m managing fee and maintenance loans.[10] Given the huge costs to the taxpayer associated with these elements of HE finance, it would seem vital to understand fully their individual effects.

3) Following on from the above, it would be extremely useful to understand the impact of HE finance in monetary terms. In other words, what is the impact of an increase of, say, £1000 (again, in 2006 prices) in grants on participation? Increases of this nature have been common in UK funding policy, and as yet no evidence of their impact exists for the UK. This type of evidence could only be ascertained by using econometric techniques to model the probability of participation given values of grants fees.

A further major reason for a better understanding of the impact of HE finance is because current system is still in a state of evolution. The deferred £3000 fee for English students has only been in place since 2006, but a review in 2009 will most likely result in their increase – and there is little solid evidence as to what the impact of such an increase will be. Given the costs associated with an increase in tuition fees – assuming that these fees would be backed by loans, as well as the desire to increase absolute numbers of students while addressing the gap between rich and poor in terms of university attendance, it would seem essential for the Government to understand the implications of any changes to the levels of aid eligibility and fee obligations.

While, as discussed, no quantitative research of this nature has been carried out in the UK, a number of US studies have been carried out over the past few decades, which explore the causal relationship between grants and fees and participation. Studies such as Kane (1994) and Dynarksi (2004) have modeled probability of participation while controlling for observed and unobservable factors, and uncovered positive impacts of aid and negative impacts of tuition fees. While these results are specific to the US and their aid and fee policies, the results imply that the levels of grants and fees set by the Government play important roles in encouraging participation.

[10] All in 2007 prices.This does not represent the amount of money lent to students, but the future cost of subsidizing and writing off student loans issued in that year as well as management of the student loans stock (DfES departmental report 2007)

In summary then, it is vital to gain a detailed understanding of the impact of maintenance grant eligibility and tuition fee obligation on participation, and this is the main aim of the first strand of the thesis. In particular the thesis aims to answer the following questions:

1) What is the impact of the Higher Education reforms of the past two decades since the 1990s on absolute levels of university participation, after controlling for observed background factors and unobservable factors?
2) What do the HE reforms mean for relative participation by socio-economic status? In particular, did the abolition of grants and introduction of up-front fees in 1998/99 have a negative impact on participation of youths from low income backgrounds relative to those from high income backgrounds? And if so, can student aid in the form of grants be used as a tool to encourage poorer youths into university?
3) Did the abolition of tuition fees and re-instatement of grants in Scotland contribute to increased participation levels compared with England?
4) What is the impact of a £1000 increase in grants and fees on participation?

This work has claims to originality and importance. A causal, quantitative analysis which attempts to untangle the separate impacts of grants and fees rather than the joint impact of the reforms has never been carried out for the UK, nor have any studies aimed to compare participation in Scotland and England given their differing HE finance strategies.

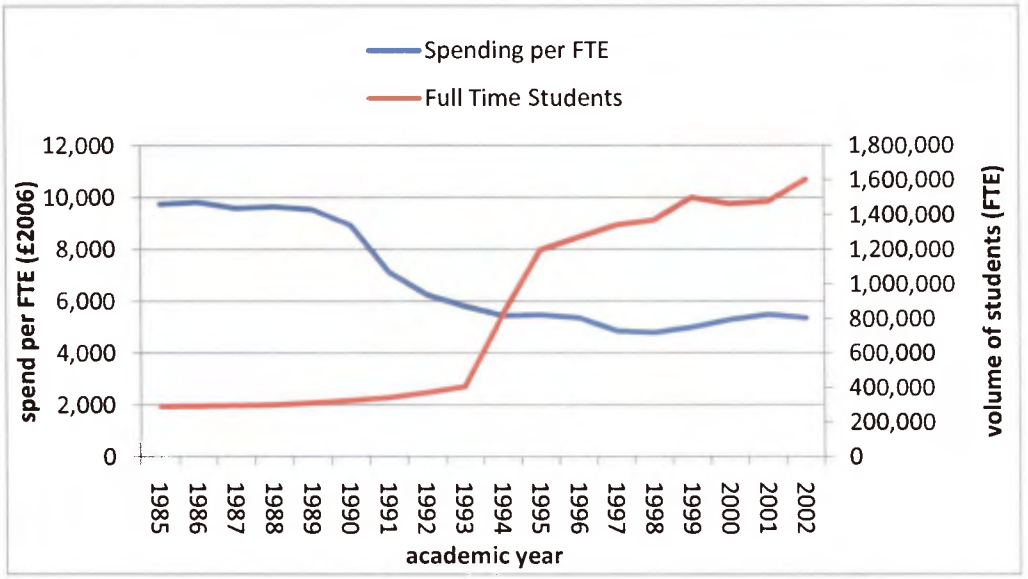
But this analysis is necessary in order to truly understand the impact of the ongoing changes to Higher Education finance policy. Due to the complex nature of university participation decision-making, which depends on many factors such as parental education and motivation, as well as youth's ability and attitude, a thorough estimation-based approach to modeling participation is required, in which background characteristics can be controlled for. In this way the impact of student maintenance grants and tuition fees on participation can be fully understood. In the first strand of the thesis the key aim is to estimate a model of this nature.

1.5 The impact of the reforms on university funding levels

As discussed in Section 1.2, one of the main aims of the Government's move towards cost-sharing in HE was to increase levels of funding per university student. Changes in the levels of tuition fee can have a dramatic impact on university funding levels.

As seen in Section 1.1, the Government failed to keep student funding levels up during the large rise in student volumes in the 1980s and 1990s. This can be seen in Figure 1.3 – a symmetry is apparent between the volume of students and funding per head, with per head funding levels over the 1990s falling as quickly as volumes of students increased.

Figure 1.3: University Spending – public funding for domestic students; Full-time equivalents UK only, 1985-2002 (figures compiled by Carpentier, V; Institute of Education)



The decision in 1998 to introduce up-front fees for full-time degree students provided a sudden increase in income for cash-strapped universities across the UK. The subsequent increase in fees in 2006 resulted in as much as a 35% increase in funding per head in England and Northern Ireland (Dearden, Goodman and Wyness, 2009). By this time, the Scottish Parliament had abolished tuition fees, thus cutting off this source of funds from their national universities. The second strand of this thesis presents an analysis of the resultant comparative funding levels in Scotland versus the rest of the UK, thus shedding light on the impact of higher education funding from the perspective of university funding

levels, and hence the competitiveness of Scotland's universities world-wide. The rationale for this is straightforward.

University funding plays an important role in maintaining quality of teaching and research – see for example Beath et al (2005), and ultimately to the competitiveness of countries in terms of their HE provision. Scottish universities have long been seen as some of the best in the world and have traditionally received more funding than those in England.

There is wide concern in the Scottish press, that the injection of additional money into the English system would result in English universities being able to provide better facilities, better pay and better resources, resulting in a potential "brain drain" of quality teaching in Scotland as lecturers and researches are attracted South of the border. Research tends to be dominated by English language institutions, and is an extremely lucrative field, attracting large amounts of money into UK universities. For example, in 2007/08 UK universities received £3722m through research grants[11] – or 15.9% of their total income, with Scottish universities themselves tending to attract a similar proportion of their overall funding from research grants. It is important for Scottish universities to remain competitive with English, to keep attracting research grants and income, and the increased levels of funding going to English universities poses a threat to this.

Furthermore, students who are attracted by the high quality facilities, research and teaching of Scottish universities may themselves be attracted to study in England instead, given increases in their relative funding. Cross-border education has become a commercial business in the UK, bringing in large amounts of money from (unregulated) high tuition fees from non-EU students. Scotland draws around 12% of its university funding from non-EU students[12] who are presumably attracted by the reputation and quality of its universities, and again a threat to its competitive position from England could have serious financial repercussions.

Further increases in tuition fees are expected in England in 2009, which will have even greater ramifications. Thus, it is essential for the Scottish Government to

[11] Total income and expenditure through research grants and contracts (HESA)
[12] Based on figures for 2007/08 (HESA)

understand the implications of the increases in tuition fees in England in terms of resources available per student in England compared to Scotland. It is equally important to understand the impact of the tuition fee policies in England, Wales and Northern Ireland have been successful in their aim to increase funding per head. Scotland provides a useful comparison group to shed light on this.
This is the main aim of the second part of this thesis.

Again, analysis of this nature – specifically comparing Scottish and English funding levels before and after the HE finance reforms, has never before been carried out.
This investigation therefore provides new insights into the potential impact of changes in the levels of tuition fees on university funding and hence, competitiveness nationwide and abroad.

1.6 Thesis outline

Having presented the rationale for investigating the impact of higher education funding reforms, Chapter 2 presents a detailed examination of the economic rationale behind government intervention in HE, plus a detailed overview of HE policy changes in the UK from the 1960s to the present date. As described in Section 1.4., there is little robust evidence on the *causal* impact of different aspects of HE finance on university participation, and many researchers have argued that factors such as early childhood development have a far greater influence in individuals' participation decisions than HE finance (Gorard, 2006; Heckman and Carneiro, 2003). The counter-argument is that HE finance does matter, and there is a small body of evidence from the US in which a significant causal relationship is found even after controlling for background and other characteristics (Card, 2005; Dynarski, 1999). Chapters 3 and 4 present this debate. Chapter 3 addresses the fundamental question of whether HE finance matters, concentrating on the role of early child development and transitions to higher education and asking what are the main drivers of higher educational enrolment, and what kind of part does HE finance play? Chapter 4 then presents the counter-argument and sets up the main body of analysis in the thesis by presenting the small body of evidence that tuition fees and grants do have some impact on individuals' participation decisions over and above the role of early development

and early years education. Particular attention is given to the methodologies used to uncover the causal relationship between HE finance and participation, which is of great relevance to this thesis. Having examined the theoretical issues surrounding the impact of HE finance on university participation decisions, Chapters 5-7 present the datasets and methods of analysis used for the first strand of the thesis. Given the complexity of methodology and the need for data that meets many criteria, an exploration of potential data sources is presented in Chapter 5, with choice of data source for this analysis and reasons behind this choice. Chapter's 6 and 7 present the results of the impact of the HE reforms on university participation using a number of strategies and approaches, including use of both individual-level data and pseudo-panel data. Chapter 7's key aim is to explicitly measure the impact of a real (2006 price) £1000 increase in grants and up-front tuition fees on university participation. This information is highly relevant to policy-makers in highlighting the delicate balance that policy-makers must achieve in setting levels of HE finance in their on-going efforts to design an equitable and cost-effective funding strategy. Chapter 8 presents the main conclusions of this strand of the thesis. Chapter 9 finishes the thesis with a stand-alone quantitative analysis of the impact of the abolition of tuition fees in Scotland on university funding levels and the resulting implications and conclusions regarding the impact of tuition fee legislation on competitiveness of universities in terms of funding per head.

First Strand

The impact of higher education finance on university participation in the UK

Chapter 2 Higher education finance policy – equity, efficiency and government intervention

2.1 Introduction

As described in Chapter 1, the UK Higher Education system has undergone several government interventions in the last few decades. These interventions had at their root the aim to increase funding per university student, but were also designed to address the issues of economic efficiency and equity (Goodman and Kaplan, 2003).

As a result of these policy interventions, the UK has moved from a system where the taxpayer footed the entire bill for HE to a system of cost-sharing, where HE participants contribute to their higher education through tuition fees and income contingent loans.

Many economists (Barr and Crawford, 1998, 2005; Goodman and Kaplan, 2003; Barr 2002; 2004; Wossman and Schultz, 2006) argue that government intervention of this nature is essential in delivering an efficient and equitable HE system and if designed and implemented correctly, can encourage a greater volume and more diverse range of applications.

It is important to understand the economic principles of the governments reforms and the rationale and intentions behind them, before going on to analyze their impact in terms of participation.

This chapter therefore looks at the economic principles behind government intervention in the HE market, focusing in particular on the cost-sharing model implemented in the UK in recent decades. The second part of the chapter accompanies these arguments with a detailed documentation of the policy changes that have taken place in the UK from 1963 to the present day. This provides context to the economic arguments by describing the nature of the UK's move towards cost-sharing as well as providing context to the entire thesis by explaining the policies that will be analyzed in Chapters 6-8 and the Government's intentions behind them.

The arguments in favour of moving towards a cost-sharing system largely centre on the two main areas of equity and efficiency. In both cases equitable and efficient systems reflect the principle that those who benefit from higher education should pay for it – since education is an investment good, which has a private return to the individual, he/she should contribute to the cost of it. Before examining the Government's rationale behind its move towards cost-sharing it is therefore desirable to know who the benefits of HE accrue to. The question of who benefits from HE, and to what extent, is therefore briefly explored, before the issues of equity and efficiency in HE are discussed in full.

2.2 Who benefits from Higher Education?

It is widely understood that graduate salaries are some way above those of non-graduates on average, suggesting that a large private benefit is obtained from investing in a university education.

However, while this may be true of the average graduate, estimates of the returns to HE vary considerably, and the relationship between higher education and earnings is not clear cut. Even if average graduate salaries are significantly higher than those of non-graduates, this may not be directly due to higher education. It may be that other factors, aside from education, have caused an individual to earn more – for example it may be that those people undertaking degrees are more intelligent or possess more skills than average, and as a result these people are also more likely to go into higher education. If this is the case, returns to education, including HE will be over-stated.

Early theories on returns to education came from Mincer (1974) who developed the famous Mincer equation to estimate the rate of return to education:

$$lnY = \alpha + \rho S + \beta_0 x + \beta_1 x^2 + \varepsilon \qquad 2.1$$

Where Y=real wage earnings, S=years of schooling, x=work experience

As is clear, the Mincerian estimation method as well as much of the early human capital based literature ignores the possibility that other factors may have

contributed to an individual's wages, most obviously that those entering higher education may have higher ability than those without a degree and this may be the factor behind their higher earnings – so called "ability bias."

Such ability bias was first discussed extensively by Griliches (1977), and this is a very developed area of research with a long history of investigation. In order to overcome the problems associated with ability bias and uncertainty, a number of methodological approaches have been used to estimate a causal relationship between education and earnings – i.e. one in which the impact of ability is somehow controlled for (see for example Angrist and Krueger (1991), Saiger and Stock (1997), Kane and Rouse (1993), Blundell, Dearden, Meghir and Sianesi (1999), Blundell et al (2000)). Such methodologies include adding controls for family background, estimating the model using an instrumental variables (IV) approach, using an instrument such as an institutional feature of the education system, using twin studies to control for bias, matching graduates with otherwise identical non-graduates using propensity score matching, or indeed controlling for ability using test scores.

Card (1994; 1998) pulls together the main methodological issues around estimating rates of return to HE, including many of those mentioned above, and estimates that OLS regressions of earnings on education may be upward biased to the tune of around 10%.

Further developments came from Heckman (2005; 2008) who argues that ability bias will almost certainly result in over-estimation of the returns to education, and adds to the literature, the theory of sequential revelation of uncertainty. In other words, as an individual goes through life, information on their potential future earnings from different sources of education are updated. For example, if an individual learns that they will incur a good wage early on, they may be more inclined to leave school and enter the labour market, whereas those staying on at school may have done so because there were no suitable or good paying jobs available to them. But those that stay on will have new information revealed to them – for example at the end of high school, the possibility of attending college is opened up, which the rational individual will go on and do if tuition costs and

opportunity costs (of sacrificing earnings) are low. Heckman therefore argues that education decisions are made sequentially and so models of returns to education must be dynamic, and factor this uncertainty in, rather than seeing education decision making as something made once in a lifetime.

More recently, Walker and Zhu (2005) find the effect of (typically a three-year) college education on wages is large – the college premium averages around 22% for men and 35% for women. They go on (in their 2008 paper) to show that even after the large increases in university participation over the 1980s and 1990s, returns to degrees are still positive in the UK, and for women actually rose, despite the large increase in the supply of female graduates.

The studies above suggest that returns to higher education, while often over-estimated, are generally positive, indicating Higher Education, does indeed represent an investment good with a significant personal return. However, even though high wage returns may be positive for the average graduate, this may not be true for all graduates. Walker and Zhu (2005) show that the cohorts of graduates entering the labour market after the mass expansion of HE appear to have lower wage premiums than those entering before the expansion. They also show that the rises in returns to degrees were not evenly distributed – they find substantial rises in returns for those in the top income quartile, while they find a fall in wage premiums for men in the bottom income quartile.

Work by Dearden et al (2005) also supports this theory, finding that different types of individual will have different lifetime earning profiles as a result of undertaking HE, and therefore focussing on average earnings profiles, and ignoring spells of non employment (especially females experience through motherhood) or graduates changing position in the earnings distribution (through moving jobs), ignores the diversity of graduate trajectories. By accounting for these factors, Dearden et al find that benefit an individual reaps from a degree is highly dependent on their place in the overall earnings distribution – while the average graduate earns more than a non-graduate, the financial advantage for many graduates is much smaller, and some graduates will end up earning less than non-graduates. For example, while male non-graduates in the bottom 10%

earning percentile earn nearly £800,000[13] less than male graduates, male non-graduates in the top 10% of earners earn £369,000 more than graduates – i.e. a substantial proportion of graduates can end up earning less than those without a degree. This analysis is not causal, but highlights there is huge variability in graduate and non-graduate earning profiles over the lifecycle and undertaking HE does not mean that all HE graduates will derive positive returns.

Card, in his 1998 review, also points out that the marginal returns to schooling vary by certain subgroups, with some apparently benefitting more than others. He concludes that there may be no unique causal effect of schooling, or at best individuals may all have different returns to education as a result of their inherent ability and varying marginal rates of substitution between earnings and future earnings, as a result of their different levels of wealth or different tastes.

So, while graduates on average will almost certainly earn more than those without a higher education, returns are not certain for all graduates.

However, this discussion has focused only on monetary benefits to graduates, whilst there may be a number of non-monetary benefits that participants derive from HE. For example university may be an enjoyable experience which also improves individuals' access to more interesting types of job or better working conditions.

Furthermore, there may be benefits to society as a whole resulting from HE. Such benefits could include increases in economic growth through technical innovation, health benefits or the contribution of education to parenting skills. Unfortunately, such social returns to higher education are notoriously hard to quantify and are by no means certain (see for example the discussion in Dolton, Greenaway and Vignoles, 1997).

Nevertheless, despite the wealth of studies of the returns to HE, a positive return to higher education is still found in the UK (Walker and Zhu, 2008), suggesting higher education represents an investment good with a significant personal return.

[13] All figures in this chapter are reported in 2006/07 prices unless otherwise stated

With this in mind, the following sections consider the equity and efficiency arguments behind cost-sharing in education.

2.3 Efficiency and Equity in Higher Education Finance

Efficiency interventions concern the costs and benefits of HE – in other words, how much benefit is obtained from the HE sector compared to the costs of running it (Wossman and Schultz, 2006). Equity in higher education can meanwhile be viewed in two lights – firstly, in terms of the issue of unequal access to higher education, and secondly in terms of inequalities in the costs incurred and benefits received.

The Government may wish to intervene in an HE system to increase university funding, and to reduce costs to the taxpayer (Goodman and Kaplan, 2003), but must balance this by maintaining efficient rates participation and equity of access.

Barr and Crawford (1998; 2005) argue that while it is possible for the taxpayer to fund an elite system such as that of the UK in the 1960's, which due to the small numbers of participants was relatively low cost, it is not possible for the taxpayer to fund a mass system – the education sector will always lose out to other priorities such as health and housing. As discussed in Section 1.5, the experience of the UK seems to support this – by the late 1990's real funding per higher education FTE (full-time equivalent student) had fallen from a high of £12,147[14] in 1973, to £4,850 in 1997.

As seen in Section 2.1, there are likely to be high private benefits associated with HE, so it would seem fair that those benefitting from HE should therefore contribute to the costs of their education. However, those contributing to the cost of HE do not always reap these benefits.

As discussed in Section 1.4, equity of access is not achieved in the UK HE system (Wossman and Schultz, 2006); a person's likeliness to participate in HE is highly correlated with their family circumstances – the proportion of youths from professional, managerial and socio-economic groups attending HE is far greater than the proportion from routine and semi-routine occupations.

[14] Again, in 2006 prices

So, while the overwhelming majority of participants in higher education are from professional and managerial backgrounds, taxpayers are spread across all socio-economic groupings. Low-income households are therefore paying taxes for a higher education system that those from high income backgrounds derive the most benefit from – in terms of both the experience of attending university, and the high wages they will likely go on to earn as graduates.

This issue has been widely debated in the UK (Barr and Crawford, 1998; 2005) and in the US (D. Bruce Johnson, 1972; 1991; 2003). Barr and Crawford's work looking at the UK system seeks to highlight the regressive nature of a purely taxpayer funded HE system. They argue that the provision of free tuition fees and grants to students (the system that was in place in the UK up to 1990) is inequitable, and highly regressive in economic terms, since the costs of HE must be paid for by all taxpayers regardless of whether or not they actually participate, while the benefits, as discussed in Section 2.2., are largely private.
Greenaway and Haynes (2003) and Goodman and Kaplan (2003) concur with this theory, with the former arguing that 'public funding redistributes resources from low income taxpayers to (future) high income taxpayers and is therefore regressive.'
This is seen as clear evidence for government intervention in the form of introducing tuition fees and loans (Barr and Crawford, 1998; 2005) – graduates derive a high private return from going to university, so they should contribute to at least some of the cost of their tuition and maintenance, rather than enjoy large subsidies from low-income taxpayers who are unlikely to go to university and therefore reap the benefits enjoyed by graduates.

Even given the uncertainty of the financial benefits of HE described in Section 2.2., it seems therefore that on equity grounds, individuals should contribute to the cost of their education in some manner.

There may be other reasons why individuals should contribute to their education on equity grounds, thus justifying cost-sharing systems. For example, even if there was little wage gain directly associated with participation, graduates may

enjoy a number of non-monetary benefits to HE, and may therefore consider it a worthwhile investment, meaning that some sort of private contribution may be justified.

One possible exception would be if there were large social returns to HE, as discussed in Section 2.2, which justified the taxpayer covering the bill for higher education. As stated, however, such returns are by no means certain and so it is difficult to justify use of taxpayers' money on these grounds.

So, given that there is likely a high private return to HE, on equity grounds it would seem justifiable that HE participants make some contribution to their education.

One possible strategy would be for the government to surrender to the free market and allow students to bear the full cost of their higher education, since as discussed above, they are likely to benefit from it in the form of increased wages. However, most youths of school leaving age do not possess adequate financial resources and would instead be reliant on their parents to loan or give them the money, or must be prepared to borrow from capital markets. While banks may be willing to loan students the money to pay for their education, they may not do so efficiently, and there are many reasons why capital markets fail – banks do not have full information on individuals future earnings (the problem of asymmetric information) and therefore may not want to loan them money or may only do so at a cost that is prohibitive to most students. Adverse selection may occur if the banks are only willing to loan to the least risky customers, since these customers are likely to need the loans in the first place, while those who would most benefit may be refused credit. A further problem may arise if people realize they can avoid paying back their loans if banks do not have sufficient information on their earnings or whereabouts. Such a problem is called moral hazard and again could result in banks refusing to issue loans to potential students.

Therefore the government may wish to intervene in the credit markets to help those who cannot afford to pay for their education (particularly those from low-income backgrounds) by offering loans at the market rate or even at lower cost.

Another way of dealing with this problem would be if the Government was to lower the up-front cost faced by students. They may ask students to make a smaller contribution to their education than the full market amount, for example, in the form of up-front tuition fees of the kind introduced in the UK in 1998/99, which were approximately 25% of the value of HE (See Section 2.5).

Johnstone (1972; 1991; 2003) argues that such tuition fees are a highly efficient means of creating a funding source for universities, since in most cases, because of the lack of wealth of youths described above, they are typically paid for by parents. Many wealthy parents would be happy to make a contribution, and some would likely pay well above the maximum fee to guarantee their child's place at a more prestigious university – so the university (and the taxpayer) reaps a rich resource.

However, up-front fees may not be an efficient or equitable means of increasing HE funding, since, certain groups of youths may be deterred from university as a result of the up-front cost. Such youths could be described as credit constrained (Carneiro and Heckman, 2003) – i.e. a lack of financial resources to pay for fees, living costs or both prevents them from attending university, rather than this being an informed choice.

To tackle this issue, the government may wish to intervene by lowering the costs to certain groups of students e.g. by means testing so that lower income groups, for example pay less or no fees. The government may also wish to lower the cost of living of certain students by offering grants or loans to cover both fees and maintenance, meaning that students would not have to pay any up-front costs.

Again, of course, certain groups of students may not wish to take out loans and enter HE if they are debt-averse, or if they have a high future discount rate – e.g. certain youths may be unprepared to forgo the chance to earn a wage straight away in order to study and may not believe their earnings upon graduation will be enough to justify taking out loan. In both cases such youths are more likely to be from low income backgrounds (Callender and Jackson, 1998; Goodman and

Kaplan, 2003). Such students may also be less informed about the income benefits of HE - research has shown that students from poorer backgrounds may underestimate the benefits of going to university and overestimate the costs (Callender and Jackson, 2005).

Thus, an inequitable, and inefficiently low number of such students may participate in HE without further government intervention. As mentioned in Chapter 1, the UK Government has expressed a desire to increasing participation rates across the board, and to increase participation of low-income students, and therefore intervention may be needed to ensure that youths are not put off by the loan requirement.

In order to allay these fears, the government may wish to design a loan system that protects against future earnings, which as seen in Section 2.2, are uncertain. This could be achieved by making the loans income contingent – i.e. students would only have to repay their loans upon graduation and employment, and if and only if their income goes above a certain threshold.

Barr (2002; 2004) and Greenaway and Hayes (2000; 2003) argue strongly in favour of income-contingent loans (ICLs) for both fees and maintenance on efficiency and equity grounds. They argue that income-contingent loans encourage participation from low-income students, as many of these students cannot afford the up-front costs of going to university, and allowing costs to be deferred until later in life would be more efficient since repayments would be smaller in the earlier years of graduation and larger in the later years, when graduates earnings increase.

ICLs often include interest subsidies – i.e. where interest rates on the loans are frozen so that graduates only pay back what they have borrowed, adjusted for inflation. Again this may be justified in that this provides an extra insurance policy for debt-averse students, who may be concerned that their debt may spiral out of control.

However, such interest subsidies are very expensive and again must be funded by the taxpayer, meaning the government must weigh up the cost of providing interest free loans to encourage participation. Greenaway and Hayes (2003) are against these subsidies on efficiency grounds, arguing that the private sector

would be more attracted to the debt – thus relieving the burden from the taxpayer – if a real interest rate was involved. However, charging real interest rates, while less expensive to the taxpayer, could be problematic since again as previously discussed, higher interest rates may result in a market for loans which again suffers from moral hazard and adverse selection problems.

Barr (2002) meanwhile argues against subsidies on equity grounds. He maintains that interest subsidies are regressive since they cost the taxpayer huge amounts of money and instead governments should provide loans at a real interest rate. Indeed Dearden et al (2004) estimate that a typical male graduate earning median graduate income up to age 55, who borrowed £3000 for 3 years in fee loans, and around £4000 in maintenance loans, would receive a government subsidy on these loans of £6103. This figure would obviously vary according to an individual's repayment status – someone taking longer to pay off a loan would have their loan interest subsidized for longer, and would therefore enjoy a larger subsidy. As the government is effectively paying the interest for this graduate, this money comes directly from taxpayer funds, and is therefore – as regressive as an education system with no student or graduate contribution (Barr, 2002).

An ICL system with a zero real interest rate was implemented for maintenance loans in the UK in 1998 (borrowers previously had to pay a flat rate per month unrelated to their earnings) and also replaced upfront fees in 2006.

A similar solution to the income-contingent loans system would be to implement a graduate tax system. This is a deferred payment strategy where some sort of tax levy is taken from graduates during their entire working lifetime. This model is often favoured on efficiency grounds (Barr, 2004), given its ease of revenue collection and that only the direct beneficiaries of HE (rather than all taxpayers) would be responsible for paying. Greenaway and Haynes, however, point out that graduated taxes can actually be rather inefficient, since revenues would be extremely slow to reach Government coffers – for example in the case of a graduate tax, they calculate that, assuming a 1% tax and a 40% participation rate, it would take 43 years from implementation for a graduate tax to reach a steady state of income. A further issue may arise when attempting to collect tax from EU

citizens who study in the UK, paying subsidized fees, then return to their home countries.

Governments may also wish to operate the HE market in a way that reflects the true costs of higher education. This could be achieved by implementing a variable fee system – i.e. one that allows universities to set their own levels of tuition fees. Such a market would be more efficient since it could take into account supply and demand, and also students themselves may make more rational decisions if they were aware of the true costs of their education.

Variable prices may also be justified on efficiency grounds (Barr, 2004). As well as allowing Oxbridge and other universities in high demand to increase their quality and competitive edge through access to a lucrative source of funds from students (and their parents) who are willing and able to pay, this might also improve equity by enabling students, through choice or necessity, to spend less on their course and go to a smaller institution. Greenaway and Hayes (2000) and Dolton, Greenaway and Vignoles (2004) support this, arguing that "a free market depends on prices determined only by competitive pressures, which of necessity will be related to true costs."

Johnstone (1972; 1991; 2003) extends this argument to the US. The US has an enormous array of colleges and universities with varying fees. There are many institutions charging relatively low tuition fees in comparison with the high rates charged by Ivy League schools, but which nonetheless produce good quality research and teaching. Individuals can decide, based on their personal circumstances which type of institution to invest in.

A further step would be to allow universities to vary their prices by subject. For example universities could charge more for subjects that are more expensive to teach, such as medicine, making incomes more relevant (Barr, 2004). For example, despite the high demand for engineering and math's degrees, in the UK students must pay the same £3000 fee for both despite the fact that engineering subjects are far more costly to teach. The system could be made more efficient by making engineering students pay more. The Australian Higher Education

Contribution Scheme (HECs), for example, has different charges for different bands of subjects[15].

A further argument for variable fees is that fixed fees harm access to UK students as universities are unable to raise their fees to boost their funds (Barr, 2004). Fees for overseas students are unregulated however, so cash-strapped UK institutions could simply increase the number of overseas students they accept in order to raise more money. This could result in a reduction in places for home students.

Thus, in order to create a market which reflects the true costs of education it would seem that variable fees would be more appropriate than fixed fees. If the desire is to reflect this true costs, income contingent loans may also be preferable to a tax system, since ICLs are clearly linked to the cost of the graduate's education – where as tax systems are open ended, meaning certain graduates, depending on their earnings, may pay much more than the cost of their education in taxes; the tax itself would bear no relation to the true cost of HE (Dolton, Greenaway and Vignoles, 2004)
By relating the price of university to its true costs, individuals can arguably make more rational decisions as to whether to invest in HE and what type of HE institution and course they may wish to invest in.

However, market failure could again occur in this situation (Barr, 2004). Such a system would only be equitable if individuals have full information – that is, every potential student has full knowledge of varying prices of institutions and courses as well as funding legislation, and is aware of the benefits they will gain from HE at the expense of their debt. Imposing free market conditions on a HE system can only be fair if youths understand all the costs and benefits associated with their education. But it is widely known that certain groups of individuals, in particular those from low-income backgrounds, have poor access to information (Brooks, 2004; Callender and Jackson, 2005). They are less likely to have friends or family who have been to university, and may be less likely to be able to access

[15] See "The International Comparative Higher Education Finance and Accessibility Project (ICHEFAP)" which has details of the HE funding systems of all major countries (http://gse.buffalo.edu/org/IntHigherEdFinance/)

information about the costs of participation, as well as their potential future earnings. Adding such complexities as variable fees may further exacerbate these problems.

Thus, further government intervention in the form of widening access to low-income youths, e.g. increasing information about the benefits of university, is needed to improve information available to those from low-income households and this is essential for a system to be efficient (Barr, 1993; 2004).

So in summary, there are many potential ways for governments to intervene in the HE market, and many of the most powerful reasons for doing so concern the current inequity of access in the UK system. Fee remissions, grants and income contingent loans, of the type discussed, are designed specifically to encourage low-income youths to attend university by tackling problems such debt aversion, lack of understanding of the future benefits of HE and credit constraints.

However, there is much evidence that issues such as credit constraints and debt aversion are minor (Gorard, 1997; 2006, Carneiro and Heckman, 2002) and that the reason for low university participation rates of youths from poorer backgrounds is that these youths are far less likely to have the necessary qualifications to enter university. If this is the case, then fee remissions and low cost loans of the type discussed above will be ineffective as tools to encourage participation.
This will be fully discussed in Chapter 3, which considers in detail the determinants of university participation and therefore the effectiveness of HE finance policy as a tool for encouraging it.

Before this though, having put forward the reasons why governments may wish to intervene in the HE sector, and the nature of such interventions, Section 2.4 now presents a detailed historical analysis of the evolution of the UK's HE funding system from the 1960s, when education was free to all, to the current system – a mixture of individual and taxpayer responsibility. This section concludes by considering the governments most major interventions and to what extent they reflect the equity and efficiency considerations discussed.

2.4 Policy changes in UK Higher Education funding, 1963-2009

Unlike many OECD countries, the UK Higher Education sector is almost entirely publicly-owned. The exception is Buckingham University, a privately run university which offers two-year degree courses, charging students around £8,000 per year in current (2009) prices. Even Cambridge and Oxford are publicly funded, though they may argue that they are privately owned.

Over the past few decades, the HE sector has moved from this largely state-funded system to one where part of the cost (in particular, the undergraduate teaching component) is borne by undergraduates. This section documents these changes, starting from the 1960's and going up to the present day.

Pre-1963

Participation Rate: 5%[16]

Funding per FTE: £6,115[17]

In the 1960's in the UK, the Government (and therefore, the taxpayer) footed the bill for the entire cost of higher education. This included teaching, tuition fees and generous maintenance grants, as well as the cost of maintaining buildings and the other numerous expenses associated with the HE sector. At this time, higher education was a privilege of only a small proportion of the adult population – the sector consisted of a small number of elite universities, mainly the 7 "ancients" (see Appendix 1). Funding per head was high, with a relatively small cost to the taxpayer given the low volume of students (Mayhew et al, 2004).

1963 – The Robbins Report

Participation Rate: 6%

Funding per FTE: £8,818

In the early 1960's the Government became concerned that the UK higher education sector was relatively small compared to the rest of the developed world

[16] Represented as the IER (Initial Entry Rate) which measures the percentages of students entering higher education for the first time at each age between 18 and 30, expressed as a proportion of the total population for each of those ages.

[17] All figures represent funding from public sources excl fees, real 2006 prices (GDP deflator), source: IOE, IFS, DfES (note, upfront fees which began in 1998 and top-up fees which were implemented in 2006 are not included in this series since a series including these fees is not available for the UK as a whole – fees charged are dependent on country of domicile).

– the UK's HE participation rate, at around 6%, was one of the lowest in the OECD (Barr and Crawford, 2005). The Government were particularly concerned that the lack of higher education in the workforce would stunt economic growth. As a response, the Committee on Higher Education was commissioned, and chaired by Lord Robbins from 1961 to 1964[18]. After the Robbins Report publication, its conclusions were accepted by the government on October 24, 1963.

The report recommended immediate expansion of universities, by two means. Firstly, all Colleges of Advanced Technology were to be given the status of universities, which would result in many students being reclassified as higher education students. Secondly, the report recommended expanding the sector by building more universities. This led to the establishment of 17 "plate glass" universities – so called because of their modern, glass fronted design.

1989 – The Government's white paper on student loans

Participation Rate: 15%

Funding per FTE: £9,530

By the time of the late 1980's, the Government felt the need to intervene in the sector once more, for several reasons. The rapid expansion brought about by the Robbins reforms had somewhat stalled, with participation at around 15% - still one of the lowest in any advanced industrial country. Furthermore, participation rates among the working class were extremely low (Greenaway and Haynes, 2003). The Government recognised the need to grow the higher education sector from an elite system to a mass system, partly in response to rapid technological change, which necessitated a highly skilled workforce, as well as recognising the equity problems associated with the sector.

However, expanding the sector even further was problematic. The real value of maintenance grants had fallen by nearly 20% between 1963 and 1982 as student numbers increased, while real wages for school leavers had risen substantially – tempting many to go straight from compulsory education into the workforce. In addition, the sector was still entirely state funded and costly – particularly as the Government paid maintenance grants for every student. The Government simply

[18] See also http://www.timeshighereducation.co.uk/story.asp?storyCode=92887&sectioncode=26 for an analysis of the evidence presented to Robbins

couldn't afford to increase the number of places available without cutting funding elsewhere, which it was unwilling to do (Barr, 1997).

In response, the Government began to examine student loan systems to cover part of the grants and thus enable further expansion of the sector.

1990 – The First Student Loan Scheme

Participation Rate: 17%

Funding per FTE: £8,928

In 1990, the first UK student loan scheme was implemented. Student maintenance was initially made up of 50% grant and 50% loan. The loan was means-tested against parental income, so for better-off students a parental contribution was still expected (though not enforced). Repayments were to be made once the student was in the workforce and earning over 85% of average earnings, and were 'mortgage style' – students repaid a flat rate every month, regardless of income (Barr and Crawford, 1998). To enable the giant task of administration and collection of repayments, the Student Loans Company (SLC) was founded – initially this was to be co-owned by the high street banks but the agreement quickly collapsed when the banks balked at the idea of their prospective best customers suddenly becoming indebted to them through an unpopular loans scheme. Instead, the Treasury itself took over the running of the SLC. This brought with it a major funding problem. Government accounting rules stipulate that when the treasury issues a loan, it must be accounted for as expenditure (Barr and Crawford, 1998). This meant that in the short term, the savings made on maintenance grants would all be taken up by the expenditure on loans. Money would only start coming in when the first students graduated and started to repay their loans in three years time. Furthermore, the loans were indexed to the rate of inflation, but otherwise interest free. This meant the Government had to cover the students' cost of borrowing – a substantial subsidy (Barr, 2004).

1992 – Further Education and Higher Education Act

Participation Rate: 23%

Funding per FTE: £6,245

The 1992 Further and Higher Education Act granted university status to 48 polytechnics, including 44 in England, 4 in Scotland and 1 in Wales (see

Appendix 1). While this act did not increase actual numbers of students, the re-classification brought about a sharp increase in students counted as being in Higher Education (Greenaway and Haynes, 2003). In addition the Act created bodies to fund higher education in England — the Higher Education Funding Council for England (HEFCE) — and the Further Education Funding Council (FEFC). Similarly, the act led to the creation of the Scottish Funding Council and the Welsh Funding Council (HEFCW).

1997 – Dearing report

Participation Rate: 33%

Funding per FTE: £4,850

Dampened by growing participation rates, funding per head had fallen to a historical low in 1997. Furthermore, it was widely accepted that the combination of loans and grants available to students was not enough, and many of them were living below the poverty line (Barr and Crawford, 1998). In response to the major funding crisis, the UK Government commissioned the Dearing report, formally known as the "National Enquiry of Inquiry into Higher Education", actually a series of reports, the principal author of which was Sir Ronald Dearing.

1998 – First Tuition Fees

Participation Rate: 33%

Funding per FTE: £4,787

Dearing's report made 93 recommendations; one of the main recommendations being that students start contributing to the cost of their education. To that end an up-front fee of £1,000 in 1998 prices, or £1200 in 2006 prices (25% of average tuition costs)[19] was introduced to be paid by all home and EU students at UK universities starting their courses in 1998 (Greenaway and Haynes, 2003). Dearing's main aim was to bring more money into the sector, and was aware that issuing more loans would not achieve this since the Treasury classified student debt in the national accounts. To get round this it was decided that there would be no loans for fees. The richest students (or their parents) would have to pay their

[19] R79 of the report recommended that '..... graduates in work make a flat rate contribution of around 25 per cent of the average cost of higher education, through an income contingent mechanism.....';

fees themselves, while the poorer students would be exempt. Against Dearing's recommendations, grants were also cut, before being abolished the following year, and maintenance loans were extended to all students. However, the main difference was that these loans were to be income contingent as opposed to mortgage style – students would only begin repaying after they earned £10,000 (nominal prices) a year – and their repayments would be automatically collected from their monthly wages in a similar way to National Insurance Repayments. Maintenance loans continued to be subsidised at a zero real rate (Barr and Crawford, 1998; Dearden et al, 2008).

1999 – Scottish devolution

Participation Rate: 39%

Funding per FTE: £4,994

As a result of the 1997 referendum, Scotland was granted powers to make primary legislation in certain 'devolved' areas of policy – notably education. The Scottish parliament first opened in 1999 and decided that the up-front tuition fee would be abolished for Scottish and EU students with the Scottish Executive to pay it on their behalf (Cubie et al, 1999). Maintenance loans were kept, but grants were re-introduced for the poorest students and renamed as the Young Students Bursary. The Graduate Endowment was also introduced. This was a deferred, one-off fee of £2289 to be paid in the final year of study, which would go towards the funding of future Scottish students. Students could take out an income-contingent loan to cover the Endowment, with the money to be ring-fenced to allow payment of tuition fees and the Young Student's Bursary as well as other grants and bursaries.

2001 – Divergence of policy between UK constituent countries

Participation Rate: 40%[20]

Funding per FTE: £5,485

The new legislation on tuition fees and graduate endowment in Scotland was agreed and by 2001 they had a completely different system from that of the rest of

[20] Note series break from 2001 due to discontinuation of IER, which was replaced by the Higher Education Initial Participation Rate (HEIPR). This measures the percentages of students between 18 and 30 who have started a higher education course for the first time and are still there after six months , expressed as a proportion of the total population for each of those ages.

the UK, with tuition fees abolished in 2000, and grants re-implemented and the graduate endowment put in place in 2001.

2004 – Higher Education Act

Participation Rate: 40%

Funding per FTE: £5,489

By 2004 participation had risen to around 40%. Even though overall participation had increased significantly, the Government became again concerned that participation from the working class had not risen. It was also widely agreed that the student support package was still too small (Barr, 2004). A further concern was that UK universities were still under funded compared with the rest of the OECD, and hence lacking in quality (Greenaway and Haynes, 2003). The Government looked at ways to improve on the post-Dearing reforms.

As a result of the 2004 Higher Education Act, upfront fees were abolished and replaced with a deferred fee, to be implemented in the 2006/07 academic year. In contrast with the set £1,200 fee, the new fee was to be variable up to £3,000 with the universities themselves to decide how much to charge each student (Dearden et al, 2004; 2008). There was no exemption from this new fee (as opposed to the upfront fee where low income students were exempt). Repayment was to be made in the same way as the maintenance loans, but in both cases repayment was deferred until earnings were above £15,000 (nominal prices). Grants were also re-introduced for the poorest students, with immediate (2004) effect.

The 2004 Act also granted decision making on tuition fee policy to the Welsh Assembly.

2005 – The Rees Review

Participation Rate: 42%

Funding per FTE: £5,661[21]

In 2005 the Welsh Assembly commissioned the Rees Review[22] to examine the implications for Wales. Rees was concerned that abolishing top-up fees in Wales would result in a large influx of students from England to escape the fees. It was

[21] Funding per FTE figures that follow are based on DfES estimates, again excluding fees

[22] Officially known as: "Fair and flexible funding: A Welsh model to promote quality and access in Higher Education. Final report of an independent study into the devolution of the student support system and tuition fee regime in Wales (The Rees Review)"

therefore concluded that tuition fees would remain at £1,200 in 2006/07 and that the £3,000 deferred fee would be adopted from 2007/08 – but that all Welsh domiciled students would be exempt from top-up fees, instead receiving a grant to cover the additional £1,800.

2006 – First implementation of top-up fees in England and Northern Ireland

Funding per FTE: £5,921

Participation Rate: 40%

In 2006/07 the £3,000 top-up fees of the 2004 Act were first implemented in England and Northern Ireland. Despite being a variable fee, almost all UK institutions chose to charge the full £3,000 fee. Scotland also raised their tuition fees to £2,700 for medical students, and £1,700 for all other students, again paid for by the Scottish Executive[23]. Tuition fees in Wales remained upfront, and at £1,200.

2007 – First top up fees introduced in Wales; Graduate Endowment abolished in Scotland; Amendments to English system.

Participation Rate: *not available at time of print*

Funding per FTE: *not available at time of print*

In 2007, the £3,000 deferred top-up fee for non-Welsh students was introduced in Wales, with Welsh domiciled students also moving to the deferred fee loan system, but still only liable for £1,200 per year with the remainder covered by a grant. The Scottish National Party (SNP) was elected was elected in Scotland, and one of their first acts was to abolish the Graduate Endowment for all Scottish domiciled students studying in Scotland[24].

2008 – Changes to grant system in England and Northern Ireland

Participation Rate: *not available at time of print*

Funding per FTE: *not available at time of print*

In England and Northern Ireland, the Secretary of State for Innovation, Universities and Skills, John Denham, announced a number of minor changes to the English and Northern Irish systems. These included increasing grants for

[23] See http://www.guardian.co.uk/education/2005/jul/20/tuitionfees.students for more details

[24] This was covered by the Graduate Endowment Abolition (Scotland) Act, 2008

those with parental incomes between £25,000 and £60,000 (at 2008 prices), decreasing loan entitlements for students of with parental incomes between £27,000 and £50,000, again in current 2008 prices (with the result that no students were worse off due to the increase in grants), and offering a repayment holiday of up to five years for those graduates repaying their loans (Dearden et al, 2008). This repayment holiday was cut to two years in 2009[25].

The next major changes to the UK system are expected late in 2009.

2.5 Conclusions and analysis of the UK system

This chapter set out to explain the economic principles behind the UK's move to a cost-sharing system, in particular the introduction of tuition fees and student loans, with detailed documentation of the evolution of that system from the fully taxpayer funded one of the 1960s.

The government interventions were designed to improve efficiency and equity in the UK HE market, bringing in more money to the system but also maintaining participation volumes, as well as aiming to widen the participation of low socio-economic groups.

The first major intervention in the UK HE market was to ask students to contribute to their education through student loans. These were at first mortgage style, meaning that students were forced to pay off a set amount each month rather than repayments based on income. Nevertheless loan repayments were only to be made once earnings were above a certain amount, and were soon moved to be fully income contingent, in line with the efficiency and equity arguments of Barr and Crawford (1889; 2005), Greenaway and Hayes (2000; 2003), and Goodman and Kaplan (2003).

Perhaps the most controversial intervention was the implementation of up-front tuition fees in 1998. While low income students were exempt from the fees, as described, up-front fees are thought by many (Barr, Greenaway and Hayes, 2000) to be an inequitable and inefficient means of increasing funding to universities,

[25] See "Education (Student Support) Regulations, House of Commons, 29 October 2008

since students are reliant on their parents or credit markets to cover the fees, potentially dissuading certain groups of people from participating in HE. However, as described in Chapter 1, the impact of these up-front fees on participation volumes, and on types of participants (by socio-economic group) has not been fully understood. This will be fully investigated in Chapters 6-8, along with an analysis of the impact of removing grants.

These controversial fees were replaced in 2006 by a deferred fee, fully covered by an income contingent loan, somewhat more in line with the economic principles described above. These fees are allowed to vary by institution, with the maximum set at £3,000. However, in practice almost every institution has set their fee at the maximum making the fee appear to be more fixed than variable – thus meaning market rules of supply and demand cannot be fully realised.

This may be because the £3,000 cap is too low – it remains to be seen whether a lifting of the cap – which will probably occur in 2009 – will encourage some universities to set their prices below the maximum to be more competitive.

Again, however, the impact of implementing this higher, but deferred fee, has yet to be directly investigated in the UK. Chapters 6-7 will briefly consider the impact of this policy (although as will be discussed, at the time of writing, insufficient data are available to properly analyse the impact of this fee).

Related to this, despite the important economic arguments for considering the type of HE system, and the financial impact of government interventions in terms of university per head, many researchers argue that HE finance has little or no causal impact on university participation. Rather, HE participation may be influenced far more by factors such as early child development and early educational attainment.

The counter-argument is that HE finance does matter, and there is a small body of evidence from the US in which a significant causal relationship of different HE systems is found even after controlling for background and other characteristics. Chapters 3 and 4 present this debate. Chapter 3 begins by addressing the fundamental question of whether, and to what extent, HE finance matters as a tool to increase volumes and types of HE participants.

Chapter 3 Does higher education finance matter for participation?

3.1 Introduction

Chapter 2 described the economic importance of higher education finance systems and the rationale behind the government intervention of recent years.

Aside from increasing university funding per student, a key aim of the UK Government is to increase participation rates across the board, and to achieve a 50% participation rate by 2010. A key factor in achieving this goal is clearly to understand how to increase participation, and in particular to encourage attendance among low income groups, who make up a large proportion of society. As described in the previous chapter, the UK HE system has been in a state of evolution since 1990, and interventions have included tuition fees, student grants and income contingent loans.

In particular, the Government has attempted to maintain or boost attendance by countering increasing tuition fees with income contingent student loans, and by offering grants to poorer students (since 2004). However, it remains unclear as to the effectiveness of these policies on absolute volumes of participants or relative participation by socio-economic group. One reason for the lack of evidence of the effectiveness is lack of available data suitable to explore the question fully (this will be discussed in detail in Chapter 5). Another reason, however, is that many researchers believe that HE finance has a minimal if not non-existent role in individuals' enrolment decision making. (Blossfield and Shavit, 1993; Carneiro and Heckman, 2002; Gorard, 2006).

There are two main ways in which HE finance could impact university enrolment decisions. Firstly, as discussed in Chapter 2, there may be a proportion of society who are "credit constrained" – i.e. that are prevented from participating in HE because they cannot afford the fee and/or maintenance costs involved, rather than because they have made an informed choice not to participate. Such individuals are clearly most likely to be from lower income households. For these people, HE

finance may be an important tool to encourage them into HE, for example as discussed in Chapter 2, if grants and loans were available to remove their credit constraint.

Secondly, some individuals may be sensitive to the price of HE and/or the nature of the HE funding system in place. For example those who discount the future returns to education heavily will be more sensitive to upfront costs, or those who are debt averse may be more sensitive to loan repayment options.

So, HE finance could impact the university enrolment decisions of these youths by lowering the price of HE, or by altering the way it is paid for (e.g. up-front versus deferred fees), and thus encouraging them to attend HE.

However, many economists such as those mentioned above argue that the proportion of youths who are credit constrained is minimal, so HE finance will have little impact here, and also that very few individuals are sensitive to the price or nature of the HE finance system, again implying a limited role for HE funding. Instead, they argue that participation decision making takes place at a very early age – and is based primarily on a child's circumstances in their early years – on factors such as their social class, parents education and parents income – as well as the child's own innate ability and qualifications obtained during school years. If this is true, then HE finance policy, delivered when a potential student is 16-18, will have a limited impact on his or her decision to go to university and any analysis of the impact of HE finance will uncover very little. This is a compelling set of evidence.

Nevertheless, as mentioned in Chapter 1, a number of studies from the US in particular, have found an impact of grants and fees over and above that of the influence of early child development and prior attainment, suggesting that a small number of youths do make their college entry decisions based on the levels of fee obligation and grants eligibility at the time of entry. The question of whether HE finance matters has concerned many researchers, academics and politicians throughout the past decades.

The following two chapters thus explore the HE finance debate, firstly in this chapter, by presenting some of the major studies which examine the role of early child development, ability and attainment and their roles in HE, and argue that these are the most influential factors in individual university enrolment decision-making. Chapter 4 goes on to explore the counter-argument, by presenting a number of studies which find grants and fees to be significant factors in youths' participation decision-making, with a detailed analysis of the methodologies used and results obtained. This chapter provides evidence that HE finance does have an impact on participation, but that modeling this relationship can be problematic unless robust econometric techniques are used. Thus, Chapters 3 and 4 fully explore the debate surrounding the determinants of HE participation.

Thus, these chapters set up the remainder of the thesis by presenting background and methodology for the analysis that will be carried out in Chapters 6-8.

3.2 Liquidity constraints

As discussed above, the type of HE finance system in place may be a powerful tool to alter the behaviour of participants who are liquidity constrained – i.e. those whose low levels of participation are due to financial constraints rather than informed choice.

The evidence for the existence of such credit constraints is minor, and somewhat mixed.

Carneiro and Heckman (2002) examine the relationship between family income and college enrolment, investigating the role of short-run credit constraints alongside factors such as individual ability, early child development and family background factors, which they define 'long-term factors'.

In their analysis, they find that controlling for these long-term factors removes the effect of short-run credit constraints. The authors argue that the resources enjoyed by high-income parents shape their children's cognitive ability at an early age. These individuals are more likely to attend college because their parents are better educated, and thus better able to develop scholastic aptitude in their children, and have better access to primary and secondary schools. The authors find these long-term factors to be far more important in predicting a youth's likeliness to go to college than short-term liquidity constraints. So, if a youth comes from a

background with a lack of long-term factors of this nature, no amount of government policy that adjusts for tuition fees or financial aid will be of use, as the child will not be qualified for college.
Nevertheless, the authors concede that short-run effects do play a role, albeit a very minor one – they estimate at most 8% of the population faces some sort of credit constraint with regards to college attendance.

Similar work of this nature comes from Dearden et al (2004). In examining the importance of credit constraints in terms of HE attainment decisions, they find evidence of minor credit constraints affecting 2-3% of males born in 1970 (so reaching college age in 1986), and 3-6% of females of the same age.

However, other research by Dearden et al (2008), when examining UK youth's responses to a cash transfer paid to youths age 16-18 in full-time education, finds the evidence for a credit constraint to be mixed; the authors test the response to the cash transfer of youths from owner-occupied homes (hypothesized to have no credit constraints since their parents have good access to cash not least through releasing equity from their homes), versus the response from youths from rented homes (who are more likely to be credit constrained since their parents presumably have limited access to funds to support them in education). The results showed the youths from rented accommodation to be more responsive to the cash transfer, but the difference in up-take was only significant at the 12 percent level. This suggests the positive impact of the cash transfer may have been a result of simply changing the price of staying on at school. An alternative suggestion put forward by the authors is that those youths from rented accommodation may also be those most likely to discount the future returns from education, and may therefore place too much weight on the up-front costs of staying on at school.

Thus, evidence of a credit constraint is somewhat mixed. As stated though, there may be other ways in which HE finance matters, such as by lowering the price of college or changing the nature of the costs involved.

However, there is a compelling set of evidence that university participation decision making takes place at a very early age, as Heckman and Carneiro attest, based on early childhood development and prior attainment. If this is true, lowering the price of college will have little impact on participation.

The remainder of this chapter examines this evidence.

3.3 Early child development

Much evidence that skill formation later in life is determined by ability developed early in life, is put forward by Heckman (1995) in his work on Human Capital Theory. Heckman examines the socio-economic gap in educational attainment, which as seen in Chapter 1 is highly significant in the UK.

Heckman argues that differences in the uptake of different levels of education – including higher education – are primarily driven by cognitive and non-cognitive skills, and that these skills emerge very early on in life. By examining cognitive test scores of children from different income groups, Heckman finds that gaps in test scores between income groups emerge as early as age 6 and remain stable – so any attempts to improve educational outcomes such as whether a youth goes to university, will have to be administered in his or her early years.

Heckman argues that the majority – though not all – of the gaps in both cognitive and non-cognitive ability, and therefore a youth's likeliness to attend HE, can be eliminated by equalizing family background characteristics such as mother's education, mother's ability, and family structure, and it is heterogeneity in these endowments among young people that produce the wide range of skills and motivations that we observe in society – thus policy interventions designed to improve educational outcomes later in life should be directed towards these elements of family background, early on in a child's life.

Further evidence, however, that ability is the driving factor in educational attainment is given by Cameron and Heckman (1998; 1999; 2001) – again examining the reasons for disparity in college attendance by certain, less well-off groups such as ethnic minorities (they point out that family incomes are highest for whites and lowest for blacks – while parental education is highest for whites

and lowest for Hispanics). In modeling the drivers of educational outcomes including college attendance among these minority groups they find family income and education to be highly significant, accounting for almost all the disparity in college attendance. However, once their measure of ability (here they use AFQT[26]) is added to the model, the influence of family background factors are substantially weakened, implying that ability is the main driver of college attendance, not family income.

Nevertheless, they do find some evidence that a credit constraint may impact on HE enrolment. Even after AQFT is controlled for there are minor, but still significant effects, mostly for enrolment at two-year and community colleges. The authors argue, therefore, that policies should be carefully targeted towards the constrained, rather than at a broad range (such as the US Clinton Hope scholarships which were targeted primarily at the middle classes).
It is important to note that Cameron and Heckman take account of the sequential nature of educational attainment – i.e. that the grades individuals attain at each level of school assessment to some extent dictate their future achievements, since attainment determines their schooling choices – the probability that a person attends college depends on whether they achieve the necessary grades in high school.

Further evidence from Human Capital Theory comes from Murnane et al (1995) who examine the link between cognitive skills – as measured by mathematics scores of youths in their last year of high school – and wages. Murnane et al find a strong link between this early mathematics score and the individuals' likeliness to graduate college. They also find strong evidence that mathematics score explains a high degree of wage returns for females – even more so than college attendance.

Support for this theory comes from Feinstein (2003) in his investigation of the differences in educational achievement between children from different social backgrounds. Feinstein attests that a children's attainment at 22 months influences

[26] Armed Forces Qualification Test

their attainment at age 26 – those who demonstrate a low level of cognitive skills in early age are less likely to gain qualifications later in life.

Like Heckman et al, Feinstein explores the link between SES and educational attainment, and supports the view that family background is the major influence on educational attainment. He finds a strong relationship between socio-economic group and attainment, even in the youngest of children. Furthermore, he supports Heckman's evidence that the attainment gaps between SES groups are stable or even increasing over time. Children of low SES who performed poorly in tests at age 22 and 24 months were highly likely to perform poorly at age 10, while children of high SES who performed poorly in the early age tests were more likely to show a high attainment at age 10 – suggesting their socio-economic status somehow propped them up and propelled them forward. The results are also true when the children are segmented by parental education.

Feinstein et al (2004) conclude that parental education and income are the most important family influences on attainment. Parental education is found to strongly influence most of the main factors in child development – e.g. more educated parents are found to be less likely to use spanking as a form of discipline (Day et al., 1998), have a warmer parenting style (Klebanov et al. (1994), and to be more likely to read to their child (see also Laosa, 1983). As well as influencing behaviours, parental education has been widely found to influence family circumstances – more educated parents are more likely to choose private schools (Melhuish et al., 1999). Further, parental education is found to heavily influence contextual factors. More educated parents have higher expectations of their children (Davis-Kean & Schnabel, 2001), while parental education is strongly negatively correlated with family size (Ferri & Smith, 2003) and likelihood of becoming a teenage parent (Rowlingson & McKay, 1998).

Parental education, unsurprisingly, also has a significant positive impact on parental income (Dearden et al., 2003). Feinstein et al conclude that parental income has a large impact on child's attainment by enabling parents to provide good learning environments such as housing and educational materials such as books and games as well as more obvious basic needs such as housing and clothing, essential to any child's outcomes. Again this is strong evidence that HE finance is a minor influence once parental income is controlled for.

A major contributor to the literature surrounding early child development is Gorard (1997, 2005, 2006), who in fact was commissioned by HEFCE in 2006 to document and summarize a number of available studies on the subject of barriers to widening participation[27]. From Gorard himself comes the theory of learning trajectories – that an individual follows a trajectory, pre-determined from a very early age, that largely determines their educational outcomes later in life. For example, an individual of a certain social background will set out on a trajectory which is constrained by his attitude to learning, lack of qualifications, previous experience – all of which are determined by the educational culture of his class. Thus, individual choice has little impact on an individuals' education – their trajectory is set, and unlikely to be effected by barriers such as cost constraints. Furthermore, which 'trajectory', from non-university-participation to lifelong learning, an individual takes can be accurately predicted on the basis of characteristics which are known by the time an individual reaches school-leaving age. Gorard concludes that an individual's trajectory can be predicted with extreme accuracy, of up to 90%, using just six independent variables –area of residence, gender, type of school, attempting qualifications, qualification at age 16, and occupational class of father. Arguably, however, area of residence and type of school attended are choice variables – parents may choose areas with better schooling and types of school which improve their child's chances of attending HE, or those from poorer areas may also be suffering from short-term credit constraints.

Gorard argues that policy in education occurring later in life – such as the Governments' Widening Participation Policy and Lifelong Learning initiatives are not effective, and that that the solution to inequalities is not, in fact, an educational one but a lifelong one. The lifelong approach argues that rather than lowering simple barriers such as the cost of education, policy must tackle lifelong entrenched and learned behaviours that lead to non-participation in HE.

3.4 Prior attainment and its role in university participation

Similarly to Heckman, Gorard emphasizes the role of prior attainment in university participation – an individual's early ability will determine their success

[27] This summary is available online at http://www.hefce.ac.uk/pubs/RDreports/2006/rd13_06/

in school examinations, which will then determine whether or not they qualify for university entry. Thus, it is imperative that any analysis of the impact of HE finance takes this into account.

The importance of prior attainment is very clearly emphasized in work by Chowdry et al (2009). The authors use longitudinal administrative data to track youths' educational attainment at key stage 2 (age 7) all the way through to potential age 18 or 19 Higher Education participation. The results showed that students from poorer backgrounds are much less likely to participate in university at ages 18-19 relative to those from better off backgrounds – however the main reason for their low participation rate is that poorer pupils do not achieve the necessary qualifications in secondary school to qualify for university. In other words, the gap in university enrolment comes about much earlier than at point of entry to university, emerging as pupils secondary school attainment record is set. Once the authors control for this prior attainment, the socio-economic gap (defined here using Free School Meals as an indicator of deprivation) that remains on entry to HE is just 1.0 percentage points for males, and 2.1 percentage points for females. This implies that HE finance may have a limited role in reducing socio-economic participation gap (though it may still impact absolute volumes of participants).

Further evidence on the role of early or prior attainment comes from Moor et al (2004) who find the biggest single factor determining whether a respondent continued their education beyond the compulsory age is their performance at GCSE/GNVQ level. Their work shows a pattern of social and economic under-representation in HE which is already apparent by the time a student has had his Level 2 qualifications – which then go on to be the main influence on his decision to go on to obtain Level 3 qualifications.

Forsyth and Furlong (1999, 2001) in their work on educational disadvantage in Scotland, however, argue that prior attainment this is not the whole story in HE participation – they report that while three quarters of all young people with 2 or more A-Levels in socio-economic (SE) groupings I and II make it into higher education, only half of similarly qualified students from SE groupings IV and V do so. However, it should be noted that Forsyth and Furlong's research is largely

qualitative and focused on interviewing small numbers of 6th form pupils in Scotland, so their findings are not representative of the entire population (see Chapter 4 for more details of their methodology).

Forsyth and Furlong also argue that while socio-economic status may not significantly impact the overall *volume* of participants from different classes, it may have a more subtle impact in terms of *type* of enrolments. For example, poorer children tend to choose different course types, subject types and institution types. So while focusing research on those who do not enter HE is important, it is also important to look at those who did enter, in terms of their choice of course and institution.

Work by Brooks (2003) meanwhile argues that young people are not a homogenous group and it is untrue to say that all children of wealthy and educated backgrounds will go on to HE – there is heterogeneity within socio-economic group in terms of the types of subjects and institutions the young people apply to and crucially the information they have access to.

Finally, many authors, such as Galindo-Rueda et al (2004) acknowledge that while A' level attainment may appear to be the main driver of participation, this may be an endogenous variable – students may make less effort in school as they anticipate barriers to entry in HE in the future.

3.5 Conclusions

This Chapter has presented a review of the drivers of and barriers to Higher Education participation, in particular exploring the argument that participation is decided early in life, and is therefore not affected by HE finance. While it is generally agreed that parental income, education and family background characteristics have a large part to play in a young person's educational attainment throughout their life, and eventually in their decision to attend university, there is minor evidence to suggest that credit constraints also have a small part to play, suggesting HE finance may have a role to play in university decision making. Work by authors such as Dearden et al also put forward the possibility that certain youths discount the future benefits of education and that altering the costs of education may improve their likeliness to participate. HE

finance may be important for other reasons such as in countering debt-aversion by offering participants more agreeable loan repayment options.

Indeed, there is a small body of work that has uncovered evidence for some impact of tuition fees and loans on participation, suggesting youths do respond to the HE finance system for reasons such as these. This body of work will be explored in Chapter 4 with the implications essential for this thesis and in particular the methodological approaches used in Chapters 6-7.

Chapter 4 Methodological approaches to estimating the impact of higher education systems on university participation

4.1 Introduction

Chapter 3 presented evidence that HE finance may have little or no effect on participation, which instead may be decided far earlier in life. Yet, a great number of quite dramatic policy changes have taken place in the UK that significantly altered the financial position of students. The main aim of the first strand of this thesis is to explore whether these changes *did* affect school-leaving youths' propensity to participate in HE. To this end, this chapter presents a review of studies which have attempted to measure the relationship between HE finance and university participation.

This chapter explores both the outcomes of this work and, crucially for this thesis, the methodological approaches used.

While this subject has been widely debated in academic and political arenas over the last decade in the UK, there remains little empirical research on the subject – especially quantitative – perhaps due to a lack of available and robust data (a topic to be covered in Chapter 5) as well as the difficulty of untangling the impact of finance policies from the impact of accompanying policies and normal growth in participation.

As a result, much of the evidence on the impact of cost-sharing comes from other countries where more data is available and reforms have been in place for longer.

This chapter summarises several of the most significant and relevant papers from the UK and abroad, paying particular reference to the methodological approaches adopted to identify the impact different aspects of HE finance reform.

The chapter begins with a discussion of the problems faced by researchers in estimating the relationship between HE finance and participation, and then moves on to examine the body of papers which have used a variety of methodologies to overcome these issues. The chapter concludes with some criticism of the

methodologies used and a summary of their results. A significant finding of this chapter is that the results presented in this summary, although using a wide range of methodologies and data, are remarkably consistent. Thus, this chapter contests that there is evidence of a link between policy changes of the nature discussed in chapter 3, and higher education participation.

4.2 The estimation problem

An obvious first step in attempting to identify the impact of student aid (e.g. grants, and in some circumstances loans) eligibility and tuition fees would be to estimate an equation such as the following:

$$P_{it} = \propto_0 + \gamma_0 AID_{it} + \xi_0 FEES_{it} + \varepsilon_{it} \qquad 4.1$$

Where P_{it} is a binary variable with the value of 1 if individual i attends university at time t and zero otherwise. AID represents the sum total of individual i's aid eligibility and FEES represents individual i's tuition fee obligation (all in £s).
In this simplistic model, γ_0 could be interpreted as the impact of a £1 increase in aid on an individual's likeliness to participate in HE.
The main issue with this type of model is that there are likely to be many factors that affect both a youth's aid and fee eligibility and his likeliness to participate in HE. For example, poorer children receive larger grants since – as was discussed in Chapter 2 – the Government may wish to encourage poorer children to go to university for both equity and efficiency reasons. But poor children are less likely to go to university for many other reasons (such as lack of information about the benefits of a university education), so student grants will appear to be negatively correlated with participation if this endogeneity problem is not properly controlled for. A number of early studies in the US attempted to solve this endogeneity problem by adding a number of controls into the equation above.

The earliest and most well-known of these studies include Manski and Wise (1983), Hansen (1983) and Leslie and Brinkman (1998). In these studies, an equation such as the following is typically estimated (in the case of Leslie and Brinkman, a meta-analysis, several such equations are reviewed):

$$P_{it} = \alpha_1 + \gamma_1 AID_{it} + \xi_1 FEES_{it} + \delta_1 X_{it} + \eta_{it} \quad 4.2$$

Where X_{it} is a set of controls which includes variables such as family income, parental education and prior attainment.

Leslie and Brinkman examine nine econometric studies of this nature. The conclusion is that the enrolment of low income students would be reduced by 20-40% without student aid; this substantial figure varies by income (is lower for medium and high income students) and by sex, ethnicity etc. Manski and Wise also find a significant impact from aid, but find that only 25% of aid (in 1979-1980) went to the students who would not otherwise have enrolled.

However, studies of this nature pose a further significant problem. While it is possible to control for many aspects of a youth's background, there may be a number unobservable characteristics that are correlated with aid, fees and attendance. These unobserved characteristics will be omitted from the model and will again result in biased estimates. An example of such a characteristic is parents' propensity towards investment – certain types of parent may be disposed towards investing in the future (e.g. in terms of savings, stocks and shares but also in terms of education). Such parents will be more likely to have high incomes – meaning the youth in question will higher fees – but are more likely to encourage their children to go to university. This could result in an over-estimation of the coefficient on fees. A problem of a similar nature might be measurement error – income data, which is often used to calculate the amount of fees and aid a student receives, as well as to control for parental income in the model, can be subject to measurement error, which again will result in downward biased estimates.

To illustrate this, the error term in 4.2 can be decomposed:

$$P_{it} = \alpha + \beta_1 AID_{it} + \beta_2 FEES_{it} + \gamma_1 X_{it} + f_i + v_{it} \quad 4.3$$

Where f_i represents the individual-level unobserved heterogeneity and v_i represents the random component of the error term. Given this, in order to obtain an unbiased estimate of aid, for example, the following is required:

$$cov(AID, f_i)=0 \quad \textbf{4.4}$$
$$cov(AID, v_{it})=0 \quad \textbf{4.5}$$

But as discussed above, this is unlikely, and rather, it is more likely that there are some unobserved individual characteristics correlated with both the explanatory variables and the error term. Chapter 6 discusses this issue in more detail, in an attempt to estimate an equation similar to 4.3.

A number of later studies have attempted to overcome the problems of associated with unobserved characteristics, using a range of methodologies. For example, Dynarski (1999), with an extensive Government run survey of 3,545 American high school seniors uses a difference-in-difference approach to analyse her data. Kane (1994; 1995) meanwhile employs panel data and fixed effects methods to estimate his models on US State-level data. Galindo-Rueda et al (2004) employ postcode matching techniques to augment their set of controls before using OLS and probit analysis. In the following sections, these methodologies and others are reviewed.

4.2.1 Difference-in-difference models

Difference-in-difference is a well established method of estimating the impact of a potentially endogenous variable, but relies upon the occurrence of a "natural experiment" involving the variable of interest. An often quoted example of such an experiment is that studied by Card and Krueger (1994) in which the minimum wage in the US state of New Jersey was increased. Employment in fast food restaurants over the same time period increased from 20.44 FTE (full-time employees) to 21.03. This suggests that the impact of the minimum wage increase was to raise employment. However, many other things may have changed over the same time period, which would also effect employment in fast food restaurants in New Jersey (e.g. increased demand for fast food through advertising etc). In order to control for these possible unobserved changes, Card and Krueger

used another state (Pennsylvania) as a comparison group – Pennsylvania was a state facing similar conditions to New Jersey with one exception – they did not increase their minimum wage. In this state, employment actually fell over the period in question. Assuming that New Jersey and Pennsylvania faced the same conditions in terms of fast food demand, and all other things that may have changed employment, by comparing the two groups one can ascertain the pure impact of the minimum wage. In this case, given employment rose in New Jersey and fell in Pennsylvania, the overall impact of the minimum wage was a net increase in employment.

So, the difference-in-difference technique can be used when there are two time periods (or more) of data, with the explanatory variable of interest changing – usually due to a policy change – during this time period for one group (the "treatment" group) and the explanatory variable remaining the same for another group (the "control" group). Clearly, the technique relies on the two groups being very similar before the policy change (in the example above the policy being the increase in the minimum wage) and nothing else changing between the two groups over the period of interest.

In the context of HE funding, suppose there had been an increase in student aid for one group of youths (e.g. if the government increased grants for poor students) but that for another group of youths, there was no such increase in aid (and also, for both sets of youths, fees were zero in all time periods). The treatment group in this instance would be those for whom aid had increased, while the control group would be the group for whom aid remained unchanged.
A causal effect of aid could be obtained by comparing participation between the two groups. If participation in the treatment group rose relative to the control group, one could conclude that aid is positively related to participation.

The benefit of the difference-in-difference approach is that, by having a control group, any other changes occurring at the time of the treatment, which may affect participation (e.g. rising unemployment) will be removed – assuming that changes that occur to the control group would have occurred to those treated if they had not received the treatment.

So, assuming there exists a control group, who are very similar to the treatment group in composition and economic conditions, a true causal effect of aid can be obtained by comparing the difference in treated with difference in control groups.

In its simplest format this would be obtained by estimating OLS on:

$$\boldsymbol{P_{it}} = \propto + \boldsymbol{\delta_0 post_{it}} + \boldsymbol{\beta_1 treatment_{it}} + \boldsymbol{\delta_1 post_{it} * treatment_{it}} + \boldsymbol{u_{it}} \quad \textbf{4.6}$$

Where post is a binary variable set to 1 if the time period is after the policy change and 0 otherwise, and treatment is a binary variable set to 1 for those in the group whom the policy change affects and 0 otherwise.

$\widehat{\delta_1}$ is therefore the incremental difference between the two groups, controlling for any changes over time and any differences between the treatment and control group, which would then be purely attributable to the increase in grants. Usually, a set of control variables such as educational attainment, gender and parental income would be included in the equation for extra precision.

A good example of the use of such a strategy is by Dynarski (1999) who studies the impact of student aid.

She exploits a policy change in 1982, when the US Congress abolished a social security benefit which had previously entitled all children with a deceased, disabled or retired father to aid of around $5,400 until the age of 18, and crucially, until the age of 22, if they attended HE. Except for the introduction of the Pell Grant program in the early 1970s, and the various GI Bills, this is the largest and sharpest change in grant aid for college students ever to occur in the United States. In 1980, two years before the programme was cancelled, 1 in 9 students were eligible for this aid.

The policy change was an exogenous shock to the system, and therefore is not correlated with any unobservable variables that may impact college attendance – the death of a child's father occurs completely at random and therefore their aid eligibility is also random.

The treatment group is therefore those who were eligible for benefits before the elimination (proxied here as those with a deceased parent) and who lost their benefits after its withdrawal in 1982. The control group is all other children, i.e. those unaffected by the policy change since they were not eligible for aid in the first place. The treatment therefore represents the withdrawal of benefits from those who would have received them, and the time periods are pre- and post-1982 (data is pooled so that the before period is 1979-1981 and the after period 1982-1983). Note here, that the control group is drawn from the same population as the treatment group, and therefore should be similar in composition. This is very important for the robustness of difference-in-difference. Note also that Dynarski does not consider tuition fees or any other type of HE finance in her estimation and looks only at grant aid.

Dynarski uses an OLS regression and a probit to estimate the following equation:

$$y_{it} = \alpha + \beta(SS_{it} * Before_{it}) + \delta SS_{it} + \theta Before_{it} + v_{it} \qquad 4.7$$

where y_{it} is a binary variable representing college attendance, *SS* is a dummy variable representing benefit eligibility (1=eligible, 0=ineligible) and *Before* is a dummy representing time (1=before treatment, 0=after treatment).

Data on 5,345 young Americans from the NLSY (National Longitudinal Study of Youth) from 1979-1983 is used.

Those with deceased fathers before the treatment, were found to be slightly more likely to attend college than other children (62% vs 59%). However, after the treatment, the pattern is reversed, with 32% of those with deceased fathers attending v 49% of others. The estimated impact of withdrawing the benefits is therefore the difference in these differences – since those unaffected by the treatment should exhibit "normal" growth, so subtracting this away from the decrease experienced by the treated group should show the pure impact of the treatment. This method should also remove any unobserved heterogeneity such as that discussed in 4.2., provided it is assumed that the control and treatment groups do not differ in any other ways that cannot be controlled for, and that the sample is drawn from the same population before and after the policy change.

In this case, the difference-in-difference is found to be 26 percentage points - meaning the effect of social security benefit is to increase the probability of attending college by 26 percentage points.

Calculating this using an OLS regression gives a (highly significant) β coefficient of 25.6 (with a standard error of 10.0). Given that the probability of attending college in the sample is 53%, this indicates that withdrawal of the benefits almost halves the probability of attending college.

Dynarski also controls for the possibility that the model is picking up differences in the control and treatment groups that vary over time. In order to combat this, she includes a set of covariates in the model, such as family size, race, year of birth etc. The point estimate drops slightly (but insignificantly) to 23.3 percentage points (std error of 8.7).

Dynarski also controls for time-varying trends – for example, attendance rates of blacks fell during the period of Social Security benefit elimination, and Social Security beneficiaries are disproportionately black. So it is possible that part of the decrease in participation seemingly from the withdrawal of benefits might be simply due to trends in college attendance among blacks. This results in the estimated impact of aid on attendance dropping to 19.4 percentage points.

Dynarksi also tests the use of a fixed-effects model – using a dummy for each household in the survey (which contains every youth of appropriate age within a given household) to measure the proportion of variance in participation that can be explained by the fact that families are different from each other. Thus, the model is then estimating the differences between children of deceased and non-deceased fathers within households rather than over time – i.e. the difference between younger and older siblings with and without deceased fathers. The fixed effects model indicates that unobserved differences between households are not driving the results – the estimates are very similar to those above.

In summary, Dynarski's analysis shows that student aid increased the US college attendance rate by 19.4 to 25.6 percentage points. Given the average social security benefit paid in 1980 amounted to $6,300 this implies that each $1,000 of aid induced an increase of 3.6 percentage points in university attendance by high-

school graduates[28]. Over the same period, the average costs faced by a student (including tuition fees, room and board) was $9,600. Thus, the implied elasticity of college attendance with respect to costs is calculated to be about 0.65.
Dynarski repeats the analysis using years of college attendance as a dependent variable, and again finds very positive results associated with student aid – she concludes that a $1,000 increase in grant aid increases educational attainment by 0.16 years.

Linsenmeier, Rosen and Rouse (2001) also use a difference-in-difference methodology; again to estimate the impact of aid on enrolment. In this example, again the identification issue is that financial aid packages are not exogenous to student characteristics. The authors therefore take advantage of a natural experiment occurring in a major North-Eastern US university. Previous to 1998, this university offered low-income students an aid package consisting of around $12,000[29] in grants, $4,000 in loans and $200 in work-aid (i.e. where a student is given a paid job on campus). In 1998, this package was altered so that the loan element was removed and replaced by additional grant money of the same value. The treatment group is therefore low income students who benefited from a reduction in amount of loans they needed. The control group is high income students whose aid package remained the same. The pre-period is before 1999 and the post period is 1999-2001. The authors use administration records on 25,958 students from the college in question. The model is estimated in the same way as Dynarski's equation 4.7. In this case, the difference-in-difference yields an increase in participation of 2.3 percentage points for low income groups as a whole – but this is not found to be significant, implying that grants and loans were viewed in a similar way for this group. However, the authors do find a significant effect for minority groups, of 8.9 percentage points, suggesting this group differ in their attitude towards loans.

[28] At 1998 prices
[29] At 1999 prices

4.2.2 Panel models

Another type of natural experiment occurs when different groups of individuals experience different policies over time. Although there is rarely a clean "before" "after" type of scenario, as there is in the difference-in-difference approach, this exogenous variation in policy can be exploited to remove the effects of unobserved heterogeneity and obtain unbiased estimators.

For example, the fixed effects approach can be used to remove unobserved heterogeneity that is assumed fixed over time. This approach uses variation over time, within a specific group (which could be individuals, households, regions or any other type of group – so long as there are multiple groups or individuals, each of which can themselves be observed over time) to identify the impact of a specific variable or variables, removing unobserved heterogeneity.

In the context of HE finance, for example, suppose this time you wanted to examine the impact of fees on participation (assuming here, that aid is zero or doesn't change over time and between control and treatment groups). If you were to examine two regions at the same period in time, one of which had high levels of fees and high university participation rates, and the other also had high fee levels and high participation rates, you might be tempted to conclude that fees are positively related to participation. But for reasons already discussed, fees are positively associated with participation for many other reasons – in this case it could be that these regions contain high proportions of parents who are highly intelligent, and hence have high incomes, and also high motivation to send their children to university.

A better solution would be to examine the relationship between fees and participation *within* each region over time. If fees increase relative to their average over time (for example as the result of a policy change), and this is accompanied by a decrease in participation, again relative to its average, this implies fees are negatively related to participation. So, the fixed effects method removes between-group differences, which are the source of heterogeneity, and uses variation in fees and participation with groups over time to identify the causal effect of fees. Because the unobserved heterogeneity is fixed over time, it will be equal to its average over time, and will therefore be removed. In a similar

fashion to difference-in-difference models, a set of controls would normally be added to the model.

The estimating equation will thus be:

$$\ddot{P}_{it} = a + \lambda_1 F\ddot{E}ES_{it} + \theta_1 \ddot{X}_{it} + \ddot{v}_{it} \qquad \textbf{4.8}$$

Where $\ddot{P}_{it} = P_{it} - \bar{P}_i$ is the time demeaned data on P, etc. This is also known as the within transformation, or fixed effects transformation. Note that the unobserved fixed effects f_i have been removed.

An example of this type of approach comes from Kane (1994) who studies the role of college costs on enrolment of blacks in the US. Black enrolment declined 14% in the US between 1980-1984 – a period during which tuition costs were rising, but then recovered in 1985, despite continued increases in tuition fees. Kane points out that simply looking at participation within US states before and after the increases in tuition fees will not provide a true picture of the impact of fees, since certain states encourage college going in other ways, such as by targeting high-schools. Kane therefore exploits between- and within- state differences in US college costs to establish their impact on enrolment. Kane's methodology relies upon the fact that states across the US not only have different income distributions, but different approaches to tuition fees – some states subsidise tuition fees heavily whilst others prefer to keep fees high and instead provide aid targeted at disadvantaged groups. The result is a wide variation in tuition fees across states – e.g. in 1987 tuition fees were as low as $900 in California, and as high as $2600 in Virginia – and within states over time, as average income levels change along with within-state policy.

Kane uses Current Population Survey (CPS) data for 56,000 households from 1970-1988. He finds enrolment to be lower in the high tuition states but also that the gap in participation between high and low-income youth are wider in states with higher tuition fees. Additionally he finds that within state rises in tuition led to falls in enrolment.

Kane's analysis implies that a $1,000[30] decrease in university tuition increases participation in of black 18-19 year olds by 3.7 percentage points. He finds a similar effect for all income groups of black students, though only low-income white students are sensitive to fees. Kane also looks at the impact of the Pell maintenance grant but finds this to have a much lower impact – which he speculates may be due to lack of information about grants, particularly for blacks. Kane concludes that while fees did account for some of the decline in college going by blacks, they were counteracted by improvements in education of black parents and increases in wage returns to college.

A similar study is carried out by Kane (1995), which again relies on variation in funding policy within and between states of the US. Some states keep tuition low to promote college entry, while some rely on government aid to do the same. Kane attempts to reconcile the two policies to establish which is a more effective method of encouraging college participation. Again, Kane exploits between and within-state variation in fee policy as well as within-state variation arising from the establishment of the Pell Grant program in 1973. He uses data from the National Longitudinal Study of Youths (NLSY) on 12,000 youths from 1979, combined with the CPS (1977-1993) and the High School and Beyond study of the senior class of 1980 and 6 years beyond.

His fixed effects methodology implies that within-state increases in tuition are reflected in enrolment declines. He uncovers a significant effect of tuition fees – a $1000 increase in public 2 year tuition fees results in a 2.4-3.5 percentage point drop in enrolment[31]. He also finds a small positive effect of grants on enrolment.

4.2.3 Time-series and cross-sectional models

A number of researchers have employed a simple time-series or repeated cross-section approach to the question of the impact of aid and fees on participation. In such cases authors tend to model enrolment rates over time, or look at participation rates before and after some sort of policy change, and choose to either present purely descriptive information, or attempt to augment their set of

[30] 1998 prices
[31] 1991 prices

controls – for example by adding parental income proxies – to provide an accurate picture of the relationship between student finance and participation.

A summary of such studies is contained in Leslie and Brinkman (1987) who perform a meta-analysis of 23 studies of the impact of student aid (including federal and state aid programs) on student choice (including general enrolment and institution type). A consensus of the studies they survey estimates the effects of a $1000[32] decline in the net price of college to drive a 4 percentage point increase in college attendance.

More specifically, McPherson and Shapiro (1991) model US enrolment rates over time from 1974-1978 – a period of huge fluctuations in loans and grants in the US. The authors create a composite "net costs" variable which is defined as fees minus aid. The aid variable itself comprises grants plus loans, where loans are entered at 50% of face value. Other controls are parental income, gender and year, and the fee and aid variables are interacted by income group (low, medium and high) dummies. Increases in the net cost of attendance are found to have a negative and statistically significant effect on enrolment for white students from low-income families (a $1000[33] increase in net costs leads to a 2.7 percentage point decrease in participation of low income students). No consistent effect is found for medium income students, and somewhat conversely, net costs are found to have a positive impact for high income students. The authors suggest this may be as a result of the strong demand among middle- and upper-income students causing colleges to raise their prices, but suggests some issues with the estimation techniques.

The Australian experience is often used as a model to examine the impact of tuition fees on HE participation. The Australian system of tuition fees (known as HECS – the Higher Education Contribution Scheme) was first implemented in 1989, and is one of the longest running schemes in the OECD. From the outset, contributions were collected using the tax system (although graduates stop paying once they have cleared their debts), making HECS the first income contingent-

[32] In $1998
[33] In $2006

repayment scheme, and thus an important part of higher education funding history.

In his 1997 paper, Bruce Chapman examines the effect of HECS ten years on, in the context of the Dearing enquiry and its then forthcoming report on funding in the UK.

The current UK HE finance system mimics HECS in many ways, with the tuition fee amounts being roughly similar, Australia charging around US$7,000 per year for students living in halls of residence[34] in 2006/07.

In considering the effect of HECS on the access of the disadvantaged, Chapman first looks at overall enrolments over time before and after the introduction of the scheme. He finds no evidence of a negative effect of HECS – enrolments of students in higher education rose by an average of 4% per year from 1988 onwards. However, as Chapman acknowledges, this gives no real insight into the direct effect of HECS.

Chapman then uses data from the Australian Council of Educational Research (ACER), examining the composition of 18-year olds in HE the year immediately before HECS, and repeating this for 1993, in particular looking at their parental income (as constructed from variables on material possessions, number of bedrooms, number of bathrooms etc). The results of this analysis show the proportion of students from low wealth backgrounds has increased significantly between 1998 and 1993 – 13% of low wealth were enrolled in university in 1998, compared to 17% in 1993. On this level, there appears to be no evidence that the HECS system has discouraged disadvantaged children from entering HE. The proportion from high wealth backgrounds increased by a similar magnitude, however (25% in 1998 v 33% in 1993) meaning the gap in attendance between students from rich and poor families remains wide. However, a grant system was also in place at the same time as HECS, potentially distorting these results.

Galindo-Rueda, Marcenaro-Gutierrez and Vignoles (2004) also look at changes in participation before and after reforms – this time in the UK. Their efforts concentrate on how the socio-economic gap in participation may have changed as a result of the 1998 reforms (in which up-front tuition fees were introduced and

[34] Source: The international comparative Higher Education Finance and Accessibility Project, University of New York at Buffalo

grants abolished – see Chapter 3 for more details). The nature of the gap they are investigating is wide – they report that over 75% of those from professional backgrounds study for a degree, versus only 14% from unskilled backgrounds. This gap has persisted over the last 40 years.

Galindo-Rueda et al point out the difficulty in determining the impact of tuition fees, since there was no "natural experiment" at the time of their introduction in 1998 – circumstances for all students changed – making difference-in-difference type analysis difficult. Examining student enrolments before and after the introduction of fees is also misleading, since there have been rises in participation every year for 30 years, so it is difficult to disentangle the true effects from that of normal growth.

The authors instead attempt to make inferences by augmenting their data with household income level, thus allowing some insight into how the reforms may have affected individuals from different income groups. They go on to use a very rich dataset with a large number of controls, again to improve their estimates.

In their analysis, Galindo-Rueda et al use data from HESA (Higher Education Statistics Agency) on student enrolments. While this is a rich source of data on institution and subject choices, it provides little information on students' socio-economic backgrounds, so they would be unable to control for parental income. To deal with this, the authors augment their data by using postcode matching – they merge CACI household income data (a commercially produced data set of 4million households, giving the income distribution for each postcode) to student postcode (which is available through HESA, and in most cases is their parental postcode, therefore a direct link to their parents wealth/SES status). This is boosted with Census data on socio-economic profiles of each neighbourhood (as measured by proportion of heads of household in each SES group) and numbers of 18-24 year olds in each neighbourhood, enabling the construction of a 'pseudo' HE participation rate for each postcode. Note that in each case there is some measurement error since Census data was only available for 1991 and 2001 so had to be extrapolated.

Galindo-Rueda et al use OLS regression to model the relationship between the HE participation rate and mean neighbourhood income, by year. They find that a 1 log point increase in mean postcode income results in a 0.13 unit increase in HE

participation. The analysis also exposes a widening in the participation gap between incomes over time – in neighbourhoods with mean income levels (£21,890 per annum in 1999 prices), participation in HE rose from 10% in 1994/95 to 19% in 2001 – a 9 percentage point increase. Over the same time period, though, neighbourhoods with income levels at 50% of the mean (£10,950 per annum in 1999 prices), participation only grew by 1 percentage point (0.89% - 1.77%). This analysis is purely descriptive, though, and so it is impossible to tell whether tuition fees, the declining real value of student grants, or declining attainment in formative education years are to blame for the increase in inequality.

A second set of analysis is therefore carried out using YCS (Youth Cohort Study) data – Government-run longitudinal survey data on under-19s, which includes their parent's socio-economic status (although not parental income), their HE attendance, qualifications etc.

Looking first at 18 year olds in 1996, the authors run a probit model, with dependent variable whether a person is in HE at age 18 or not. Explanatory variables in the MLE analysis are gender, socio-economic status, ethnicity, parental education and school type – i.e. all measures of a person's socio-economic background. Note that prior academic achievement is not included at this stage, since the aim is to measure the impact purely of someone's background (which of course, may impact their prior attainment). The results indicate that a student's background has a large impact on their likeliness to participate in HE. Students from professional/managerial backgrounds are almost 3 percentage points more likely to attend HE compared with those from skilled backgrounds (although those from unskilled backgrounds are equally likely to attend as those from skilled backgrounds). However, once prior academic attainment (i.e. number of A-levels) is included in the model, the impact of socio-economic background disappears. It seems then, that socio-economic background has an indirect impact only – by limiting educational attainment early in life.

The analysis is repeated for 18-year olds in 2000 – i.e. after the introduction of tuition fees. The results are quite different – the impact of coming from a professional/managerial background has risen to 12 percentage points, and more importantly, is still significant even when A-level attainment is included in the model. Students from unskilled backgrounds are meanwhile 10 percentage points

less likely to attend HE. However, again socio-economic background drops out when prior attainment is included for this group. When controlling for GCSE performance as well as A-level performance, and restricting the comparator group to those with 5 good GCSEs, which is arguably a more meaningful comparison since those without such qualifications are highly unlikely to be able to attend HE, socio-ecomomic status becomes insignificant, with A level attainment the biggest driver of participation.

Overall, the results certainly indicate a large and growing gap in HE participation between those from rich and poor parental backgrounds. However, the authors conclude that this gap is part of a long-term time trend and so is not likely to be attributable to HE policy.

A further example of examining data on participation over time to make inferences about the UK reforms comes from Blanden and Machin (2004). They find a similar result to Galindo-Rueda et al – i.e. that the gap between rich and poor in HE has widened over time – though not necessarily as a result of HE finance policy – in their analysis of the impact of the UK HE expansion on inequality. The authors use longitudinal data from the BHPS, NCDS and BCS to study the changing participation rates of students from different income backgrounds over time.

They find that while participation in HE is largely driven by prior attainment and parental income, the gap in participation between the rich and the poor actually widened between the years of 1981 and 1999. This coincides with the time period of rapid expansion in HE, a time when student numbers were rising so rapidly that the Government had to find ways to reduce the costs per student. Over this time period, benefits such as housing benefit were removed from students, and grants were first frozen and then totally withdrawn and loans were introduced for living costs (see Chapter 2). Again, however, while Blanden and Machin's findings suggest that the continual loss of income in the form of benefits and grants slowed the growth of participation of low-income students, and was outstripped by growth in the participation rates of high income students, this is likely part of a long-term trend unrelated to HE finance policy.

4.2.4 Qualitative methods

While unable to deal with the issue of bias caused by the presence of unobserved heterogeneity, qualitative methods are a popular means of gauging opinion on higher education funding policy. Often, these methods are mixed with other types of methodology such as self-completion surveys.

Forsyth and Furlong (2000; 2003), and Furlong and Cartmel (2005) use a mixed methodology to explore in great detail the transition from school to higher education by young people living in disadvantaged areas in Scotland.

They use a mixture of large scale postal surveys and detailed qualitative interviews to explore the impact of several types of disadvantage thought to affect HE participation (defined in this case by those doing a degree or an HND) by young people in Scotland. They chose 4 areas which were particularly deprived (as measured by the DEPCAT index of deprivation[35]) but in geographically contrasting areas of Scotland, each of which represent an element of deprivation thought to be relevant to access. An initial sample of 531 children is chosen, in the following areas – i. Glasgow, representing an area of severe deprivation – Glasgow contains the greatest number of deprived postcodes in Scotland, ii. Lanarkshire, representing an area of low qualifications – Lanarkshire has suffered many years of decline in its industries, leaving its workforce unemployed and uneducated. iii. Ayreshire, representing an area of high unemployment and population decline and iv. Argyll, an area with no university in commuting distance, to capture the added disadvantage from having to move away from home to attend HE. In this way, a mixture of children of different classes is contained within the sample, though all are from deprived areas described.

It should be noted though, that this study, while revealing interesting results, does not control for prior attainment or background characteristics. However, the

[35] Deprivation categories are used to divide a population into groups based on the material affluence / deprivation of the area where they live. There are 7 deprivation categories: 1 being the most affluent (least deprived) and 7 the most deprived. Every postcode sector is allocated a 'deprivation score' or 'depcat', derived from four sets of information collected in the census: overcrowding; male unemployment; car ownership and the proportion of people in households in social class 4 or 5.

sample is made up of youths who have enrolled in the sixth form of school. This is an optional year in Scotland and is generally taken by the more academically ambitious children, so provides a sort of control for prior attainment, and also means the sample of children are atypical.

The survey contains 3 waves – an initial wave in 1999 when the children were in sixth form and so at the critical stage of deciding whether to enter into HE, in 2001 when those children who had decided to go on to HE were in their first year, and in 2004 when the respondents were nearing the end of their degrees. At each stage a mixture of postal questionnaires and face-to-face interviews is carried out. At the first stage, 531 children were in the sample, while by the third wave the sample still contained 395 respondents. In each wave, response rates were very high, averaging 72%.

The study shows clear links between socio-economic disadvantage and access to HE – those children from SEI and II had on average 13 higher points (the Scottish equivalent of A-level) whilst those from SE V had gained only 5.5 points by the beginning of sixth year. The study also shows a negative relationship between social class and likeliness to apply to HE – 82% of children from SE I had applied to university by this time, whilst 51% of those from SE V had done so. This statistic may seem surprisingly high, but could be explained by the research design chosen by Forsyth and Furlong, of having only children enrolled for sixth year at school. As stated this optional year tends to be taken by students with greater academic ambition than average. This means the sample may contain a higher proportion of successful children who happen to live in areas of social disadvantage. (the authors themselves postulate that some of the children in the sample may be from the "sunken middle class" – a phrase coined by Jackson and Marsden in their book "Education and the Working Class" (1968) to describe children who have a parent from the middle class, but have become working class over their lifetime. This is usually a female through marriage, but could also be due to bankruptcy, illness etc.)

By the time of the first follow up survey, social class effects were as pronounced as ever – 64% of those in SE I were doing a degree, while 6% were doing an HND. For SE V, 22% were doing a degree, 8% an HND, 30% were doing an NC and the remainder were not in education.

A well as uncovering a direct link between socio-economic status and access to university, the study also uncovered more subtle effects of socio-economic disadvantage in terms of HE such as choice of subject type (the sample were over-represented on 'vocational' versus 'academic' subjects), university type and location – 58.8% of HE students in the sample – attended the university nearest their home, and only 6% of the Glasgow sample actually left home to attend university, while 46% of those in Ayrshire stayed at home, despite having to endure an average 2hr36m commute per day to do so. Whilst many of those from the Glasgow area attended Glasgow or Strathclyde universities (an ancient and a 'red brick' respectively), no-one was found to be attending an ancient or red brick university outside of Scotland. Again, social class among the sample was apparent in university type – 22% of those from SE I were attending an ancient institution (Glasgow or Edinburgh) and 60% were attending a red brick, with the remainder at 'new' universities. Of those in SE V, only 5% were attending an ancient university, 15% were in a red brick school, and 10% were in a new university. The remainder were in FE institutions.

While these findings provide evidence of socio-economic disadvantage in HE, it is of greater relevance to this thesis to look at the impact of HE finance on the children in the sample.

Those children in the sample who had enrolled in a degree in the second phase of the study were subject to a £1,000[36] tuition fee for each year that they attended HE. However, the majority had qualified for the fee remissions which were available to disadvantaged students at that time, meaning that only 25% of those doing a degree were actually paying a full or partial fee.

The longitudinal nature of the study meant that students could be asked about their knowledge of tuition fees before and after they enrolled in HE. The survey uncovered a huge incidence of uncertainty regarding the fees – 73% of students were not aware of what fee they would be liable for before entering HE. Only 12% of students anticipated paying the full fee before entering, while 26% actually ended up paying it. More seriously, there was a tendency to over-estimate the cost of HE, even among those who eventually went on to study – only 13% of

[36] 1998 prices

students believed they would be exempt from the fee, although 36% actually turned out to be.

At the time of the second wave of research in 2001, the endowment fee had just been introduced (see Chapter 2), and the upfront fee abolished. Perhaps unsurprisingly, those respondents who were now considering enrolling for a degree (either later than their peers, or following on from an HND) were unhappy with this move – which meant they would now be eligible for an expensive endowment fee at the end of their degree, since they would have been exempt from the upfront fee. While it is not clear from the research whether the endowment dissuaded study participants from entering HE it remains one of the few pieces of qualitative evidence of negative attitudes towards fees, and the (now defunct) Scottish endowment system.

As well as fees, lack of information impacted respondents in many other ways. Respondents in HE complained of not being advised correctly in what degree to do, the logistics of UCAS forms and which subjects to take both at university and at school. The main source of information for the respondents was friends and siblings – a major concern since this group are least likely to have a sibling or friend at university.

The survey also uncovers several interesting findings regarding students attitudes towards maintenance loans.

In exploring this, Forsyth and Furlong used willingness to take out a student loan immediately upon enrolment as a measure of debt aversion (i.e. those who did not take a loan out straight away were considered to be more debt averse than those taking one up straight away). Indeed, many of the poorer students did not actually take out the full loan, but instead worked to get by, rather than have to face the debt later, perhaps eroding their experiences as students, both socially and academically. This finding is supported by the findings of Callender and Jackson (2005) who find that working class students have far more negative feelings toward debt than their richer counterparts.

Financial worries were the biggest barrier to entry and success in HE, and the qualitative interviews carried out are effective at isolating issues caused by credit constraints and debt aversion. The participants described a host of fears about

their finances, which were a mixture of credit constraints (not being able to afford the up-front costs of university) and debt aversion (being reluctant to borrow the money needed). Many students actually deferred entry into HE in order to save up to be able to afford it, while one student dropped out of her HE course as she was unable to afford the commute each day. Finance was the main reason given for students choosing to live at home. Debt aversion resulted in many students working during term-time to avoid spiralling debt, then working over the summer to re-pay the debt they had incurred.

In general Forsyth and Furlong note that debt aversion is not the sole reason for lack of success in HE by those from low socio-economic groups, but is very often the 'tipping point' when other things go wrong. Many respondents who were on the cusp of either staying on for more HE or leaving after an HND, cited fear of debt as the tipping point towards a negative outcome. As one student put it, regarding her mounting loans "It makes you think twice"
This indicates that while fear of debt may not be a main factor in most students HE decision-making, it may be a major factor for those students on the margin – i.e. who are undecided about whether to participate or not participate in HE.

4.3 Conclusions and analysis

While Chapter 2 presented the established view that the major factors in determining whether a young person will go to university or not is their prior attainment and family background characteristics, there are a number of studies that attempt to go beyond this and look for real affects of Government HE finance policies. This Chapter has presented those studies.

The difference-in-difference methodology employed by Dynarski and Linsenmeier, Rosen and Rouse is one of the most appealing. This methodology has the advantage of mimicking a controlled experiment and therefore can provide credible causal results. Furthermore, particularly in the case of Dynarski, such a methodology lends itself well to calculating elasticities of college demand with respect to costs and aid. However, the main disadvantage is that the difference-in-difference requires a clean natural experiment of which there are

few available in UK HE policy (see Chapter 2), and also, crucially, requires the treatment and control groups to be unaffected by anything other than the policy change being examined (other than characteristics that can be controlled for). For the difference-in-difference experiment to be robust, it is a required assumption that changes experienced by the control group would have happened to the treatment group too, in the absence of the policy change. This assumption is probably the most difficult to maintain in the HE debate, especially if the treatment and control groups come from difference socio-economic groups, as is the case with many of the policy changes described in Chapter 2, largely due to the tendency for policy changes to be means tested. This issue will be re-visited in Chapter 6. While Dynarksi's analysis concerns a treatment and control group that are assumed to be different only at random (due to the death of a parent), the results imply surprisingly sizeable effects of the reforms and a resulting large elasticity of demand with respect to grants, perhaps suggesting the results are still suffering from some sort of bias.

The panel within groups approach as exemplified by Kane has similar appeal to the difference-in-difference methodology in that there is a clear attempt to prove causality experimentally. This method is perhaps more flexible in that no "clean" experiment such as that of Dynarski's is required – the method can be used when several policy changes have taken place, affecting different groups, as is the case in the UK. Particularly in the case of within groups (fixed effects) estimators, however, the key assumption is that unobserved effects are fixed over time, and requires variation in the explanatory variables over time. The method also requires detailed data with observations on individuals or groups repeated over time.

The time-series and cross-sectional approaches discussed have the obvious advantage of simplicity, involving observations of university participation before and after a policy change. As discussed this does not imply causality, though authors such as Chapman (1997) attempt to overcome this by splitting data into income bands. Blanden and Machin (2004) and Galindo-Rueda et al (2004)'s methodology is perhaps more appealing in that a very rich set of controls is used. However, in practice, obtaining such a set of controls is difficult – as the authors illustrate – and the authors' parental income measurement in particular may be

subject to measurement error. Furthermore a fundamental issue with this study is that it does not control for unobserved factors such as motivation.

Finally, the qualitative methodology employed by Forsyth and Furlong, and Furlong and Cartmel's appeal lies in the depth of information uncovered, though unable to provide a credible estimate of demand for university with respect to costs and aid. Forsyth and Furlong uncover many findings which are perhaps too subtle to be drawn from large-scale empirical work – such as the detrimental effect of information constraints, or the effect of liquidity constraints on institution and subject choice. Such issues would not be picked up in a study examining overall change in participation rates.

Forsyth and Furlong also uncover an important point – that while HE finance may not be a major issue for the majority of students, those students on the margin – i.e. students from poorer backgrounds, who are already affected by debt aversion, lack of information or other problems, and who are therefore at a pivotal stage in their decision making, may be the most impacted. This indicates that methodologies must look in particular at marginal students since the impact of debt aversion (potentially exacerbated by the increasing requirement to borrow money for maintenance and fees), while unlikely to dissuade those who have strong leanings towards a university education, appears to be a potentially decisive factor for students on the margin.

Finally, and in order to find these marginal students, analysis which takes into account parental income would be of particular value. Such evidence is few and far between with the majority of studies discussed here using some sort of proxy, such as free school meals, or a regional level income. Since HE funding arrangements are predominantly means-tested it would seem vital to have knowledge of parental income for accuracy in the results, and to have full knowledge of the grants and fees actually received, rather than assuming all students are eligible for the maximum grant or fee, or a mean level.

Table 4.1 summarises the findings of the studies described above, in which marginal effects and / or elasticities[37] of HE demand with respect to fees and aid

[37] For simplicity, marginal effects rather than elasticities are shown. All have been converted into 2006 prices (GDP deflator).

are calculated. To clarify, in the case of Kane, a $1000 increase in fees results in a 1.9 percentage point decrease in participation of low income students.

Interestingly, the results seem to be remarkably consistent, despite the variety of methodologies and data-sets used. Particularly in the case of the impact of net costs and fees, the range of estimates obtained is quite narrow, with the majority of coefficients similar in magnitude at around a 3 percentage point impact for $1000 (for fees, net costs and grants), though in the case of Kane, grants are not found to have an effect, suggesting the value of grants as a tool for increasing participation is not yet clear.

That all the results are quite well in line seems somewhat surprising, given that the earlier studies, as discussed, did not control for unobserved heterogeneity. However, Dynarski (1999) suggests this may be because of competing biases at work; cross-sectional estimates of the coefficient on fees may be biased downward since eligibility for fees is correlated positively with propensity to attend college, and estimates of the effect of grants may be biased upward, since eligibility for this type of aid is correlated negatively with the underlying propensity to attend college.

Table 4.1: Summary of marginal effects of a $1000 increase in fee and aid eligibility on university participation (2006 prices)

Author	Year	Country	Data	ME: $1000[1] increase in grant / fee / net cost on participation (ppt)[2]:
Manski & Wise	1983	US	NLS (Class of 1972)	Grant 0.031
Leslie & Brinkman	1988	US	Review of 23 econometric studies	Net cost[2] -0.033
McPherson & Schaprio	1991	US	CPS / AFS (1974-1984)	Net cost -0.027 (low income)
Kane	1994	US	CPS (1970-1988)	Net cost -0.032 Fee -0.031 (low income) Grant no effect
Dynarski	2001	US	NLSY (1979-1996)	Grant 0.03

1 At 2006 exchange rates, $1000=£525; at 2009 exchange rates, $1000=£613
2 Leslie & Brinkman, McPherson & Shapiro calculate net costs as (fees – grants – loans); Kane calculates as (fees – grants)

This chapter's aim is to describe the many methodologies employed by researchers to uncover the impact of fees and aid on college participation, and to examine their findings. In the majority of cases, a significant effect of the correct sign is found.

The implication of this chapter is that there is strong evidence of a role fees and grants in university participation, alongside the well-established roles of prior attainment and socio-economic status described in Chapter 2. However, in many cases it is not clear why youths respond to the levels of grants and fees as they do. For example, while Dynarski's analysis shows a positive response to grants, it is not clear whether the decrease in participation resulting from the removal of the grant was due to credit constraints, or youth's responses to changes in the price of college, possibly driven by students valuing the upfront costs of education more than possible future returns.

Similarly, it is difficult to draw conclusions of this nature from the work of Kane. While he finds low income students to be more sensitive to tuition fees than high income students, this could be because low income students are more likely to experience credit constraints, but could equally be because these students are more responsive to upfront costs than anticipated future benefits to HE.

Perhaps the only study which sheds any light on the reasons behind youth's responsiveness to HE systems is that of Forsyth and Furlong. This study did find clear evidence of debt aversion among the students involved, as proxied by those choosing not to take up a low-cost maintenance loan. A number of these students also appeared to be credit constrained. However, as discussed, Forsyth and Furlong's study had a number of other methodological issues which may have affected the validity of the findings.

A further crucial finding from this chapter is that there is a clear gap in research for the UK, where, to date, no studies have attempted to calculate the marginal effect of grants and fees on participation, despite the many changes in HE finance policy that have taken place.

The evidence presented in Chapters 3 and 4 is somewhat contradictory, and the conclusion may be that early child development factors and HE financial systems

may *both* play roles in university participation decisions of youths. It is likely, given the strong evidence of Chapter 3, that while aid eligibility and fee obligations may matter, they are not as influential as early-years factors, as suggested by Heckman. This matter will be investigated fully in Chapters 6-8, which will add to add to the body of work described in this chapter, by presenting an estimation of the impact of fees and grants on participation using some of the methodologies described above.

Chapter 5 Using the Labour Force Survey to examine higher education participation

5.1 Introduction

The intention of the first strand of this thesis is to add to the body of work described in Chapter 4 by estimating the impact of tuition fees and maintenance grants on university participation in the UK. The study will concentrate on the major UK higher education reforms of the last decade, in particular the following:

i. The introduction of the £1,200[38] up-front tuition fee in 1998/99
ii. The reduction and subsequent abolition of grants over the period 1998/99 – 1999/00
iii. The abolition of tuition fees in Scotland in 2000/00
iv. The re-introduction of maintenance grants in Scotland in 2001/02
v. The re-introduction of maintenance grants in England and Northern Ireland in 2004

And, to estimate by regression analysis the overall impact of tuition fees and maintenance grants on university participation using this variation in funding policy, and testing and refining this specification by experimenting with a range of methodologies based on those described in Chapter 4.

Data on young people aged 18-19 (spanning school leaving age and first year at university) covering the last two decades, with information on the youths' activities, educational or not, is therefore required. In particular, it is preferable to observe only young people immediately after they have left school and therefore eligible for first year of university – the reasoning for this is that it is essential to know what policy is in place when they make their decision whether to attend university or not. For example, if one looked at the behavior of 20 year-olds in 2004, one could not be sure if they had decided not to attend university in 2003

[38] For the subsequent chapters, all financial amounts will be expressed in 2006 prices (GDP deflator)

because there were no grants, and then, upon the re-introduction of grants in 2004 had decided to attend – or they had simply decided to take a gap year.
By restricting the sample to only immediate school leavers, the HE finance policy in place at the time of their decision making will be clear.

During the period of analysis (1992-2005) grants and fees were means tested, so it is also crucial to know the youths' parental incomes in order to understand the amount of grant and fee they are potentially eligible for (a further reason behind this is; even if the survey in question had information on fees and grants received, this would only be available for the part of the sample actually participating in university). It will also be necessary to know the amount of student maintenance loan the youth is eligible for, since this will be an important factor – maintenance loans (which were also means tested) obviously have a major impact on the up-front costs of going to university and will therefore be crucial in youths participation decisions[39].
To establish parental income it will be useful to observe individuals in the parental home, ideally the year before they decide whether or not to participate (since at time of writing, no surveys which interview a young person directly and also ask them their parents' income are known to exist, so a survey is needed in which both parents and their children are interviewed, which establishes parental income).
Because of the variation in grant, fee (and loan) amounts by year due to policy changes and inflationary increases, it is obviously essential to know which academic year the youth would be eligible for immediately upon leaving school (as discussed above), in order to understand what level of finance s(he) would be subject to. This will be determined using month and year of birth. This is necessary because of the nature of the UK academic system – the university

[39] As will be discussed in Chapters 6-7, while maintenance loans will be controlled for, putting a causal interpretation on the loans coefficient is not advisable. Loans are inherently different to up-front fees and grants since they represent both an up-front benefit and a future cost. Furthermore, loan repayments are linked to future earnings so will vary by individual, as will discount rates. In addition, there are many other types of loan (such as credit card debt) also not included in this analysis. Future research will aim to tackle this with a more dynamic model, incorporating individuals' future debt obligations based on predicted future earnings, but is beyond the scope of this thesis.

academic year a youth is eligible for varies according to their month and year of birth – simply knowing their age is not sufficient.

Given these criteria, in choosing a dataset, the following conditions must be met:

i. Large scale survey data on young people aged 16-19 (spanning school leaving age – to collect parental incomes – and first year after leaving school) over the time period in question – 1992-2005, covering the four constituent countries of the UK.

ii. Status of the young person – i.e. whether they are at school, university, or otherwise, and preferably whether they are studying at degree level, since the reforms primarily affected degree students.

iii. Year and month of birth of the child. As discussed above this is essential in order to derive the university academic year each child is first eligible for. Simply knowing the age of the young person is not sufficient to derive the academic year they are immediately eligible for upon leaving school. This is because of the nature of the UK academic system – children in England start school aged between 4 and 5 years old, depending on their date of birth. The school academic year begins in September and policy dictates that children must start school in the academic year in which they turn 5. Thus, the year in which you start school is dependent on your date of birth, in turn meaning that the age at which you qualify for university, after the 14 years of school needed to acquire the required number of A-levels, will also vary by date of birth. In short, those born before September will start university at age 18, while those born September-December will start a year later. The system is Scotland is different still, with the academic year running from March - February (see Appendix 2 (Chapter 5): Education systems in England and Scotland for more details). Without knowing at least month and year of birth, it is impossible to tell which academic year a child qualifies for, and thus whether they are in the treatment or control group.

iv. Parental income data. This is also essential due to the means-testing nature of the UK reforms – in order to know if the young person would have been eligible for the grant or fee in question, and indeed the amount of fee owing or grant/loan eligible for, it is essential to know their parents

income in the year prior to attending university, when means testing would take place.

Given these extensive criteria, and the fact that no research of this nature has been carried out before, and therefore no dataset previously identified as suitable, finding an appropriate dataset was a major part of the research undertaken in this thesis. Three major UK Governmental studies were carefully examined over a number of weeks, paying heed to the above criteria. This chapter describes the research carried out and the reasons for the choice of the LFS as the most suitable dataset for the analysis and indeed any analysis which attempts to identify the impact of HE finance on participation.

The Chapter concludes with descriptive statistics on the LFS, description of the variables used and the cleaning process involved.

5.2 Datasets considered

Three datasets are examined for the purposes of this analysis – the British Household Panel Survey (BHPS), the Family Resources Survey (FRS) and the Labour Force Survey (LFS). Below, a discussion of the merits of each is presented.

5.2.1 The BHPS

This is a UK representative longitudinal survey which began in 1991 and runs to 2005 at the time of writing.

Structure: The longitudinal nature of the BHPS lends itself well to this research question. The survey panel starts in 1991 with 5,000 families. Should any family member move out of the house, for example to go to university, they are followed by the BHPS and are thus not lost from the survey. In addition, the leavers' new housemates/husbands/wives/children are also added to the sample. The longitudinal nature of the study plus the unique method of following panel members wherever they go means that it is possible to see children reach school-leaving age and then observe them at the critical time of deciding whether to go to university or not, even if they leave home to do so.

Availability of data: The BHPS has information on month and year of birth so it is possible to compute a students' eligibility for university using the rules discussed previously. Since the BHPS is a study of families, data on school leavers' parents' income (and other characteristics of their parents) is available.

Sample Size: The study starts with 5,000 households, or around 10,000 people in total in 1991. As discussed, if people leave home they are followed, bringing with them additional panel members. In addition, sample boosts for Scotland, Wales and Northern Ireland were added in 1999. Despite all this, the BHPS samples are still very small, particularly when trying to look at eligible school leavers (17-19 year olds) in the constituent countries of the UK. For example, for the 2001/02 academic year, around 460 respondents are eligible for university, with 15% participation – or 73 university participants. Looking only at Scotland reduces the sample size to around 20 eligible people, and even fewer participants – rendering estimation meaningless.

Key issues: Other than the obvious issues with sample sizes, the nature of the BHPS brings about several estimation problems:

a) University start dates. All interviews are carried out in September of the year. This is problematic since university term dates tend to begin in September or October, and vary throughout the month depending on the institution. The result is that a BHPS respondent being interviewed on September 10th who is intending to start university on October 1st will be recorded as not being at university that year. It will only be until the following year that they will be recorded as a university student. Conversely, a respondent might be interviewed on October 24th, who started university on September 10th, and who will be recorded as being at university in that academic year. This means that it is never clear when an individual actually started university and thus whether they attended university during a policy year.

There are, however, details of a persons' university end date, from which start date can be imputed (using the general rule that degrees take 4 years in Scotland and 3 years in England) and in 2000, a university start date question was added.

However, in many cases both university start and end date is missing – partly for reasons to be explained below – further reducing sample sizes.

b) New Panel Members and Additional Household Members. The BHPS has an unusual way of dealing with new panel members (e.g. panel members whose family are in the panel but were below the minimum interview age, panel members from the Scottish sample boost in 1999, and respondents entering the panel through marriage or co-habiting). For example, questions regarding university attendance and start date are based on changes since the previous wave, and so are routed only to those who have been interviewed in a previous wave. So those entering the panel for the first time will not be asked these questions. In some cases, slightly different questions are asked instead – e.g. in the case of university attendance, new respondents are asked if they are still in education and what type, so their university status can be garnered from this. But their university start or end dates will not be recorded unless they re-appear in the panel the next year. This is a further major problem since, particularly in the case of university entrants, they will move into shared accommodation in their first year. Thus, additional panel members will be added to the sample who will have no attached information about their university start year. In a large number of cases, the original panel member will find different accommodation the following year, in another house. Thus the new entrants from his previous house-share will not reappear, and another set of new housemates will be added – again with no information on university attendance or start date (see illustration in Figure 6). While an obvious solution would be to disregard these new entrants, the already limited sample sizes in the BHPS mean that it is of priority to capture as many respondents as possible. Thus other means must be used to impute university start-dates of new members.

c) Parental income data. Since students themselves are not asked about their parents incomes, in order to capture parental income it is necessary for a student's parents to be in the sample too. The BHPS is in fact an excellent source of parental income data, since panel members typically live with their parents in the years prior to university, and all family members are interviewed with regards to total income from employment, benefits and investment. However two problems

arise – again when panel members are added from shared accommodation, in which case no parental information is available, or when 18 year olds eligible for university happen to be living outside the home at the time they enter the panel (this occurs occasionally).

In summary: the main issue with the BHPS is sample sizes, which make the estimation very unstable, particularly for estimating models including Scottish data. Attempts to boost sample sizes by adding information from individuals entering the survey through shared accommodation or marriage causes additional problems due to the lack of background data on them. A further major issue is the uncertainty around the academic year in which the individual is participating in university.

5.2.2 The FRS

This is a UK representative cross-sectional survey of UK families which began in 1992 and runs to 2005 at the time of writing. The FRS has particular emphasis on collecting information about the income of the family in question, be it income from employment, benefits, investment or any other source.

Structure: Unlike the BHPS, the FRS is not a longitudinal survey, so it is not possible to observe individuals at different points in time, and observe their behaviour before the decision to attend or not attend university. Instead, individuals are only present at one point in time. Thus, for the purposes of this thesis it is necessary to find individuals who are eligible for university in the year they were surveyed, and observe whether they attended university or not.

Availability of data: The FRS has excellent and detailed income data, for reasons outlined above.

However, date of birth is no longer available in the FRS survey, since it was removed by the National Statistics office following a tightening of security measures. As discussed previously, it is therefore impossible to tell which funding regime a student would have been subject to, whether they would have had to pay

tuition fees or not. This problem effectively renders the FRS unsuitable for the purpose of this study.

Sample Size: The FRS has an annual target of 24,000 households or 60,000 people, a good sample size for the purpose of this research.

Key issues:

a) Parental income data. Similar to the BHPS, the unit of observation is the household, so an individuals' parental income is only observable if they live in the same household as their parent or parents. Since it is not possible to observe individuals transitioning from the year before university, when they usually are living with their parents, to their first year of university or work, instead they must be observed in their first year at university. However, in this case there will be two groups of people who are not living at home, and therefore whose parental income will be unknown – this will be anyone at university living away from home, either in halls of residence or in private accommodation, and similarly, anyone who has moved away from their parents home to work (or who is unemployed, training or any other activity than studying).

The FRS structure goes some way to solving the former of these problems by asking each parent whether they have a dependent child, aged 16-24, in education, but living away from the family home. While it is not clear what the nature of the education is, it is a reasonable assumption to assume anyone over 16, in education and living away from home is at university or college rather than school. The children themselves are not interviewed, but their parents are asked a very brief set of questions about them, and because of this, their parental incomes are known.

However, a major problem with this 'external child record' is that the actual age of the child is not recorded anywhere, just that they are aged between 16 and 24. Without age (or to be precise, month and year of birth) it is not certain which higher education funding policy the child is subject to, rendering this information inadequate.

b) Absence of month and year of birth. As detailed above, another issue with the FRS is the absence of date of birth, making it impossible to tell whether an individual is in a treatment or control group.

c) University Participation. A further issue arises as a result of the interview timings. Unlike the BHPS, FRS interviews are carried out all throughout the year. This presents some issues when attempting to identify whether an individual is eligible for university and whether they are a university participant. For example, if a child is eligible for university in the academic year 2003/04, they will start university in September or October. But if they are interviewed in June, say, they will be recorded as not being at university in that year, even if they go on to enroll in September.

This means it is necessary to look for people who are interviewed in the calendar year *after* they were first eligible for university. For example, if someone is eligible for university in the academic year 2003/04, they need to have been interviewed in or after September 2003 in order for it to be certain whether they are at university or not.
This somewhat lowers the chances of finding panel members suitable for analysis, but is a far lesser problem than the absence of information on date of birth and the missing parental income data on a large proportion of the group of interest. However the issue of missing age of external children is the largest problem with FRS data.

5.2.3 The LFS

The LFS is something of a hybrid of the previous two surveys, having both cross-sectional and longitudinal elements. The survey began in 1975 as an annual survey, but became a quarterly survey in 1992. As in the previous two surveys, information is collected by household, and as the name suggests, there is particular emphasis on the labour market activities of each panel member.

Structure: As mentioned, the LFS has both cross-sectional and longitudinal elements. Households are interviewed longitudinally for 5 consecutive quarters before they are removed from the panel and replaced. This means that it is

possible to observe a family in the base year, and then again exactly a year later. While this is clearly a limited amount of time compared to the BHPS, it is ideal for this analysis, since individuals in the year immediately before their decision to participate in higher education can be observed, and observed again the year later when they carry out this decision.

Availability of data: The LFS has good information on income from earnings from employment, but has much less detail on income from benefits or investment. Thus, the income of an unemployed or inactive person or their parent must be imputed. Since individuals are observed the year before their university eligibility year, they will usually be at home, and thus it is possible to observe their parents income.

Month and year of birth is also available for all individuals, as is detailed information on their labour market activities – as a student, employee or otherwise.

Sample Size: The LFS has by far the largest sample size of all three studies, with 60,000 households interviewed in each wave.

Key issues:

a) Transitions out of the family home. Again, a major issue arises as a result of the household-based structure of the LFS. Interviews of households, as opposed to particular individuals are carried out, and when an individual leaves the household, be it to go to work, university or otherwise – unless (s)he chooses to live in a university hall of residence, (s)he is lost from the sample. This precludes the observation of his/her parental income (and hence his/her fee and grant eligibility). Independent individuals are of course observed in the LFS as independents, but are not asked about their parents' incomes at any time of their appearance in the LFS, and therefore this information is missing (even though in the case of a student living in a house-share rather than hall of residence, their student grant and fee amounts would be calculated on the basis of their parents' incomes by the Government.)

More detail on the means of dealing with this is below.

b) University Participation. In exactly the same way as the FRS, LFS interviews are carried out all throughout the year. Thus, the same method must be used to match up a person's interview timing with their eligibility and participation. i.e. look for people who are interviewed in the calendar year *after* they were first eligible for university and check their university status (see 5.3.2. for details of participation measure used).

In summary, the LFS appears to be the most appropriate dataset for this piece of work. While this dataset has some issues with parental income data of certain groups of individuals, this problem can be surmounted – while the BHPS's small sample sizes, and the lack of age data on a large portion of the sample of FRS data are problems too great to overcome. Thus, the LFS is chosen for the main strand of this thesis. It is important to note at this point, that the LFS sample which will be used in the remainder of this thesis, contains data going up to and including 2005. While data were available for 2006 and 2007 at the time of analysis, certain restrictions were placed on the dataset from 2006 onwards meaning month and year of birth (or any other indicator of year of university eligibility), were not. Therefore all analysis that follows uses data from 1992-2005.

5.3 Issues and solutions in using the LFS dataset

As detailed above, there are a number of issues arising when using the LFS dataset for this research. These issues and the solutions used are described below.

5.3.1 Parental Income data

As discussed, a proportion of the LFS sample in question have missing parental incomes. As described above, these individuals are those aged 18-19 who are not living with their parents or living in a university hall of residence.

Helpfully, given the 'first year eligibility' status required, the majority of the sample of interest do live at home or, if they go on to university, in halls of residence (in which case parental income is observed), meaning these "missing parental income" youths make up only 11% of the sample of interest. Table 5.1

shows the make-up of youths in the sample by academic year of university eligibility – those living independently will have missing parental incomes.

Table 5.1 Distribution of status of sample members (% of total)

academic year	*living:* at home	in hall of residence[1]	independently
1992/93	88.2	-	11.8
1993/94	86.7	-	13.3
1994/95	87.4	-	12.6
1995/96	86.4	-	13.6
1996/97	79.8	6.1	14.1
1997/98	83.4	7.8	8.8
1998/99	81.8	8.0	10.2
1999/00	82.4	6.9	10.8
2000/01	81.5	7.8	10.8
2001/02	81.6	7.9	10.6
2002/03	82.3	7.6	10.0
2003/04	83.1	7.0	10.0
2004/05	82.6	7.1	10.4
2005/06	81.6	6.8	11.5
Total	82.0[2]	7.3[2]	11.2
#	20,593	1,366	2,773

[1]prior to 1996, the LFS did not contain a "flag" for students living in halls of residence, though these were included in the sample, as living at home. Hence there are a higher proportion of "home" students in the years prior to 1996.
[2] only calculated for academic years 1996/97 – 2005/06

To overcome this problem, the independent individuals' fee, loan and grant eligibility are estimated on the basis of their own characteristics (GCSE, gender, ethnicity, region – described in full in section 5.3.2) using the year of university eligibility for identification. The sensitivity of this approach is tested by excluding them from the model completely. The results are found to be similar – see Appendix 3.

Descriptive statistics for these "missing income" youths are also examined in order to understand further their similarity or difference from the rest of the sample, to be sure that this approach is reliable (i.e. that they are roughly in line with the rest of the sample). These are shown in Table 5.2. The results indicate that these youths are likely to be in the lower income category, given their similarity with youths in this category – in terms of ethnic status and prior attainment, again as presented in Table 5.2. This group, given their private residence status, may also be more likely to be attending universities with limited halls of residence, such as colleges of the University of London.

Note that a further small proportion of the sample also has missing parental income data even though they *do* live with their parents, due to simple non-completion of the survey. However, response to the income question is reasonably high and the LFS have employed a number of strategies to overcome reluctance to respond, such as only asking individuals in the last wave of sampling. Nevertheless, those with missing parental incomes who do live at home make up around 13% of the entire sample. In all the analysis that follows, these individuals are discarded from the sample – this is necessary since all the regression specifications that follow require knowledge of parental income. The individuals' observable background characteristics are found to be close to the average implying that removing them from the sample should not result in major bias. Further details are contained in Appendix 4.

Having dealt with this issue of missing income data, the sample of potential participants is divided into three groups based on their parental incomes in the year prior to first year eligibility (i.e. at age 17-18 when ideally living at home) – 'low' (defined as those whose parental incomes were such that they would have received a full grant prior to 1998/99 and paid no fees after 1998/99; joint annual parental income of roughly £17,000 or less), 'medium' (those who would have received a partial grant before 1998/99 and would pay partial fees after 1998/99; parental income of £17,000 - £37,000) and 'high' (those whose parental incomes were high enough that they would have received no grant before 1998/99 and paid the full up-front fee after 1998/99; joint parental income of around £37,000 or more). All three groups would receive a loan of between £300 and £3000 in 2006 prices. As mentioned 'missing' income groups are also included in all models.

The reasoning for this income categorisation is as follows:
(1) each income group is affected predominantly by only one element of the reforms in question, which will make it easier to draw conclusions based on their behaviour. Figures 5.1-5.3 illustrate this crucial point – average eligibility for grant, fee and loan differs by both academic year and parental income. For example in Figure 5.1, youths from low income groups are displayed. The chart shows the constant erosion of real grants throughout the 1990s until grants are

finally abolished in 1999/00 and then restored in 2004/05. Loans are increased more or less in line with the erosion of grants (indicating the importance of controlling for loans) while low income students are never eligible for fees during the period up to 2005/06. By contrast, figure 5.3 shows fee and aid eligibility for high income students. These students are never eligible for grants, by definition, but are eligible for the full £1,200 fee introduced in 1998/99 and also experience increases in loans, though at a lesser rate than for low income students. This illustrates the variation in policy arising as a result of means testing, but is also useful for the purpose of analyzing the impact of the reforms; for example if, in 2004, participation increases among low income students compared with participation of high income students, it can be inferred that this may be due to the increase in grants – since this only affects low income students (this will be explored in more detail in Chapter 6).

(2) government/policy tends to focus on participation among income groups of this nature

(3) this provides more variation in the data. These groups will hereon be referred to as 'low', 'medium' and 'high'.

Figure 5.1 Variation in Fees and Support by Parental Income – Low Income England, Wales, Northern Ireland (LFS)

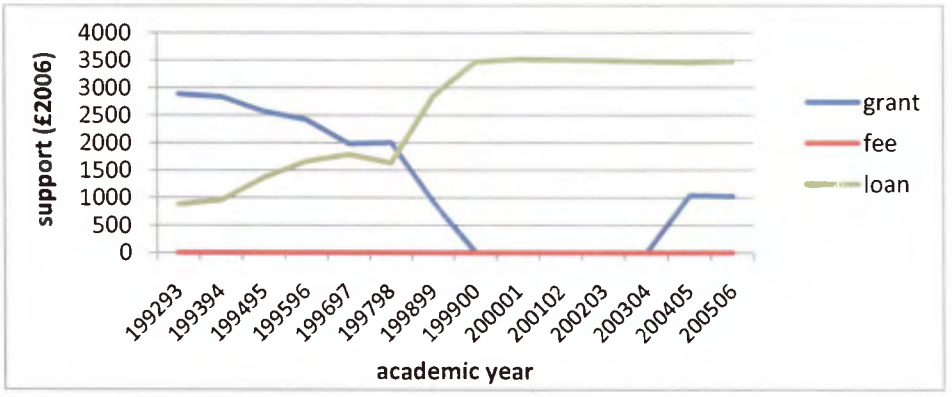


Figure 5.2 Variation in Fees and Support by Parental Income – Medium Income England, Wales, Northern Ireland (LFS)

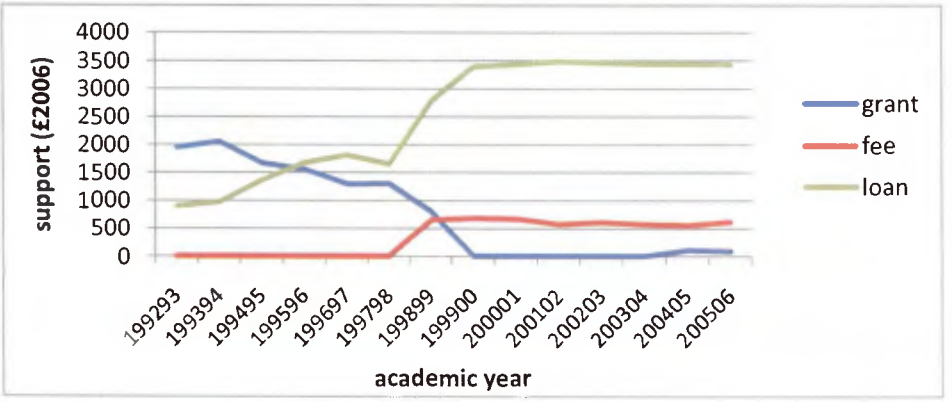
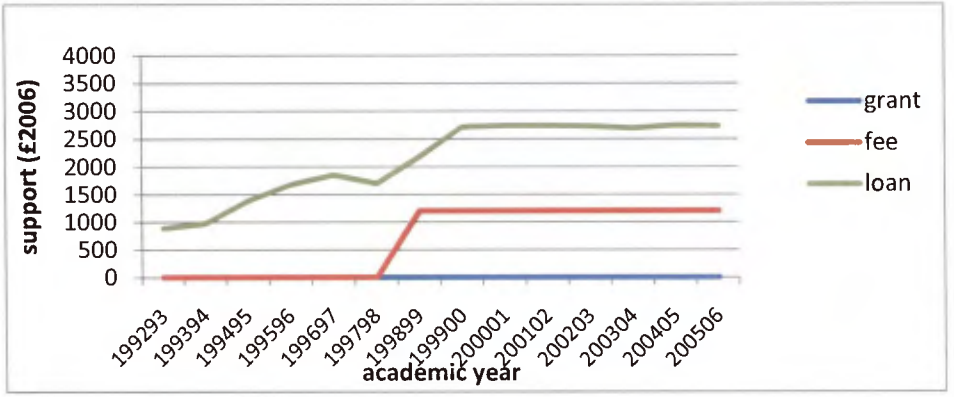


Figure 5.3 Variation in Fees and Support by Parental Income – High Income England, Wales, Northern Ireland (LFS)



This variation will obviously differ by country – again this point will be covered in Chapter 6.

Of course, with fiscal drag, (i.e. the process where income thresholds are either not adjusted for inflation, or fail to keep pace with earnings growth) the proportions of families falling into each of the three income groups will change over time. This could potentially cause estimation issues if the characteristics of individuals in each group changes. This issue will be fully explored in Chapter 6, Section 6.4.

5.3.2 Participation and grant, fee and loan variables

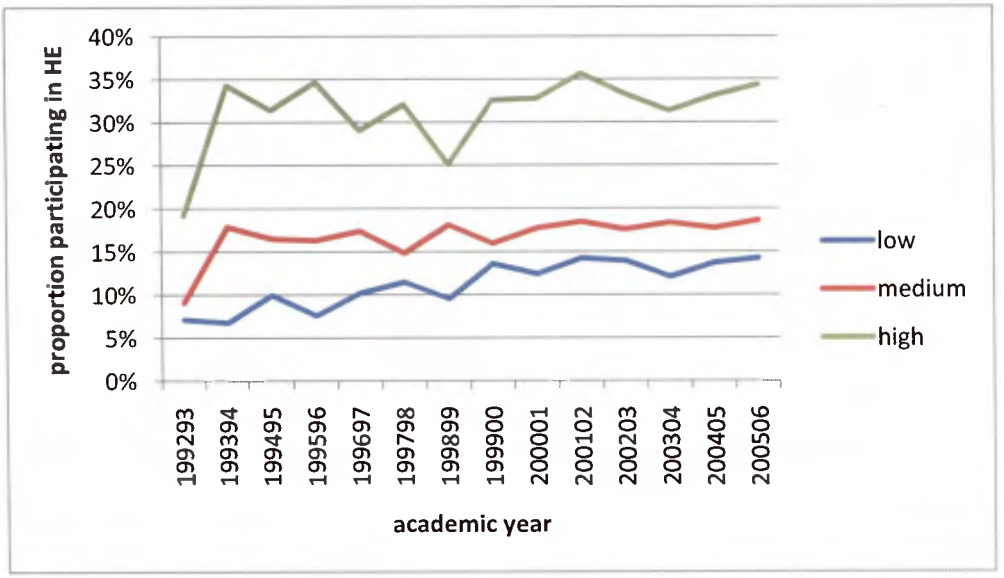
The data source does not carry information on grants, fees and loans that 18-19 year old youths are eligible for, so these variables are instead constructed (for both participants and non-participants, in the latter case in terms of what they would have received if they had gone to university) using knowledge of the students parents' incomes at age 17-18 as described above, and the governments own means-testing rules. However, as previously mentioned, LFS income data measures only income from earnings, and does not contain information in income from other sources such as benefits and investments, which are taken into account in means-testing calculations. Therefore, there may be some measurement error associated with the grant, fee and loan variables because of this approach. This issue will be discussed in Chapter 6.

A further issue, particularly with grants, arises as a result of the approach of calculating individuals' grant and fee eligibility according to parental income, as described above, since this takes no account of their actual take-up behaviour. It may be the case, for example, that certain youths do not take up their grants, perhaps because they do not have knowledge of what they are eligible for, or believe their grant award will be so low as to not justify the paperwork etc involved. By using this approach the effect of grant and fee *eligibility* rather than actual uptake is being assessed. This means the "intention to treat" or ITT is being analysed.

Indeed this is preferable, being a key policy question – policy makers' main concern is how individuals respond to what is offered to them, rather than what they actually take up, since this is the measure policy makers are most able to control. Furthermore, analyzing take-up, rather than eligibility will result in selection issues if only certain individuals decide to take up a grant.

Two possible variables in the LFS are considered as the outcome variable – "enrolled at university, college or polytechnic" or "currently studying for first degree". The latter is chosen as the outcome variable since this is the least ambiguous – it is certain that all those in this category (and potential people eligible for university) will be subject to the same government policy on loans, grants and fees, whereas those in the former, broader definition may not be – finance is very different for students on college and polytechnic courses. Figure 5.4 illustrates participation, again by income categorization.

Figure 5.4 Degree participation by parental income background, 1992-2005 (LFS)



As can be seen in Figure 5.4 above, unsurprisingly, participation is significantly higher for high income youths and significantly lower for youths from low parental income backgrounds. There is a significant amount of noise in the data in the earlier years – particularly for high income youths for whom sample sizes are smallest (see Table 5.2) The significant increase in participation in 1992/93 academic year arising from the 1992 HE act is also somewhat apparent[40].

Finally, an upward trend in participation is apparent for all income groups, though for the high income groups this is less true if the year 1992/93 is excluded.

5.3.3 Youth's personal and background characteristics

Table 5.2 shows summary statistics and sample means for the individual level data, including the selection of control variables which will be used throughout the rest of this piece of analysis. The control variables are ethnicity (a binary variable taking the value of one if the individual is white and zero otherwise)[41], youth's prior attainment (a binary variable taking the value of one if the youth has five or more good GCSEs and zero if the youth has less than five)[42], parents

[40] In a sensitivity testing stage, all models are re-estimated excluding 1992/93, with little effect on the results.

[41] While a number of ethnic groupings are available in the LFS dataset, white represents the majority with the others spread throughout several smaller categories, so for simplicity a binary variable is created

[42] A variable measuring number of A-levels is available in the LFS dataset, but only from 1993 onwards, and is limited in granularity to less than 1 or 1 or more, and to English, Welsh and Northern Irish students. Scottish students undertake Scottish Highers, which are one-year courses

education (this is available for each parent and is measured in 3 categories of attainment using the National Qualification Framework of both educational and vocational qualifications – see Appendix 5 (Chapter 5): NVQ Level Framework for full details of qualifications included), current parental income (this is the sum of both parents' annual income in the *current* year – i.e. when the youth is eligible for university at age 18-19) and region (using 20 regional dummies in total, representing 16 major regions of England, as well as two dummies for two major Scottish regions, and one each for Wales and Northern Ireland). Note that region represents the region of home domicile of the individual. This means that those living at home or in halls of residence will have their home domicile as their region, rather than the region of the institution they are attending. This is in fact preferable, since HE finance is dependent on country of domicile rather than location of institution. For example, English, Welsh and Northern Irish students studying in Scotland would still have to pay fees even though they were abolished for Scottish students, so knowing the location of their institution is irrelevant. However, for Scottish students studying in non-Scottish institutions, fees would be payable, even after their abolition in Scotland, somewhat complicating matters. It is widely known though, that Scottish institutions have a somewhat captive market, with over 85% of Scottish students studying in Scottish institutions (Hoare, 1991), so this would seem to be a minor problem.
A further control variable, as discussed, is the level of maintenance loan entitlement, as depicted in Figures 5.1-5.3.

In each case, the data are split by each of the three income groups which are also added as controls (with additional information on those with missing income, for whom the value of grants, loans and fees is imputed, as discussed). The average participation rate of the sample is 16.1% though participation varies considerably by income group, as seen in Figure 5.4, with only 11.4% of individuals from low income backgrounds doing a degree, versus 31.8% from high income backgrounds. The sample is evenly split between males and females, those with and without five good GCSEs and parental education types. Again it can be seen,

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and so not comparable with A-levels. For these reasons GCSE or equivalent is chosen as a more robust measure of prior attainment.

unsurprisingly, that those with high parental incomes have very highly educated parents, and vice versa.

Table 5.2 Summary Statistics (LFS, 1992-2005)[1]

		parental income				sex	
	all	low	medium	high	missing	male	female
% all sample	-	45.5	28.3	14.9	11.2	51.4	48.6
% of participants	16.1	11.4	16.7	31.8	12.9	14.4	17.9
% of non-participants	83.9	88.7	83.3	68.2	87.1	85.6	82.1
ethnicity							
white (%)	85.6	81.7	90.6	92.2	79.9	85.5	85.7
non-white	8.3	11.8	4.4	3.6	10.4	8.3	8.3
missing (%)	6.1	6.5	5.0	4.3	9.7	6.2	6.1
youth's education							
GCSES >= 5 (%)	47.3	41.5	51.5	69.5	30.6	43.5	51.3
GCSES < 5 (%)	49.6	55.4	45.9	28.8	62.8	53.1	45.8
missing (%)	3.1	3.1	2.6	1.7	6.7	3.4	2.9
parent's education[1]							
NVQ level 4 +	34.8	24.4	44.4	74.0	-	35.8	33.6
NVQ level 2 or 3	22.3	25.8	29.5	15.0	-	23.3	21.4
NVQ level <2	27.1	44.2	20.7	7.3	-	28.8	25.3
missing (%)	15.8	5.5	5.3	3.7	100.0	12.1	19.7
parental income £	22,279	6,319	27,929	57,568	-	21,906	22,719
region							
England	80.4	78.6	81.1	84.2	81.0	80.6	80.2
Scotland	9.1	8.9	9.9	8.6	8.6	9.1	9.1
Wales	5.3	5.5	5.2	4.8	5.4	5.1	5.5
Northern Ireland	5.2	7.1	3.8	2.5	4.9	5.2	5.3
sample size	24,732	11,263	6,999	3,697	2,773	12,721	12,011

[1] Sample below is all those first year eligibles, with known parental incomes or, for those living independently, but of eligibility age, imputed parental incomes

[2] This is the education level of the more educated parent.

The sample is heavily skewed towards white ethnic groups, and English youths, reflecting the UK population as a whole. As will be seen in the following chapter, small sample sizes for Scotland means limited inferences can be made on this particular group. Regional information (including unemployment rates) is also available for 16 regions of England and 2 regions of Scotland. This will be further explored in Chapter 7, but in the models that follow, regional dummies for each region are included in the explanatory variable set, as are unemployment rates.

Those youths with missing parental income tend to have the least information available on them in general – and obviously no information on their parents – though a range of information is still available for them. In general they are reflective of the sample as a whole, though they are slightly over-represented in terms of non-whites and have lower likelihood of having 5 or more GCSEs.

In the regression analysis that follows throughout this thesis, where individuals have missing information on certain covariates, dummy variables are created, with the value of 1 if the covariate is missing, and 0 otherwise, in order to include all individuals in the regressions.

5.4 Conclusions

This Chapter began with an exploration of viable datasets which could be used to explore university participation with regards to higher education funding policy. While no dataset can be described as perfect for this task, the Labour Force survey is found to be the most suitable dataset, having information on parental income for the great majority of potential university participants as well as being a suitable source of university participation information.

This dataset contains a good set of background variables on individuals in the UK including the control variables discussed in Chapters 2 and 4 which are crucial to form an understanding of participation behaviour – such as GCSE scores, to be used for prior attainment measures, essential to any analysis – as discussed, as well as parental background factors such as education.

The chapters that follow aim to explore different methodologies, such as those discussed in Chapter 4, to investigate the relationship between HE finance and participation. In Chapter 6, individual-level data is first explored, with difference-in-difference models tested, as well as the specification of a university demand equation.

Chapter 6 Using individual-level data to estimate the impact of fees and support on participation

6.1 Introduction

The aim of this chapter is to estimate the impact of upfront fees and student maintenance grants on participation in university at the age of 18-19 (the first year after the completion of secondary school), using the LFS dataset described in Chapter 5.

As discussed in Chapter 4, estimating a simple equation in which grants, fees and a set of control variables are regressed on participation may result in biased estimates if there are unobserved characteristics that are correlated with aid, fees and attendance.

However there are a number of methodologies available that can overcome this, and other problems such as measurement error, to obtain unbiased and consistent results.

The aim of this chapter, then, is to attempt to implement some of these methodologies on individual-level data, exploiting the HE policy changes occurring over the period 1992-2005 in the UK. The first part of the chapter attempts to use difference-in-difference analysis, exploiting a number of "natural experiments" that occurred over the period in question, both as a result of differing policies between countries of the UK, and as a result of differing eligibility criteria arising from Government means-testing rules.

This is followed with a time-series type approach, using OLS and Probit regression, using fees and grants, as well as a composite "upfront costs" measure as explanatory variables, with a rich set of controls. A number of specifications are tested and discussed. The Chapter concludes with a discussion of the merits of these approaches and the case for attempting a panel-level approach to overcome problems and sources of bias that still exist in these specifications.

6.2 Difference-in-Difference analysis of the HE funding policy reforms

As discussed in Chapter 4, difference-in-difference is a useful methodology to employ when a "natural experiment" occurs as a result of a policy or external event such as an increase in student grants. The analysis requires a "treatment" group – a group affected by the policy change in question, and a "control" group for whom nothing changes over the same time period.

The reforms of the past 15 years have generated four such natural experiments[43]:

i. 2000/01 – Tuition Fees Abolished – Scotland

In 1999, Scotland was granted powers of devolution. The devolved Scottish Government went on to completely abolish tuition fees at Scottish universities for the academic year 2000/01. Only Scottish students studying at Scottish universities benefited from this reform – those Scottish students choosing to study in England, for example, would still have to pay their fees, while English students studying in Scotland would similarly have to pay. In place of the fee, Scottish students would have to pay a Graduate Endowment – this would be payable only upon graduation and was set at £2289 – a much lower figure than the £1200 a year for a four year course that was previously in place.

The abolition of tuition fees affected only those responsible for paying fees – i.e. those with parental incomes above £33,000 in 2000 – or £40,000 in 2006 prices. However, those with parental incomes below £40,000 cannot serve as a control group because their circumstances were also changed by the policy in that their grants were restored the following year (see ii).

However, English, Welsh and Northern Irish students were unaffected by the policy, and continued to pay tuition fees of £1,200 per year up to 2006, so can serve as the control group to measure this policy impact – i.e. for them, nothing changed in terms of tuition fee obligations and therefore they can be used as a suitable comparison group.

[43] Again, all monetary values that follow are in 2006 prices unless otherwise stated. Note, as previously stated, all grant, loan and fee thresholds are applied to the data in current prices, by year, according to government rules. 2006 prices shown for convenience of comparison.

It is important to note at this point, that there was no incentive for non-Scottish students to study in Scotland as a means of escaping the tuition fee, since non-Scottish students were not eligible to have the fee paid on their behalf, and instead would have to pay the £1200 fee themselves, just as they would if studying in their own country.

Treatment: Abolition of tuition fees in Scotland
Treatment Group: Students with parental incomes >=£40,000 in Scotland
Control Group: Students with parental incomes >=£40,000 in England, Wales, NI

ii. 2001/02 – Grants restored – Scotland

Again, as a result of devolution, the Scottish parliament decided to restore grants – which had been abolished UK-wide in 1999 – to poor students. This policy affected low income students – those whose parental incomes were below £15,000 (£17,500 in 2006 prices) who experienced a £2150 increase in grants in 2001/02. While high income Scottish students did not experience this increase since they were not eligible for grants, they are not a suitable control group since their tuition fees were abolished the previous year, and furthermore, by virtue of being from high parental income backgrounds, their behavior may be quite different than those from low income backgrounds. However, again non-Scottish low income students should be a suitable control group since their grants were not restored.

Treatment: Grants restored in Scotland
Treatment Group: Students with parental incomes <=£17,500 in Scotland
Control Group: Students with parental incomes <=£17,500 in England, Wales, NI

Note here, that again non-Scottish students were not eligible for this newly restored grant if they studied in a Scottish institution. However, potential contamination of this experiment could occur if Scottish students chose to study in England, since such students would be eligible for the grant[44].

[44] A brief examination of UCAS data shows no apparent increase in Scottish students studying in England, or vice versa, over this time period

iii. 1999/00 – Grants Abolished – UK wide

In 1999/00, the year immediately following the introduction of tuition fees, the UK Government abolished student grants. The average pay-out had already been halved in 1998 but had nevertheless remained in place while loans and fees were introduced. By 1999/00 they were completely removed.

Grants had been given out to those with parental incomes under £14,000 (£16,000 at 1999 prices)[45] and this was the group solely affected by this reform. This group received loans but their value remained unaffected from the previous year. Tuition fees were already in place by this time for those with parental incomes over £35,000 (£40,000 at 2006 prices). This group were mostly unaffected by the removal of grants, and thus can serve as a control group. A potentially major issue here, though, is the difference between the treatment and control groups. As mentioned in Section 4.2.1, difference-in-difference analysis works best when the treatment and control groups are drawn from the same population; if the treatment and control groups are very different, and/or on different trajectories, this will invalidate the analysis. Unfortunately in this case, there is no better control group available, as the reforms affected all students in the UK[46].

Treatment: Removal of student grants in UK

Treatment Group: Students with parental incomes <=£16,000

Control Group: Students with parental incomes >= £40,000

iv. 2004/05 – Grants re-introduced – England, Wales, NI

In the run up to the introduction of top-up fees, the UK Government took the decision to re-introduce student grants, which had been abolished in 1999. This policy affected those with parental incomes equal to or below £15,000 (£16,000 at 2006 prices) who now qualified for the grant of up to £1000 (£1050 at 2006 prices)[47]. Those with incomes above £40,000 did not qualify for this new grant,

[45] Note, this is a slightly different treatment group from ii above, as grants were restored in Scotland in 2001 to a slightly different income group than those UK wide youths losing grant eligibility in 1999.

[46] Kane (2005) performs a difference-in-difference analysis similar to this one, comparing US youths from the bottom quartile of parental income groups, with youths from the top three quartiles.

[47] Again, a slightly different income reference category is used for low income students compared with ii and iii above – i.e. those for whom grants were restored in 2004/05.

and so can serve as a control group. Again it is important to note that inherent differences between the two control groups, similar to those in iii above, cast this analysis somewhat into doubt. The results are presented in the following sections.

Treatment: Re-introduction of Student Grants in England, Wales, NI
Treatment Group: Students with parental incomes <=£16,000 in England, Wales, NI
Control Group: Students with parental incomes >=£40,000 in England, Wales, NI

6.2.1 Abolition of tuition fees in Scotland

In the case of the first natural experiment (the abolition of the £1,200 tuition fee in Scotland), the "pre" cohort will be high school leavers in 2000, whose parental incomes are higher than £40,000 in 2006 prices – i.e. those paying *full* tuition fees before the reform. In the interests of maximizing available sample sizes and also since the reforms affected cohorts over a number of years, the data are pooled in the years before and after the reforms.
The "post" cohort is therefore high school leavers eligible for entry into academic years from 2000/01 – 2005/06 inclusive, with parental incomes above £40,000 (versus those from the years 1998/99-1999/00, when the full fee was in place for those of the same parental income). The group eligible for fees during the before period but not the after period – i.e. Scottish school leavers – will be the "treatment" group, and the "control" group will be all other school-leavers – i.e. those from England, Wales and Northern Ireland, and thus not affected by the tuition fee legislation.

The estimating equation will thus be:

$$\boldsymbol{P_{it} = \alpha + \beta(Scot_{it} * Post_{it}) + \delta Scot_{it} + \theta Post_{it} + v_{it}} \qquad 6.1$$

where $Scot_{it}$ is a binary variable set to 1 if the student is from Scotland and 0 if not. $Post_{it}$ is a binary variable set to 1 if a student becomes eligible for university in the academic years between 2000/01-2005/06 and set to 0 if the student

becomes eligible for university in 1998/99 or 1999/00. The estimation is restricted to those with parental income backgrounds over £40,000 p.a.

Sample means and standard errors for the treatment and control groups, before and after tuition fees were eliminated in 2000, are presented in Table 6.1.

Table 6.1: Summary Statistics: youths with high parental incomes[1]

	Academic year youth eligible for:			
	1998/99-1999/00 ("Before")		2000/01-2005/06 ("After")	
	Scotland	England, Wales, NI	Scotland	England, Wales, NI
White	99.8	97.3	99.3	94.9
	(0.001)	(0.007)	(0.006)	(0.005)
Male	50	54.3	52.8	51.6
	(0.061)	(0.020)	(0.037)	(0.011)
GCSE attainment[2]	90.3	83.9	88.6	88.2
	(0.037)	(0.015)	(0.026)	(0.008)
Parents' ed. NVQ 4+[3]	84.1	75.6	86.2	74.5
	(0.046)	(0.019)	(0.027)	(0.01)
Parents' ed. NVQ 2-3	9.5	20.4	8.0	14.6
	(0.04)	(0.017)	(0.021)	(0.01)
Parents' ed. NVQ <2	6.3	3.9	5.7	10.8
	(0.031)	(0.08)	(0.017)	(0.07)
Parental income	56,564	59,051	55,468	56,564
	(1054)	(1963)	(635)	(1054)
Grant	-	-	-	-
Fee	1,200	1,200	0	1,200
Loan	2,361	2,430	1,295	2,752
n	63	561	174	1883

[1] Missing values not included in calculated means
[2] Where 1=5 GCSEs or more, 0 = less than 5 GCSEs
[3] This is the education level of the most educated parent

As table 6.1 shows, the sample has a high proportion of highly educated students, with around 90% attaining 5 or more GCSEs. The sample also comprises those with highly educated and well-off parents. This is not surprising since the sample is restricted to those who would qualify for full fees in 2000/01.

Comparing the treatment and control groups; both Scottish and English youths in the sample appear to have quite similar characteristics before 2000, although there are slightly more whites in the Scottish sample, and parental incomes are slightly lower, though slightly better educated.

After 2000, there are few changes in characteristics of the samples, though interestingly, average real parental incomes have decreased slightly.

By definition, none of these high parental income students received any grants before or after the reforms – but Scottish students experienced a change in their tuition fee obligation from £1,200 to £0.

Two major issues are apparent in Table 6.1. Firstly, sample sizes for Scotland, particularly pre-2000 are extremely small – restricting the sample to only two years of data, for high parental income students only, seriously limits the sample size.

A further major issue can be seen by examining the maintenance loan statistics – as can be seen average loan amounts before the 2000/01 reforms were very similar for English and Scottish youths, but after the reforms, loans continue to increase for English students, whilst there is a significant drop for Scottish students. This is because the Scottish parliament decreased student maintenance loans for Scottish students at the same time as fees were abolished. The SNP Government of the time was (and still is) against increasing the debt burden of its students and was instead committed to replacing part of the loans system with grants.

"An SNP government will abolish the Graduate Endowment tuition fee and replace the expensive and discredited Student Loans system with means-tested student grants. We will remove the burden of debt repayments owed by Scottish domiciled and resident graduates"(SNP Manifesto, 2007)

This is critical for the analysis and may damage the validity of the "natural experiment" depending on youths' attitudes to loans. This will be explored in much greater detail in Chapter 7 (but see Appendix 6 for more details of the Scottish loan reforms)

Table 6.2 contains the probabilities of attending university, for the treatment and control groups, before and after tuition fees were abolished.

Table 6.2: Difference-in-differences, probability of attending university degree course (LFS) n=2681

	Scotland	England, Wales, NI	Difference
Eligible for academic yr 1998/99 - 1999/00 (%)	33.3	27.8	5.5
Eligible for academic yr 2000/01 - 2005/06 (%)	39.1	31.9	7.2
Difference	5.7	4.1	1.7[1]

[1] Note, some numbers may be subject to rounding errors

For the cohort of students in the years between 1998-1990, Scottish youths were more likely to participate in university than their English counterparts; 33% of Scottish high income youths went to university versus 28% of English youths – a difference of 5.5 percentage points. This is a widely documented difference between the two countries, with Scotland traditionally having a higher proportion of youths at university. For the cohort after the reforms in 2000, Scottish youths were still more likely to participate in university, and (following the withdrawal of tuition fees), their advantage had increased to 7.2 percentage points.

The estimated effect of eligibility for tuition fees on the probability of attending college is the difference in these two differences: 1.7 percentage points.

As discussed above, this difference-in-difference can also be calculated by estimating equation 6.1 by OLS. The results of this estimation are contained in column 1 of Table 6.3 below:

Table 6.3 Difference-in-Differences, probability of attending university degree course

	(1) Difference-in-differences	(2) Add Covariates	(3) Probit[2]
Scottish * academic yr 2000-2005	0.017	0.031	0.027
	(0.072)	(0.068)	(0.070)
academic yr 2000-2005	0.041	-0.035	0.002
	(0.022)	(0.051)	(0.033)
Scottish	0.055	-0.004	0.005
	(0.062)	(0.060)	(0.060)
male		-0.065	-0.065
		(0.017)**	(0.017)**
parental income (£'000s)		0.01	0.03
		(0.000)**	(0.000)**
white		-0.074	-0.075
		(0.043)	(0.046)
GCSE		0.271	0.343
		(0.029)**	(0.027)**
father, NVQ Level 2-3[1]		-0.042	-0.041
		(0.023)	(0.023)
father, NVQ Level <2		-0.059	-0.064
		(0.026)*	(0.026)*
mother, NVQ Level 2-3		-0.047	-0.044
		(0.023)*	(0.022)*
mother, NVQ Level <2		-0.109	-0.110
		(0.022)**	(0.020)**
unemployment rate		0.005	0.005
		(0.002)*	(0.002)*
Constant	0.278	-11,617.982	
	(0.020)**	(11,934.153)	
Year dummies	Y	Y	Y
Region dummies	N	Y	Y
Observations	2681	2681	2681
R-squared	0.00	0.13	

Standard errors in parentheses; * significant at 5%; ** significant at 1%

[1] In each case, omitted category is "parent educated to >NVQ level 4"

[2] Marginal effects of probit are presented for ease of comparison, using STATA's 'dprobit' command

The coefficients in the regression give some insight into participation in the treatment and control groups before and after the reforms. The constant shows the average participation rate of a non-Scottish student *before* the reforms – i.e. 27.8%. The "Scottish" coefficient of 5.5 shows the difference between Scottish and non-Scottish students' participation rate, again *before* the reforms (i.e. 33.3% participation in Scotland vs 27.8% in England, Wales and NI), "academic yr 2000-2005" meanwhile shows growth in non-Scottish students after the reforms – i.e. the increase in participation in England, Wales and NI was 4.1 percentage points. So, as described in Chapter 4, the difference-in-difference is calculated as

the incremental difference in participation in Scotland after the reforms (39.1%), controlling for: participation of non-Scottish students (27.8%), the difference in participation between Scottish and non-Scottish students (5.5), growth in participation in England, Wales and NI (4.1). This calculation (i.e. 39.1-27.8-5.5-4.1=1.7) gives the difference-in-difference estimator.

The difference-in-difference coefficient in this case is the coefficient on "Scottish*academic year 2000-2005". The estimate of 1.7 percentage points is not significant, indicating that tuition fees had no impact on participation rates. In fact, the model itself seems quite imprecise, due to very low sample sizes. A set of covariates as described in Chapter 5, comprising parental income, ethnicity, GCSE attainment, parental education and the regional unemployment rate is added to the model. The addition of these covariates increases the coefficient from 1.7 percentage points, to 3.1 percentage points (as shown in Column 2), but the estimator remains insignificant.

Dynarski (1999) points out that difference-in-difference estimators can be sensitive to non-linear transformations of the dependent and independent variables. The sensitivity of the specification is therefore tested using a Probit analysis – the results of this are contained in Column 3 and indicate the model is robust to a non-linear specification; the OLS and Probit marginal effects are quite similar, and again no significant effect of the treatment is found.

The results of this analysis seem to quite clearly indicate that the withdrawal of tuition fee obligations for high income students in Scotland did not significantly impact on their propensity to participate in higher education. However, there are several issues with this particular finding. Firstly, the sample sizes for the Scottish cohort are extremely limited, making statistical inference extremely problematic.

Secondly, and crucially for this analysis, the Scottish parliament significantly decreased maintenance loans for Scottish students following the abolition of tuition fees and re-introduction of maintenance grants. It is possible that the reduction in loans experienced by Scottish high income students relative to their English, Welsh and Northern Irish counterparts may have negatively impacted their propensity to attend university. This factor will be further explored later in this chapter, and also in Chapter 7; the issue of the abolition of tuition fees in

Scotland will also be returned to in Chapter 7 with a view to obtaining a richer understanding of movements in participation.

6.2.2 Re-introduction of maintenance grants in Scotland

The second "natural experiment" of interest is that which followed the abolition of tuition fees in Scotland – namely the re-introduction of maintenance grants the following year, in 2001/02. As opposed to the tuition fee reform, maintenance grants were re-introduced only for poor students, (and were entitled "Young Students Bursaries"), having been abolished as part of the UK-wide reforms in 1998/99 – 1999/00. Since the sample in question only consists of students of low parental incomes, these students will not have been affected by the abolition of fees that had just occurred in 2000.

So, in summary, Scottish students with parental incomes below £17,500 received no maintenance grants since 1999, then had a maintenance grant of up to £2150 re-instated in 2001/02, which continued beyond the end of the LFS sample period of 2005/06. The treatment group, then is Scottish students eligible for the academic years 2001/02 and beyond, where again academic years are pooled to maximise sample sizes.

English students with the same income criteria and over the same time period will again serve as the control group – these students continued to receive no maintenance grants following the 2001 reforms in Scotland, so their financial situation remained unchanged. However, these students did begin receiving grants again in 2004, so the 'after' period is restricted to up to 2003.

The estimating equation is thus becomes:

$$\boldsymbol{P_{it} = \alpha + \gamma(Scot_{it} * Post_{it}) + \zeta Scot_{it} + \eta Post_{it} + \varepsilon_{it}} \qquad 6.2$$

Where $Scot_{it}$ is a binary variable set to 1 if the student is from Scotland and 0 if not. $Post_{it}$ is a binary variable set to 1 if a student is eligible for university in the academic years between 2001/02-2003/04 and set to 0 if the student becomes eligible for university in 1999/00 or 2000/01. This equation will only be estimated for students from low income backgrounds as described above.

Sample means and standard errors for the treatment and control groups of this low-income sample, before and after grants were re-instated in 2001, are presented in Table 6.4.

As the sample in question is now comprised of low parental income students by definition, there are a number of differences in the summary statistics as compared with Table 6.1. In this case, GCSE attainment, parental education and parental incomes are all lower, with parental incomes being around £7000 in real terms. Again, the differences between Scotland and England, Wales and Northern Ireland are minimal, though Scottish students are more white and with slightly higher GCSE attainment. Comparing the periods before and after the re-instatement of grants, there is little change in the attributes of the youths in question, aside of course, from the significant increase in grants – from zero to over £2,000 for Scottish low income first year eligible students.

Table 6.4 Summary statistics, youths with low parental incomes [1]

	Academic year youth eligible for:			
	1999/00-2000/01 ("Before")		2001/02-2003/04 ("After")	
	Scotland	England, Wales, NI	Scotland	England, Wales, NI
White	98.1	86.2	96.3	84.2
	(0.011)	(.009)	(0.012)	(.007)
Male	57.7	53	48.7	55.3
	(0.037)	(0.012)	(0.032)	(0.010)
GCSE attainment[2]	79.8	70.4	74.4	70.4
	(0.034)	(0.013)	(0.033)	(0.011)
Parents' ed. NVQ 4+[3]	33.5	27.0	32.6	26.1
	(0.045)	(0.011)	(0.031)	(0.008)
Parents' ed. NVQ 2-3	27.7	29.0	25.2	22.4
	(0.031)	(0.012)	(0.031)	(0.007)
Parents' ed. NVQ <2	38.7	43.9	42.1	51.4
	(0.037)	(0.012)	(0.031)	(0.008)
Parental income £	6,977	6,903	6,719	7,014
	(569)	(267)	(521)	(210)
grant	-	-	2,150	-
fee	-	-	-	-
loan	3,475	3,492	1,959	3,491
n	182	1683	232	2450

[1] Missing values not included in calculated means
[2] Where 1=5 GCSEs or more, 0 = less than 5 GCSEs
[3] This is the education level of the most educated parent

However, as in Section 6.2.1, the estimation suffers from the same problems of extremely low sample sizes for Scotland (although improved slightly due to the use of the more prevalent low income sample) and crucially again, the significant

reduction in student loans received by low income students between the time periods in question. Again, a major concern is that this negative change in upfront support of poor students will counteract the potentially positive effect of the re-instatement of grants, and will make distinguishing the impact of grants and loans impossible.

With this in mind, Tables 6.5 and 6.6 show the changes in mean participation for the treatment and control groups before and after the reform, and by LPM regression.

In this case, the re-introduction of grants appears to actually have had a negative impact – participation of low income students in Scotland appears to have decreased between the periods before and after the re-introduction of grants, while participation in England over the same period rose by a small amount.

However, the difference-in-difference estimate of -2.3 percentage points is not significant, so drawing any kind of conclusion, other than that of "no change" is ill-advised, particularly in the light of the change in student loans experienced by students in the treatment group.

Table 6.5: Difference-in-differences, probability of attending university degree course (LFS) n=4547

	Scotland	England, Wales, NI	Difference
Eligible for academic yr 1999/00 - 2000/01 (%)	12.1	13.3	-1.2
Eligible for academic yr 2001/02 – 2003/04 (%)	10.3	13.8	-3.5
Difference	-1.7	0.5	-2.3

The results obtained in these two sections are far from persuasive. As stated, the small sample sizes for the treatment groups are an issue, but more importantly the experiment may not be "clean" as a result of changes to loan legislation in Scotland over the periods studied.

This issue will be returned to in Section 6.3.2. where separate impacts of grants and fees will be obtained.

This chapter now turns to examine the further two "natural experiments" occurring in the UK over the last two decades – this time with cleaner policy changes – but unfortunately, as will be discussed, less suitable control groups.

Table 6.6: Difference-in-differences, probability of attending university degree course

	(1) Difference-in-difference	(2) Add Covariates	(3) Probit[2]
Scottish * academic yr 2001-2003	-0.023	-0.023	-0.014
	(0.035)	(0.033)	(0.021)
Academic yr 2001-2003	0.005	0.011	0.013
	(0.011)	(0.023)	(0.014)
Scottish	-0.012	-0.024	-0.015
	(0.027)	(0.025)	(0.016)
Male		-0.020	-0.017
		(0.010)*	(0.007)*
parental income (£000s)		0.001	.002
		(0.000)	(0.003)
white		-0.077	-0.069
		(0.015)**	(0.015)**
GCSE		0.200	0.172
		(0.013)**	(0.016)**
father, NVQ Level 2-3[1]		-0.045	-0.020
		(0.015)**	(0.009)*
father, NVQ Level <2		-0.062	-0.042
		(0.013)**	(0.009)**
mother, NVQ Level 2-3		-0.081	-0.032
		(0.020)**	(0.009)**
mother, NVQ Level <2		-0.088	-0.042
		(0.017)**	(0.010)**
unemployment rate		0.001	0.001
		(0.001)	(0.001)
Year dummies	0.133	-6,581.004	
Constant	(0.008)**	(13,394.716)	
	4547	4547	4547
Observations	0.00	0.14	
R-squared	-0.023	-0.023	-0.014

Standard errors in parentheses; * significant at 5%; ** significant at 1%
[1] In each case, omitted category is "parent educated to >NVQ level 4"
2 Marginal effects of probit are presented for ease of comparison, using STATA's 'dprobit' command

6.2.3 Grants abolished UK-wide in 1999

This policy change affected all constituent countries of the UK. To summarize, low income students – those with parental incomes of less than £16,000 in 1989/99 received a "full grant" of just over £900. This maintenance grant had already been reduced significantly throughout the 1990s and had been halved from the previous year.

The following academic year, in 1999/00, this grant was completely abolished for all UK students - though as discussed above, Scottish students had their grants restored in academic year 2001/02. Because of this, Scottish students are excluded

from the following analysis. As tuition fees were already in place in 1998/99 for high income students, and these students were unaffected by the abolition of grants since their parental incomes precluded them from being eligible, these students are used as the control group.

Thus, the treatment group is English, Welsh and Northern Irish students with incomes below £16,000; these students lost £900 in grants in 1999. The control group comprises English, Welsh and Northern Irish students with incomes above £40,000 in 1989/99 – for whom nothing changed. Note, "medium income" students cannot be used in this analysis, since they received (and therefore lost) a partial grant at the time of the reforms, and became eligible for a partial fee during the analysis period. Note also, that the period of estimation may only go up to 2003/04, since in 2004/05 grants were restored (see iv). Again, it is important to point out that this is not an ideal natural experiment, since the treatment and control groups are obviously quite different in nature (for example, they are unlikely to have the same time trends), by virtue of being from different income groups.

So the estimating equation is now:

$$\boldsymbol{P_{it} = \alpha + \lambda(FullGrant_{it} * Post_{it}) + \mu Post_{it} + \pi FullGrant_{it} + \omega_{it}} \quad 6.3$$

Where $FullGrant_{it}$ is a binary variable set to 1 if the student is received a full grant in 1998/99 – i.e. had parental income below £16,000, and 0 if the student received no grant (and full fees) in 1998/99 – i.e. their parental income was above £40,000.

$Post_{it}$ is a binary variable set to 1 if a student becomes eligible for university in the academic years between 1999/00-2003/04 and set to 0 if the student becomes eligible for university in 1998/99 – the only year in which treatment students received a full grant and control students had tuition fees in place. This equation will only be estimated for students from England, Wales and Northern Ireland.

Below in Table 6.7 are sample means and standard errors for the treatment and control groups, before and after grants were abolished in 1999.

A concerning feature of table 6.7 is the differences in the covariates between the control and treatment groups. As the control group comprise low income students – those who received a full grant in 1998/99, they have fewer GCSEs, less educated parents, and obviously, poorer parents.

The "full grant" group also contains more ethnic minorities, reflecting the relative lower incomes of this group. Thus, as discussed, the treatment and control groups in this particular exercise are quite different, compared to the relative similarity of Scottish versus non-Scottish students in the first two examples. The differences described in Table 6.7 are obviously controlled for – though any other differences between the two groups will not be. Nevertheless, this exercise has advantage over those used in the previous two difference-in-difference estimators – firstly there are relatively few issues with sample size since Scotland is not being used as a control group, and secondly, maintenance loans are relatively stable for the two groups meaning the experiment is not polluted with changes in financial circumstance. Furthermore, the abolition of grants in England, Wales and Northern Ireland was a major policy shift and so warrants some sort of investigation.

Table 6.7 Summary statistics, youths from England, Wales and Northern Ireland [1]

	Academic year youth eligible for:			
	1998/99		1999/00 – 2003/04	
	Full grant	No grant	Full grant	no grant
white	87.4	96.1	84.7	95.2
	(0.012)	(.012)	(0.005)	(.005)
male	54.9	55	54.5	51.9
	(0.018)	(0.031)	(0.07)	(0.013)
GCSE attainment[2]	68.6	83.4	70.3	88.3
	(0.020)	(0.024)	(0.008)	(0.009)
Parents' ed. NVQ 4+[3]	26.9	75.0	26.2	76.3
	(0.016)	(0.269)	(0.007)	(0.011)
Parents' ed. NVQ 2-3	26.8	20.7	24.5	13.7
	(0.017)	(0.025)	(0.007)	(0.009)
Parents' ed. NVQ <2	46.0	4.0	49.1	9.8
	(0.018)	(0.012)	(0.008)	(0.008)
parental income £	6,179	55,575	6,566	58,184
	(422)	(1337)	(164)	(737)
grant	917	-	-	-
fee	-	1,200	-	1,200
loan	2,849	2,173	3,491	2,714
n	759	262	4005	1387

[1] Missing values not included in calculated means
[2] Where 1=5 GCSEs or more, 0 = less than 5 GCSEs
[3] Where 1=NVQ level 4 or more, 2=NVQ level 2-3, 3=NVQ level <2

Table 6.8 and 6.9 show the difference-in-difference estimators for this experiment, both non-parametrically and by OLS and Probit regression:

Table 6.8 Difference-in-difference, probability of attending university degree course (LFS) n=6413

	Full Grant	No Grant	Difference
Eligible for academic year 1998/99 (%)	9.2	25.2	-16.0
Eligible for academic yr 1999/00 – 2003/04 (%)	13.4	32.5	-19.1
Difference	4.2	7.33	-3.11

Table 6.9 Difference-in-difference, probability of attending a university degree course

	(1) Difference-in-differences	(2) Add covariates	(3) Probit
Full grant* academic yr 1999	-0.031	-0.026	0.007
	(0.029)	(0.027)	(0.021)
academic yr 1999	0.073	0.037	0.030
	(0.025)**	(0.033)	(0.015)
full grant	-0.160	0.011	-0.016
	(0.027)**	(0.028)	(0.023)
male		-0.027	-0.022
		(0.009)**	(0.007)**
parental income (£000s)		0.004	0.001
		(0.011)	(0.009)
white		-0.069	-0.072
		(0.015)**	(0.015)**
GCSE		0.217	0.204
		(0.012)**	(0.014)**
father, NVQ Level 2-3		-0.049	-0.026
		(0.013)**	(0.009)**
father, NVQ Level <2		-0.059	-0.046
		(0.012)**	(0.009)**
mother, NVQ Level 2-3		-0.061	-0.026
		(0.015)**	(0.009)**
mother, NVQ Level <2		-0.088	-0.051
		(0.014)**	(0.009)**
unemployment rate		0.002	0.002
		(0.001)	(0.001)
Constant	0.252	-12,167.614	
	(0.023)**	(11,541.406)	
Year dummies	Y	Y	Y
Region dummies	N	Y	Y
Observations	6413	6413	6413
R-squared	0.05	0.17	

Standard errors in parentheses; * significant at 5%; ** significant at 1%
[1] In each case, omitted category is "parent educated to >NVQ level 4"
2 Marginal effects of probit are presented for ease of comparison, using STATA's 'dprobit' command

Here, the abolition of grants in England, Wales and Northern Ireland appears to have no impact, since the sign on the difference-in-difference estimator "Full grant * academic year 1999" is insignificant.

Again a set of covariates (which now include a set of regional dummies – this was not possible in the regressions involving Scotland, which has only 1 region) is included, and the model is also estimated using a probit model.

A number of issues must be noted: Firstly, a potential issue is that – although nothing changed in terms of fee obligation between the before and after time periods for the control group, tuition fees had just been implemented for this group in 1998/99. This could have potentially slowed growth for this group. Ideally the experiment would take place a number of years after the implementation of fees, to be sure this did not pollute the experiment.

Secondly, the sample sizes of the control group, although larger than in the previous two experiments considered, are still quite small, as reflected in Figure 6.1 below, which shows the average participation by year for each group, with standard errors.

Thirdly, the "before" period comprises only 1 year of data, which again reduces the sample sizes of the experiment.

Finally, the loss of £900 maintenance grants experienced by the treatment group, while substantial, was far less than had been previously lost by this group over the course of the 1990s. As illustrated in Figure 5.1, grants had been eroded all throughout the 1990s – having peaked at almost £3,000 in 1992 in real terms, to reach just below £2,000 in 1997, before halving in 1998. Thus, low income groups may simply have become "used" to this erosion of grants.

Figure 6.1 Treatment and control groups: grants abolished in 1999/00

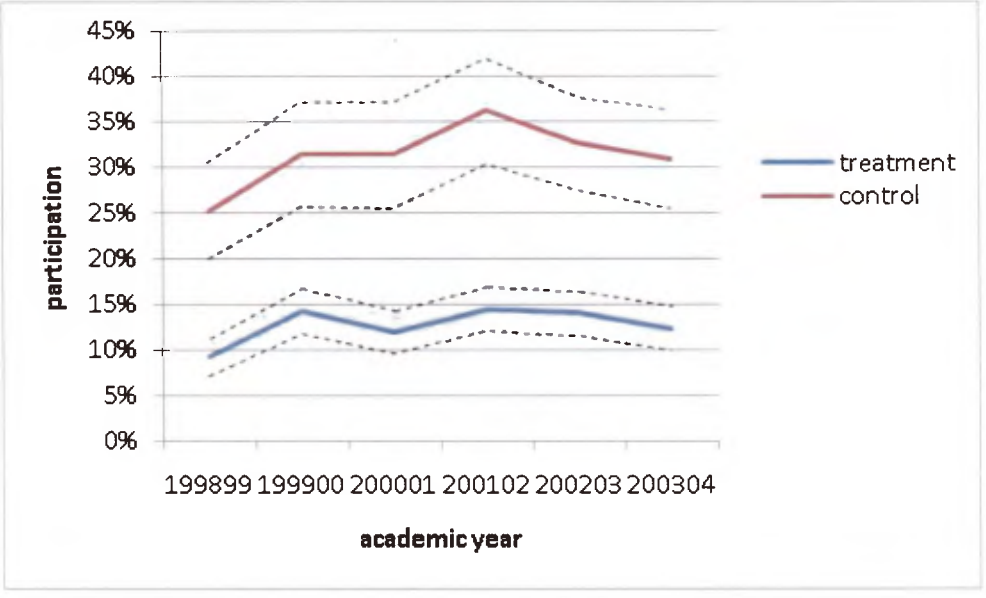


Figure 6.2 Difference-in-difference, low income vs high income groups before and after 1999 maintenance grant abolition, n=6413

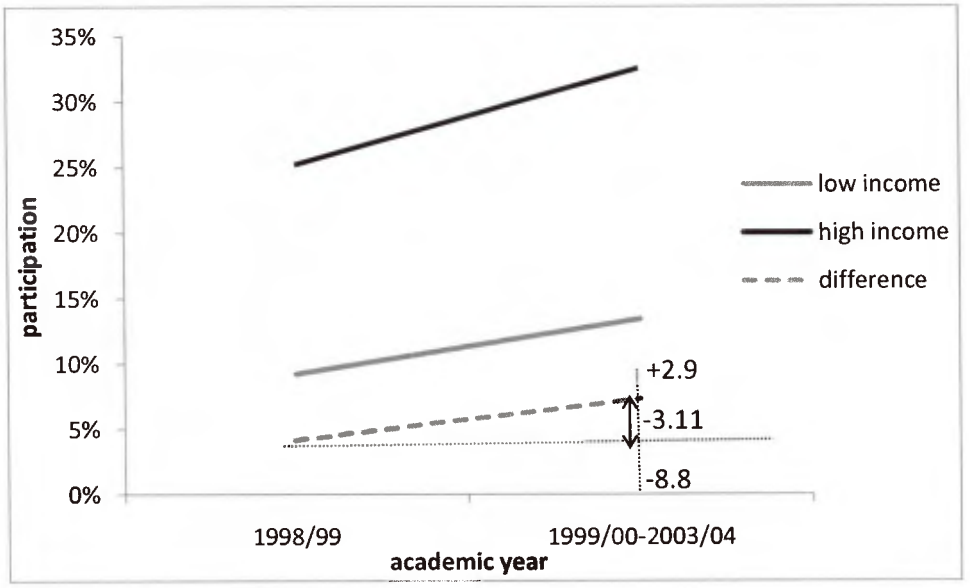


Figure 6.2 illustrates the difference-in-difference in this case. Average participation for high income students between 1998/99 and 1999/00-2003/04 can be seen in the black solid line, rising from 25.2% to 32.5%, and average participation over the same time period for low income groups is the grey line, rising from 9.2% to 13.4%. The dashed line illustrates the difference between the two groups – 4.2 percentage points in 1998/99 and 7.3 percentage points in 1999/00-2003/04. Thus, the difference-in-difference is described by the difference of these two points on the dashed line; -3.11. But, as the dotted line illustrates, the confidence interval of the difference-in-difference estimator is quite wide, with the range between +2.9 percentage points and -8.8 percentage points – indicating that there is no statistically significant difference between the change in the treatment and control groups.

6.2.4 Grants restored in England, Wales and Northern Ireland, 2004

The final "natural experiment" this thesis considers is that of the restoration of maintenance grants in 2004 for non-Scottish students. This is perhaps the cleanest and most robust of the experiments available over the time period in question. Again the experiment concerns youths of different parental income groups.

In summary: from the years 1999/00 – 2003/04 low income students (those of parental income less than £16,000 in 2004) received no grants. In 2004 these students had grants of £1050 restored to them (again it is preferable to deal only with students qualifying for the full grant rather than include those with tapered grants which would confuse matters). Over the same period of time, high income students (parental incomes above £40,000) experienced no change in financial circumstances, tuition fees having been in place since 1998/99 and grant entitlement being zero in all years for this group. Thus, high income students are used as the control group, with the treatment being the re-instatement of grants for low income students in 2004, as equation 6.5 illustrates.

$$\boldsymbol{P_{it} = \alpha + \rho(FullGrant_{it} * Post_{it}) + \phi Post_{it} + \psi FullGrant_{it} + \tau_{it}} \quad 6.4$$

Where $FullGrant_{it}$ is a binary variable set to 1 if the student's parental income is low enough to receive a full grant in 2004/05 (less than £16,000) and 0 if the student's parental income precludes them from being eligible for a grant after 2004.[48] $Post_{it}$ is a binary variable set to 1 if a student becomes eligible for university in the academic year 2004/05 or 2005/06 and set to 0 if the student becomes eligible for university between 1999/00 and 2003/04. Again, this equation will only be estimated for students from England, Wales and Northern Ireland due to changes in grant and fee eligibility in Scotland in 2000/01 – 2001/02.

Below in Table 6.7 are sample means and standard errors for the treatment and control groups, before and after grants were restored in 2004/05. Again the issue of inherent differences in the control and treatment groups is apparent; the control group, being of higher parental income, have better GCSE scores, are more white, and have better educated parents.

The experiment is illustrated by the change in grants in the "after" time period versus the "before" time period – an increase from zero to £1050 for the treated

[48] Note, in this instance it is not possible to include "medium income" students as part of the control group as they did not experience any change in grants after 2004 – grants were only re-introduced to the very poorest students. However, students of this income level received partial grants prior to 1999 and so for reasons of consistency these students are excluded.

group. Helpfully, again the loan eligibility amount for the two groups remains relatively stable over time.

Table 6.10 Summary statistics, youths from England, Wales and Northern Ireland [1]

	Academic year youth eligible for:			
	1999/00 - 2003/04		2004/05 - 2005/06	
	Full grant	No grant	Full grant	No grant
White	84.3	95.2	86.1	94.7
	(0.006)	(0.005)	(0.009)	(.007)
Male	54.4	51.9	53.6	52.9
	(0.008)	(0.013)	(0.013)	(0.021)
GCSE attainment[2]	70.3	88.2	71.9	88.7
	(0.008)	(0.009)	(0.017)	(0.016)
Parents' ed. NVQ 4+[3]	25.6	75.8	29.7	77.6
	(0.007)	(0.113)	(0.012)	(0.017)
Parents' ed. NVQ 2-3	24.3	14.2	23.3	14.7
	(0.007)	(0.009)	(0.011)	(0.014)
Parents' ed. NVQ <2	50.1	10.1	46.9	7.6
	(0.008)	(0.007)	(0.014)	(0.012)
parental income £	5,860	57,658	6,274	55,924
	(166)	(718)	(316)	(1331)
Grant	-	-	-	-
Fee	-	1,200	1,050	1,200
Loan	3,490	2,718	3,464	2,734
N	3764	1433	1287	565

[1] Missing values not included in calculated means
[2] Where 1=5 GCSEs or more, 0 = less than 5 GCSEs
[3] Of the most educated parent, where 1=NVQ level 4 or more, 2=NVQ level 2-3, 3=NVQ level <2

Again, difference-in-differences are calculated in Table 6.11 below, and by OLS and Probit regression, including a number of covariates, in Table 6.11.

Table 6.11 Difference-in-difference, probability of attending university degree course (LFS) n=7049

	Full Grant	No Grant	Difference
Eligible for academic year 1999/00 – 2003/04	13.2	32.2	-19.1
Eligible for academic year 2004/05-2005/06	13.9	33.3	-19.4
Difference	0.7	1.0	-0.3

Table 6.11 describes the difference-in-difference in this case; participation of students with low incomes increased by 0.7 percentage points after the restoration of grants, versus an increase of 1 percentage point for those with high incomes. This renders a difference-in-difference estimator of -0.3.

Table 6.12 contains OLS and Probit estimators. Again, the difference-in-difference estimator is not found to be significantly different from zero, implying no significant increase in participation as a result of the re-instatement of £1050 maintenance grant.

Table 6.12 Difference-in-difference, probability of attending university degree course

	(1)	(2)	(3)	(4)
	difference-in-difference	Add covariates	Probit	Add time-varying covariates
full grant* academic yr2004	-0.003	-0.014	-0.003	-0.017
	(0.023)	(0.021)	(0.017)	(0.035)
academic yr 2004	0.010	0.005	0.014	-0.023
	(0.019)	(0.029)	(0.018)	(0.067)
full grant	-0.191	-0.031	-0.030	-0.030
	(0.012)**	(0.017)	(0.014)*	(0.019)
male		-0.027	-0.023	-0.026
		(0.009)**	(0.007)**	(0.009)**
parental income (£000s)		0.001	0.002	0.001
		(0.000)**	(0.001)*	(0.000)**
white		-0.076	-0.079	-0.076
		(0.016)**	(0.017)**	(0.018)**
GCSE		0.214	0.220	0.227
		(0.013)**	(0.015)**	(0.014)**
father, NVQ Level 2-3[1]		-0.062	-0.036	-0.057
		(0.013)**	(0.009)**	(0.015)**
father, NVQ Level <2		-0.070	-0.057	-0.059
		(0.012)**	(0.010)**	(0.014)**
mother, NVQ Level 2-3		-0.057	-0.029	-0.050
		(0.015)**	(0.010)**	(0.018)**
father, NVQ Level <2		-0.072	-0.045	-0.077
		(0.013)**	(0.010)**	(0.016)**
unemployment rate		0.015	0.010	0.015
		(0.006)*	(0.005)*	(0.006)**
parental income * 2004				0.000
				(0.000)
White * 2004				0.001
				(0.033)
GCSE * 2004				-0.075
				(0.033)*
father, NVQ < 2 * Yr2004[1]				-0.020
				(0.029)
father, NVQ 3-4 * Yr2004				-0.039
				(0.026)
mother, NVQ < 2 * Yr2004				-0.022
				(0.034)
mother, NVQ 3-4 * Yr2004				0.023
				(0.030)
Constant	0.322	8,269.788		4,971.645
	(0.010)**	(7,758.261)		(7,866.507)
Year dummies	Y	Y	Y	Y
Region dummies	N	Y	Y	Y
Observations	7049	7049	7049	7049
R-squared	0.05	0.16		0.17

Standard errors in parentheses; * significant at 5%; ** significant at 1%

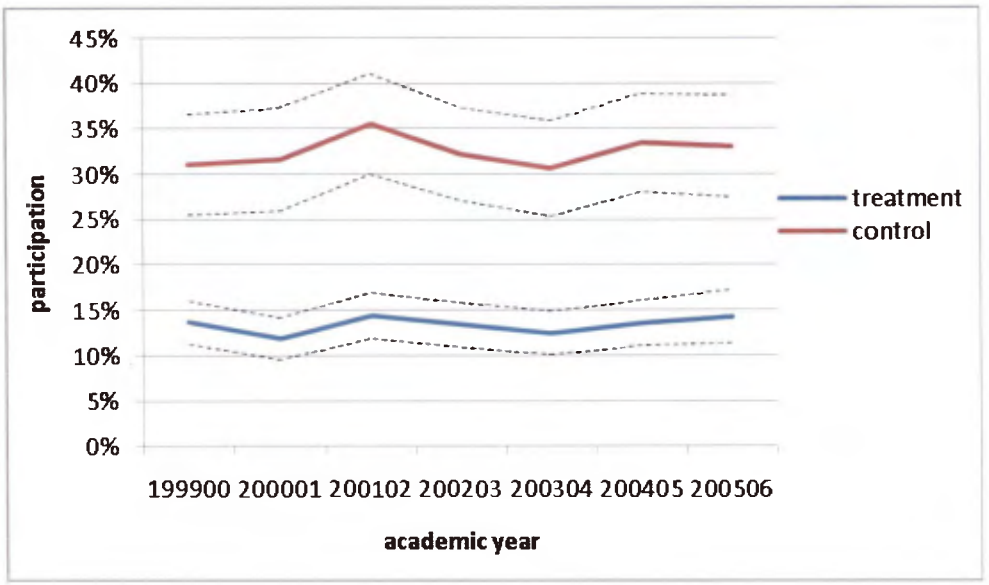
[1] In each case, omitted category is "parent educated to >NVQ level 4"

2 Marginal effects of probit are presented for ease of comparison, using STATA's 'dprobit' command

As can be seen in Table 6.12, as well as estimating the regression with covariates and as a Probit, time-varying covariates are added in column (4). The reasoning behind this is as follows: the relationship between the set of explanatory variables and university participation may have changed after 2004. For example, GCSE attainment has a strong positive effect on participation, as can be seen in column (2). However, after the re-introduction of grants in 2004 GCSE may have a lesser effect on participation. Indeed, this seems to be the case – the coefficient on GCSE*2004 is one of the few significant time varying covariates.

But, while the addition of time-varying covariates has a small impact on the "difference-in-difference" coefficient, it remains insignificant. Again, this is illustrated in Figure 6.3 below.

Figure 6.3 Treatment and control groups: grants restored in 2004/05



It is clear from Figure 6.3 that the increase in participation of the treated group after the treatment in 2004/05 is not substantial, indicating an increase of £1,050 in maintenance grants has no impact on participation.

However, the large difference in participation in the treatment and control groups must be taken into consideration. While the overall increase in participation before and after the reforms for the low-income treatment group is just 0.7 percentage points compared with 1 percentage point for the high-income control

group, the low-income participation rate was only 13.2% to begin with, versus 32% for high-income students, so in relative terms this increase is substantially larger. To clarify, low-income students' participation rate was 13.2% pre-reform, then rose to 13.9% after the reforms. This represents a 5.5% increase. This compares with a 3.2% increase in participation for the high income control groups after the reform.

Table 6.13 illustrates:

Table 6.13 Difference-in-difference

	Full Grant	No Grant	Difference
Eligible for academic yr 1999/00 – 2003/04 (%)	13.2	32.2	-19.1
Eligible for academic year 2004/05-2005/06 (%)	13.9	33.3	-19.4
Difference	0.7	1.0	-0.3
Difference (%)	5.5	3.2	2.3

Unfortunately it is not possible to test the statistical significance of the 2.3% difference-in-difference estimator calculated in this way (other than by bootstrapping). But it does suggest that there may be a significant positive effect of maintenance grants.

Of course, this exercise could also be carried out for the abolition of fees in section 6.2.3, but given the many other associated issues with that particular scenario, and the unavailability of standard errors to verify significance, this analysis is not carried out.

6.2.5 Summary of Difference-in-Difference approach

So far, this chapter has used difference-in-difference analysis to estimate the impact of higher education funding policy changes on university participation. The results of this analysis are inconclusive for a number of reasons:

1) The sample sizes for the treatment and control groups are quite small on a number of occasions, increasing variability in the data and reducing precision in the estimates.

2) Some of the experiments, particularly those comparing Scottish and English youths are not "clean" in that student maintenance loan amounts were also changing at the time of the reforms. This may have impacted participation at the same time as the reforms.

3) The control and treatment groups are different. Ideally, an experiment would use control and treatment groups that are as similar as possible before the treatment. This is not possible for the purpose of this analysis and instead suitable control groups must be found in other countries and in individuals of different income levels. While much of the differences may be controlled for, as described in 6.2.4, this could reduce the chance of finding a significant effect. More generally, a potential problem with the difference-in-difference methodology is that it cannot account for different prior trajectories of the two groups. A common way of dealing with such an issue is to carry out a "placebo test" – i.e. carry out the analysis in a year prior to the year of the policy change (Bertrand, Duflo, and Mullainathan, 2004). If a similar significant effect is found this suggests the treatment and control groups are different in ways that are not being controlled for and the experiment may be invalid. Since no significant effect is found in any of these experiments the placebo test is not appropriate in this instance.

4) Using this type of methodology – particularly where more than one reform happened simultaneously, and affected different income groups in different ways, such as the changes occurring in 1998/99 – 1999/00, does not offer any insight into the separate impact of tuition fees and grants on participation.

Since the aim of this thesis is to estimate the impact of fees and aid, it is desirable to "unpack" the reforms – i.e. gain some understanding of the separate impact of grants and fees on participation. This is where the thesis turns to next.

6.3 Time-series regression analysis of individual-level data

In this section, the aim is to use the LFS data described in Chapter 5 to estimate a model of participation with respect to grants and fees and a rich set of controls;

being mindful of the issues of measurement error and unobserved heterogeneity described previously.

In the analysis that follows, the sample is restricted to youths in England, Wales and Northern Ireland since as previously mentioned Scotland experienced a significant departure from UK policy in 2000, and as part of this, introduced a endowment of £2289 per student, to be paid upon graduation. This renders the Scottish system somewhat different to the English system, with no comparable series in the rest of the UK. Thus, the total sample size, including those living away from home and not in halls of residence for whom parental income is imputed, but excluding those with missing parental income for other reasons, is 22,486 youths of age 18-19.

Table 6.14 provides summary statistics and sample means for these individual level data, again split by each of the three income groups (with additional information on those with missing income, for whom the value of grants, loans and fees is imputed, as discussed in Chapter 5). The average participation rate of the sample of English, Welsh and Northern Irish students is 15.9% though participation varies considerably by income group, with only 11.4% of individuals from low income backgrounds doing a degree, versus 31% from high income backgrounds. The sample is evenly split between males and females, those with and without five good GCSEs and parental education types.

Table 6.14: Summary Statistics, English, Welsh and NI university eligible youths (LFS)

		parental income:				sex:	
	all	low	medium	high	missing	male	female
% all sample	-	45.6	28.1	15.0	11.3	51.4	48.6
% of participants	15.9	11.4	16.6	31.0	12.9	14.1	17.9
% of non-participants	83.9	88.7	83.3	68.2	87.1	85.9	82.2
ethnicity							
white (%)	84.8	80.6	90.0	92.0	79.2	84.8	84.8
non-white (%)	8.5	12.7	4.8	3.9	10.9	9.0	9.0
missing (%)	6.7	6.7	5.2	4.1	9.9	6.3	6.2
youth's education							
GCSEs >=5 (%)	46.9	41.2	51.1	69.2	30.0	43.2	50.9
GCSES < 5 (%)	49.9	55.7	46.3	29.1	63.7	53.4	47.6
missing (%)	3.2	3.1	2.6	1.7	6.4	3.4	1.5
parent's education [1]							
NVQ level 4 +(%)	34.2	24.0	43.7	73.1	-	35.2	33.1
NVQ level 2 or 3(%)	22.4	25.8	29.6	15.7	-	23.3	21.5
NVQ level <2(%)	27.6	44.7	21.6	7.5	-	29.5	25.7
missing (%)	15.8	5.5	5.1	3.7	100	12.0	19.8
parental inc £	22,227	6,315	27,914	57,449	-	21,872	22,649
region							
England (%)	88.4	86.2	90.0	92.1	88.8	88.7	88.2
Scotland (%)	-	-	-	-	-	-	-
Wales (%)	5.8	6.0	5.8	5.2	5.9	5.7	6.0
Northern Ireland (%)	5.8	7.8	4.2	2.7	5.3	5.7	5.8
sample size	22,486	10,264	6,308	3,380	2,534	11,567	10,919

[1] this is the education level of the most educated parent

Again, those youths from low income backgrounds tend to have poorer GCSE attainment (41% achieved 5 good GCSEs versus 69% from high income backgrounds) and less educated parents (24% of low income parents are educated to NVQ level 4 or above, versus 73% of high income parents). Due to the exclusion of Scotland, regions are heavily biased towards England.

The models that follow use variation in participation over time, and between the income groups described in Chapter 5, to identify the effects of grants and fees on participation – in other words, changes in HE funding policy over time and across different income groups due to means testing (illustrated in Figures 5.1-5.3), brings about variation in individuals fee and grant eligibility, which can be exploited to identify the individual impact on participation.

The equation of interest is therefore:

$$P_{it} = \alpha + \beta_1 F_{it} + \beta_2 G_{it} + \beta_3 L_{it} + \gamma X_{it} + \rho_r + \tau_t + u_{it} \quad 6.5$$

Where P_{it} is a binary variable with the value of 1 if individual *i* attends university in year *t* and zero otherwise; F_{it}, G_{it} and L_{it} measure the level of up-front fees payable and grants and loans eligible for, for individual *i*, in time *t* ; X_{it} are all the other characteristics that determine university education of individual *i* at time *t*, including parental education, whether students come from a low (LOW), medium (MED) or high (HIGH) income family (based on the estimate of family income when they were 17-18 previously described), academic outcomes at age 16, ethnicity, regional unemployment rate, gender and family income at age 18-19. Common regional effects (ρ_r) and time effects (τ_t) are also included, in the case of the latter (τ_t) by including a quadratic time trend interacted by family income group at the age of 17-18. That is:

$$\tau_t = (\delta_1 + \delta_2 * MED_i + \delta_3 * HIGH_i) * t + (\delta_4 + \delta_5 * MED_i + \delta_6 * HIGHi*t2 \quad 6.6$$

In the sections that follow, a number of approaches are adopted to attempt to estimate equations based on equation 6.5, firstly using a composite "upfront costs" variable, then modeling the separate effects of grants and fees on individual participation, before moving on to panel-level specifications in Chapter 7.

6.3.1 The impact of net upfront costs on participation

The first specification attempts to examine how *upfront costs* affect the probability that a given youth will attend a university degree program. This strategy follows the work of McPherson and Shapiro (1999), and Kane (1995) (see Chapter 3), who calculate net upfront costs for each individual as (tuition fees – grants – loans[49]), giving an overall measure of how financial obligation at the point of entry to university may affect participation. Note, though students

[49] In Kane (2005) loans are excluded from the analysis altogether, so upfront costs is defined as fees-grants

also face other costs, such as rent, food costs, etc, these are not included in the net costs calculation since all youths, student or otherwise would have to face these costs[50]. The advantage of using this measure is that this variable expresses an overall upfront obligation and therefore measures how upfront costs faced at point of entry to university impact a youths decision to participate (because loans are treated purely as an upfront benefit in the same way as grants – future debt is assumed to have no impact on the decision – this means youths reaction purely to the benefit they will receive upfront is being captured). Effectively we assume all youths have a zero future discount rate – in practise this is plausible, since government loans of the type discussed here are heavily insured in that they are only repayable once the individual is earning over a certain amount, and only a small percentage of income must be repaid each month. These loans are therefore very different to other debt such as credit card debt.)

Hence the starting point is thus:

$$\boldsymbol{P_{it} = \alpha + \delta_1 NC_{it} + \theta X_{it} + \rho_r + \tau_t + u_{it}} \qquad 6.7$$

Where NC_{it} is the net upfront cost for each individual based on his or her fee, loan and grant obligations as described above[51]. All other variables are as described in Section 6.3.

Figures 6.4 – 6.6 illustrate the net cost series for low, medium and high income students.

[50]Students in the UK were previously eligible for housing benefit, but this was abolished in 1990

[51] Of course, this variable could also be constructed as net upfront benefits – the money a student has available to him/her to live on during each year at university. This would instead be calculated as (grants + loans – tuition fees) and would give identical results, but with the opposite sign. However in the interests of comparison with existing literature, the "net costs" approach is used in the following section.

Figure 6.4 Net upfront costs (fees – loans – grants), low income students (LFS) n=10,264

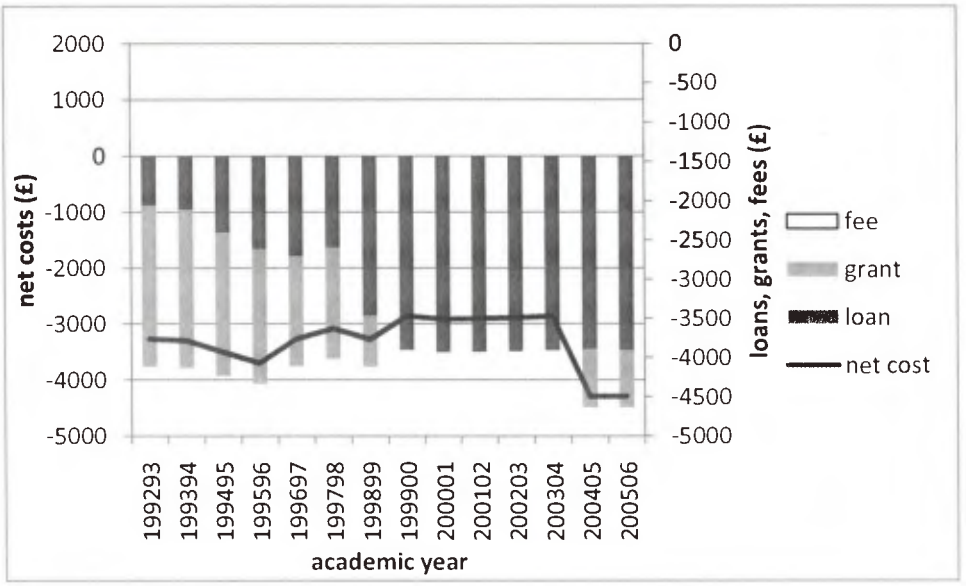


Figure 6.5 Net upfront costs (fees – loans – grants), medium income students (LFS) n=6,308

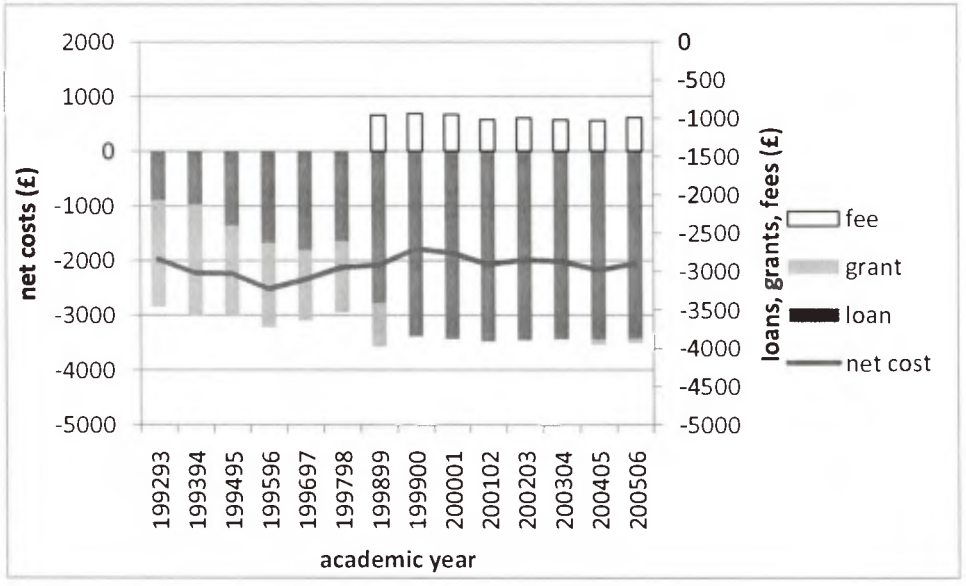
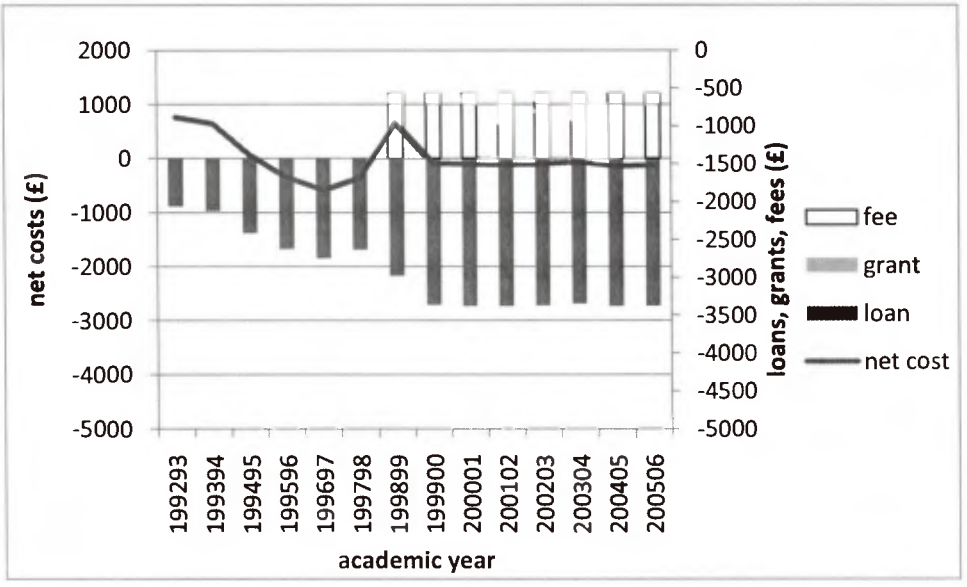


Figure 6.6 Net costs (fees – loans – grants), medium income students (LFS) n=3,380



Low income students, understandably, have the lowest net upfront costs. (In fact, in each year since 1992 they have negative net costs – i.e. they receive more than they must pay out). As can be seen in Figure 6.4, in 1992, their net costs are around -£3,700 – i.e. they have £3,700 per year to spend on maintenance if they take out their full loan and accept all their grant eligibility. This contrasts with high income students, whose net costs are around -£800 – i.e. they have only £800 leftover per year, comprising wholly of a maintenance loan.

Over the course of the 1990s, low income students experience a slight increase in net upfront costs – falls in grants are not quite made up for by increases in loans. A sharp decrease in net costs is apparent in 2004, though, when grants are restored. By contrast, high income students experience falling costs throughout the 1990s as loans are steadily increased, until 1998, when fees are increased and there is a sharp increase in net costs as a result (rising from around -£2000 to around -£1500 after the increase in fees). Note the spike in net costs in 1998 which comes about because of the loan amount set by the DfES in this year, which was significantly higher than in previous years – but significantly lower than in subsequent years (see Appendix 6 for maximum loan rates for the years above).

The starting point is to estimate model 6.7 using OLS[52]. As previously mentioned the dependent variable is a binary variable, hence the model is also estimated using Probit analysis, and the two are compared in Table 6.15. In Column 1 are the OLS estimates, while the Probit estimates are in Column 2 along with standard errors (in the case of the Probit model the marginal effects are reported – i.e. the impact of a one unit change in the explanatory variables).

The OLS and Probit estimates are quite similar. In both cases, net upfront costs are expressed in £1000's (£2006), so the coefficient on each shows the increase in the probability of participation caused by a £1000 increase in net upfront costs. For both the OLS and Probit results, net costs have a significant negative effect on participation. For example, in the case of the OLS specification, a £1000 increase in upfront costs leads to a 9.8 percentage point decrease in the probability of undertaking a degree, versus a somewhat lower 4.4 percentage point decrease in the Probit specification.

Given the presence of linear and non-linear time trends, as well as the rich set of controls, it is quite difficult to interpret the coefficients on low, medium and high income groups, but the estimates in Column 1 (OLS with no controls) indicate, unsurprisingly, that low income students are the least likely to participate, and high income students the most likely.

[52] Since the dependent variable in all main regressions is a binary variable, in each case Linear Probability Models are used

Table 6.15 Analysis of university degree participation decision

	(1) no controls	(2) with controls	(3) probit
low[1]	-0.345	-0.152	-0.826
	(0.020)**	(0.031)**	(0.325)*
med	-0.241	-0.211	-1.138
	(0.020)**	(0.036)**	(0.357)**
lowY*time	0.006	0.003	0.023
	(0.001)**	(0.001)**	(0.005)**
medY*time	0.004	0.003	0.008
	(0.001)**	(0.001)*	(0.006)
highY*time	0.003	-0.000	-0.004
	(0.002)*	(0.002)	(0.007)
lowY*time^2	-0.001	-0.001	-0.005
	(0.000)**	(0.000)**	(0.001)**
medY*time^2	-0.000	0.000	0.003
	(0.000)	(0.000)	(0.002)
highY*time^2	-0.000	0.001	0.005
	(0.000)	(0.000)**	(0.002)**
net costs	**-0.066**	**-0.098**	**-0.044**
	(0.004)**	**(0.000)****	**(0.000)****
father, NVQ Level 2-3[2]		-0.054	-0.216
		(0.007)**	(0.033)**
father, NVQ Level <2		-0.062	-0.303
		(0.007)**	(0.034)**
mother, NVQ Level 2-3		-0.066	-0.216
		(0.008)**	(0.037)**
mother, NVQ Level <2		-0.086	-0.340
		(0.007)**	(0.035)**
Male		-0.017	-0.088
		(0.005)**	(0.023)**
White		-0.063	-0.343
		(0.009)**	(0.044)**
GCSE		0.223	1.012
		(0.015)**	(0.077)**
GCSE*low[1]		-0.042	0.158
		(0.016)*	(0.081)*
GCSE*med		-0.012	0.209
		(0.017)	(0.085)*
parental income		0.001	0.002
		(0.000)**	(0.008)*
parental income*low[1]		0.001	0.004
		(0.000)*	(0.002)
parental income*med		0.003	0.002
		(0.000)**	(0.002)**
unemployment rate		0.010	0.052
		(0.003)**	(0.013)**
Constant	0.186	-0.092	-3.353
	(0.016)**	(0.034)**	(0.325)**
Regional dummies	N	N	N
Observations	22486	22486	22486
R-squared	0.05	0.17	

[1] High income category omitted [2]omitted category "parent educated to >=NVQ level 4"
Standard errors in parentheses; * significant at 5%; ** significant at 1%

In an initial testing stage, all explanatory variables (including net upfront costs) were interacted with low, medium and high income categories and t-tests were performed to ascertain which were significant – i.e. which variables had a significantly different effect on participation, for each income level.

Only two variables found to have significant interactions were GCSE, parental income. The impact of upfront costs was found to vary by income level but the coefficients were highly erratic, often with incorrect signs, suggesting the specifications were not robust to interacting this variable with income group.

The set of explanatory variables is highly significant. Parental education and prior attainment are key drivers of participation, in line with the theory described in Chapter 2. In the case of parental education, for example, a child whose father is educated to NVQ level 2-3 is 5.4 percentage points less likely to participate in university than a child with a father educated to NVQ level >=4 (the omitted category), controlling for all other factors, including mother's education.

GCSE attainment has a strong positive impact on participation – an increase from less than 5 good GCSEs to 5 or more good GCSEs leads to a 22 percentage point increase in the probability of attending university, though the impact varies by income level, as described above. In this case being from a low income background reduces the effectiveness of having 5 good GCSEs on participation by 4 percentage points from the average, while being from a medium income category only has a very slight downward impact from the average.

Current parental income (also expressed in £1000s) also has a strong positive effect on probability of going to university, while whites are less likely than non-whites to go to university and females slightly more likely than males to participate.

Finally, differentiating the linear and non-linear time trends provides the rate of change in participation for each income group since 1992 – meaning it is possible to see which income groups have experienced the fastest expansion of participation[53]. The results are contained in Table 6.16 below.

[53] E.g. for high income groups, the time trend in participation is $(\delta_3 * time) + (\delta_6 * time^2)$, so the rate of change will be $(\delta_3 + 2\delta_6 time)$

Table 6.16 Rate of increase of participation by income group 1992-2005

Income group	Rate of increase of participation (evaluated at mean level of time)
Low	-0.012* (0.004)
Medium	0.009* (0.004)
High	0.024** (0.006)

Standard errors in parentheses; * significant at 5%; ** significant at 1%

The results indicate that participation of medium and high income groups have expanded at the fastest pace since the 1990s – with high income groups apparently accelerating most, and that the rate of growth participation of low income groups has actually slowed. These results are in line with the findings of Blanden and Machin (2004) as discussed in Chapter 1, that the expansion of HE throughout the 1990s benefitted the rich over the poor.

Two concerns arise from this first specification. Firstly, in terms of the coefficient on net costs in particular, the OLS and Probit estimates are slightly different. Furthermore, the coefficient on net costs seems quite sizeable (though compares quite favourably with the results of around -0.03 from Kane (1994) and similar from Leslie and Brinkman (1983) – both in 2006 $US), particularly for the OLS specification, suggesting some sort of bias may be at play, such as that driven by unobserved heterogeneity, as previously discussed.

The next step is to attempt to untangle "net costs" and estimate separate series for grants and up-front fees, whilst controlling for maintenance loan availability.

6.3.2 Untangling the impact of grants and fees

The next step, then, is to estimate a model of the form:

$$\boldsymbol{P_{it} = \alpha + \beta_1 F_{it} + \beta_2 G_{it} + \beta_3 L_{it} + \gamma X_{it} + \rho_r + \tau_t + u_{it}} \qquad \textbf{6.8}$$

Where all variables are the same as above, but in this case NC_{it} is replaced by F_{it}, G_{it} and L_{it} which measure the level of up-front fees payable, and grants and loan eligible for by individual i. X_{it} includes the same controls included in equation 6.7.

Again the model is estimated using OLS and Probit and is shown in Table 6.17 below. Here, grants, fees, loans and parental income are expressed in real prices in £1000's, so the coefficient on each shows the increase in the probability of participation caused by a £1000 increase in the particular variable.

For both the OLS and Probit specifications, the coefficients on grants and fees are significant (except in the case of OLS with no controls, where fees is not found to have a significant impact on participation) and their signs are intuitive – upfront fees have a significant negative effect on participation, whereas grants have a significant positive impacts on participation. In the case of the OLS specification, a £1000 increase in fees leads to a 6.4 percentage point decrease in participation, while a £1000 increase in grants leads to a 9.4 percentage point increase in participation. The Probit specification generates slightly lower values for the coefficients on grants (0.063) and fees (-0.04), which are perhaps more realistic (indeed given the low average rate of participation a Probit model would normally be preferable), and as with the net costs model, the coefficients are reasonably in line with the US research of similar nature described in Chapter 4, though the coefficient on grants seems somewhat high.

An interesting, and counter-intuitive result, is that loans appear to be worth more as a participation influence than grants – i.e. the coefficient on loans is higher than the coefficient on grants. However, as previously discussed, while it is important to control for the amount of loan a youth is eligible for, putting a causal interpretation on this parameter is inadvisable. In fact, the coefficient could be interpreted as causal only if individuals are assumed to have a zero discount rate – i.e. they completely discount the future repayments they will have to make and react purely to the upfront cash benefit of the loan – while this may be plausible for some youths, given the income-contingent features of the loan, others are more likely to take account of future repayments they may have to make.

Table 6.17 Analysis of university degree participation decision

	(1) no controls	(2) with controls	(3) probit
low[1]	-0.353	-0.142	-0.115
	(0.022)**	(0.032)**	(0.050)*
med	-0.240	-0.187	-0.117
	(0.021)**	(0.036)**	(0.034)**
low*time	-0.012	-0.013	-0.007
	(0.002)**	(0.002)**	(0.001)**
med*time	-0.017	-0.015	-0.011
	(0.002)**	(0.002)**	(0.001)**
high*time	-0.017	-0.015	-0.011
	(0.002)**	(0.002)**	(0.002)**
low*time^2	-0.000	-0.000	0.000
	(0.000)	(0.000)	(0.000)
med*time^2	0.001	0.002	0.001
	(0.000)**	(0.000)**	(0.000)**
high*time^2	0.002	0.003	0.002
	(0.000)**	(0.00)**	(0.00)**
fee	**-0.005**	**-0.064**	**-0.040**
	(0.09)	**(0.010)****	**(0.007)****
grant	**0.071**	**0.094**	**0.063**
	(0.005)**	**(0.006)****	**(0.005)****
loan	0.142	0.158	0.104
	(0.006)**	(0.006)**	(0.005)**
father, NVQ Level 2-3[2]		-0.053	-0.030
		(0.007)**	(0.004)**
father, NVQ Level <2		-0.060	-0.042
		(0.007)**	(0.005)**
mother, NVQ Level 2-3		-0.064	-0.029
		(0.008)**	(0.005)**
mother, NVQ Level <2		-0.084	-0.049
		(0.007)**	(0.005)**
male		-0.016	-0.013
		(0.005)**	(0.004)**
white		-0.064	-0.065
		(0.009)**	(0.009)**
GCSE		0.221	0.166
		(0.015)**	(0.014)**
GCSE*low[1]		-0.042	0.026
		(0.016)**	(0.014)
GCSE*med		-0.012	0.035
		(0.017)	(0.016)*
parental income		0.001	0.002
		(0.000)**	(0.001)*
parental income*low[1]		0.001	0.004
		(0.000)	(0.022)
parental income*med		0.004	0.017
		(0.000)**	(0.002)**
unemployment rate		0.014	0.010
		(0.003)**	(0.002)**
Constant	0.107	-0.511	
	(0.017)**	(0.078)**	
Regional dummies	N	Y	Y
Observations	22486	22486	22486
R-squared	0.06	0.18	

[1] High income category omitted [2] In each case, omitted category is "parent educated to NVQ level 4+" Standard errors in parentheses; * significant at 5%; ** significant at 1%

It may be the case that the impact of fees and grants is different depending on parental income – i.e. an additional £1000 of grants may be worth more to someone from a low income background to someone with a medium income background.

To test this, interactions between grants, fees, loans and parental income groups are added, and the model below is estimated:

$$P_{it} = \alpha + \delta_1 F_{it} * high_{it} + \delta_2 F_{it} * med_{it} + \delta_3 G_{it} * low_{it} + \delta_4 G_{it} * med_{it} + \delta_5 L_{it} * low_{it} + \delta_6 L_{it} * med_{it} + \delta_7 L_{it} * high_{it} + \gamma X_{it} + \rho_r + \tau_t + u_{it} \quad 6.9$$

However, the coefficients resulting from this model (not shown), particularly in the case of high income students, are unfeasibly high in some cases, suggesting sample sizes are too low to support multiple interactions.

Returning, then, to the main model 6.8, as discussed, the coefficients on β_1 and β_2 give the marginal effect of £1,000 increase in fees and grants respectively, on participation. For example, a £1000 increase in grants results in a 6.3 percentage point increase in participation according to the Probit specification.
Given that the data seems unable to support interactions by income, as discussed above, a useful way to examine the impact for different income groups is to calculate the elasticities of demand for university with respect to grants and fees for each income group.

The elasticity of demand is the percent change in y for a 1% change in x – in other words, the percent change in participation brought about by a 1% change in grants or fees. While this is less intuitive than the marginal effects given by the coefficients above, the elasticities can be calculated for each income group and take into account of the different HE finance obligations and participation rates of each group, thus shedding some light on the impact of HE finance for different income groups.

It is possible to calculate at the means of participation and HE finance eligibility for each income group, as shown below (where the coefficients from the probit specification in Table 6.17 are used):

Table 6.18 Elasticity of demand for university with respect to fees and grants

	Income group:		
variable	Low (*P*=0.114)	Med (*P*=0.166)	High (*P*=0.31)
fees	-	-0.166**	-0.27**
grants	0.97**	0.546**	-

Calculated using STATAs MFX command
* significant at 5%; ** significant at 1%
[1] As previously stated, the coefficients and interactions on loans should be treated with a degree of caution.

The results in Table 6.18 imply that fees have a stronger effect for high income youths than medium income; a 1% increase in fees results in a 0.27% decrease in participation for high income students and a 0.16% decrease for medium income groups.

A 1% increase in grants results in a 0.97% increase in participation for low income youths versus a 0.55% increase for medium income youths, implying grants have

Finally, as with the net costs specification, it is possible to examine the linear and non-linear time trends to ascertain the rate of growth of participation among income groups. Table 6.19 illustrates.

Table 6.19 Rate of increase of participation by income group, 1992-2005

Income group	Rate of increase of participation (evaluated at mean level of time)
Low	-0.013** (0.003)
Medium	0.009* (0.004)
High	0.023** (0.006)

The results, unsurprisingly given the similarity of specification, again illustrate the average rate of growth of participation of high income students outstripping that of medium and especially low income students over the 1990s to the mid 2000s.

6.4 Sources of bias in individual-level models

In order for the models described above to provide an unbiased estimate of the impact of upfront fees and grants, these variables must be exogenous. That is, grants and fees must be uncorrelated with the error term u_{it}.

As previously discussed, if there is an unobserved effect that affects parental income at age 17-18 (which totally determines the level of fees and grants a youth faces) and university participation, then the estimates of the impact of upfront fees and grants will be biased. Such factors could include having highly motivated parents – such parents are likely to have higher incomes, and thus be more likely to encourage their children into university. Thus higher fees, payable by those with these higher income parents, will be associated with high university attendance.

If this is ignored, the effect of fees (which are positively related to parental income) will potentially be over-stated, and the effects of grants (which are negatively related to parental income) will be underestimated.

Even after successfully controlling for parental income, there may be additional reasons why fees and grants may be endogenous – for example if there was a shock to parental income that also affected participation.

This could happen if a youths' parent suffers an injury. In this case their income may decrease, and thus the youth will be entitled to a higher grant level and lower fees. But this student may be more inclined to go to work rather than university, to support his/her parent, given their loss of earnings, or to stay at home to look after the parent rather than go to university.

There may also be additional unobserved variables – such as additional parental financial support or credit card borrowing which may be related to grants, fees and participation, which are also omitted from the model. Again this may result in biased estimates.

A further issue may arise if parents attempt to alter their income levels (either falsely in the means-testing forms or by deliberately reducing their earnings through hours worked etc) in the time period immediately before their children go to university in order to increase their child's grant award or reduce their fee

obligation. This creates a further endogeneity issue: such parents are again more likely to be more financially motivated, and better off, and by the same rationale are also likely to encourage their children to participate in university. Furthermore fees for this group will appear higher than they are, and therefore the impact of fees will be overestimated for this group.

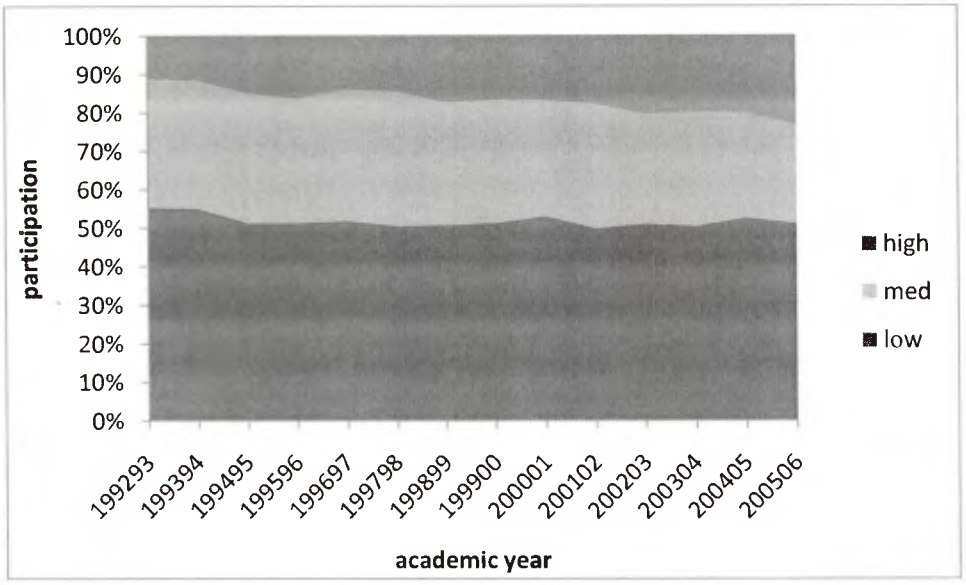
In addition to these issues, there may be a number of other potential problem areas in the model described above, which will directly affect the estimates of grants and fees:

1) As described in Section 5.3.1, the three parental income categories used in the models above are created according to government criteria for who should receive full grants, or who should be eligible for full fees each year. However, this categorisation method causes a potential problem. The relationship between parental income and unobservables may vary over time as the proportion of individuals qualifying for the maximum levels of fee or grant changes. Figure 6.7 shows the proportion of those falling into the low, medium and high income categories over time (missing income youths are excluded in this chart). As is apparent, the proportion of high income students is increasing over time. This is because of fiscal drag – that is, household earnings increased at a faster rate than the minimum earnings criteria set by the Government for the level of full fee eligibility, meaning more and more youths found themselves eligible for the full fee each year. Thus, the pool of high income students has widened, meaning students eligible for full fees each year may include those less motivated (e.g. with slightly lower household incomes and therefore less motivated parents) and less likely to go to university. Since fees were increasing over the years of observation, this may result in an over-estimate of the impact of fees. The same may be true for low income students, the proportion of whom is decreasing over time.
2) Given the limitations of the LFS income data (as described in 5.3.2), there is also a possibility that the estimates of the fees and grants (and loans) an

individual would face may be measured with error. This would have the effect of downward biasing the estimates[54].

3) Policy changes in one year may not only affect contemporaneous HE participation rates – there may be more dynamic processes at work. For example policy reforms may have reduced the likelihood of 18-19 finishing school in 1997 undertaking gap years in 1997 as if they did they would be subject to the upfront fee when they started in September 1998 whereas if they went straight to HE in 1997 they would not. In addition, in response may be other dynamics at play if pupils change their behavior in response to anticipated changes in the finance regime. For example, youths may be less motivated to undertake GCSEs or A-levels if they believe they will not be able to afford to go to university in the future. These potential dynamics are not dealt with in the models above.

Figure 6.7 Proportion of youths in each parental income category (England, Wales and NI only)

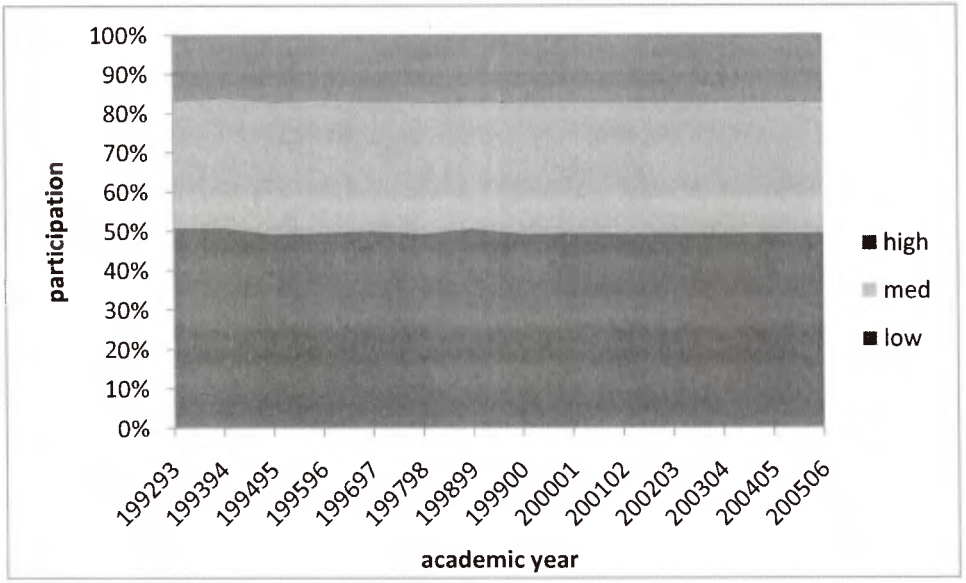


In the case of the first issue, the problem is that part of the results may be driven by changes in the composition of the groups caused by fiscal drag. A means of dealing with this is to select a year as typical and ensure that the sample composition is the same for all the other years. This is accomplished by using Kernel based propensity score matching.[55]

[54] See Wooldridge (2004) Chapter 4, Section 4.4.2., pp73-76
[55] See for example Sianesi (2001a; 2001b)

In this case, the mid-point year of 1998 is chosen. For each income group separately, each individual in the base year is given a 'score' based on their characteristics, to create a profile of characteristics for each income group in the base year. Then, again based on his / her characteristics, if a youth in the high income sample in 1992, say, is 'similar' in composition to the characteristics of high income students in the base year (i.e. has a similar propensity score), he / she is given a high weight. If the youth is very different in composition to the characteristics of high income students in the base year (i.e. has a very different propensity score), he / she is given a low weight. The effect of weighting is illustrated in Figure 6.8 below. As is clear, the proportions of youths in each income group, after weighting, is now steady.

Figure 6.8 Proportion of youths in each parental income category (England, Wales and NI only) after matching to 1998 characteristics



Model 6.8 is then re-estimated, with individuals weighted according to these criteria. The results are found to be very similar to those described in Table 6.17, indicating that the issue of changing proportions of youths by income level is not a major problem.

Issues 2 and 3, however, as well as the ongoing issue of endogeneity of the grant and fee variables, are more difficult to deal with using individual-level data.
Instead, these issues will be dealt with using the well-established panel-data techniques described in 4.2.2.

6.5 Conclusions

This Chapter has used individual-level LFS data to attempt to estimate the impact of HE finance on university participation using two different approaches commonly used with data of this nature.

The first approach was to use a difference-in-difference method, such as that used by Dynarski (1999), taking advantage of the natural experiments generated by differences in policy between constituent countries of the UK, as well as across different income groups as a result of means testing.

None of the experiments uncovered a significant impact of HE finance – in this case maintenance grants and up-front fees – on participation.

However, this approach raised a number of issues which brought the results into doubt. Firstly, in some cases, more than one policy change occurred at the same time (i.e. loans were cut in Scotland at the same time as fees were abolished), meaning it was not possible to establish the true effect of the treatment being studied. Secondly, the control and treatment groups were very different from each other in terms of parental income and hence their base levels of participation before the reforms, again making comparison of the two groups before and after treatment difficult.

The second approach was to simply regress HE finance variables against participation, with a rich set of controls (including lagged and current parental income). This approach is similar to strategy of Galindo-Rueda (2004), though no studies have to date attempted to model HE finance variables explicitly for the UK.

The results were quite different from those generated by the difference-in-difference approach. The estimates revealed a strong negative impact of up-front fees on participation and a strong positive impact of maintenance grants.

The average rate of growth of participation of high income students was found to have outstripped that of medium and especially low income students over the 1990s to the mid 2000s. This is in line with the findings of Blanden and Machin (2004) that the expansion of HE throughout the 1990s benefitted the rich over the poor.

The latter, regression based approach would seem to be preferable to the difference-in-difference approach for a number of reasons. As stated, the difference-in-difference models suffered from a variety of problems, most seriously that the experiments themselves were not always clean, and that the two groups were quite different, and potentially on different trajectories before the policy change took place. Given this, the results from the difference-in-difference models would seem to have little credibility, and the regression of HE finance on participation would seem the more robust and preferred option.

However, this estimates generated from this second approach may be subject to bias caused by the presence of measurement error in the explanatory variables, as well as unobserved heterogeneity arising from omitted variables.

A solution to these potential problems would be to use a method such as fixed effects, as described in Chapter 4, in which any fixed unobserved heterogeneity is removed by demeaning or by another method such as first-differencing.
However, in order to apply this methodology it is necessary that individuals in the data are observed in two or more time periods. As described, though, individuals in the LFS dataset are not observed over time but only appear once each year (and obviously, only make the decision of whether or not to go to university once), so it is not possible to use this type of methodology.

The next Chapter seeks to rectify this issue by collapsing the LFS data into a 'pseudo-panel' such as that used by Kane (1995) – data are collapsed to regional level, by year, creating repeated levels of participation by region over time. In this way, panel data approaches such as those described in Chapter 4 can be used to deal with the issues encountered in this chapter, by re-estimating the models at a panel level and testing a number of specifications.

Chapter 7 Using a 'pseudo panel' to estimate the impact of fees and support on participation

7.1 Introduction

Chapter 6 was an attempt to model the impact of HE finance on university participation using individual level data from the LFS. This chapter follows up this analysis by re-estimating the models used in Chapter 6 but for regional panel data. This will allow the use of alternative methodologies such as fixed effects, designed to deal with the presence of bias arising from measurement error in the explanatory variables, as well as from unobserved heterogeneity.

In this chapter several specifications (some based on studies mentioned in Section 4.2.2.), commonly used for estimation with panel data, are tested. These include random and fixed effects models as well as dynamic specifications. The preferred specification is chosen, based on model selection techniques, and finally, the results are put into context in terms of fee obligation and financial support given to individuals from different income backgrounds over the period following the 1998 and 2006 reforms.

7.2 Creating a 'pseudo-panel'

Returning to equation 6.8 (repeated here for convenience),

$$P_{it} = \alpha + \beta_1 F_{it} + \beta_2 G_{it} + \beta_3 L_{it} + \gamma X_{it} + \rho_r + \tau_t + u_{it} \qquad 6.8$$

whilst it is not possible to create an individual panel data over time that would potentially deal with the presence of unobserved heterogeneity, it is possible to create such a panel by taking advantage of the regional information contained within the LFS dataset.

Similar to the individual-level data is it desirable to observe lots of variation in participation, grants and fees over time, in order to be able to identify the impact of the HE finance variables.

Indeed, there have been very different regional differences in university participation, grants and fees over time, largely arising from the compositional

differences in these regions – particularly household income levels. Table 7.1 shows mean participation levels and mean grants, fees and loans by region and income group before and after the 1998/99 tuition fee reforms (note, while potentially more variation could be found by using a more detailed regional breakdown, such as local authority, sample sizes would be insufficient to carry out robust analysis).

Table 7.1 Regional Variation in university participation and finance

1992-1997								
Region	ppn	low	med	high	miss	grant	fee	loan
Tyne and Wear	9.6	49.8	25.1	9.9	14.2	1842	0	1375
Rest of North East	14.8	39.0	36.5	12.7	10.3	1689	0	1365
Greater Manchester	11.6	48.8	25.0	10.5	13.7	1850	0	1371
Merseyside	14.2	54.6	26.2	8.6	9.7	1841	0	1401
Rest of North West	16.4	41.2	32.2	16.3	8.9	1657	0	1405
South Yorkshire	14.5	38.5	29.7	9.1	20.7	1824	0	1373
West Yorkshire	14.5	51.3	27.5	8.6	10.9	1802	0	1406
Yorks & Humber	12.8	43.1	31.0	10.8	13.0	1799	0	1385
East Midlands	15.1	41.7	32.5	11.2	12.3	1746	0	1370
W Midlands Metro	11.6	52.4	26.3	7.1	12.8	1964	0	1392
Rest of W Midlands	14.1	40.6	37.6	12.5	8.0	1726	0	1377
Eastern	14.2	40.3	33.1	15.7	9.3	1628	0	1431
Inner London	9.5	58.6	15.8	5.4	18.4	2824	0	1482
Outer London	13.4	48.6	27.8	15.3	7.1	2435	0	1497
South East	14.5	40.1	31.1	18.0	9.4	1597	0	1361
South West	14.4	42.9	33.3	11.4	10.7	1765	0	1380
Wales	14.8	46.6	30.2	9.7	11.7	1840	0	1401
Northern Ireland	13.9	62.0	20.4	3.9	12.3	1992	0	1274

1998-2005								
Region	ppn	low	med	high	miss	grant	fee	loan
Tyne and Wear	15.3	49.9	22.4	15.6	11.1	238	353	3220
Rest of North East	13.1	44.7	27.4	13.7	12.9	224	369	3248
Greater Manchester	16.6	45.2	27.5	14.7	10.5	195	386	3230
Merseyside	19.9	52.7	27.2	13.5	5.4	231	357	3247
Rest of North West	18.4	45.8	29.8	14.1	8.1	194	385	3278
South Yorkshire	12.4	45.1	25.6	14.0	13.5	223	359	3216
West Yorkshire	15.3	48.9	25.0	13.8	10.6	200	355	3268
Yorks & Humber	17.1	42.9	29.1	15.6	11.0	191	395	3253
East Midlands	16.2	44.9	28.1	15.2	10.0	207	412	3248
W Midlands Metro	16.0	52.4	23.0	13.4	9.8	203	342	3255
Rest of W Midlands	17.7	42.1	32.8	16.8	6.9	200	450	3220
Eastern	16.5	42.7	25.4	21.0	8.9	190	469	3205
Inner London	15.6	66.5	13.2	6.2	12.4	368	150	3314
Outer London	20.7	44.7	26.0	19.0	8.5	247	439	3246
South East	18.2	38.1	29.2	25.0	6.6	170	527	3189
South West	16.2	39.7	32.5	17.9	8.8	198	441	3239
Wales	20.1	48.1	26.0	15.4	9.0	243	373	3245
Northern Ireland	19.5	60.7	20.7	10.3	6.9	237	267	3276

It is clear from Table 7.1 that there is a great deal of variation between these regions in terms of income level and participation both before and after the 1998 tuition fee reforms. In both time periods, areas such as the South East contain the highest proportions of high parental incomes, and the highest participation rates, while more deprived areas such as Greater Manchester contain high proportions of students from poor backgrounds, high grant entitlements, and low university participation rates.

Before 1998, youths in Greater Manchester were eligible for grants of £1850 on average. Following the reforms, their grants were reduced to zero (though on average the value over 1998-2005 is £195 due to the grant of maximum £1050 that was re-introduced in 2004), while average fees went up to £386 from zero pre-1998.

Meanwhile, the South East, being a relatively well-off region, was eligible, on average, to grants of £1597 before the reforms, with no fees to pay. After 1998 this region's grant entitlement was reduced to just £170 and fee obligations averaged £527 for the region.

Such variation within region over income group and time assists the identification of the impact of HE finance – for example in estimating a fixed effects model, adding more variation in the explanatory variables improves the chances of identifying and removing effects which are constant over time, while still identifying the impact of time-variant variables.

Thus, the approaches that follow involve creating a pseudo panel data set that exploits this variation in the variables of interest by region. Variation in participation, grants and fees by gender is also apparent (even though HE finance amounts do not vary by gender, random differences in the gender of youths will be associated with different parental incomes and hence HE finance amounts), and so gender is added as an additional layer of variation. Hence for each of the 18 regions (16 in England, plus Northern Ireland and Wales) in the data, the data are averaged for all of the variables of interest by gender, income group (including those with missing parental incomes, making 4 income groups) and year to construct a pseudo panel data set.

The equation of interest then becomes:

$$P_{rt} = \alpha + \beta_1 F_{rgyt} + \beta_2 G_{rgyt} + \beta_3 L_{rgyt} + \gamma X_{rgyt} + \tau_t + f_{rgy} + v_{rgyt} \quad 7.1$$

$$= \alpha + \gamma Z_{rgyt} + f_r + v_{rgyt} \quad 7.2$$

Where P_{rgyt} represents the mean participation rate in Higher Education in the 144 regional groupings (18 English, Northern Irish and Welsh regions split by gender g (male or female) and income group y (low, medium, high or missing)) at time t (between 1992 and 2005). The remaining variables, aside from the error terms, are contained in Z_{rgyt}, and are as described in Chapter 6, again at their mean levels within region, for each income and gender group, by year.
Now, the presence of unobserved heterogeneity that is fixed over time is allowed for by region (f_r), while v_{rgyt} represents the usual random error component.

The pseudo panel has 14 years of data (t=1992,1993, ...2005) and a potential regional sample size in each year of 144 (18 regions x 2 gender x 4 income groups) so potentially a sample size of 2016.[56]

Because the data is now set up as a panel, there are a number of methodologies that can be deployed to control for unobserved heterogeneity. In the following sections, a number of specifications are tested based on equation 7.2 obtain estimates of the impact of loans, grants and fees on participation.

Generally in the literature there are three common specifications for dealing with such unobserved heterogeneity at a panel level – random effect models (or multi-level models), fixed effect models (or within group models), and first difference models. In all the approaches that follows, it is assumed that:

$$E(v_{rgyt}) = 0; E(Z_{rgyt}, v_{rgyt}) = 0 \quad 7.3$$

[56] In practice, this sample size is not achieved as there are a number of empty cells due to limited sample sizes. In all the estimation that follows the estimates are weighted by the average cell sizes that the pseudo panel are based on.

i.e. the explanatory variables are not correlated with the error component v_{rgyt} (though in some cases they may be correlated with the fixed component f_{rgy})

7.2.1 Random effects models

Random effects models are often used in cases where the data being analyzed consists of observations in different levels (e.g. data such as this regional panel, where the observations are at a regional level, over time).

In the random effects (multi-level) model, the unobserved fixed effect f_r is assumed to be uncorrelated with the explanatory variables[57]:

$$E\left(Z_{rgyt}, f_{rgy}\right) = E\left(f_{rgy}\right) = \mathbf{0} \qquad 7.4$$

As above, random effects also assumes that the explanatory variables are uncorrelated with v_{rgyt}, given f_{rgy}.

In the random effects context, f_{rgy} can be thought to represent the deviation of the average of all participation at the rgy_{th} region, gender and income group from the average participation in the whole population, while v_{rgyt} represents the deviation of participation at time t from the average participation in that region, gender and income group.

A key feature of random effects is that f_{gyr} is put into the error term. Because of this, f_{rgy} appears in every time period (academic years in this case), so the result is there is likely to be dependence of the composite error term $u_{rgyt}=f_{rgy} + v_{rgyt}$ within region over time.

As a result of the dependence of the composite error over time, OLS estimation of equation 7.2 will produce standard errors that are not correct or efficient. Random effects estimation corrects for this by taking account of the dependence of the composite error term using GLS. So, if the random effects assumptions hold, it is a more efficient model than the fixed effects that will be described below.

[57] For the models that follow, for simplicity, the constant is assumed to be contained within Z.

OLS could still be used, in this case, and correct standard errors obtained by calculating robust standard errors and by clustering at the regional level. The results of this Random Effects specification (which is equivalent to the corrected OLS specification) are contained in Table 7.2 alongside the results of the specifications explored below.

7.2.2 Fixed effects models

The key difference between the fixed and random effects model, is that the fixed effects model allows f_{rgy} to be correlated with Z_{rgyt} - i.e. fixed effects allows:

$$E(Z_{rgyt}, f_{rgy}) \neq 0 \qquad 7.5$$

If the fixed effects assumption is true, (i.e. the unobserved fixed effect is correlated with the regressors), then the random-effects model will produce biased estimates of the causal impact of the variables of interest. The fixed effect model (or within group model) solves this problem by removing the impact of the unobserved fixed effect altogether. This is accomplished by transforming the main equation (equation 7.2) by averaging over time, t=1....T to obtain the cross section equation:

$$\bar{P}_{rgy} = \bar{Z}_{rgy} + f_{rgy} + \bar{v}_{rgy} \qquad 7.6$$

This $\bar{P}_r$ is the mean participation over time for regions 1...R, $\bar{Z}_r$ contains the mean levels of each explanatory variable over time for regions 1-R, and so on.

Equation 7.6 is then subtracted from equation 7.2, thus removing the impact of the unobserved fixed effect – i.e. the fixed effect is invariant over time so will be equal to its own mean over time and will drop out of the equation:

$$P_{rgyt} - \overline{P_{rgy}} = \gamma(Z_{rgyt} - \bar{Z}_{rgy}) + (v_{rgyt} - \bar{v}_{rgy}) \qquad 7.7$$

The fixed effects estimator is called the within estimator because it uses the time variation within each cross section (i.e. region, income and gender). The

information between regions has been removed in the de-meaning process, leaving just the differences that occur within regions (rather than in the random effects model, in which both the within and between-region effects are modeled). Since the fixed effects model is reliant upon variation over time within region (and income group and gender), it can only estimate the effects of variables that change over time. In this case, this should not be a problem, since, as previously described, there is a great deal of variation in all the variables by region and over time.

For the fixed effects estimator in equation 7.7 to be unbiased, a requirement is that the Z_{rgyt} in *all* periods are uncorrelated with the v_{rgyt} in *all* periods, that is that the Z_{rgyt} are *strictly exogenous*.

As described, the key consideration between Random Effects and Fixed Effects is whether the unobserved heterogeneity is correlated with the regressors – i.e. does $E(Z_{rgyt}, \boldsymbol{f}_{rgy}) = 0$. In the case where $E(Z_{rgyt}, \boldsymbol{f}_{rgy}) = 0$ random effects is the more efficient model, so should be used. However, since Fixed Effects is consistent when f_{rgy} and Z_{rgyt} are correlated, but Random Effects is inconsistent, a statistically significant difference between the two is evidence against Random Effects.

The Hausman test can be used to test this – results of the fixed effects specification and the Hausman test are again presented in Table 7.2. (note, limitations of the Hausman test will also be discussed in Section 7.3).

7.2.3 First difference models

An approach which again involves removing the unobserved fixed effect is to use a first difference model. In this case, instead of taking the mean effect away as in fixed effects, the lag of each variable is removed from the main equation (7.2), thus estimating:

$$\boldsymbol{P}_{rgyt} - \boldsymbol{P}_{rgyt-1} = \gamma(\boldsymbol{Z}_{rgyt} - \boldsymbol{Z}_{rgyt-1}) + (\boldsymbol{v}_{rgyt} - \boldsymbol{v}_{rgyt-1}) \quad 7.8$$

$$\Delta \boldsymbol{P}_{rgyt} = \gamma \Delta \boldsymbol{Z}_{rgyt} + \Delta \boldsymbol{v}_{rgyt} \quad 7.9$$

Again, because of its time invariant nature, f_{rgy} is the same in every time period, so subtracting its lag will successfully remove it (as was the case with the fixed effect model). Again, the Z_{rgyt} must vary over time, otherwise they too will be differenced away.

Again, first differencing specifications assume exogeneity of Z_{rgyt} - i.e. that the explanatory variables are not correlated with v_{rgyt}. However, in this case, for consistent estimates it is necessary only to assume that $(v_{rgyt} - v_{rgyt-1})$ is uncorrelated with $(Z_{gyrt} - Z_{rgyt-1})$. This is a much weaker assumption than the strict exogeneity assumption of the fixed effect estimator. (with strict exogeneity, explanatory variables can't depend on past, current or future values of the error term, meaning there can be no lagged dependent variables in Z_{rgyt}.)

Note to get correct standard errors when estimating the first difference specification (which is simply OLS on equation 7.8), it is again necessary to use robust standard errors and cluster at the regional level.

First difference models often suffer from autocorrelation in the errors. If the errors are found to be suffering from autocorrelation, first difference will be inefficient, in which case it is preferable to use the Fixed Effects method. First difference estimations are also shown in Table 7.2 with accompanying tests for autocorrelation in the residuals.

7.2.4 Dynamic models

All the pseudo panel data approaches that have been discussed so far assume that participation in Higher Education is a static rather than a dynamic process.

But it is conceivable that regional participation in HE may depend on participation rates in previous years, or that policy changes in one year may not only affect contemporaneous HE participation rates but may also affect participation rates in the future. For example, the announcement of the 1998 policy reforms may have reduced the likelihood of 18-19 year old school leavers undertaking a gap years in 1997, because to do would mean they would start university in September 1998 and thus incur the up-front fee, whereas if they went straight into HE in 1997 they would not. A further possibility is that grant

and levels in year *t-1* may affect participation in year *t* if there is a delayed response to information. So far, all the models have ignored these potential dynamics.

If there are these dynamics operating, the OLS estimator (or random effects estimator) and the fixed effect estimators will be biased.

So, the final approach involves estimating a flexible dynamic equation, based on:

$$P_{rt} = \zeta_1 \mathrm{P}_{\mathrm{rgyt-1}} + \gamma Z_{rgyt} + f_{rgy} + v_{rgyt} \qquad 7.10$$

Where lagged values of participation are now included alongside the set of explanatory variables.
As usual, first differences are taken to remove f_r, giving:

$$\Delta P_{rgyt} = \zeta_1 \Delta \mathrm{P}_{\mathrm{rgyt-1}} + \gamma \Delta Z_{rgyt} + \Delta v_{rgyt} \qquad 7.11$$

Or

$$\Delta P_{rgyt} = \zeta_1 (P_{rgyt-1} - P_{rgyt-2}) + \beta (Z_{rgyt} - Z_{rgyt-1}) + (v_{rgyt} - v_{rgyt-1}) \qquad 7.12$$

Normally (i.e. if the model were in levels), this model could be identified as long as $E(P_{rgyt-1}, v_{rgyt}) = 0$. Since we are using repeated cross-section rather than longitudinal data, in this case P_{rgyt-1} is not correlated with v_{rgyt-1}, meaning this equation can be estimated using OLS or Fixed Effects estimators. In this case, Fixed Effects estimators are used.

It may also be desirable to introduce more dynamics, extending 7.12 to include lagged values of fees and grants (this could also potentially contain lagged values of loans) as explanatory variables:

$$\Delta P_{rgyt} = \zeta_1 \Delta P_{rgyt-1} + \beta_{10} \Delta F_{rgyt} + \beta_{20} \Delta G_{rgyt} + \beta_{11} \Delta F_{rgyt-1} + \beta_{21} \Delta F_{rgyt-1} + \beta_{21} \Delta G_{rgyt-1} + \gamma \Delta \mathrm{X}_{\mathrm{rgyt}} + \Delta \mathrm{v}_{\mathrm{rgyt}} \qquad 7.13$$

Where X_{rgyt} contains all explanatory variables from Z_{rgyt} other than those of fee and grant amounts described above. Here, the assumption is that grants in previous years as well as current years could affect current participation rates. So for example, a shock increase in grants in one year may affect youth's likeliness to participate in the following year. Or as explained above, it may be that grant levels in year *t* are impacted by participation rates in year *t-1* etc.

A number of these specifications are tested with the preferred specification included in Table 7.2 for comparison with the other models, and with appropriate tests for validity of this model.

7.3 The impact of HE reforms on participation – panel level results

The results of the specifications described above are presented in Sections 7.3.1 and 7.3.2 below, firstly using the composite net costs variable, and then moving on to look at grants and fees separately.

7.3.1 Results for net upfront costs variable

Looking first at the upfront costs variable, in each case, other than with the first-difference model, a significant negative effect is found. Estimates vary between -0.019 (suggesting a £1000 increase in net costs results in a 1.9 percentage point decline in participation) for random effects to -0.056 for the dynamic specification.

The OLS specification is, by definition, identical to the RE specification so only one is shown.

Table 7.2 Probability of Attending a University Degree Course given £1000 of net costs; Static and Dynamic Regional Panel Models

	(1) OLS/RE	(2) FE	(3) FD	(4) Dynamic
net costs	**-0.019**	**-0.030**	**-0.058**	**-0.025**
	(0.008)*	**(0.008)****	**(0.018)****	**(0.000)****
parental income	0.002	0.001	0.00	0.001
	(0.001)**	(0.000)	(0.000)	(0.000)**
white	-0.054	-0.098	-0.091	-0.109
	(0.021)*	(0.035)**	(0.041)*	(0.038)**
GCSE	0.249	0.215	0.209	0.19
	(0.028)**	(0.027)**	(0.038)**	(0.029)**
father, NVQ Level 2-3[1]	-0.073	-0.057	-0.069	-0.041
	(0.031)*	(0.028)*	(0.042)	(0.031)
father, NVQ Level <2	-0.087	-0.060	-0.078	-0.045
	(0.032)**	(0.028)*	(0.037)**	(0.029)
mother, NVQ Level 2-3	-0.097	-0.095	-0.097	-0.077
	(0.045)*	(0.033)**	(0.062)	(0.036)**
mother, NVQ Level <2	-0.107	-0.091	-0.0634	-0.080
	(0.038)**	(0.029)**	(0.052)	(0.031)**
unemployment rate	0.003	0.010	0.00	0.009
	(0.001)**	(0.003)**	(0.000)	(0.003)**
Pt-1				-0.074
				(0.025)**
Pt-2				-0.103
				(0.025)**
Constant	2,338.5	1,289.2	836.1081	894.056
	(877.4)**	(1,069.6)	(1011.3)	(1543.9)
Observations	1950	1950	1756	1582
R-squared	0.33	0.13		
Time trend (lin & non-lin)	Y	Y	Y	Y
Number of groups		144	144	144[2]
Hausman Test (RE v FE)	Reject v FE (p=0.02)			

Robust standard errors in parentheses * significant at 5%; ** significant at 1%
[1]In each case, omitted category is "parent educated to >NVQ level 4"
[2] Number of instruments=141

In order to test for the preferred specification, a number of criteria can be used. To test between Fixed effects (FE) and Random effects (RE), as previously mentioned, the Hausman test can be used. As explained, the fundamental difference between FE and RE is that FE allows f_{rgy} to be correlated with Z_{rgyt} while RE does not. Therefore if f_{rgy} and Z_{rgyt} are correlated, the RE model will give inconsistent results, but the FE estimator will always give consistent results. The Hausman test is simply a test of whether f_{rgy} and Z_{rgyt} are correlated. The two estimators are therefore compared, and a significant difference between the

two indicates that f_{rgy} and Z_{rgyt} are correlated. If this is the case FE should be used.

The results of the Hausman test are below:

Test: H_0: difference in coefficients not systematic
chi2(16) = 30.06
Prob>chi2 = 0.0177

Since the null is rejected, there is a significant difference between FE and RE, suggesting that the FE specification is preferred to the RE (and OLS) specification. It is worth pointing out though, that as discussed above, the Hausman test is simply a test of whether the coefficients from the RE and FE models are different. However, in this case the FE model would seem to be the more appropriate choice, since net costs are unlikely to be exogenous – as previously discussed, the values of grants, loans and fees are linked to parental income, which may be driven by parental motivation, a factor also affecting youth's participation. Therefore, the FE model would seem to be a more preferable option in this case.

Looking also at the other models, the First-Difference (FD) model does not find a significant impact of net costs on participation. However, the hypothesis of no first order serial correlation is rejected, as is common with first difference models, suggesting first difference is less efficient and again the fixed effects model is the preferred model.

In terms of the dynamic specification, a number of specifications were tested, with results largely similar, regardless of lags of dependent and explanatory variables included in the specification (see Appendix 7). Table 7.2 (and equation 7.16 below) shows the specification with two lags of participation, though these were not found to be significant:

$$\Delta P_{rgyt} = \zeta_1 \Delta P_{rgyt-1} + \zeta_2 \Delta P_{rgyt-2} + \beta \Delta Z_{rgyt} + \Delta v_{rgyt} \qquad 7.14$$

AR tests reject the null hypothesis of no first-order autocorrelation in the differenced residuals, but do not reject the null hypothesis of no second-order autocorrelation. First-order autocorrelation does not imply that the estimates are inconsistent, but second-order autocorrelation would imply this.

It is worth pointing out that, given the dynamic nature of the model, the dynamic coefficients displayed in Table 7.2 describe short-run effects of net costs on participation. Long-run effects can be computed by transforming 7.16 so that

$$lr_{net\ costs} = \frac{\beta_{net\ costs}}{1-\zeta_1-\zeta_2} \qquad 7.15$$

This results in the following:

$lr_{net\ costs}$ = - 0.058** (se=0.017)

Which is very similar to the long-run effect of net costs, of -0.056, suggesting that the long-run effects of HE finance on participation are roughly similar to effects occurring in the short-run.

Nevertheless, since there appear to be no significant effects of lagged participation or lagged net costs, it would appear that a static model is sufficient.

Therefore, the preferred specification in this instance is the Fixed Effects model. The results indicate that a £1,000 increase in overall net upfront costs faced by a school-leaver induces a 3 percentage point decrease in his / her likeliness to undertake a university degree. This figure is quite different from the individual-level specification estimate in Section 6.3.1, being significantly lower than the OLS estimate, and somewhat lower than the Probit model. Reassuringly, the panel data estimate appears to be in line with effects found in other studies of this nature (see Table 4.1). McPherson and Shapiro find an effect of 2.7 percentage point decrease in 2006 US dollars, and Kane (1995) finds a $1000 decrease in net costs to result in a 3.2 percentage point decrease in participation. This suggests the 3 percentage point figure here is slightly lower than the results above, depending on exchange rates, but may be a more credible estimate than that generated by the individual-level data suggesting that there were indeed issues

with this estimation, such as those of endogeneity and measurement error, as described in Section 6.4.

Again, elasticities are computed for each income group to establish whether upfront costs have a different effect by income group. The results are shown below:

Table 7.3 Elasticity of demand for university with respect to net costs (FE model)

	Income group:			
Variable	All	Low	Med	High
	(*P*=0.159)	(*P*=0.114)	(*P*=0.166)	(*P*=0.31)
Net costs	-0.54**	-0.98**	-0.52**	-0.14**

* significant at 5%; ** significant at 1%

Here, in each case, a 1% increase in net costs results in a less than 1% decrease in participation. The results are intuitive in terms of income group, with net costs having the biggest impact for low income groups (almost a 1% drop in participation generated by a 1% increase in costs), and the least impact for high income groups. Similar to the individual model in Chapter 6, this suggests different income groups respond differently to changes in net costs. However, it is important to note that these elasticities are, obviously, generated purely by the model specification, and are limited in this sense. It would be far preferable to interact net costs with parental income group in the model, but this is not possible since there are not sufficient observations in the panel model.

7.3.2 Results for grants and fees estimated separately

Moving on to look at the results for grants and fees separately, again significant effects are found for all specifications except for the first-difference specification, as shown in Table 7.4 below.

Table 7.4 Probability of Attending a University Degree Course given £1000 of grants and fees; Static and Dynamic Regional Panel Models

	(1) OLS/RE	(2) FE	(3) FD	(4) Dynamic
grant	**0.016**	**0.032**	**0.055**	**0.022**
	(0.008)	**(0.009)****	**(0.017)****	**(0.011)***
fee	**-0.029**	**-0.048**	**-0.049**	**-0.039**
	(0.012)*	**(0.014)****	**(0.026)*****	**(0.012)****
loan	0.021	0.052	0.084	0.047
	(0.012)	(0.014)**	(0.020)*	(0.014)**
parental income	0.002	0.005	0.001	0.002
	(0.000)**	(0.000)	(0.000)	(0.000)*
white	-0.055	-0.098	-0.090	-0.11
	(0.021)*	(0.035)**	(0.041)**	(0.038)**
GCSE	0.251	0.219	0.20	0.19
	(0.028)**	(0.027)**	(0.038)**	(0.028)**
father, NVQ Level 2-3[1]	-0.074	-0.058	-0.068	-0.042
	(0.031)*	(0.028)*	(0.042)	(0.031)
father, NVQ Level <2	-0.090	-0.058	-0.073	-0.045
	(0.032)**	(0.028)*	(0.037)*	(0.029)
mother, NVQ Level 2-3	-0.098	-0.097	-0.097	-0.081
	(0.045)*	(0.033)**	(0.063)	(0.036)*
mother, NVQ Level <2	-0.109	-0.094	-0.06	-0.085
	(0.038)**	(0.029)**	(0.052)	(0.031)**
unemployment rate	0.003	0.011	0.000	0.011
	(0.001)**	(0.003)**	(0.000)	(0.003)**
Pt-1				-0.078
				(0.025)**
Pt-2				-0.103
				(0.025)**
Constant	2,707.091	2,453.246	1937.494	3174.381
	(955.9)**	(1,215.8)*	(1110.9)*	(1823.6)*
Time trend (lin & n-lin)	Y	Y	Y	Y
Observations	1950	1950	1756	1582
R-squared	0.33	0.13		
Number of groups		144	144	144[2]
Hausman Test (RE v FE)	Reject v FE (p=0.01)			

Robust standard errors in parentheses * significant at 5%; ** significant at 1%
[1]In each case, omitted category is "parent educated to >NVQ level 4"
[2] Number of instruments=141

Again, the preferred model is found to be the Fixed Effects model.

The Hausman test rejects RE at the 1% level (p=0.01), (and furthermore, as explained in Section 7.3.1 the dependent variables are believed to be endogenous) and again the first difference model, which gives significantly different results to the FE model, fails to identify the impact of tuition fees.

The results of the dynamic specification in Column 4 are quite similar to those of the FE model.

The long-run coefficients for the Dynamic model are below:

lr_{fees} = - 0.036** (se=0.014)

lr_{grants} = 0.021** (se=0.011)

Again, implying that the long and short run effects of increases in grants and fees are very similar.

So, again the preferred specification is the FE model, though there is some evidence that the dynamic model may also be relevant. The results imply that a £1000 increase in fees results in a 4.8 percentage point decrease in participation, whilst a £1000 increase in grants leads to a 3.2 percentage point increase in participation. The results also imply, (assuming a zero discount rate, as previously discussed), that a £1000 increase in loans leads to a 5.2 percentage point increase in participation.

These results, particularly for grants and loans, are somewhat different to those estimated on individual-level data – the coefficient on grants has now reduced from 0.063 (Probit) to 0.032, and the loan coefficient from 0.107 to 0.052 suggesting there may have been issues with the individual-level specification as discussed.

By comparison with other studies that identified separate impacts of grants and fees, the panel-level results compare reasonably well.

Kane (1994) finds a $1000 increase in fees decreases participation by 3 percentage points in US dollars versus the panel-level decrease of 4.8 percentage points for a £1000 increase found in this thesis. Kane thus finds a quite similar (though slightly higher) impact of up-front fees, again depending on exchange rates. Kane finds no impact for grants, though Dynarski finds that $1000 extra in grants induces a 3 percentage point increase in participation (in US dollars) – somewhat higher than the finding of 3.2 percentage points from this model.

Looking at results by income group, again, in the absence of interactions of fees and grants by income group due to small sample sizes, but in the context of relative participation and HE finance obligations of different income groups,

elasticities are presented below (again with the caveat that these results are imposed by the model, rather than obtained by interacting fees and grants by income group).

Table 7.5 Elasticity of demand with respect to fees and grants: FE model

	Income group:			
Variable	All	Low	Med	High
	(*P*=0.159)	(*P*=0.114)	(*P*=0.166)	(*P*=0.31)
Fees	-0.08**	-	-0.10**	-0.11**
Grants	0.14**	0.36**	0.15**	-

* significant at 5%; ** significant at 1%

The elasticities indicate that fees and grants have quite a small impact on participation across the board. Fees are found to have a similar impact for both medium and high income students, while grants have a much larger impact for low income students than medium.

Finally, it is interesting to see how each model predicts participation. Figure 7.1-Figure 7.3 show the predicted versus actual participation rates for the preferred Fixed Effects model, as well as the Random Effects and dynamic models.

The Fixed Effects and Random Effects models seem to perform similarly. Interestingly, both seem unable to predict the dip in participation seen in 2002, though the dynamic specification somewhat picks this up (with something of a lag), suggesting the inclusion of dynamics in the model may be worthwhile.

Figure 7.1 Actual versus predicted university degree participation rate, FEModel

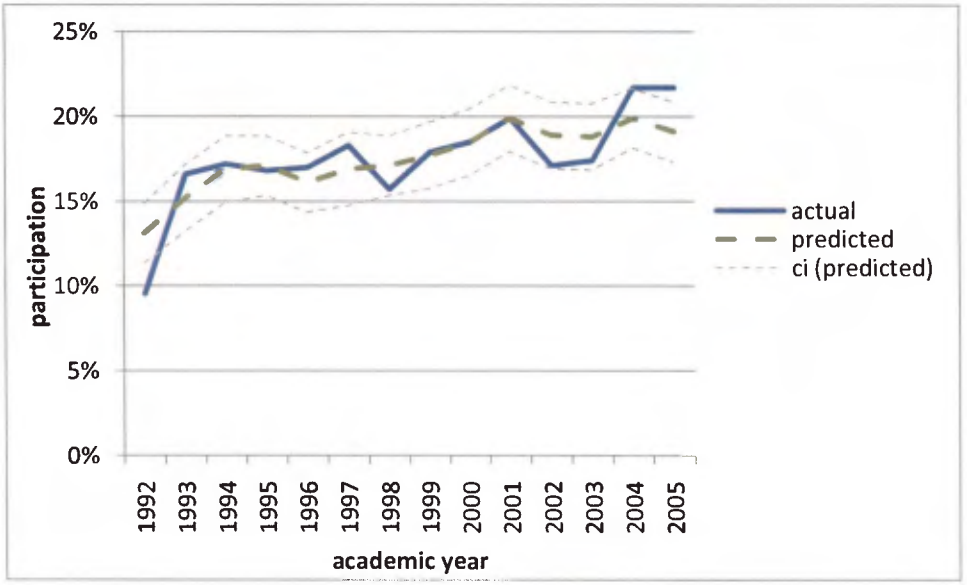


Figure 7.2 Actual versus predicted university degree participation rate, RE Model

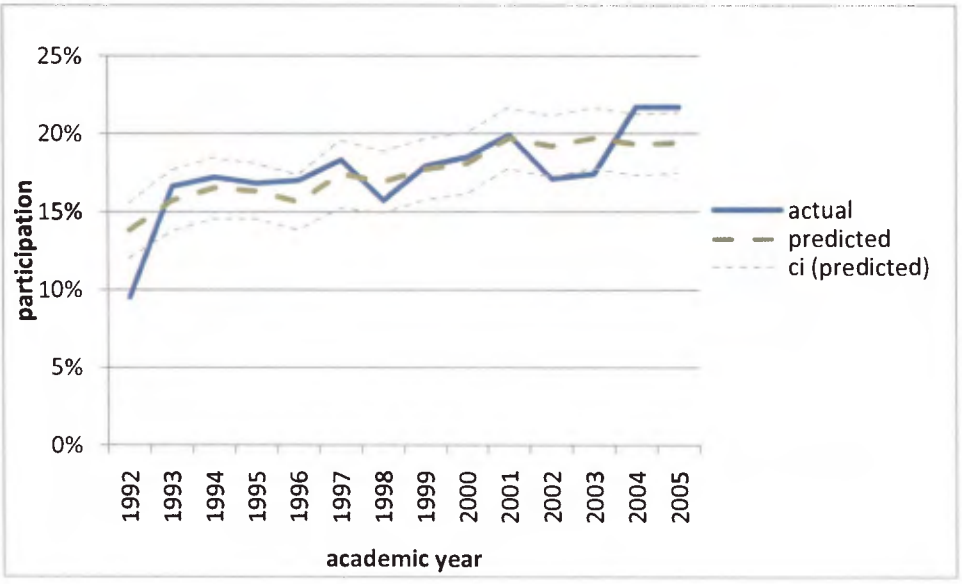
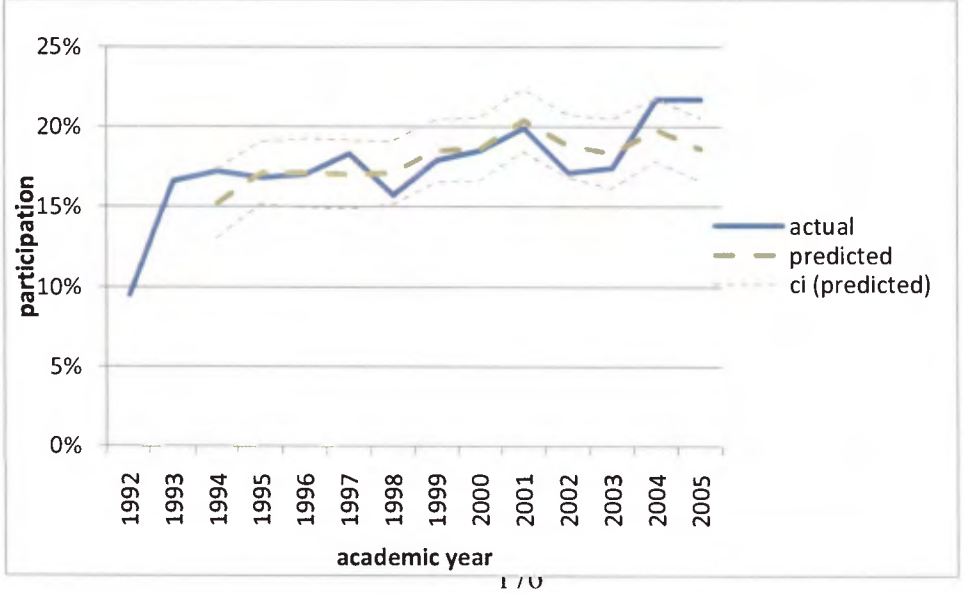


Figure 7.3 Actual versus predicted university degree participation rate, Dynamic model



So far, this analysis has not taken into account the actual fee, grant and loan amounts awarded over the years since 1992, and how the major reforms may have altered individual participation rates as a result.

The next stage in this strand of the thesis is to contextualise these results in terms of fee obligation and financial support available to individuals from different income backgrounds over the period following the major 1998 reforms. By doing so it will be possible to better understand the actual impact on participation of the reforms.

7.4 Estimating the overall impact of the reforms compared to a counterfactual

7.4.1 Contextualising the 1998/99 reforms

The aim of this next section is to contextualise the results of the preferred Fixed Effects specification, by using the coefficients on grants and fees to estimate the impact of the 1998/99 reforms. So, rather than just observe what happened to participation after the reforms the aim is to calculate the impact of introducing tuition fees and abolishing grants, compared to what *would* have happened had these reforms not taken place – i.e. had grants not been abolished and tuition fees not been introduced.

In order to do this, it is necessary to create counterfactual values of grants and fees assuming they had continued along the same trend as before the reforms. Since maintenance loans were also changing during this time period, and have a significant impact on participation, it will be important to control for loan amounts in the analysis. Thus, counterfactual values for these are also calculated. In order to do this grants, fees and loans are regressed on a time trend and the usual set of controls for each of the three income groups separately (see equation 7.18 below) , thus creating estimates of the average value for each of grants, fees and loans, for each income group post 1998, had there been no reforms.

$$\mathbf{G}_{it} = \alpha + \gamma \boldsymbol{X}_{it} + \rho_r + \tau_t + \varepsilon_{it} \qquad 7.16$$

Equation 7.18 is estimated separately for each income group, and for each of loans, grants and fees. Here, for example, G_{it} represents grant eligibility, X_{it}

includes the usual set of controls, ρ_r are regional dummies, and τ_t represents the usual time trend interacted with income group (see equation 6.6) as well as dummies to capture the 1998/99 reforms, including a dummy taking the value of 1 if the individual is eligible for academic years from 1998-2003 and a 0 otherwise, this dummy interacted with a time trend, and a final dummy for 1999 academic year, to capture the abolition of grants in this time period.

These values are estimated for the period up to 2004, at which point further reforms took place involving the re-instatement of grants. The resulting created counterfactual values are in Table 7.6, alongside their actual values, and those pre-1998. By way of illustration, counterfactual vs actual grants and loans for medium income students are displayed in Figures 7.4 and 7.5 respectively (obviously, counterfactual values for fees are zero for all income groups).

Table 7.6 Average loans, grants and fees, pre and post reforms, and counterfactual (£s, 2006 prices)

	1992-1997 actual	1998/9-2003[1] actual	1998-2003 counterfactual
Low income			
Grant	2455	0	1077
Fee	0	0	0
Loan	1382	3398	2492
Medium income			
Grant	1631	0	602
Fee	0	620	0
Loan	1408	3338	2472
High income			
Grant	0	0	0
Fee	0	1200	0
Loan	1461	2649	2541

[1] for students with a partial or full grant, a small amount of grant was still available in 1998, but on average the figure over 1998-2003 is close to zero.

Figure 7.4 Actual and counterfactual values for grants; medium income students

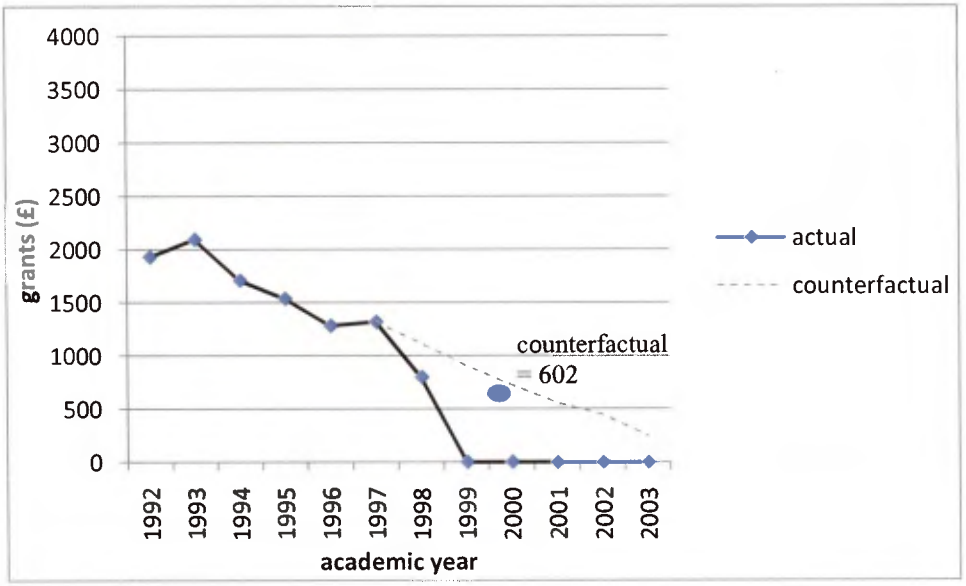
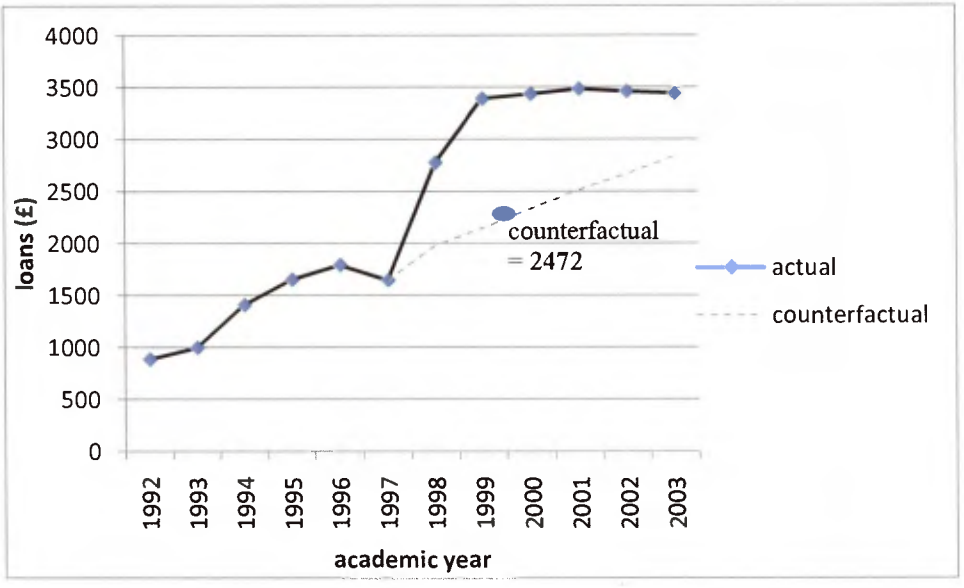


Figure 7.5 Actual and counterfactual values for loans; medium income students



So looking at medium income groups, for example, grants were on a clear downward trend over the 1990's – so the counterfactual of what would have happens, predicts that grants continued on this downward trend (note, that the step change in 1998, when grants were halved is not taken into account here, so that the prediction effectively takes place after 1999 for grants). In terms of loans for medium income groups, as the chart illustrates, loans were on a relatively upward trend, before being raised significantly at the same time as fees were introduced.

So the counterfactual prediction is that this upward trend would have continued, though without the large increase in 1998.
Note, the counterfactual for fees is obviously always zero, since the aim is to explain what would have happened had there been no introduction of fees.

Low income and high income groups (not shown graphically) largely follow the same pattern – for low income groups, grants are assumed to have continued to decrease in value, and loans continued to increase. For high income groups, loans are predicted to have carried on increasing.

Thus, low income groups therefore lost £1077 in grants – since grants were predicted to be at £1077 on average from 1998-2003; medium income groups lost £602 in grants and gained £620 in fees, and high income groups gained £1200 in fees. As discussed, students from all income groups experienced changes in loan amounts.

The next step, then, is to use these values in conjunction with the coefficients from the preferred model in Section 7.3.2 to calculate participation rates after 1998 – imagining the reforms had not taken place and grants and fees took their counterfactual values. The generated participation rates are then compared with the participation rates predicted by the model using the real levels of grants and fees after 1998, and the difference is estimated. As discussed, it is also important to control for maintenance loan amounts, which also changed over the same period.

Since the FE model was the preferred model after selection, the results are presented for this model. However, as mentioned, there may be dynamics at play in university demand, so the coefficients from the dynamic model are also used in the estimation.

So, the "policy on – policy off" effect is estimated for each income group for the Fixed Effects and dynamic specifications, in Table 7.7 below. The results for both specifications are similar.

Table 7.7 – Predicted effect of policy change (policy on – policy off) on average participation rates over 1998-2003[58]

	Predicted effect of 1998 reforms using:	
Income group	FE model	Dynamic model
low income	0.013	0.018
	(0.008)	(0.007)
medium income	-0.004	0.004
	(0.011)	(0.12)
high income	-0.052	-0.042
	(0.017)**	(0.018)*

Robust standard errors in parentheses
* significant at 5%; ** significant at 1%

The results in this table can be interpreted as the change in participation over the period 1998-2003 *compared to what it would have been* had there been no reforms. So, low income students appear to have experienced no significant impact of the reforms. That is, the removal of maintenance grants over the period of 1998/99 – 1999/00 did not significantly alter their participation behaviour – the complete withdrawal of grants does not appear to have reduced participation of low income youths.

Medium income students' participation rates similarly appear to have not been impacted by the loss of grants and partial fee they became eligible for in 1998 – a slight negative impact is found, but is not significant.

High income students, however, do appear to experience a decrease in participation compared to what would have happened, had tuition fees not been brought in, in 1998/99. The estimate is between -0.052 and -0.042, depending on the specification chosen. This indicates that high income students' participation rates were between 5.2 and 4.2 percentage points lower on average over the period 1999-2003 than what they would have been in the case of no reforms. Given that participation rates for high income students were around 33% in 2003, this seems like a relatively small shift, but nevertheless implies a victory for those wishing to narrow the socio-economic gap in participation.

[58] This is accomplished using STATA's lincom command

In all, these results seem somewhat surprising, given the general consensus that high income students are relatively immune to changes in HE finance, whilst low income students are most vulnerable.

However, it is important to note that loan amounts were also changing over the period of the reforms.

So, to understand how the different elements of HE finance impact each income group separately, the overall effects are now broken down into the separate effects for each income group. The results of this decomposition are illustrated in Table 7.8, again for both the FE and Dynamic models.

Table 7.8 Decomposing the effect of the policy change: Predicted effect on average participation rates over 1998-2003

FE model	**(1) Predicted effect of 1998 reforms**	(2) Marginal effect of grant change	(3) Marginal effect of fee change	(4) Marginal effect of loan change
low income	**0.013**	-0.034	-	0.047
	(0.008)	(0.01)**		(0.013)**
medium income	**-0.004**	-0.019	-0.030	0.045
	(0.011)	(0.006)**	(0.009)**	(0.012)**
high income	**-0.053**	-	-0.058	0.006
	(0.017)**		(0.017)**	(0.002)**
Dynamic model				
low income	**0.018**	-0.023	-	0.042
	(0.007)	(0.012)**		(0.012)**
medium income	**0.004**	-0.013	-0.023	0.040
	(0.014)	(0.007)**	(0.010)**	(0.012)**
high income	**-0.042**	-	-0.047	0.005
	(0.019)*		(0.019)**	(0.002)**

Robust standard errors in parentheses * significant at 5%; ** significant at 1%

The decompositions in Table 7.8 above paint an interesting picture about the separate effects of the reforms experienced by each income group.

Column 1 shows the overall impact of the reforms, as described in Table 7.7., while columns 2-4 show the overall impact is decomposed, illustrating the marginal effects of the changes in HE finance; i.e. the effect of a £1077 drop in grants (from £1077 to zero) for low income students; a £602 drop in grants and a £620 increase in fees for medium income students; and a £1200 increase in fees for high income students (as reported in Table 7.6).

For low income students, the decrease in grants they experienced as a result of the reforms had a significant negative impact – abolishing grants resulted in participation being 3.4 percentage points lower than it would have been, as described in Column 2. This itself is a striking result, since no other UK study has been able to quantify the effects of the abolition of grants in 1998-1999. However, going on to look at Column 4, low income students also experienced an increase in loans over the same period, and this appears to have had a positive effect on participation. While, for reasons previously stated, it is not possible to untangle the positive effects of loans (as a liquidity tool) from their negative effects (as future debt), it does appear that the increase in maintenance loan eligibility counteracted the negative impact of the decrease in grants. Indeed, if all youths were assumed to have a zero discount rate so that the upfront value of loans was their only concern, the conclusion would be that the increase in loan eligibility given to low income students completely counteracted the decrease in grants; once loans are controlled for, no change is apparent in participation of low-income students as a result of the reforms. The results are similar for the dynamic specification.

For medium income students, similar to low income students, the individual elements of the reforms are all significant. As with low income students, medium income students also experienced a loss in grants (though this loss was less than for low income students) which also had a negative impact on their participation rates to the tune of 1.9 percentage points – as shown in Column 2. But medium income students also experienced an increase in fees, the impact of which is shown in Column 3. This had a significant negative effect, inducing participation to be 3 percentage points lower than the counterfactual. Again, this result is important, and implies that the policy of introducing upfront fees in 1998 resulted in participation levels being below their potential for these students. However, again once maintenance loan increases are controlled for (as shown in Column 4), the net result is no significant change in participation of medium income students, compared to the counterfactual. This again suggests that loans play an important role as a tool in maintaining participation rates in the face of increased upfront costs.

High income students, while enduring no loss in grants, experienced the biggest increase in fees as a result of the reforms. The impact of the £1200 increase was that participation for this group was 5.8 percentage points lower than it would have been (according to the FE specification) had the reforms not taken place. Again, this is a striking result, and the main driver of the overall reduction in participation of 5.3 percentage points (again using the FE specification) compared to what would have been.

In summary then, the increased costs of university participation imposed in 1998/99, while reducing participation of high income groups, did not appear to sacrifice the goal of widening participation of low income groups.

7.4.2 Contextualising the 2000 and 2001 reforms in Scotland

The coefficients from the Fixed Effects model also allow further analysis of the Scottish reforms which were examined in Chapter 6 using difference-in-difference analysis.

As discussed, although the difference-in-difference analysis revealed no significant change in Scottish participation compared to the English counterfactual after the abolition of fees in 2000 and the re-introduction of grants in 2001, this may be because of changes in loan eligibility amounts in Scotland which occurred at the same time.

Using the counterfactual approach, it is now possible to examine the changes in Scotland versus the Scottish counterfactual – i.e. again creating counterfactual values of grants and fees – and obviously loans – in Scotland for the post reform periods, based on levels before the Scottish reforms, and comparing participation rates predicted by the true levels of grants, fees and loans versus the counterfactual. In this case, given the similarity of the results of the FE and dynamic models, only the FE model is used here, for simplicity.

However, before this can be done, it is necessary to re-estimate the FE model with the inclusion of the two Scottish regions in the panel, in order to obtain results

true for Scotland.[59] (In this case, given the similarity of the results of the FE and dynamic models, for simplicity only the FE model is used here.) This is also an interesting test of robustness of the specification. The re-estimated FE model is shown in Table 7.9 below with the estimates from the model not including Scotland shown alongside for ease of comparison. Reassuringly, the estimates for grants and fees are very similar with the inclusion of Scotland.

Table 7.9 Probability of Attending a University Degree Course given £1000 of loans, grants and fees; Fixed Effects models with and without Scottish regions

	FE (inc Scotland)	FE (not inc Scotland)
grant	**0.029**	**0.032**
	(0.01)**	**(0.009)****
fee	**-0.043**	**-0.048**
	(0.013)**	**(0.014)****
loan	0.043	0.052
	(0.012)**	(0.014)**
parental income	0.001	0.005
	(0.000)*	(0.000)
white	-0.115	-0.098
	(0.035)**	(0.035)**
GCSE	0.212	0.219
	(0.025)**	(0.027)**
father, NVQ Level 2-3[1]	-0.059	-0.058
	(0.027)*	(0.028)*
father, NVQ Level <2	-0.066	-0.058
	(0.027)*	(0.028)*
mother, NVQ Level 2-3	-0.071	-0.097
	(0.031)*	(0.033)**
mother, NVQ Level <2	-0.081	-0.094
	(0.028)**	(0.029)**
unemployment rate	0.003	0.011
	(0.002)	(0.003)**
Constant	2,629.126	0.052
	(1,136.440)*	(0.014)**
Observations	2170	0.032
Number of groups	160	(0.009)**
R-squared	0.13	-0.048

Robust standard errors in parentheses * significant at 5%; ** significant at 1%
[1]In each case, omitted category is "parent educated to >NVQ level 4"

To recap, the reforms in Scotland were as follows:

[59] Note, it is not possible to estimate this model with only Scotland since there are only 2 Scottish regions meaning sample sizes would be inadequate.

In 2000, tuition fees were abolished for high income students (here, defined as those with parental incomes above £40,000 in 2006 prices) resulting in a net gain of £1200 for these students.

In 2001, maintenance grants were re-instated for low income students (those with parental incomes below £17,000), resulting in them being over £2000 better off. However, in both cases, maintenance loans were reduced simultaneously.

Again, counterfactual rates of fees, grants and loans are created for Scotland before and after 2000, and 2001 in the same manner as described in Section 7.4.1.

These are described below in Table 7.10.

Table 7.10 Average loans, grants and fees, pre and post Scottish reforms, and counterfactual (£s, 2006 prices)

High income (fees abolished)	1998-1999 actual	2000-2005 actual	2000-2005 counterfactual
Grant	-	-	-
Fee	1200	0	1200
Loan	2363	1350	2500
Low income (grants restored)	**1999-2000 actual**	**2001-2003[1] actual**	**2001-2003 counterfactual**
Grant	0	2150	0
Fee	-	-	-
Loan	3475	1946	3533

[1] this time period is used for ease of comparison with difference-in-difference model, in which English counterfactual was only valid up to 2003.

Table 7.10 illustrates the changes in Scotland. Firstly looking at high income students, fees went down from £1200 to zero, so the counterfactual here is a fee of £1200. However, at the same time, loans were also reduced – falling from over £2000 in the old system, to a maximum for high income students of just £1400 in 2004 for students with parental incomes above £45,000 and only £800 for those with parental incomes above £50,000 (see Appendix 6).

So, even though high income students in Scotland benefitted from a saving of £1200 a year, their access to cheap maintenance loans was cut dramatically, which may have had an impact on their participation decision making.

As can be seen in Table 7.11, the abolition of fees in Scotland had a significant positive impact on participation of high income students – inducing university enrolment rates to be 5.2 percentage points higher than they would have been (on average from 2000-2005). However, again looking at Column 4, it appears that the large decrease in loans experienced by these students may have affected participation levels negatively (again with the caveat that this parameter may include confounding effects of debt and liquidity) meaning that overall, no significant effect of the reforms is apparent, compared to the counterfactual of what would have been. This result is therefore in line with the findings of the difference-in-difference approach which also found no significant change in participation – as shown in Column 5.

For low income students who had their grants restored, a similar story is evident. Again looking at Table 7.10, even though these students had grants restored in 2001, thus benefitting from a £2150 improvement in their finances, they also faced a sharp decrease in loans available to them.

So, the increase in grants experienced by this group appears to have had a significant positive effect – participation of low income groups was 6.4 percentage points higher than it would have been, (on average, over the four years of 2001-2005) had there been no grants – this is shown in Column 2 of Table 7.11.

But the drop in loans experienced by this group again appears to have had some sort of counteracting effect. Once the impact of loans is controlled for in the model, the net overall impact of these reforms is zero – there is no significant improvement in Scottish low income students' participation rates, as Column 1 illustrates. Again these results are found to be in line with the difference-in-difference outcome of no impact, shown in Column 5.

Table 7.11 Predicted effect of policy change (policy on – policy off) on average participation rates after major Scottish reforms; decomposed by loans, grants and fees

	(1) Predicted effect of 2000/2001 reforms	(2) Marginal effect of grant change	(3) Marginal effect of fee change	(4) Marginal effect of loan change	(5) Predicted impact from D in D
high income	**0.003**	-	0.052	-0.049	0.031
	(-0.015)		(0.016)**	(0.013)**	(0.068)
low income	**-0.004**	0.064	-	-0.068	-0.023
	(-0.012)	(0.019)**		(0.018)**	(0.033)

Robust standard errors in parentheses * significant at 5%; ** significant at 1%

These results imply that using difference-in-difference analysis is not a particularly viable option in this case, though it does provide a useful sanity check against the analysis above. It is unfortunate, though, that the Scottish reforms were again a mixture of positive and negative changes in loans, grants and fees.

7.4.3 Contextualising the 2004 reforms in England, Wales and Northern Ireland

The 2004 reforms in England, Wales and Northern Ireland are the most straightforward to analyse. The reforms concerned the reintroduction of £1050 grants to low income students (in this case, those with incomes less than £16,000). This was the only change in circumstances for this group – their maintenance loans remained unchanged at around £3000 before and after the reforms (the before period being 1999-2003 and the after period being 2004-2005). Therefore the counterfactual is easy to construct – the test is simply what would have happened had grants not been restored, and remained at zero after 2004.

Table 7.12 illustrates the findings, again using the coefficients obtained in the Fixed Effects model to determine the difference between the actual and counterfactual participation rates. Since there is only one element of HE finance being altered, the total figure represents the impact of the restoration of grants. The result is positive and significant – i.e. the restoration of grants resulted in participation of low income students being 3.2 percentage points higher than it would have been had grants not been restored.

In terms of comparison with the difference-in-difference results, as seen in Section 6.2.4, the difference-in-difference which used high income students as a control group failed to find a significant uplift for poor students. However, in proportionate terms, (i.e. comparing percentage uplift in the treatment and control groups rather than the absolute), the difference-in-difference uncovered a similar impact compared to this model – an uplift of 2.3 percentage points in participation compared to had there been no grant increase.

Table 7.12 Predicted effect of policy change (policy on – policy off) on average participation rates after 2004 restoration of grants in England, Wales & NI

	(1)	(2)	(3)
	Predicted effect of 2004 reforms	Predicted impact from D in D	Predicted impact from D in D (non parametric)
Income < £16k	0.032	-0.003	0.023
	(0.009)**	(0.017)	n/a

Robust standard errors in parentheses * significant at 5%; ** significant at 1%

In this case, the conclusion is somewhat mixed, though there is certainly evidence to imply that the restoration of grants in 2004 was beneficial for poor students. Again, the methodology employed here of creating a counterfactual for low income students, rather than using high income students as a control group seems more appropriate, since high income students have such different participation patterns.

7.4.4 The impact of the 2006 top up fees in England, Wales and Northern Ireland

Finally, it is of interest to examine the impact of the 2006 introduction of top-up-fees in England and Northern Ireland. As described in Chapter 2, in 2006, upfront fees were abolished and replaced with a £3000 deferred fee – in other words, the new, higher fee was no longer up-front but offset by an additional fee loan, which students would not have to pay back until after graduation.

Although the LFS data used in this thesis does not contain data for 2006 and 2007, official statistics are published (as seen in Chapter 1) showing the changes in volume of students and proportion from socio-economic backgrounds after the introduction of the 2006 deferred fee.

Figure 7.6 Volume of degree accepts by socio-economic group, 2006 fee reforms (UCAS)

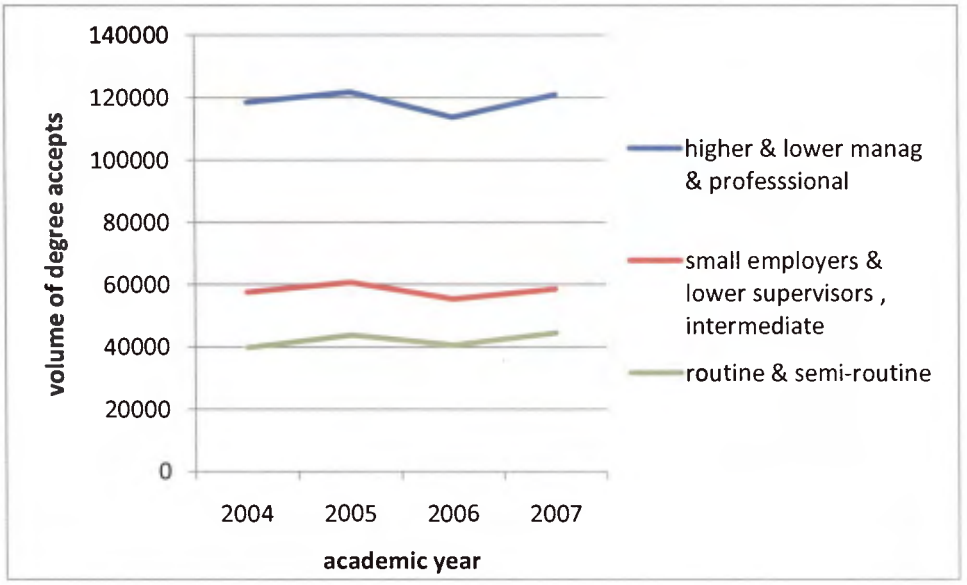


Figure 7.7 Proportion of degree accepts by socio-economic group, 2006 fee reforms (UCAS)

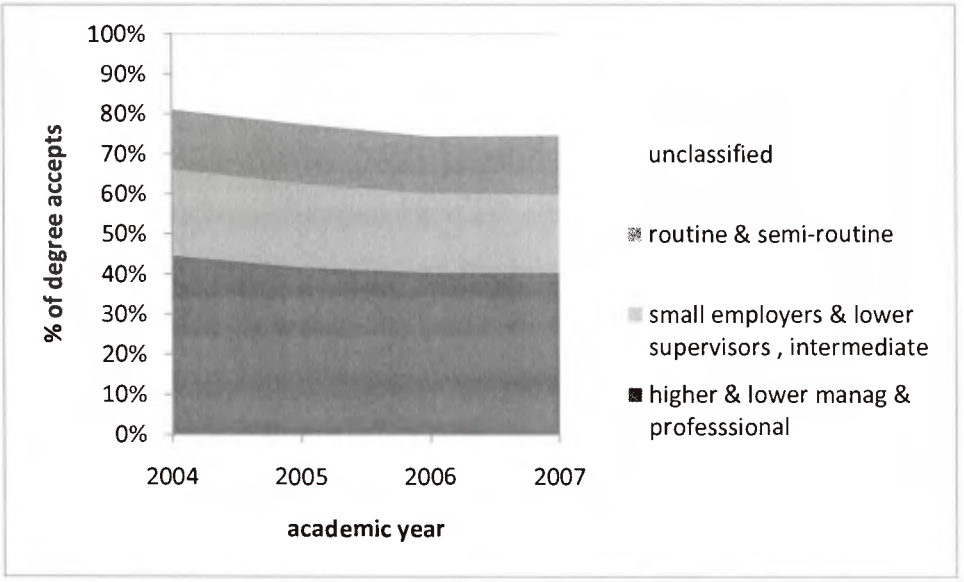


Figure 7.6 and Figure 7.7 display the overall changes in degree participation after 2006 and the proportions of the total coming from difference socio-economic backgrounds – as stated previously, no figures are available for parental income, so socio-economic status is used as a proxy here. Figure 7.7 shows proportions of students coming from each socio-economic background, rather than the ideal

series, which would be proportions of each socio-economic group going to university – this series is not available.

The figures above are somewhat useful in understanding the impact of the 2006 reforms – in terms of overall volumes, aside from a noticeable reactionary dip in 2006 itself, participation volumes seem somewhat flat for all socio-economic groups aside from the lower classes of routine and semi-routine, for whom a slight increase in participation can be observed. However, in terms of overall proportions, this group remain flatly at 15% of the total, though the higher socio-economic groups' proportion is decreasing largely in favour of the unclassified group.

But again, these statistics do not contribute to the understanding of what degree participation would have been like, had the £3000 deferred fee not been brought in.

Unfortunately it is not possible to use the coefficients generated from the panel-level specifications of Section 7.4 to test the impact of the reforms, for two main reasons.

Firstly, the coefficient for fees in Table 7.4 refers only to up-front fees, whereas and youths' reactions to deferred fees could be quite different – and as previously stated, appropriate data beyond 2005 are not available to separately analyse the impact of these reforms.

Secondly, while debt levels pre 2006 are at relatively low levels (around £3290 on average in 2005), driven by maintenance loans, the 2006 reforms resulted in a sharp increase in future debt for all income groups, of £3000 per year. The specifications described in this study do not separately control for debt, so it is inadvisable to attempt to extrapolate the results to the 2006 reforms.

The results do imply though, that the introduction of a tuition fee of £3000 without a fee loan to cover it would, based on this study's estimates of the negative impact of upfront fees, have been detrimental to degree participation.

Future work in this area will be to estimate directly the effects of the reforms using data up to and beyond 2006, and to build a more dynamic model of loans, incorporating future debt repayments.

7.5 Conclusions

This chapter attempted to estimate the impact of tuition fees and grants on participation using an alternative means to the individual-level approaches discussed in Chapter 6. At the outset of this chapter, the individual-level repeated cross section data from Chapter 6 were converted into a panel with the dimensions of region, income group, gender and time. This meant that the suspected estimation problems – namely measurement error in the explanatory variables and unobserved heterogeneity – could be dealt with using well-established methods such as fixed effects, since observations were then observed in more than one time period.

The use of panel data also meant that dynamic specifications could be tested, where the explanatory and dependent variables were allowed to appear in lags, such as would be the case if levels of grants and fees in one year influenced participation in the following year.

A number of specifications were tested and a preferred Fixed Effects model was chosen. The outcome was intuitive, showing that upfront tuition fee eligibility has a negative and statistically significant effect on university participation, and that maintenance grants have a positive influence on participation. Dynamic models generated similar long-run estimates of the impacts, with slightly higher short-run impacts.

A £1,000 increase in tuition fees *reduces* degree participation by 4.8 percentage points, while a £1,000 increase in maintenance grants *increases* participation by 3.2 percentage points.

The major funding reforms of the past 20 years were tested against a counterfactual which was created using the data and estimates. The introduction of tuition fees in 1998 was found to have a negative impact on participation of students from high income backgrounds, while the abolition of grants in 1999 was found to have a negative impact on participation of students from both low and medium income backgrounds.

For low income students, the loss of full grants resulted in participation being 3.4 percentage points lower than it would have been, had grants remained in place.
For medium income students, the loss of partial grants resulted in participation being 1.9 percentage points lower than it would have been, and this was coupled with an increase in tuition fees of around £620 on average per year, resulting in participation being a further 3 percentage points lower than it would have been, had fees not been brought in.
However in the case of low and medium income students, no *overall* change in participation was predicted as a result of the reforms once maintenance loan increases were controlled for. It appears that the increase in maintenance loan eligibility, which occurred over the same period, counteracted the negative impact of the decrease in grants and fees – though it is difficult to conclude this without further research into individuals' responses to loans.
For high income students, meanwhile, the net effect of the 1998 reforms was to decrease their participation levels to the tune of 5.3 percentage points, compared to what participation would have been with no fees. This decrease was largely driven by the large increase in upfront tuition fees that this group experienced, which this survey finds to have a significant negative effect on participation.

These results are highly relevant for policy makers, who should be aware of the negative impact of upfront fees – i.e. those not covered by a fee loan – and the positive impact of aid on participation. Maintenance grants, in conjunction with maintenance loans, can potentially be used to offset the negative influence of fee increases, given their opposing influences on participation.
Policy makers should also be aware of particularly vulnerable groups when setting levels of fees and grants, and may need to target specific groups with more generous aid to counteract any increases in tuition fees.

Chapter 8 Summary and conclusions

8.1 Summary

The aim of the first strand of this thesis was to investigate the role of higher education finance in university participation. In particular, the thesis aimed to ascertain whether maintenance grant eligibility, and upfront fee obligations faced by school-leavers make a difference to their decision to attend university *over and above* the well-understood roles of prior attainment and socio-economic background. Much research has been carried out looking at the latter two influences, finding them to be overarching explanatory factors in youth's university enrolment decision-making, and therefore concluding that HE finance, which (presumably) becomes relevant only when a youth reaches the last stages of compulsory schooling, at age 16 or more, is largely irrelevant to this decision.

Despite this, the UK has seen much debate over the introduction of cost-sharing in higher education, particularly the establishment of tuition fees in 1998/99 and the gradual replacement of maintenance grants with loans. The UK system is still in a state of evolution. There has been, and continues to be, much concern that increasing levels of debt faced by students will dissuade them from going to university. Investigation into the impact of increasing fees is therefore necessary to provide policy-makers with understanding of the impact and effectiveness of their decisions.

The impact of HE finance has been studied in many other countries with long histories of student contribution systems, and many of these studies have uncovered robust evidence that youths *do* consider HE finance as a factor in their higher education enrolment decisions. It is important, therefore, to carry out similar research for the UK, as this thesis has aimed to do.

This study has encountered many challenges in its attempt to explore the relationship between HE finance and participation. Finding an appropriate dataset with adequate sample sizes and information for all types of school leavers, including their destination after school and critically, their parents' income levels proved to be highly challenging and time-consuming, as explained in Chapter 5. Issues with model estimation, particularly the need to deal with endogenous

variables, common when estimating causal relationships between fees and aid and participation also proved challenging.

This thesis has overcome these hurdles by using pseudo panel data and econometric techniques to generate unbiased and consistent estimates of the impact of fees and grants on university participation under reasonable assumptions.

This strand of the thesis has generated a number of interesting findings. Primarily, HE finance is found to have a significant effect on university participation over and above the roles of prior attainment and socio-economic background; upfront tuition fees are found to have a negative influence on school-leavers likeliness to go to university, while maintenance grants exert positive influences on participation. Moreover, the major reforms of 1998/99 in which fees were introduced and grants abolished, were found not to have dissuaded low income students from participating in HE, though a small negative impact was apparent in participation of high income students.

The main findings of this first strand of the thesis, and their policy implications are discussed in depth below.

8.2 Main findings and conclusions

1. Higher education finance, in the form of maintenance grants and upfront fees, has a significant impact on the university participation decisions on youths of school-leaving age. This study finds that a £1000 increase in tuition fees leads to a 4.8 percentage point decrease in likeliness to participate in a university degree program, while a £1000 increase in maintenance grant eligibility leads to a 3.2 percentage point increase in likeliness to participate.

In each case, these results are statistically significant even in models which include the youth's prior attainment in the form of 5 good GCSEs, and socio-economic background measured as parental education and income levels, as well as several other factors such as regional unemployment rates, gender and ethnicity. Past research has shown that it is crucial to control for these factors since they are extremely influential in youths' university enrolment behaviour, but

this research indicates that prior attainment and background factors are not the full story. Policy makers must therefore be aware that there are demand responses to changes in tuition fees and grants, and that responses to increases in fees are significant and negative, while responses to increases in grants are positive. Only medium and high income students are eligible for fees, so the negative response suggests the price of HE finance does matter, even to students from wealthier backgrounds. This information is critical in policy decision making and so far, no other work in the UK has attempted to quantitatively estimate the elasticity of demand for participation with respect to HE finance. In particular, there has been little research to indicate that upfront fees are a deterrent to university participation.

2. Different income groups may respond differently to upfront costs and aid. While this study, largely for reasons of inadequate data and sample sizes, has been unable to quantify the effects of grants and fees for each income group, there is some evidence to suggest that low income students have a stronger response to grants than medium students. In calculating the elasticity of demand for university for each income group, low income groups were found to be the most sensitive to changes in grant eligibility. That is, pound for pound, an increase in grants will induce a larger increase in degree participation from low income students than from medium or high income students. Likewise, medium income students appear to be more responsive to increases in net costs than high income students. However, these elasticities were simple calculations based on the model output; ideally a model would include income groups interacted with the HE finance variables, but as stated above, inadequate sample sizes meant this could not be reliably performed.

Nevertheless, policy makers must be aware that certain groups of youths are more sensitive to finance than others and that targets can be met more effectively with this understanding. The Governments ongoing Widening Participation policy, for example, aims to encourage both poorer and older individuals into HE – this study finds that poorer people can be more effectively targeted by increasing grants available to them, relative to higher income students.

3. The 1998 reforms, in which grants were abolished and up-front fees introduced for the first time, affected youths from different income groups in different ways. The impact of abolishing grants for low income students was significant and negative, while similarly, the impact for medium income students, who lost partial grants and gained partial fees in the reforms, was that their participation rates were lower than they would have been in the absence of such increases in costs. However, in both cases, once increases in student loans were controlled for, participation of low and medium income groups was unaffected, suggesting increases in loan eligibility may counteract the negative effects associated with removing grants and increasing fees.

High income students, however, experienced a negative impact of the 1998 reforms, with their participation rates after the reforms 5.3 percentage points (on average, between 1998-2003) lower than they would have been, had tuition fees not been brought in. These findings emphasise the positive impact of grants and the deterrent of upfront fees.

4. The reforms occurring in Scotland after devolution in 1999, in which tuition fees were abolished and grants restored to poor students appear to have had a neutral impact on participation despite the large financial benefit to students of all income groups. While the abolition of fees had a negative impact and the re-introduction of grants boosted participation levels, these reforms were accompanied by a cut in maintenance loan availability, and once this is controlled for, the reforms appear to have a neutral effect. Scottish participation rates (though not informative of what would have happened had tuition fees continued and grants not been restored) do not display any upturn in participation after the reforms.

5. It is unclear whether the 2004 reforms, in which grants were re-introduced to poorer students, encouraged poorer students to university. There is some evidence to imply that the restoration of grants in 2004 was beneficial for poor students, but the conclusion is somewhat mixed. It is hard to draw conclusion on the impact of the 2006 reforms, meanwhile, since while upfront costs fell as a

result of the reforms, levels of debt increased significantly. This study does not attempt to model the impact of such increasing debt levels.

6. Participation of medium and high income groups accelerated at a faster pace than that of low income groups, between 1992 and 2005. In fact, the rate of growth participation of low income groups has actually slowed. These results are in line with the findings of Blanden and Machin (2004), implying that the expansion of HE throughout the 1990s benefitted the rich over the poor.

7. Better research is needed in order to fully understand of the role of HE finance in university participation. Regression based estimations, including those tested in this thesis, are fraught with measurement error and unobserved heterogeneity arising from omitted variables such as youths inherent ability and parental factors such as motivation. Robust estimation strategies, such as difference-in-difference analysis are needed to control for these issues – though in practise such methods are troublesome to implement, since UK education finance policy changes are rarely "clean" but have tended to occur alongside other policy changes, while appropriate control groups are difficult to find.

Because of these issues and the unavailability of good datasets that provide an adequate set of control variables and well-measured parental income data (covered in 8 below), the small number of UK-based studies aiming to explore the impact of HE finance have tended to estimate the ex-post response to changes in a whole package of support, by examining participation changes after the reforms. These studies have generally concluded that the UK HE reforms did not impact participation and that the low participation rates of those from poor backgrounds are part of a long-term trend.

However, without a counterfactual, such as that used in a difference-in-difference analysis, it is not possible to understand the true impact of the reforms on participation (i.e. what would the level of participation be in the absence of the reforms) – growth or declines in participation after the reforms may have been caused by other factors.

8. Better data are needed to enable a deeper understanding of the relationship between access to finance, fee obligations and university participation. This study

examined a number of large-scale government run surveys and found a number of challenges with the existing datasets, threatening the viability of this study. Firstly, there are very few studies which follow individuals after they have left the household (the BHPS being an exception). The result is that no information on background factors such as parental education or income is held on those living independently, meaning income data has to be imputed for such individuals (such as by Galindo-Rueda et al (2004), and this thesis), or they are left out of the study altogether. Secondly, good data on household income – which includes benefit and investment income, crucial to calculate means tested levels of fees, grants etc, is rarely available, and proxies such as earnings data must be used instead, generating bias through measurement error. Thirdly, sample sizes, when studying school-leavers in particular, are often inadequate for the purposes of analysis. Datasets with large sample sizes, which follow individuals from the household (thus observing parental background factors) into work, university or otherwise are needed to further analysis into these important and expensive reforms. An excellent example is the recent creating of a dataset of pupils from the PLASC dataset (thus containing everyone) which is linked with HESA information, enabling the user to observe where the person is and even what subject they are studying. Such datasets provide vital insights into the decision-making of youths throughout their lives, and but are still extremely rare despite Governments continued focus on widening participation and encouraging youths into higher education.

8.3 Discussion

The aim of this thesis was to test the hypothesis that HE finance affects youths' decisions to go to university. The thesis has claims to originality for a number of reasons. Almost all studies quantitatively examining the impact of the UK finance reforms rely on studying the changing profile of university participants by socio-economic status over the period of the reforms; this study observes both participants and non-participants, and uses parental income to calculate exact amounts of finance eligibility – crucial to understanding the impact of finance. Furthermore, this study identifies the elasticity of participation with respect to university costs, something which no other UK based study has attempted to do quantitatively.

A number of limitations, however, should be noted:

1. As outlined in Section 8.2, the datasets available for the study were limited in many ways, and the final dataset used suffered from various inadequacies, reducing robustness of the results and introducing biases through measurement error. A study with larger sample sizes and more accurate data on parental income would be able to provide more in-depth analysis, such as the effects of HE finance by different income groups, but such data is not currently available in the UK.

2. This study can only be generalized to certain types of HE finance scheme since it explores finance policies specific to the UK in the 1990s and 2000s. For example, the results do not take into account possibilities such as real interest rates being applied to loans, as is the case in other countries, and upfront fees, rather than deferred fees are evaluated. Furthermore, the study makes no assertions as to individuals demand responses to fees and grants over a certain amount. In this study, for example, fees were set at a maximum of £1200; the forthcoming UK review could see fees going as high as £5000. It is difficult to generalize the results of this study to fees of this level. Moreover, the results do not incorporate levels of debt, which increased significantly in 2006 upon the introduction of deferred fees of £3000 per year, nor do they incorporate individuals' attitudes towards loans – such as their discount rate or knowledge of future repayments. Future work will attempt to tackle this using a more dynamic modeling approach.

3. By definition, this study has only examined response to finance eligibility, rather than uptake, thus analyzing intention to treat (ITT). It is conceivable that certain individuals may lack information on grant availability, for example, and therefore may not take up their grant. Since the study wished to examine responses purely to eligibility rather than uptake, the study did not consider this. However, some surveys do contain information on grant and loan uptake and so a possible extension would be to examine this, rather than focusing on ITT.

4. It is difficult to make any assertions as to the reasons behind youth's responses to fees and grants. For example, the negative response of high income students to up-front fees might suggest some type of credit constraint, but this seems unlikely given the relatively high earnings of their parents, and could instead be a result of price sensitivity. Further research into the reasons behind the responses to HE finance would be a useful further step.

The results imply that there is a role for HE finance in youth's participation decisions, with results in line with those found in similar US research. However, this study does not wish to underplay the role of youths' background and prior attainment in university participation. Undoubtedly these factors are of vital importance – indeed without an adequate number of GCSEs or A-levels it would be very difficult if not impossible for an individual, however motivated by the HE package available to him or her, to go to university. One hypothesis is that there is a marginal group of students that may be undecided about university participation at the time of decision-making, and the amount of aid available to them, and the fees they will have to pay may be the tipping point as to whether to attend or not. For example, a youth from a poor background who may have achieved good GCSE and A-level scores, may be on the borderline of committing to HE, but upon discovering that no grants are available and living costs must be funded by loans, may decide against going to university.

Such marginal students are hard to find in datasets examined in this thesis and perhaps qualitative research, such as that carried out by the likes of Forsyth and Furlong and Furlong and Cartmel (2005) would help to shed more light on the nature of individuals who are motivated by higher education finance.

Second strand

The impact of higher education finance on university funding per head in the UK

Chapter 9 The impact of higher education finance on university funding levels and competitiveness

9.1 Introduction

As described in the first strand of this thesis, the Higher Education reforms of the past decade since the introduction of tuition fees in 1998 had at their root, the aim to increase university funding levels, but also had important economic consequences for students.

A further consequence, arising from the reforms and also from Scottish and Welsh devolution, was to significantly alter the landscape between the four constituent countries of the UK in terms of funding per head, changing the balance of funding between universities in the UK.

As has been extensively covered in the first strand of this thesis, the actual funding systems applied in England and Scotland first diverged significantly after devolution in 1999, when the Scottish Labour party decided to abolish the up-front university tuition fee of £1200[60] that had been in place across the UK from 1998, and introduce the Graduate Endowment[61]. These reforms were fully enacted by 2001/02. A further major development occurred as a result of the 2004 Higher Education Act, when the UK Government abolished the up-front fee for English undergraduates, but replaced it with a deferred fee of up to £3000 per year for new undergraduates from 2006/07 onwards. The act also gave the National Assembly for Wales powers to decide on tuition fees in Wales, whose government decided to exempt Welsh domiciled students from the £3000 fee, instead freezing their fee at £1200 with the Welsh government paying the additional £1800 on their behalf (see Chapter 2 for more details).

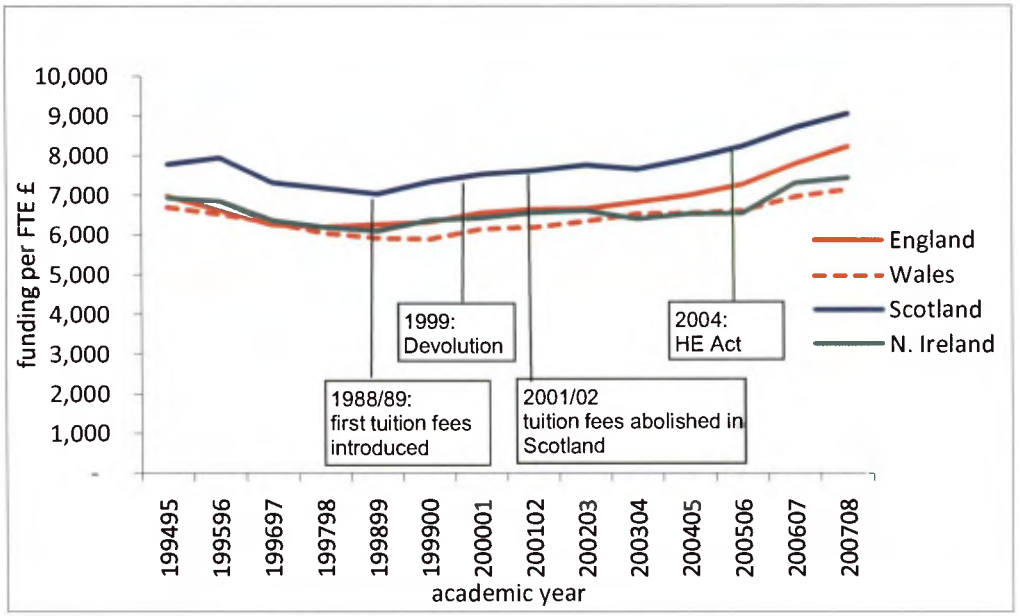
These developments provoked wide debate in the Scottish press. There was great concern that the injection of additional money into the English, Welsh and

[60] As with other chapters, all figures are in 2006 prices unless otherwise stated
[61] The graduate endowment was a £2289 one-off payment all students had to pay upon graduation – see Section 2.4 for more details

Northern systems would result in their universities being able to provide better facilities, better pay and better resources than universities in Scotland[62].

Universities in Scotland have traditionally been funded at a higher rate than those in the rest of England, Northern Ireland and Wales. Figure 9.1 illustrates university funding per FTE (full-time equivalent student) in the UK from 1994/95-2007/08, with Scotland clearly set apart from the remainder of the UK.

Figure 9.1 University Funding per FTE, UK constituent countries – UK, EU and non-EU teaching and tuition, research, capital grants and all other sources of income (£), HESA



The injection of additional funding per head received by English, Welsh and Northern Irish universities represents a clear challenge to Scotland's historically competitive funding position. This emphasizes an interesting and important "by product" from the divergence of HE finance policy in the constituent countries of the UK – in particular in Scotland. While Scottish students no longer have to pay fees to study at Scottish universities, the flipside is that Scottish universities do not have access to fee payments from these students, unlike their UK counterparts, resulting in a potentially large funding gap between the two countries.

[62] See for example http://www.heraldscotland.com/news/education/call-to-bring-back-university-tuition-fees-1.918985

As discussed, the increase in financial inputs into English, Welsh and Northern Irish universities relative to Scottish universities provoked concern in Scotland for a number of reasons:

1) University quality. Maintaining university quality, in terms of teaching, facilities and research, is clearly of vital political importance to Scotland[63]. Research in particular is an extremely lucrative field, and can be a highly important revenue stream so it is important for universities to maintain their research quality. This in turn requires a high level of funding. As seen in Figure 9.1, the Scottish government has provided a consistently high level of funding to its universities relative to those in the rest of the UK. By choosing to abolish tuition fees, the Scottish government will have to rely mainly on taxpayer money to finance its HE institutions, meaning quality could slip if other sectors of the economy are deemed needier and funding is prioritized away from the HE sector (Barr, 2004).

2) University competitiveness. By extension, if universities in the rest of the UK are able to increase the quality of their facilities, teaching and research relative to those in Scotland, this could erode Scotland's competitiveness, and result in a potential "brain drain" of quality in Scotland as lecturers, researchers and even students are attracted South of the border. This issue is important, not only in terms of competitiveness with other UK constituent countries but also to competitiveness worldwide in attracting students.

3) Political consequences. The possible funding gap between Scotland and the rest of the UK could also have significant political ramifications. Scottish MPs can vote on UK tuition fee legislation and will no doubt consider the impact on their competitive position when doing so. Therefore, it is of political importance to explore the impact of the tuition fees in terms of financial inputs to English universities versus Scotland.

[63] See for example the SNP Manifesto 2007, pp54

The overarching aim of this chapter, then, is to assess the extent of the funding gap between Scotland and the rest of the UK, looking at the short, medium and long term future for the position of Scottish Higher Education Institutions (HEIs) in terms of comparative funding per FTE compared to the other constituent countries in the UK, and how this has been influenced by the recent HE funding reforms, in particular the introduction of £3000 deferred fees in England, Wales and Northern Ireland. The study concentrates particularly on a comparison between Scotland and England (though where readily available, data from Wales and NI are included), since England can be construed as fairly representative of Wales and Northern Ireland in terms of funding legislation, while Scotland is clearly set apart.

9.2 How does Higher Education funding impact university quality and competitiveness?

As discussed above, one of the key ways in which university funding may impact universities is by increasing the quality of the institution, in terms of facilities, teaching, research and resources. There is much existing literature regarding the advantage between universities in this sense.

University quality tends to be measured in terms of university research and publications (often measured by RAE[64] ranking), the quality of teaching (captured in various ways, including QAA[65] scores), or the quality of the student-body intake (for example captured by the average A level score of attendants). See for example HEFCE's Information on Quality and Standards in Higher Education (2005), HEFCE's NSS (National Student Survey) and the TQI index (teaching quality index). A further body of literature ranks universities in terms of their attractiveness to students. This is usually measured by the ratio of applications to acceptances, the hypothesis being that those universities with a high volume of applicants for every acceptance are more elite, while those with fewer applications must lower their entry standards to fill their places. Other measures along these lines are cross border acceptances (the assumption being that students

[64] Research Assessment Exercise – see Research Assessment Exercise 2008: the outcome
[65] Quality Assurance Agency for Higher Education

prefer to study close to home, but high quality institutions will encourage them to travel) and reliance on clearing.

A number of studies have attempted to estimate university competitiveness, intrinsically linked to the quality of institution. Abbot and Leslie (2004) model student demand in terms of applications per university, as a function of entry standard of the university plus a group of variables thought to influence demand - including a quality ranking variable, size of university, subject mix (some universities are less attractive because they have a heavy influence on science), dummies for pre- and post-1992, Oxbridge, plateglass, Russell group, and resources in terms of funding per head.

They find strong regional influences on applications – universities in Scotland and Wales have lower demand from outside the region – so have negative coefficients. One explanation offered is the separate tradition of 4 year degrees, which may serve as a deterrent, particularly to English students.

In a similar fashion, Hoare (1991) examines application types at UK universities, and finds further strong regional differences in application type. In Scotland 87% of all regionally originated applications are for local courses. Geographical isolation and distinctive education systems (i.e. Highers and O'Grades) are offered as explanations for the relatively high dependence of Scottish universities on local applications. These studies suggest low levels of competitiveness between England and Scotland.

However, competitiveness of universities in terms of their financial inputs, measures closer in nature to those that will be discussed in this strand of the thesis, are also of vital importance to policy makers.

Again, a number of studies have attempted to examine university competitiveness in terms of financial inputs. Depending on the country of study this can be either public or private (or both). American institutions for example, are famously well funded from private sources such as tuition fees (OECD Education at a Glance, 2008) and generous donations from alumni. In these terms they are among the richest in the world. Despite this, UK and Australian universities have recently

emerged into the "global elite" (Marginson, 2005). This is in part due to the continued domination of English speaking institutions. Foreign students are highly attracted to English-language institutions due to the desirability of English-language based skills in business, IT and scientific research. Such cross-border education has become a commercial business in the UK, bringing in large amounts of money from (unregulated) high tuition fees from overseas students. Furthermore, research tends to be dominated by English language institutions, and is an extremely lucrative field, again attracting large amounts of money into UK universities – underlying the financial importance of offering high quality research.

While there may be evidence that increases in university funding per head improve competitiveness, however, there is little available evidence that increases in tuition fees of the nature implemented in the UK over the last decade, actually significantly increase university funding per head.

The debate on tuition fees has focused on under-funding in universities (CBI, 2009; Universities UK, 2009), and the Governments' decision to ask undergraduate students to contribute to their fees – yet to date there has been no real way of telling how funding purely for undergraduates has changed as a result, using published data. This is largely because published data are inadequate for ascertaining the impact of tuition fee reforms on university funding levels.

To explain: published data are available on university funding per head (e.g. HESA[66] data), but these widely used measures of HE funding per head are distorted by the inclusion of postgraduate, overseas student and research funding, so it is not possible to fully assess the impact of the funding reforms, which were purely focused at undergraduates, using these data. In order to fully understand the impact of the funding reforms on universities, a pure undergraduate funding series is needed.

Furthermore, while it has been long understood that university funding per student in Scotland is significantly higher than that in the rest of the UK, given

[66] Higher Education Statistics Agency

that the widely published figures describing funding per FTE are inflated by the factors described above, these data do not give a true picture of funding per head in Scotland and the rest of the UK.

Therefore a key aim of this strand of the thesis is to remove these effects, and create a series which looks at funding per head solely for UK and EU domiciled undergraduates. The creation of this series will enable exploration of Scotland and England's competitive position in terms of funding for UK and EU undergraduates, and will enable better analysis of the impact of the 2006/07 deferred fee, and whether Scotland was able to maintain its competitive edge in the face of the large injection of funds to English universities.

A further aim of this strand of the thesis is to gain a deeper understanding of Scotland's apparent historical advantage in funding per head compared to England. University funding has traditionally been allocated based on volumes of students enrolling at a university, but also the subjects they choose to study. These compositional differences are important factors in relative funding levels, and this strand of the thesis aims to investigate their contribution to funding levels, as well as overall generosity of funding in each country.

This chapter will also consider future developments in tuition fees, and in particular the HE funding review in 2009 in which the cap on England's tuition fee levels could be raised. This again will have repercussions for Scotland's relative competitiveness in terms of funding levels.

A final aim is to explore UK University funding per head relative to the rest of the OECD. Should universities in the UK wish to compete directly (in terms of funding per head) with those in the OECD it is necessary to understand the relative position in the current day, and the level of funding discrepancy between the UK and the highest-funded countries.

The overarching aim of this chapter though, is to focus on what the increase in resources directed at English universities as a result of the introduction of deferred fees in 2006/07, will mean for relative funding of English and Scottish universities.

9.3 Second strand thesis outline

The structure of this chapter is as follows. Section 9.4 briefly sets out the data used and outlines the different funding per head series that are constructed. Section 9.5 considers how the historical comparison between English and Scottish universities is affected by the choice of different measures of university funding. In Section 9.6 a funding per head series purely for UK and EU domiciled undergraduates is constructed, with an illustration of how compositional differences in the courses taken by English and Scottish universities impact relative funding. From this series it is possible to accurately measure the impact of the recent reforms. Section 9.7 looks to the future, assessing how changes after the 2009 review in England may further affect the funding landscape between England and Scotland. Section 9.8 broadens the analysis by considering how factoring in student support in the form of loans and grants alters the relative picture between countries. Section 9.9 places the analysis in the context of funding within other OECD countries, and Section 9.10 concludes.

9.4 Data sources

The primary data source for this report is HESA (Higher Education Statistics Agency). At the time of writing, HESA data is available up to 2007/08. HESA data comprises detailed information on all students studying at UK universities, including country of origin, institution of study, subject of study (with details of 19 different subject types) and level of study (undergraduate or postgraduate). The data are aggregated to university, country or subject level (i.e. individual student level data are not available) and comprise information on thousands of students. For example in 1998/99 there were 835,526 full-time undergraduate students studying in English universities, according to the HESA dataset.

As well as holding information on student volumes, the dataset also comprises information on total funding awarded to universities in each of the constituent countries of the UK, as well as a breakdown of this funding in terms of funding for research, teaching, and capital, again by EU and non-EU student type.

As explained, while this dataset is extremely comprehensive, this information alone does not allow the calculation of a funding series specifically looking at UK domiciled undergraduates, since the data are not broken down to this level.

Therefore, as will be explained throughout this chapter, additional information on allocation of funds by undergraduate is taken from HEFCE (Higher Education Funding Council for England), HEFCW (Higher Education Funding Council for Wales) and SFC (the Scottish Funding Council) grant letters, which are available up to and including 2007/08.

9.5 Funding per FTE in the UK from 1994/95 – 2007/08

In this analysis of funding per FTE, four measures of funding per FTE are constructed. A top-line measure, which comprises funding from all sources (including research, teaching and overseas students) illustrates Scotland's clear funding advantage over the rest of the UK. However, this measure includes capital and research funding, which while a highly lucrative source of income, is not relevant for this analysis, for reasons previously stated. Research and capital income is therefore stripped out, a measure for teaching and tuition only is duly constructed. This is the most widely used measure of funding per head, and the most frequently quoted. However, again this measure distorts the true picture, since teaching money includes that for postgraduates and FE students, and more importantly, tuition fees from overseas students. It is widely known that fees from overseas students outstrip those of home and EU students significantly. This measure of funding provides a very distorted view when considering the impact of Government policy, not least because these fees are not subject to Government regulations. Stripping out the effects of overseas fees, to look at teaching and tuition for home and EU students only, brings the series closer to one measuring the impact of Government policy on tuition fees, and paints a very different picture from the more commonly used measures, with Scotland's funding advantage somewhat reduced.

The series of most interest, however, is a pure undergraduate funding series, since the recent tuition fee reforms have focused solely on this group. As stated, it is not

possible to construct such a measure using HESA data, because teaching and tuition funding is not disaggregated at this level – i.e. there is no way of knowing what proportion of teaching funds are meant specifically for undergraduates. Indeed the universities themselves are free to decide how to divide the money between student types, so such a break-down is not essential for their purposes.

It is essential for the purposes of this paper, though. The debate on tuition fees has focused on under-funding in universities, and the Governments' decision to ask undergraduate students to contribute to their fees – yet to date there has been no real way of telling how funding purely for undergraduates has changed as a result. Instead those trying to understand the impact of the reforms have had to look at measures which are inflated by overseas tuition fees, research money and money for postgraduates. Of course, there is likely to be cross-subsidisation occurring in universities – e.g. money for post graduate students and research likely cross subsidizes under graduate students. However, understanding the influence of cross-subsidization is beyond the scope of this study.

Thus, information from the funding councils of each country is combined with HESA data to construct a series of undergraduate funding per head. The method used is as follows. Funding is allocated to universities on the basis of subject type – each subject type has a price (Section 9.6 provides greater detail on the price of each subject) and university funding is calculated on the basis of 'volume times price' (where volume is the number of students at universities studying each subject from the HESA data). Therefore, a measure of undergraduate funding per head can be calculated by this simple methodology.

This newly constructed measure of undergraduate funding adds a further dimension to understanding of funding, and in particular reveals the effect of compositional differences, as well as allowing the impact of undergraduate top-up fees to be examined, and different tuition fee scenarios to be considered.

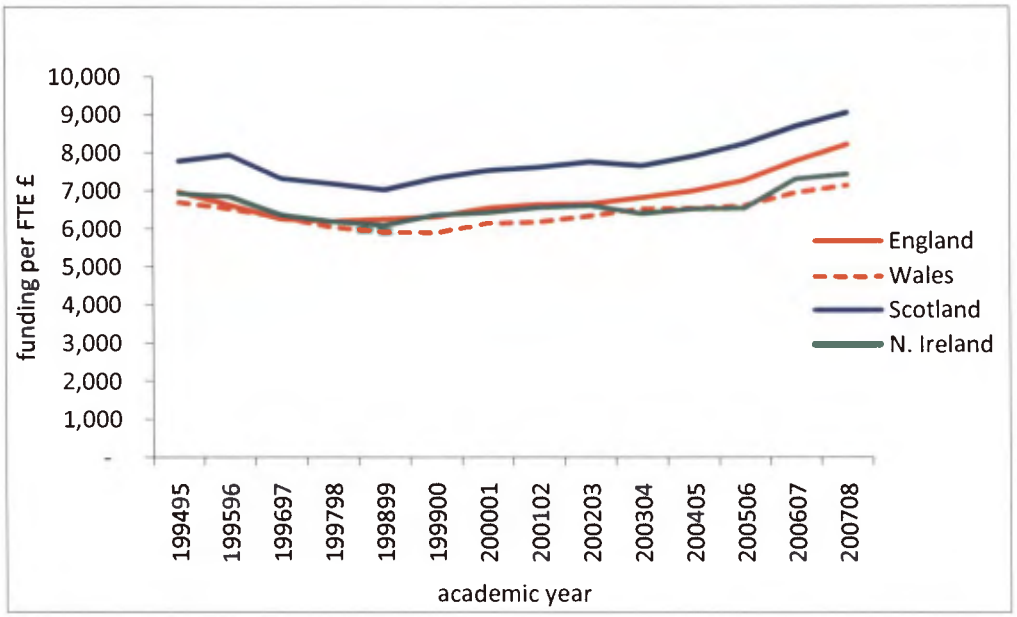
Each of the funding series constructed are detailed in the following sections.

9.5.1 Topline funding per FTE

Includes: Teaching, Tuition, Research, Capital Grants, FE provision and all other sources for undergraduate, postgraduate and FE students from UK, EU and non-EU countries

The first series examined is top-line funding per FTE. This measure of funding is for all students including undergraduates, postgraduates and further education students. It comprises all sources of university income, namely – teaching, tuition, research, capital investment and all other sources (see Figure 9.2). This measure is calculated over the ten years from 1994/95 to 2007/08 (the latest data available for this measure).

Figure 9.2 Topline funding per FTE – teaching and tuition, research, capital grants and all other sources of income (£2006)



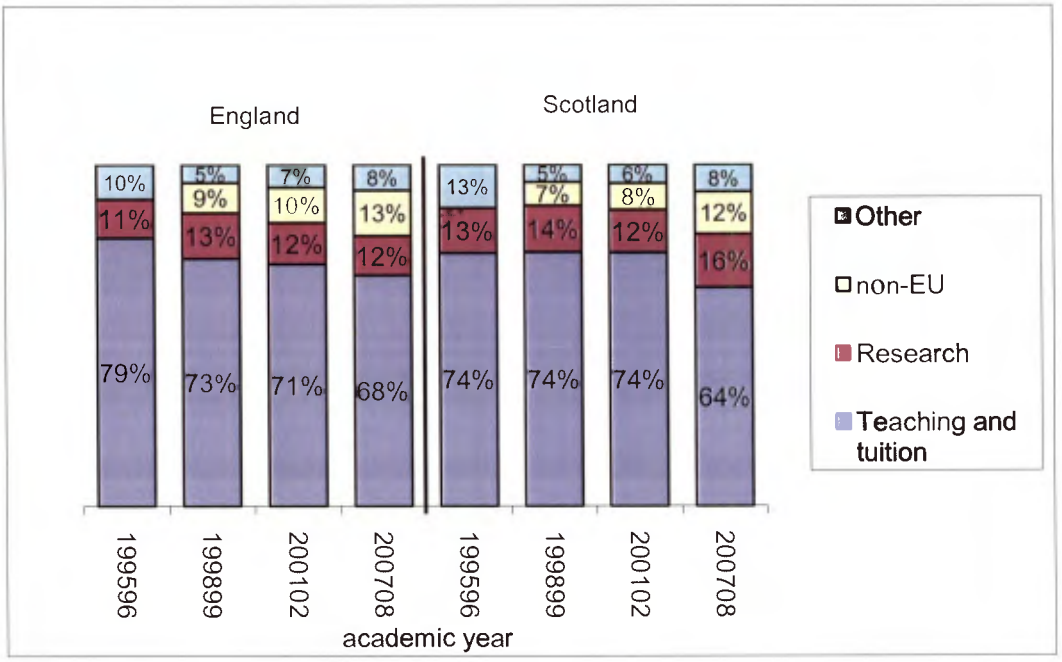
This series clearly shows Scotland's funding advantage. Scottish funding per FTE is significantly (around £1000 on average) higher than England's over the course of the ten years this study examines – with Wales and Northern Ireland at very similar levels to England. Scottish funding peaks in 1995/96 at £7936 then begins to slide, so by 1998/99 it has fallen to £7023. This coincides with the introduction of tuition fees following the Dearing Report, whereupon funding per FTE starts to slowly rise.

By 2001/02 Scotland has abandoned the tuition fee and introduced the graduate endowment. Funding per FTE continues to rise but fails to recover to 1994/95

levels. Note that England, Wales and NI show similar patterns to Scotland, but by 2007/08 the gap between England and Scotland is also beginning to narrow.

In order to understand what this overall measure of funding per FTE comprises, and how this distribution has changed, it is useful to examine the component parts of university funding. These are illustrated in Figure 9.3 below.

Figure 9.3 Breakdown of university funding, England and Scotland 1995-2007 (HESA)



As Figure 9.3 illustrates, teaching and tuition money clearly makes up the majority of university income, with research, capital grants and other sources of income making up a further 15-20%. Over the timeline, both England and Scotland have seen the proportion of funding from teaching and tuition fees fall gradually while the proportion from research has remained fairly stable, although it has climbed to 16% in Scotland, compared to 12% in England[67].

This overall funding per head series, then illustrates at a very high level, the large advantage Scotland has over England, in terms of funding. At this high level, Scotland's comparative advantage appears to stem from more generous teaching

[67] Note that prior to 1998/99 funding from non-EU sources was not separately itemized in the HESA data, but was included in the total tuition figure.

and tuition funding. By examining the teaching and tuition series in more depth, clearer conclusions can be drawn about funding in each country.

9.5.2 Funding per FTE – teaching and tuition only

Includes: Teaching, Tuition for undergraduate, postgraduate and FE students from UK, EU and non-EU countries

Removing research, capital investment, and other sources of funding creates a pure teaching and tuition fee series for UK, EU and non-EU postgraduate, undergraduate and further education students. The levels of funding from this series are described in Table 9.1 below:

Table 9.1 Funding per FTE – teaching and tuition – all student types, UK, EU, non-EU (£2006)

England (ave. 1995/96-2007/08)	£5,625
Scotland (ave. 1995/96-2007/08)	£6,230
Difference (Scotland – England)	£605

Removing these sources of income obviously reduces funding per head in Scotland compared to England. Indeed research is a particularly important element of funding in Scotland, making up 16% of income from Scottish universities in 2007/08. Overall research expenditure in Scotland was £245m in 2007/08 – or £1493 per head. This is almost 50% higher than England's research funding of £999 per head, and so is a key contributor to Scotland's financial position.

Nevertheless, without research included Scotland's funding per FTE is still around £600 higher than in England. This series is the one most frequently quoted in comparison figures. However, as this paper focuses on the effects of the recent changes in UK tuition fee policy, it is appropriate to look at the implications for teaching and tuition fees for UK and EU undergraduate students only – since these are the only students directly affected by such policies (graduate and non EU students are subject to different tuition fee rates). Therefore, it is important to examine a series in which funding from non-EU students is removed.

Nevertheless, this study acknowledges the vital importance of funding from non-EU sources as a key source of income for universities. Moreover, EU and UK

domiciled students may benefit from this funding, since it will improve university quality in general (though favouring non-EU students could decrease the supply of places for home students). For this reason, the next series to be examined is that of funding from non-EU students.

9.5.3 Funding per FTE – teaching and tuition – non-EU students

Includes: Teaching, Tuition for undergraduate, postgraduate and FE students from non-EU countries

Although EU legislation forces universities to charge the same fees for EU students as home students, fees for overseas students (and home students from other constituent countries) are unregulated. Indeed, non-EU students can be a very lucrative source of income, with many universities charging around £10,000 per year in fees. Table 9.2 illustrates this. Scotland's funding per FTE from non-EU students has gradually risen each year from 1995/96 to reach £9,988 per FTE in 2007/08, compared with £9,115 per head in England.

Table 9.2– Funding per FTE – teaching and tuition all student types, non-EU (HESA)

England (ave. 1995/96-2007/08)	£7,973
Scotland (ave. 1995/96-2007/08)	£8,339
Difference (Scotland – England)	£366

Given these funding levels, it is not surprising that UK universities want to attract non-EU students to study. In 2007/08 Non-EU students made up around 11% of Scotland's overall student base, and 12% of England's (see table 9.3).

Table 9.3 Origins of students at UK universities, 2007/08 (HESA)

	England	Wales	Scotland	NI
UK	83%	84%	82%	91%
EU	5%	5%	7%	6%
non-EU	12%	11%	11%	3%

Table 9.4 – Funding sources at UK universities 2007/08 (HESA)[1]

	England	Wales	Scotland	NI
UK & EU	84%	89%	84%	96%
non-EU	16%	11%	16%	4%

[1] As a proportion of teaching and tuition only

The contribution to overall funding levels of teaching and tuition is illustrated in Table 9.4. Both England and Scotland have become more reliant on funding from non-EU students over the past twelve years, so that by 2007/08, England derive 16% of overall teaching and tuition revenue from non-EU students, while the equivalent figure for Scotland is also 16%.

Given the continuing debate regarding funding shortages in UK universities, it is conceivable that, without regulation, the proportion of non-EU students in UK universities may rise even further. This could be conceived as an ongoing threat to the position of home students, who are financially less attractive to universities. Indeed in recent months there has been wide reportage in the press of universities offering clearing places to non-EU students in favour of home students, for this reason.[68]

This, therefore is an argument for raising the cap on fees and allowing universities to charge home students comparable rates.

Having briefly investigated resources coming from abroad, the focus turns to examining teaching and tuition money coming from the UK and EU, for whom regulated tuition fees must be charged, and so for whom this study is of most relevance.

9.5.4 Funding per FTE – teaching and tuition – UK and EU students only

Includes: Teaching, Tuition for undergraduate, postgraduate and FE students from UK, EU and non-EU countries

Removing sources of income from non-EU students results in a series illustrating funding per head for teaching and tuition only – for home and EU students – again for graduates, undergraduates and further education students.[69] Details are summarised in Table 9.5.

[68] See for example http://www.timesonline.co.uk/tol/life_and_style/education/article6788739.ece
[69] Note that FE courses are traditionally inexpensive compared to HE

Table 9.5 Funding per FTE – teaching and tuition
UK & EU students, £2006 (HESA)

England (ave. 1995/96-2007/08)	£5,413
Scotland (ave. 1995/96-2007/08)	£5,950
Difference (Scotland – England)	£537

This series provides a useful tool for comparing the financial landscape in the UK in terms of Government funding purely meant for teaching and tuition for UK domiciled students. As previously stated, it is worth noting that income from non-EU students is obviously not solely for the benefit of non-EU students, but is used to subsidise all students – and is therefore an important element of funding. But for reasons previously stated non-EU funding is removed, to look purely at funds from UK and EU domiciled students.

On this basis, table 9.5 shows Scottish universities' funding advantage being slightly impacted by the removal of non-EU students, with their advantage over England slipping from £605 to £537, when averaged over 10 years.

Note that Wales and Northern Ireland are at similar levels to England, being funded around £600 per student lower than Scotland on average.

Of course, this series still includes both graduate and undergraduates and so is not the best series to consider when examining how changes to undergraduate fees affect the competitive landscape in the UK. In order to understand the impact of the £3000 top-up fee which was charged only to undergraduates, it is necessary to look at funding per head for undergraduates only. This is where this chapter turns to next.

Before this, Table 9.6 summarizes the results of sections 9.5.1 – 9.5.4 above, showing the effects of stripping out each funding element from the HESA data. It can clearly be seen that currently available HESA figures do not allow calculation of the series that is most relevant to analysing the impact of undergraduate top of fees in England – namely a teaching and tuition series for UK and EU domiciled undergraduates.

Table 9.6 Funding per FTE (1995/96-2007/08) summary

Funding per FTE series	Student types	England	Scotland	Difference (England – Scotland)
Teaching, tuition, research, capital grants & all other sources	**Undergraduate and graduate, UK, EU and non-EU**	**£6821**	**£7784**	**£963**
Teaching and tuition	**Undergraduate and graduate, UK, EU and non-EU**	**£5625**	**£6230**	**£606**
Teaching and tuition	**Undergraduate and graduate, non-EU**	**£7973**	**£8339**	**£366**
Teaching and tuition	**Undergraduate and graduate, UK and EU**	**£5413**	**£5950**	**£537**
Teaching and tuition	**Undergraduate, UK and EU**	**?**	**?**	**?**

The sections above have aimed to get as close as possible, using widely available higher education statistics, to producing a funding per FTE series which can be used to analyse the impact of the 2006 tuition fee reforms on university funding. As Table 9.6 shows, the most widely available series that are frequently used to gain an understanding of university funding are inflated with the inclusion of research and capital grants, as well as money coming in from non-EU students.

The series above nevertheless reveal information about university funding, particularly the proportion of funds coming from non-regulated fees from non-EU students. Furthermore, given part of the aim of this chapter is to gain a clearer understanding of the funding gap that has traditionally held between England and Scotland, these figures also shed light on the sources of this gap. While a significant proportion of Scotland's funding advantage seems to arise from generous funding for research, and from non-EU students, there is still a £537 per student funding gap even after all this funding is stripped out.

In the next section, the aim is to create a series purely looking at funding for undergraduates – thus allowing the analysis of the impact of raising tuition fees, and to shed further light on the sources of the funding disparity between England and Scotland and what this means for HE funding policy in these countries.

9.6 Constructing an undergraduate funding per FTE series in the UK from 1994/95 – 2007/08

Each year the funding councils for England (HEFCE – the Higher Education Funding council), Wales (HEFCW) and Scotland (the Scottish funding council) announce their funding figures for the year ahead. Northern Ireland do not have a separate funding council, and funding is allocated using the same methodology as in England.

Funding is allocated on the basis of subject, since certain subjects are more expensive to teach than others. Therefore, the funding a university gets depends primarily on its composition of students – or what its students are studying. A university with a high proportion of engineering students, for example, will receive more funding than one with a high proportion of mathematics students, since engineering, which requires specialized equipment and technology, is more expensive to teach than maths (which can be taught with a pen and paper). The funding councils set prices for each subject according to these criteria, although prices are assumed by the councils and may not reflect the true cost of each subject.

In Scotland there are 13 different subjects each commanding a different price, while England has only 4 base prices. In general however, the subjects commanding the highest premium are medicine and veterinary science, followed by pre-clinical medicine, engineering, science and computing subjects (those subjects requiring a lab), creative arts and the built environment (mainly town planning) – which attract a premium as studio based subjects, the remaining subjects – maths, social sciences and humanities commanding the lowest premium. Table 9.7 summarizes the base prices for England and Scotland undergraduates over the past 10 years[70]. Note that these figures include income from tuition fees (i.e. that paid directly by students in England, and from 2001/02 paid by the Scottish Executive on students behalf in Scotland). Details of the fees in place are also illustrated in the table (for more details on subjects included in

[70] Figures for Wales and NI are also available but excluded for reasons previously discussed.

each heading, see Appendix 8 (Chapter 9): Scottish Funding Council and Higher Education Funding Council Subject Breakdowns)

Table 9.7 Unit prices 1998 – 2007; funding council £ per subject area £2006 (HEFCE & SFC)[1]

£ per subject*	1998/99			2001/02			2007/08		
	Eng	Scot	+/-	Eng	Scot	+/-	Eng	Scot	+/-
Medicine, Vet	14481	13021	-1460	14407	13990	-418	16218	15085	-1133
Pre-clinical	6458	7117	659	6403	7110	707	7634	7652	18
Creative arts	4827	6669	1842	4803	6764	1961	6142	6917	775
Engineering	6458	7694	1237	6403	7829	1426	7634	8051	417
Science	6458	7317	859	6403	7445	1042	7634	7701	67
Computing	6458	7011	554	6403	7134	730	7634	7029	-605
Education	3218	6258	3040	3202	6507	3305	5022	7102	2080
Built en'ment	4827	5851	1024	4803	5955	1152	6142	6153	11
Mathematical	3218	5013	1795	3202	5103	1902	5022	5213	191
Humanities	3218	4470	1252	3202	4551	1349	5022	4736	-286
Social science	3218	3798	580	3202	3867	665	5022	3933	-1089
Tuition fee	1200	1200		1200	1200		3000	1700[2]	

[1] includes assumed income from tuition fees [2] £2700 for medical students

As Table 9.7 illustrates, over the past 10 years, up to the introduction of tuition fees in England, Scottish students have benefitted from a higher rate of funding in each subject (with the exception of medicine, which is more generously funded in England). In particular, education, mathematics and humanities students have received consistently greater levels of funding in Scotland.

The decision in Scotland to abolish tuition fees and introduce the graduate endowment, fully implemented in 2001/02, did not actually have a great impact on funding. This is because the Scottish executive simply pay the fees on the students' behalf meaning there is no loss to universities. Furthermore, the graduate endowment in Scotland is not considered in these or any other figures since this money is ring-fenced "for the purposes of student support"[71] and therefore Scottish universities do not benefit from this money. Indeed in 2001/02 the funding gap between England and Scotland remained wide.

However, the introduction of the variable tuition fee in England in 2006/07 immediately reduced Scotland's funding advantage. The impact of the top-up fee in 2006/07 (continuing through 2007/08) resulted in English universities receiving

[71] Education (Graduate Endowment and Student Support) (Scotland) Act 2001, 2 (1)

more money than their Scottish counterparts in a third of subjects, with pre-clinical, science and built environment now all receiving very similar funding amounts in both countries [72].

Funding levels per student are obviously only part of the story. The composition of students actually studying in each area is key to the analysis and is illustrated in Table 9.8 below.

Table 9.8 Composition of students by subject area studied (HESA)

	1998/99			2001/02			2007/08		
	Eng	**Scot**	+/-	**Eng**	**Scot**	+/-	**Eng**	**Scot**	+/-
Medicine, Vet	2.9%	5.8%	3	3.0%	5.5%	2	3.4%	5.2%	2%
Pre-clinical	12.2%	13.3%	1	14.1%	15.3%	1	12.6%	13.5%	1%
Creative arts	8.8%	4.7%	-4	9.5%	4.9%	-5	10.3%	6.1%	-4%
Engineering	9.1%	9.6%	0	7.9%	9.0%	1	6.2%	7.8%	2%
Science	12.6%	15.4%	3	11.3%	14.3%	3	13.2%	16.2%	3%
Computing	6.5%	3.9%	-3	8.0%	5.1%	-3	4.5%	4.0%	-1%
Education	5.4%	4.5%	-1	5.2%	4.5%	-1	5.1%	3.7%	-1%
Built en'ment	2.6%	4.2%	2	2.2%	3.5%	1	2.6%	3.5%	1%
Mathematical	1.7%	1.4%	0	1.6%	1.8%	0	1.9%	2.0%	0%
Humanities	29.4%	30.1%	1	28.6%	28.6%	0	30.9%	29.2%	-2%
Social science	8.9%	7.2%	-2	8.7%	7.5%	-1	9.3%	8.7%	-1%

Looking, then, at volumes of students over the same time period, it is apparent that the great majority of students in England and Scotland are in the humanities – some 30% in each country. Other popular subjects are pre-clinical, science and social sciences.

The composition of students is very stable for each country, although in Scotland there is an apparent slide in the proportion of clinical and engineering students between 1996/07 and 2007/08 (although actual numbers have risen). This is illustrated below, in Figures 9.4 and 9.5.

[72] The changes to tuition fees in 2006/07 apply only to students entering university that year. Therefore, average tuition fees paid in 2007/08 will be somewhat lower than the stated amounts.

Figure 9.4 changing composition of subjects – England (HESA)

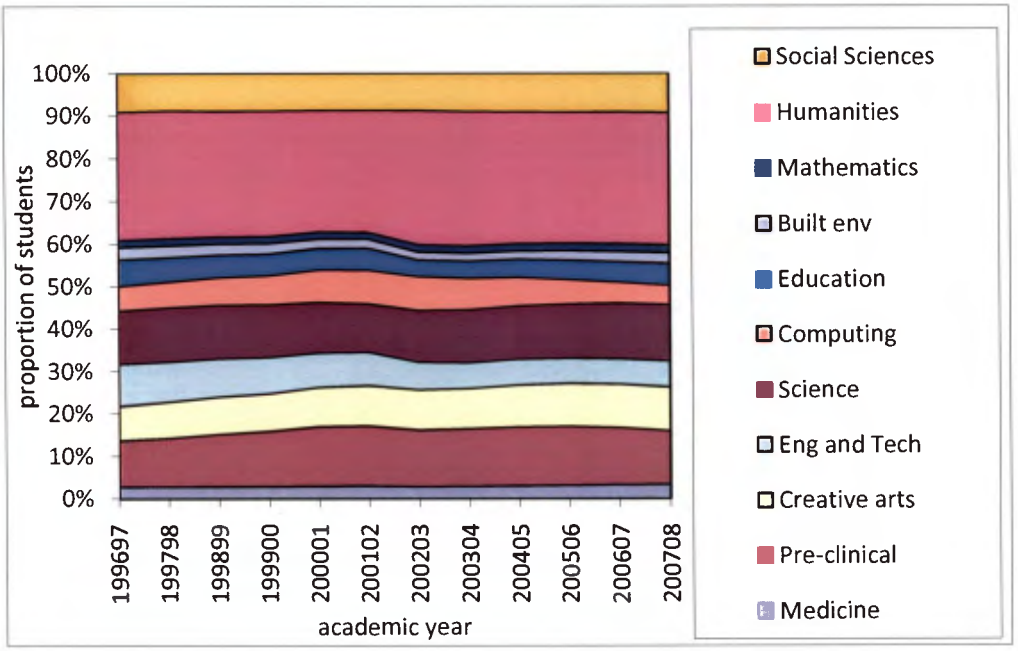
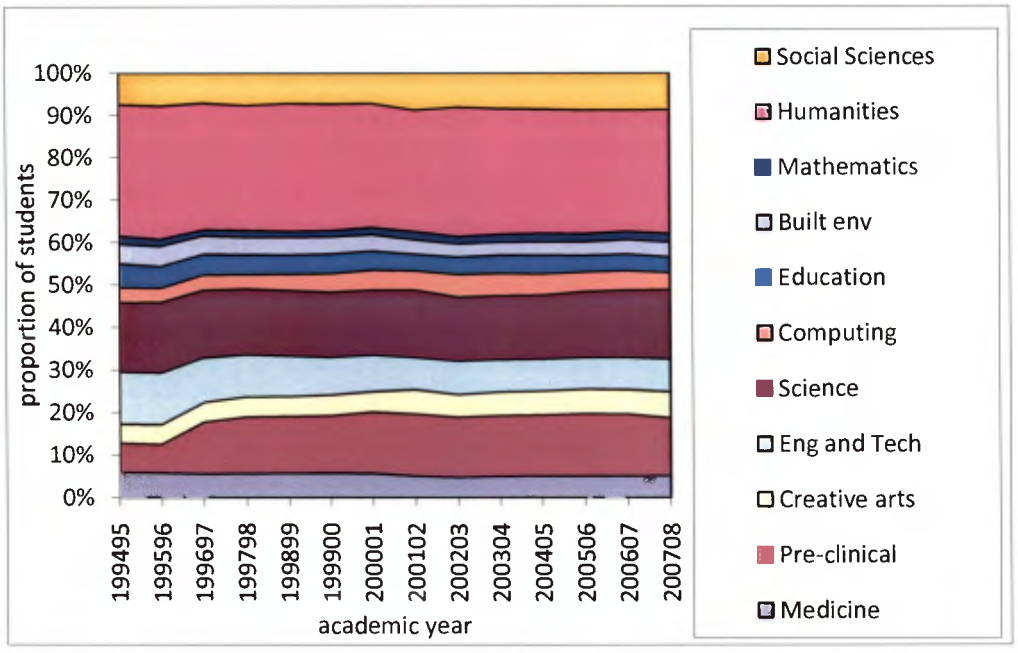


Figure 9.5 changing composition of subjects – Scotland (HESA)

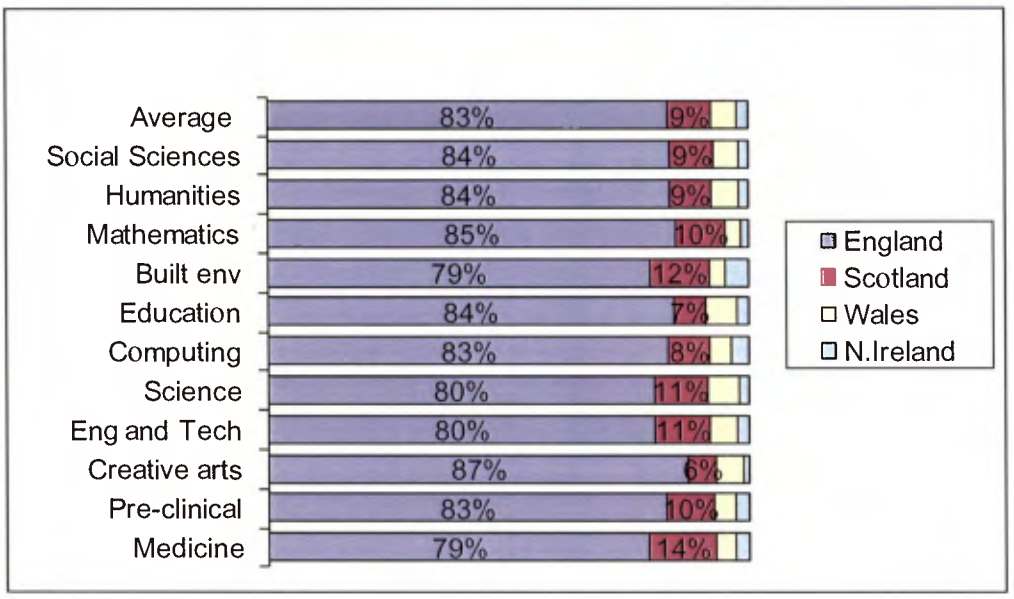


In comparison to England, Scotland has a large proportion of students in high premium subjects – i.e. medicine, science and engineering. Examining the market shares for each subject – i.e. the proportion of all students in the UK studying for

example, medicine in Scotland emphasises this point (see Figure 9.6). In comparison to its overall market share of 10% of UK students (i.e. 10% of all UK-based students study in Scottish universities), Scotland has a disproportionately high share of students in high premium subjects such as medicine and veterinary science, engineering, science and the built environment and this is a major part of the reason for their higher funding per head. This clearly distorts the comparison between England and Scotland even further – while Scotland gain more money from having more students studying these high premium subjects, the subjects themselves are more expensive to teach. This fact will be explored in more detail later in this section.

As a rule, England's market share of these premium subjects tends to be below its overall average, while computing and creative arts are more popular South of the border.

Figure 9.6 Market shares by volume of students – 2007/08 (HESA)



Although universities receive further funding according to other criteria (e.g. volume of disabled students, small institution premium etc[73]) these SFC and HEFCE base prices above, multiplied by the volume of students in each category, can provide a simple measure of undergraduate funding per FTE. This calculation

[73] Funding from widening access premiums makes up approximately 5% of recurrent grants in England (source HEFCE, 2006)

is made using the base prices and volumes for each year between 1994-2007 and then extrapolated using knowledge of tuition fees from 2008-2009, with volumes of students in each subject and base prices otherwise held steady from 2008-2009.

Note that this series differs from those described in Section 3 in that both the numerator (overall funding) and the denominator (number of FTE students) have been reduced. Overall funding purely for undergraduates will be naturally lower than that for all student types, but the volume of students has also been reduced to purely undergraduates[74].

The resulting series for each country is illustrated in Figure 9.7. (including projections to 2009 when the next funding review will take place). The series for Wales is also included, which as discussed, is relatively similar to that in England. As funding in Northern Ireland is calculated on a different basis the results for this country are not present here.

This shows at first hand the impact of tuition fees upon Scotland and England's relative funding positions.

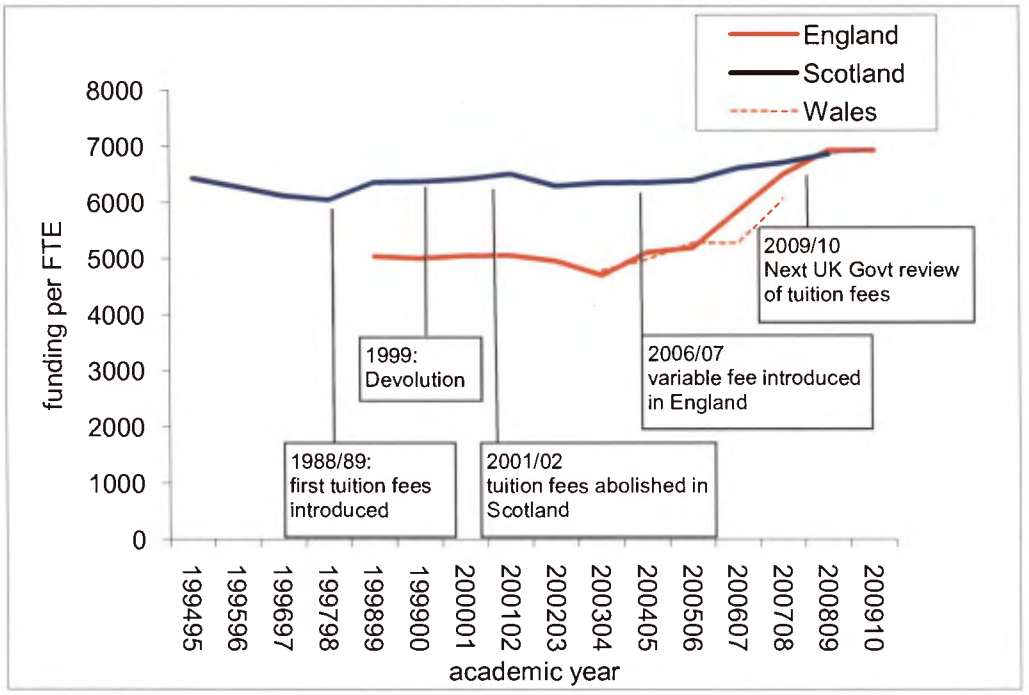
Scotland's undergraduate funding per FTE is significantly higher than England's up to 2004/05 when the gap begins to narrow. In 2006/07, England's introduction of the £3000 deferred fee narrows the gap significantly. As only those entering in 2006/07 are responsible for paying the fee, however, fee revenues are not at the full potential, so Scotland maintains its funding advantage. By 2007/08, 75% of students in England are paying the fee, reducing Scotland's lead to just £207 per head (compared to a high of £1652 in 2003/04). The impact of the top-up fee is not fully realized until 2008/09, by which time 100% of undergraduates in England are paying £3000. At this point, Scotland's undergraduate funding per head is projected to be £70 per head lower than England's.

Note that the effects of the bursary in England are netted out from the total tuition fee figure, since it is compulsory for English universities to give back a minimum of £300 per low-income student from the income gained through fees.

[74] Undergraduates make up 84% of all student types in the UK (source HESA 2004/05)

A straw poll of several university websites indicates the mean bursary figure may be much higher, at around £1000, but there are no official figures on bursary spend – and much of this spend could be construed as a marketing cost to attract new students. Thus, only the minimum compulsory amount of £300 for every low-income student starting in 2006/07 is subtracted. Note that if universities were giving away £1000 in bursaries for every £3000 received in tuition fees, and not offsetting these costs anywhere else (e.g. from marketing budgets) England's competitive position would be much reduced.

Figure 9.7 Funding per FTE – teaching and tuition – UK and EU undergraduates only, £2006



Figures for 2008/09 – 2009/10 based on estimates

Up to the point of undertaking this analysis, HEFCE have not reduced their overall funding levels since the top-up fee was implemented – meaning the top-up fee represents a real increase in per capita funding. While it is by no means certain that they will maintain their current levels of funding in the long run, the additional funding from fees has resulted in an overall increase in income to English universities.

The distribution of income between the teaching grant and income from tuition fees is also altered by the reforms, so that in 2006/07 England derives 33% of

undergraduate university funding from tuition fees, compared to around 23% in previous years, and around 20% in Scotland (see figures 9.8 and 9.9).

Figure 9.8 Distribution of university income (undergraduate students) – England

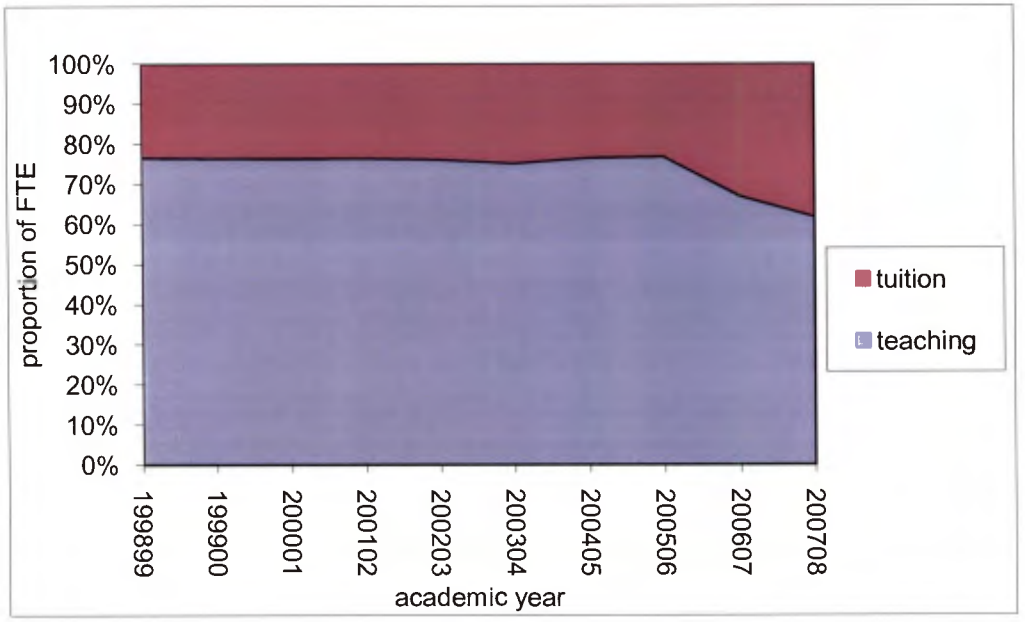
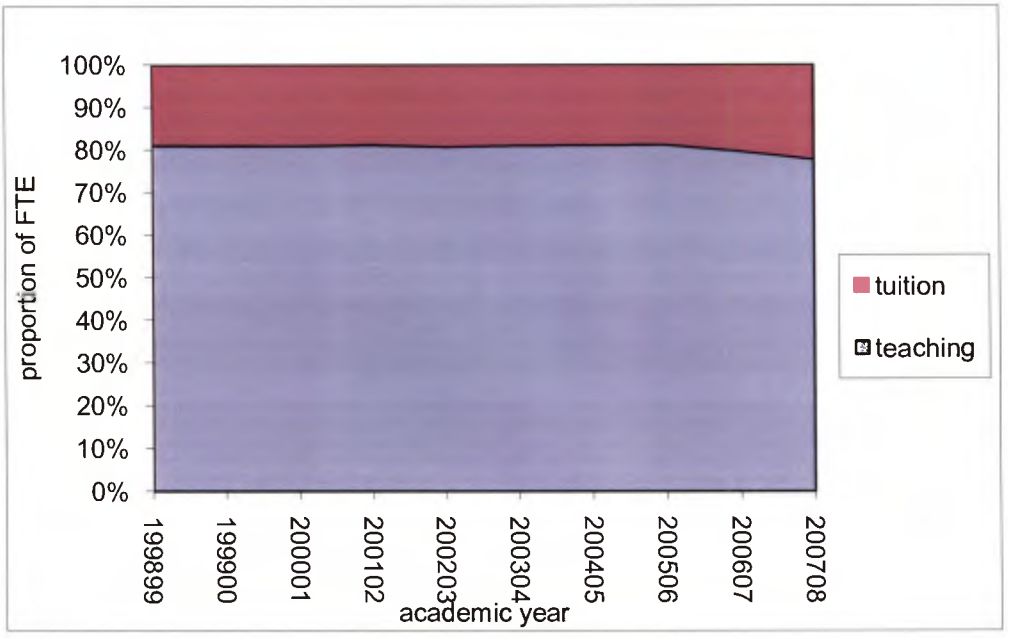


Figure 9.9 Distribution of university income (undergraduate students) - Scotland



The result of this analysis is clear – by 2009, given that Englands new revenue from tuition fees will have been fully realized, funding per head in English universities will be level with that in Scotland. In terms of competitivness measured on simple funding per university, Scotland will no longer have their

advantage over England (which was largely driven by subject composition). This finding has political relevance to the Scottish Government, in terms of maintaining quality of universities in Scotland versus their neighbours in the rest of the UK, the Scottish Funding Council in terms of their funding decisions and to Scottish universities themselves in terms of their strategies to attract high revenue students.

However, in order for policy makers to act on this information, it is crucial to gain a deeper understanding of the nature of the differences in funding.
This entanglement of funding and subject together distorts comparison between countries with different subject mixes and different levels of funding per subject – apparent advantage driven purely by subject mix is not truly a funding advantage if the subjects in question are much more expensive to teach. This cannot be seen by just examining topline figures.

The next section elaborates on the findings above, by decomposing the differences in the new undergraduate funding series, into price and composition components. This will show the true source of the funding differentials between countries.

9.6.1 Decomposing undergraduate funding per head

As discussed above, undergraduate funding per FTE is calculated simply as:

$$\textit{Funding per FTE} = \textit{volume of students} \times \textit{unit price per subject} \qquad 9.1$$

So the difference between FTE in England v Scotland will comprise the difference arising from composition of students plus the difference arising from price per subject (including tuition fees).

Using simple calculus, the FTE series can be decomposed in order to understand where the differences in funding are coming from[75].

[75] This is accomplished using the product rule; because prices and compositions are fairly similar in each country, average prices and compositions of both countries are used as factors.

The decompositions show what the difference between Scotland and England's funding per FTE is made up of – i.e. how much of the difference is due to pure funding effects (i.e. differences in the funding per subject) and how much is due to pure composition effects (i.e. the differences in the volumes of students choosing each subject).

The funding effect shows the difference in Scotland v England if all the compositional effects were stripped out, and the composition effect shows the differences if all the funding effects were stripped out.

Decompositions for the following key timelines are presented – 1998/99 when both England and Scotland's funding regimes were the same, 2001/02 by which time Scotland's up-front tuition fees had been abolished and endowment introduced, 2006/07 when England implemented the £3000 fee and bursary, and the most recent data for 2007/08 (see Tables 9.9 – 9.12). The current situation in Scotland is also compared with that in 1994/95 (see figure 9.13).

Table 9.9 1998/99 - before devolution.

Scotland 1998/99 v England 1998/99	funding effect	composition effect
Clinical and Veterinary Practice	-63.3	392.3
Pre-clinical	84.0	74.6
Creative arts, hospitality & design	124.5	-239.1
Engineering and Technology	115.2	34.3
Science	120.2	188.9
Computing and Information Science	28.7	-174.8
Education	150.3	-38.6
Built environment	34.7	84.7
Mathematics, Statistics and OR	27.7	-11.1
Humanities, Languages and Business	372.7	28.9
Social Sciences	46.7	-58.8
Total	1041.3	281.2
Scotland 1998 - England 1998		**1322**
Scotland £ per FTE		**6359**
England £ per FTE		**5037**

In Table 9.9, both systems were the same and both countries charged their students an up-front fee of £1000 (£1200 in 2006/07 prices). Scotland's funding per FTE, at £6359, is significantly higher than in the previous few years, but has not recovered to the heights of 1994/95. Scotland's funding per head is £1322 higher than England's, largely as a result of higher funding across the board (and

particularly in education, humanities and creative arts, which are shaded in the table above).

Interestingly, although the majority of difference is generated through funding effects (with the total difference through funding standing at £1041), the single largest differentiator between the 2 countries is as a result of the composition of medical students in Scotland. Although English medical students receive slightly more funding per head, Scotland has a higher composition of medical students (6% vs 3% in England) and gains £392 per head in funding advantage through this fact alone. Other significant compositional differences result from high proportions of science and built environment students in Scotland, which again receive high funding premiums. However, England's high proportion of students in creative arts and computing results in a combined loss of ground of £413 on average.

Table 9.10 2001/02 – Scotland's tuition fees abolished

Scotland 2001/02 v England 2001/02	funding effect	composition effect
Clinical and Veterinary Practice	-17.8	346.6
Pre-clinical	103.7	80.2
Creative arts, hospitality & design	140.8	-269.1
Engineering and Technology	120.4	78.3
Science	133.5	203.5
Computing and Information Science	47.9	-190.7
Education	160.6	-30.9
Built environment	32.9	74.7
Mathematics, Statistics and OR	32.2	11.5
Humanities, Languages and Business	385.4	0.5
Social Sciences	53.8	-43.9
Total	1193.5	260.8
Scotland 1998 - England 1998		**1454.3**
Scotland £ per FTE		**6506**
England £ per FTE		**5051**

Table 9.10 shows the first policy divergence of the English and Scottish systems – Scotland's up-front fee of £1200 is now abolished and the graduate endowment has been introduced. Scotland's funding per FTE, at £6506, is at its highest since HESA records begin in 1994, and is £1454 higher than in England.

Again, the differences arise largely through funding effects and in a similar pattern to the situation immediately before devolution – Scotland's largest

advantage arises through funding effects in general, but £346 of its advantage arises from Scotland's high proportion of medical students. This is a slight drop from 1998, as the proportion of medical students has fallen from to 5.8% to 5.5% (while in England the proportion has risen slightly, from 2.9% to 3%). Science has gained importance in Scotland - the proportion of students actually declines between 1998 - 2001, but remains high at 14.5% (vs 11% in England) and funding per student increases.

The next significant occurrence arises after the 2004 HE Act, when England abolish the upfront fee and introduce deferred fees and bursaries for new students. At this point Scotland have increased their tuition fee to £1700 (although still paid for by the Scottish government) and increased their fee for medical students to £2700, as well as making significant increases in funding for all subjects. The results of this are illustrated in Table 9.11.

Table 9.11 2006/07 – £3000 variable fee adopted in England

Scotland 2006/07 v England 2006/07	funding effect	composition effect
Clinical and Veterinary Practice	-26.8	270.3
Pre-clinical	79.2	79.1
Creative arts, hospitality & design	106.3	-277.2
Engineering and Technology	65.5	120.3
Science	88.2	197.6
Computing and Information Science	-2.5	-24.9
Education	114.8	-53.0
Built environment	16.6	58.1
Mathematics, Statistics and OR	14.0	7.6
Humanities, Languages and Business	82.6	-100.6
Social Sciences	-46.3	-13.6
Total	491.6	263.9
Scotland - England		**755.5**
Scotland £ per FTE		**6604**
England £ per FTE		**5849**

As a result of the additional money from the new £3000 top-up fee, England's funding per FTE reaches a 10 year high of £5849. While some funding effects begin to seep through in 2006/07, the effect of the top-up fee is yet to be fully felt (as only around a third of all undergraduates pay the fee in 2006/07), so Scotland maintains its competitive position. Nevertheless, but the gap between England and Scotland is reduced to £755 (compared to £1197 the previous year).

Again, it can be seen that the main reason for Scotland's apparent funding advantage arises from their high proportion of medical and science students – because these subjects are more expensive to teach. Also notable is the dramatic fall in Scotlands advantage through pure funding down to £491 vs £1193 in 2001/02.

Table 9.12 shows the decomposition for 2007/08. At this point, 75% of undergraduates in England are paying a £3000 top-up fee, and there is now very little difference between the two countries in terms of funding per head – only £207 per student per year, compared to Scotland's competitive high of £1652 per student in 2003/04. If there were no compositional differences, England's funding per head would be £57 higher than Scotland's, with several subjects receiving higher funding per head than in Scotland.

Table 9.12 2007/08 - Most recent information

Scotland 2007/08 v England 2007/08	**funding effect**	**composition effect**
Clinical and Veterinary Practice	-48.2	280.8
Pre-clinical	2.3	69.8
Creative arts, hospitality & design	63.6	-271.1
Engineering and Technology	29.2	124.2
Science	9.8	228.5
Computing and Information Science	-26.0	-37.9
Education	91.5	-89.2
Built environment	0.3	59.4
Mathematics, Statistics and OR	3.7	8.6
Humanities, Languages and Business	-86.0	-84.4
Social Sciences	-98.1	-23.9
Total	-57.7	264.7
Scotland 2007/08 - England 2007/08		**207.0**
Scotland £ per FTE		**6705**
England £ per FTE		**6498**

Once again, Scotland's funding position is driven ahead almost exclusively by the high proportion of medical, engineering and science students (and the generous funding afforded to them[76]). Controlling for these compositional differences (and therefore giving a truer measure of competitiveness) would change their position significantly.

[76] It is important to note that while medical students receive more funding in Scotland, this report does not take into account the actual cost of providing medical tuition

From 2008/09 onwards, 100% of English undergrads pay the full fee. With no further changes to funding, this will result in England overtaking funding in Scotland.

Finally, Table 9.13 shows the differences between funding per FTE in Scotland in 1994 vs 2007/08. In 1994, funding per head was suffering as a result of the 1992 reforms, when student volumes rose substantially, and although funding per FTE was relatively high, declined steadily until 1997. Funding then began to rise to another peak in 2001 after the tuition fee had been abolished. Funding then slumped again, but the 2006/07 funding injections have brought Scotland's funding per head back up, and indeed by 2007/08 funding is at a high.
Increases in funding in particular for medical, science and humanities students have contributed to the current funding per head, but compositional differences have actually dampened overall funding differences. In particular, small declines in medical, engineering and science students have eroded funding per FTE.

Table 9.13 Scotland 2007/08 vs Scotland 1994/95

Scotland 2007/08 v Scotland 1994/95	funding effect	composition effect
Clinical and Veterinary Practice	60.7	-122.1
Pre-clinical	16.9	509.2
Creative arts, hospitality & design	8.1	113.8
Engineering and Technology	53.2	-351.2
Science	103.4	-1.9
Computing and Information Science	-1.3	35.8
Education	31.2	-135.1
Built environment	5.4	-69.0
Mathematics, Statistics and OR	2.0	5.2
Humanities, Languages and Business	44.5	-84.0
Social Sciences	-0.4	51.4
Total	323.4	-47.8
Scotland 2007 - Scotland 1994		**275.6**
Scotland £ per FTE 2007/08		**6705**
Scotland £ per FTE 1994/95		**6429**

These decompositions are highly illuminating. The results for 2007/08 in particular indicate that, if Scotland had the same composition of students as England, Scottish universities would be funded at a lower rate per student than in England.
One way to increase funding at a university would be for the university to attract more high-premium students. However, arguably, this would not improve the

funding situation since such students are more expensive to teach and require more sophisticated equipment etc – the main reason for allocating such students high funds. Therefore the truest picture of the funding differential must be through pure funding effects. These show Scotland's competitive advantage to have been completely eroded as a result of the £3000 fee increase. The ramifications are clear; if Scotland wishes its universities to remain funded on a par with England, they must increase funding. Since the current SNP Government in Scotland is committed to protecting Scottish students from tuition fees, it is highly unlikely that additional revenue will be raised from this source, leaving the public sector the most likely source of funding. However, it is unclear as to whether funding to Scottish universities is likely to increase in the near future.

The funding review in England, however, is set to occur in late 2009. There has been wide speculation around the outcome of this review, with many believing that the cap on fees in England and Northern Ireland will be lifted to as much as £5000. The next Section in this Chapter examines this possibility in terms of its impact on relative funding per head versus Scotland.

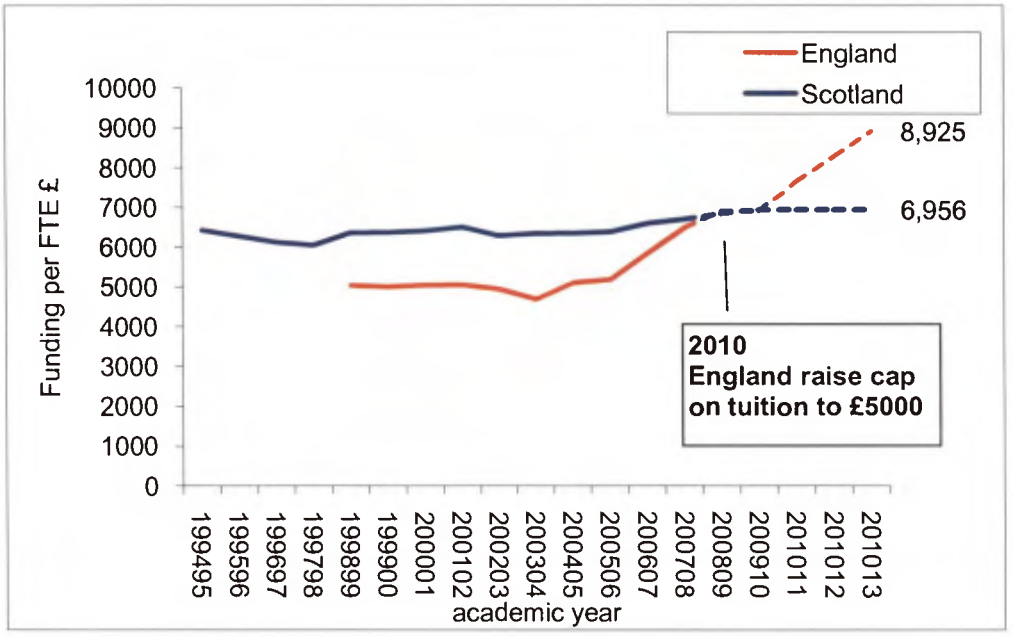
9.7 Future scenarios

The next Governmental review of tuition fee policy is due in 2009. There has been wide speculation around the outcome of this review, with many believing that the cap on fees will be lifted. The recent political changes in Scotland indicate that the two countries will continue to diverge in terms of higher education funding legislation. In the light of this, some possible future scenarios are considered.

The first is to consider what would happen if England were to lift the cap on tuition fees after the review in 2009. The projection is based on a £5k fee in England, implemented in 2010. Although England's funding per FTE would increase by a further £2k, to £8925 once fully realized, (bearing in mind it would take a few years for England to fully feel the impact), there would be slightly less impact on Scotland since by this time all Scottish universities will receive a tuition fee of £1700 per student (and £2700 for medical students). Nevertheless,

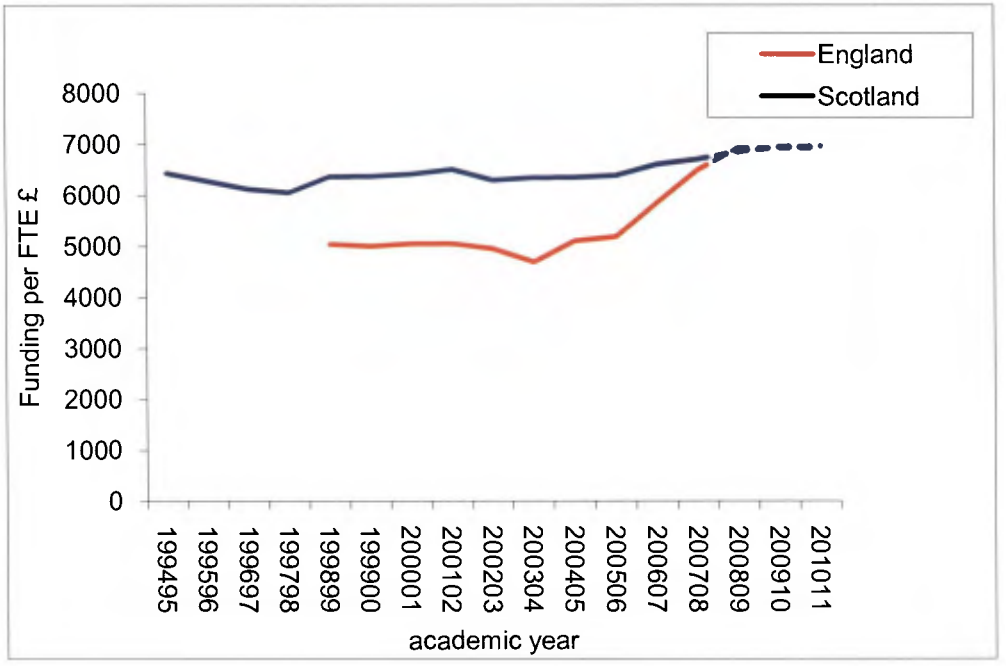
Scotland's funding per head would end up around £2000 lower than England in this scenario (see figure 9.10).

Figure 9.10 – Effect of a lift in England's fee cap in 2010 to £5000



The next and final scenario considered, is if the cap remains in place after the 2009 review. By this time (assuming constant funding) all of English students would be paying £3000 per year, and all of Scottish students would be paying £1700 (and £2700 for medics). The projections illustrated in Figure 9.11 show that in the long term, Scotland would fail to regain their competitive position, although as a result of the increased tuition fees in Scotland, the funding per head gap between the two countries would not widen.

Figure 9.11 Effect of England freezing the £3000 tuition fee cap



At the time of writing this thesis, the first scenario seems the most likely, with speculation that the tuition fee cap may even be raised as high as £7000.

Policy makers in Scotland must therefore be prepared to react to such a scenario, at which point the funding advantage would lie firmly in England's favour.

9.8 Income from other sources

While this study has primarily been focused on exploring income from teaching and tuition, it is of relevance to consider Government funding of all kinds, to complete the picture of funding for undergraduates.

Table 9 shows funding based on students background income for 2007/08 (for an undergraduate student under 25 who will study full-time away from home).

English students in 2007/08 benefit from significantly higher loans and slightly higher maintenance grants than in Scotland, plus the bursary for those from low-income households. Although the differences in overall funding per head are small, this shows that English students' resources, including money allocated for their teaching and tuition, outstrips Scottish students for all income groups.

Table 9.14 Funding from all sources, 2007/08 £2006, (DIUS)

England				
parental income £p.a.	**17,000**	**25,000**	**35,000**	**45,000**
teaching and tuition (excl bursary)	6,498	6,498	6,498	6,498
maintenance loan	3,280	3,280	4,109	3,963
maintenance grant	2,765	1,584	401	-
bursary	300	-	-	-
total	12,843	11,362	11,008	10,461
Scotland				
parental income £p.a.	**17,000**	**25,000**	**35,000**	**45,000**
teaching and tuition	6,705	6,705	6,705	6,705
loan	1,890	2,797	3,031	1,920
bursary	2,510	1,345	-	-
additional loan	575	-	-	-
total	11,680	10,847	9,736	8,625

9.9 Funding per head in the UK relative to OECD countries

While this study has been concerned with funding per head within the UK, it is of interest to compare the UK as a whole with a range of other OECD countries. Figure 9.12 shows the total annual expenditure per head on tertiary education in 28 OECD countries. As these figures are calculated using the UOE (UNESCO-OECD-Eurostat) data collection methodology[77], they are not directly comparable with those cited throughout this paper. However this chart serves as a useful benchmark for comparison.

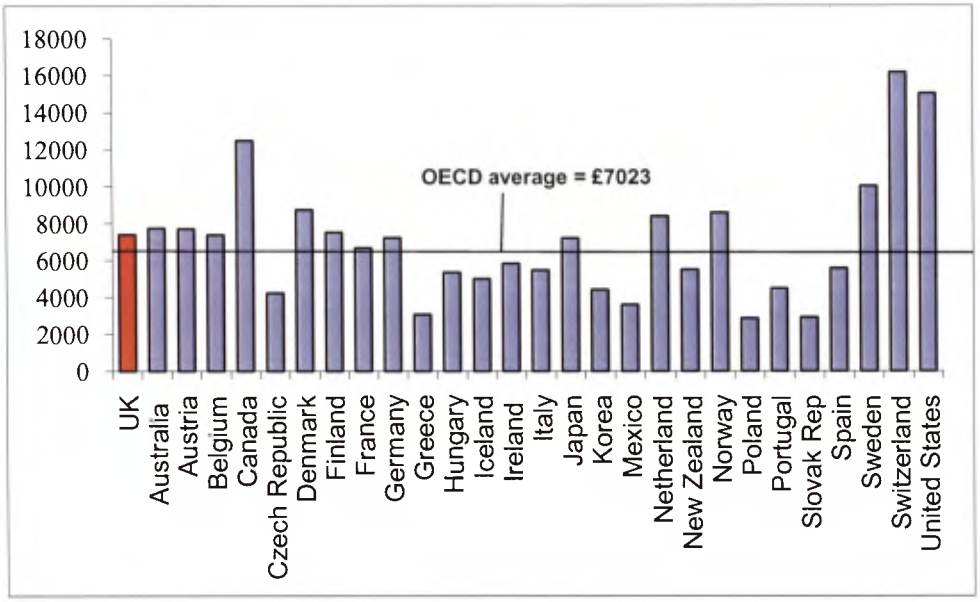
As the most recent OECD information is for 2003, the effects of the UK 2004 reforms and the top-up fee in particular, are not realized in figure 20. Furthermore OECD data does not contain splits for UK constituent countries.

In 2003 funding per head in the UK was slightly above the OECD average and ranked 11th of the 28 countries listed. Were the effects of the top-up fee included, this would likely move the UK's expenditure per student up to around the levels experienced in the well-funded Scandinavian countries. As Scotland is at similar levels to England in terms of funding per head, this implies Scotland is well

[77] See OECD Education at a Glance, 2006, Annex 3 at www.oecd.org/edu/eag2006 for details

placed within the OECD. The current £3000 top-up fee is still too low, however, to push England into the realms of the US, Canada and Switzerland where the average funding per head stands at around £16,000. Similarly, Scotland would have to find significant additional resources to compete on this level

Figure 9.15 OECD Annual expenditure per student on core services, ancillary services, £2006 (OECD Education at a glance, 2006)



While there are many world-class universities in these regions, and, as discussed, UK universities' ability to attract overseas students is a crucial part of their overall revenue, indicating that increasing funding levels towards those of overseas institutions will increase the relative quality of their institutions and hence their ability to attract overseas students. UK university funding levels should arguably be set in terms of the economic benefit of higher education, rather than their global ranking. However

9.10 Conclusions

This strand of the thesis has examined how recent higher education funding policy reforms have affected the relative funding position of English compared to Scottish universities, concentrating specifically on funding for home (including UK and EU) undergraduate students, measuring funding per student on a consistent basis, and taking into account of the compositional differences in the courses studied.

Widely used funding per head figures do not provide an accurate picture of home domiciled undergraduate funding, which is necessary to understand the impact of increasing tuition fees for undergraduate students. This is because they include funding for research, postgraduate and overseas students. The empirical work of this study focused on creating a consistent series of funding per full-time equivalent undergraduate over time for England and Scotland, stripping out funding for research, non-EU students, and post-graduate degrees. The series created in this strand of the thesis also takes into account the different composition of undergraduate degree subjects taken in England and Scotland.

The findings indicate that:

1. Funding comparative funding advantage over England is significantly reduced (though still significant) when effects of research, overseas students and post-graduate students are removed. It has been long understood that university funding per student in Scotland is significantly higher than that in the rest of the UK. However, the widely published figures describing funding per FTE are inflated by these effects. Removing them, and looking at funding per head solely for UK and EU domiciled undergraduates, Scotland's lead over England is significantly reduced – partly because of lucrative research funding in Scotland.
2. The apparent historical advantage in funding per head in Scottish institutions compared to English ones has been largely driven by compositional differences – Scotland has a high proportion of medical, science and engineering undergraduates – subjects which command greater funding due to their relative complexity to teach. Because of the expensive nature of these courses, funding per head appears relatively high in Scotland. Removing the effects of these compositional differences would result in funding in England being above that of Scotland's in 2007/08 for home undergraduates.
3. As a result of the 2004 reforms in England (fully enacted during 2008/09), England's undergraduate funding per head has increased by 25% between 2005/06 and 2007/08. While Scotland has maintained its competitive edge in the face of this, its lead has been reduced so that the two countries are now almost level in terms of funding per head. The top-up fee introduced in 2006/07 will

bring funding per head in England to similar levels as that experienced in Scotland, suggesting that any historical advantage in the relative funding of Scottish students – compositional differences notwithstanding – will disappear unless additional new sources of public or private funding for Scottish universities are found.

4. Following the review in 2009, if the cap on England's tuition fees is kept steady at £3000 and current funding levels are maintained, Scotland will remain on an even keel with England. Should England raise the cap on fees in 2010 to £5000, this would result in an overall rise in funding per head to £8925 – around £2000 per head higher than in Scotland.

5. Following the 2004 reforms, UK (including England and Scotland) university funding per head is well-placed by OECD comparison, and is similar to that experienced in the Scandinavian countries. Should UK universities want to compete directly with funding levels in the US, however, top up fees (and/or Government expenditure on higher education) will have to rise substantially. But this is by no means a necessary step.

The results of this strand of the thesis have important repercussions for policy makers in England and Scotland. The current Scottish Government is strongly committed to the global competitiveness of its universities[78], and the results imply that additional sources of public (or private) will have to be found if its universities are to remain competitive with England as well as EU and non-EU countries at least in terms of undergraduate funding. English universities, meanwhile, appear to be gaining ground on their traditionally better funded Scottish neighbours, suggesting their policy of cost sharing through tuition fees is effective in boosting university funds.

This study, however, is limited purely to undergraduate funding measures, since the aim was to understand the impact of the 2006 tuition fee reforms in England. Therefore the final series analyzed takes no account of money from other sources such as research or non-EU students – lucrative sources of funding for both

[78] *"Our universities compete on a global basis in research and development, and we need to provide more government support for them to continue to do so as a key driver in Scotland's economic and enterprise agenda." SNP Manifesto, 2007*

England and Scotland, competition through the reputation of Scottish universities which entices students from home and abroad to study in the country.

Funding from non-EU sources is a highly topical matter. At the time of writing this thesis, there has been a dramatic increase in university applications in 2009 due to the effects of the recession. Many universities, because of the governments caps on amount of EU students it is prepared to fund, are favouring overseas in their clearing places. The increased demand for non-EU students is an emerging issue and opportunity for future research.

A further opportunity for future research could be to examine funding at individual institutions. One limitation of this study is that it focuses purely on average funding levels in England and Scotland, while in practice there is considerable heterogeneity in funding by institution driven by volume and types of students as well as research and other grants awarded.

Cost-sharing versus free education – two countries, two agendas

This thesis as a whole as explored the implications of a cost sharing in higher education, both from the point of view of students themselves in Strand 1, and universities in strand 2.

While not the main focus of this thesis, an underlying theme in both strands is the different agendas of England and Scotland in terms of HE funding policy. Thus, in comparing the agendas of the two countries, this thesis also compares two distinct theories of education funding.

Scotland can be thought of as representing a more means-tested approach to HE finance, with the most recent SNP's education manifesto reflecting this "*We believe that access to further and higher education should be based on the ability to learn, not the ability to pay.*" (Manifesto, 2007).

England, meanwhile, is representative of a more universal stance, with students from all backgrounds paying the same levels of tuition fees and maintenance loans being at similar levels for most students. As yet there are no details of whether tuition fees will be raised in 2009 or kept at their current rates (£3,225 in current prices for the academic year 2009/10) but there is little doubt that students will have to continue to contribute to the costs of their education given the current economic situation.

Comparing these two viewpoints on the basis of the evidence in this paper reveals the repercussions for individuals and universities.

Under the Scottish system, individuals are certainly better off in terms of having significantly less debt after they graduate than English students. The first strand of thesis concentrates on costs and support at the *point of entry* to universities. By this definition, under the current SNP system Scottish students are worse off than

in England. English students have access to more upfront support through loans as well as similar amounts of maintenance grants to those in Scotland, meaning they are more able to meet upfront living costs. Furthermore, fees in England are covered with a loan, thus there are no upfront costs associated with fees.

Since a key finding of this thesis is the large positive effect of support on likeliness to participate in HE this implies that the English system is better placed to increase levels of participation among youths of school leaving age.
While this implies Scotland's current system does not support their agenda to widen participation, it is important to note that this thesis does not take into account the impact of debt levels on participation, nor the parental contribution that may be made in many cases, which may reduce costs faced by students in both countries.

In terms of funding to universities, as seen in the second strand of this thesis, Scotland's decision to remove tuition fees has resulted in its university funding per undergraduate becoming level with England's for the first time since HESA records began. The SNP manifesto again pledges commitment to maintaining competitiveness of Scottish universities on a global basis. The research in this thesis indicates that the position of Scottish universities is threatened by countries, including England, who adopt student contributions, so the Scottish Government must act with increased public sector spending on education if they are to maintain this agenda.

The review of higher education funding in England and Northern Ireland is due in late 2009. The outcome of this review may be to alter the funding balance between England and Scotland even further. As yet it remains to be seen how much more these two neighboring, but increasingly politically dissimilar countries will continue to diverge, and what the repercussions will be for their higher education sectors.

Appendices

Appendix 1 (Chapter 1): Universities in the UK

Ancient Universities

The "ancient" universities in United Kingdom and Ireland are, in order of formation:

University of Oxford – founded before 1167
University of Cambridge – founded 1209
University of St Andrews – founded 1413 (incorporating the University of Dundee from 1897 to 1967)
University of Glasgow – founded 1451
University of Aberdeen – founded 1495 (as King's College, Aberdeen)
University of Edinburgh – founded 1582
University of Dublin (Trinity College, Dublin) – founded 1592

Following the creation of the ancient universities, no more universities were created in the region until the late 18th century:

St Patrick's College Maynooth – established 1795.
St Davids College Lampeter – established in 1822 (Royal Charter 1828),
University College London – established 1826
King's College London – established 1829 (both this and University College London received their Royal Charters and became part of the University of London in 1836)
University of Durham – established 1832 (Royal Charter 1837).

Red Brick Universities

The "red brick" universities in the United Kingdom and Ireland are:

The University of Birmingham - royal charter granted in 1900.
The University of Liverpool - royal charter granted in 1903.
The University of Leeds - royal charter granted in 1904.
The University of Sheffield - royal charter granted in 1905.
The University of Bristol - royal charter granted in 1909.
The University of Manchester - formed in 2004 with the merger of Victoria University (1880) and UMIST (1956).
University of Dundee (originally a constituent college of the University of St Andrews)
University of Exeter (originally an extension college of the University of London)
University of Hull
University of Leicester
Newcastle University (originally two extension colleges of the University of Durham)
University of Nottingham
University of Southampton

Plate-Glass Universities

The "plate-glass" universities in the United Kingdom and Ireland are:

University of East Anglia (1963)
University of Essex (1964/5)
University of Kent (1965)
Lancaster University (1964)
University of Sussex (1961)
University of Warwick (1965)
University of York (1963)

Other universities sometimes referred to as plate-glass universities:

Aston University (1966)
University of Bath (1966)
University of Bradford (1966)
Brunel University (1966)
City University, London (1966)
Heriot-Watt University (1966)
Keele University (1962)
Loughborough University (1966)
University of Salford (1967)
University of Stirling (1967)
University of Strathclyde (1964)
University of Surrey (1966)
University of Ulster (1968)

Post-1992 Universities

Post-1992 universities formerly designated "Polytechnic Universities" are:

Anglia Ruskin University – formerly Cambridgeshire College of Art and Technology, Anglia Polytechnic then Anglia Polytechnic University
Birmingham City University – formerly the University of Central England in Birmingham and before that, Birmingham Polytechnic
University of Brighton – formerly Brighton Polytechnic
Bournemouth University – formerly Bournemouth Municipal College, Bournemouth College of Technology, Dorset Institute of Higher Education then Bournemouth Polytechnic
University of Central Lancashire – formerly Lancashire Polytechnic
Coventry University – formerly Lanchester Polytechnic then Coventry Polytechnic
De Montfort University – formerly Leicester Polytechnic
University of East London – formerly the West Ham College of Technology then North East London Polytechnic
University of Glamorgan – formerly Glamorgan Polytechnic then The Polytechnic of Wales
Glasgow Caledonian University – formed from the merger of Glasgow Polytechnic and The Queen's College, Glasgow
University of Greenwich – formerly Thames Polytechnic
University of Hertfordshire – formerly Hatfield Technical College then Hatfield Polytechnic
University of Huddersfield – formerly Huddersfield Polytechnic
Kingston University – formerly Kingston Polytechnic, and before that the Kingston Technical Institute,
Leeds Metropolitan University – formerly Leeds Polytechnic
University of Lincoln – formerly Humberside Polytechnic, then University of Humberside and then University of Lincolnshire and Humberside
Liverpool John Moores University – formerly Liverpool Polytechnic
London Metropolitan University – merger of London Guildhall University, formerly the City of London Polytechnic, and University of North London, formerly the Polytechnic of North London
London South Bank University – formerly South Bank Polytechnic
Manchester Metropolitan University – formerly Manchester Polytechnic
Middlesex University – formerly Middlesex Polytechnic

Napier University – formerly Napier Technical College, Napier College of Commerce and Technology then Napier Polytechnic
Northumbria University – formerly Newcastle Polytechnic, formed from the merger of Rutherford College of Technology, the College of Art & Industrial Design and the Municipal College of Commerce
Nottingham Trent University – formerly Trent Polytechnic then Nottingham Polytechnic
Oxford Brookes University – formerly Oxford School of Art then Oxford Polytechnic
University of Plymouth – formerly Polytechnic South West, formed from Plymouth Polytechnic, Rolle College, Seale-Hayne College and Plymouth School of Maritime Studies
University of Portsmouth – formerly Portsmouth Polytechnic
Sheffield Hallam University – formerly Sheffield Polytechnic then Sheffield City Polytechnic
Staffordshire University – formerly Staffordshire Polytechnic (originally called North Staffordshire Polytechnic) having previously been the separate Staffordshire College of Technology, the Stoke-on-Trent College of Art and the North Staffordshire College of Technology
University of Sunderland – formerly Sunderland Technical College then Sunderland Polytechnic
University of Teesside – formerly Teesside Polytechnic
Thames Valley University – formed from the merger of Thames Valley College and Ealing College of Higher Education as Polytechnic of West London
University of the West of England – formerly Bristol Polytechnic
University of Westminster – formerly The Royal Polytechnic Institution (1838), Regent Street Polytechnic then The Polytechnic of Central London
University of Wolverhampton – formerly Wolverhampton Polytechnic

Post-1992 (or "modern") universities not formerly designated "Polytechnics"

University of Abertay Dundee – formerly Dundee Institute of Technology
University of the Arts London – formerly London Institute
Bath Spa University – formerly Bath College of Higher Education
University of Bedfordshire – formerly University of Luton, created by the merger of the University of Luton and De Montfort University's, Bedford campus
Bishop Grosseteste University College Lincoln – formerly Bishop Grosseteste College
University of Bolton – formerly Bolton Institute of Higher Education
Buckinghamshire New University – formerly Buckinghamshire Chilterns University College, and before that Buckinghamshire College of Higher Education, and earlier the High Wycombe College of Art and Technology
Canterbury Christ Church University – formerly Christ Church College
University of Chester – formerly Chester College of Higher Education
University of Chichester – formerly Chichester Institute of Higher Education then University College Chichester
University of Cumbria – formed in January 2007 from the merger of St Martin's College, the Cumbria Institute of the Arts (CIA) and the Cumbrian campuses of the University of Central Lancashire
University of Derby – formerly the Derbyshire College of Higher Education
Edge Hill University – based in Ormskirk, Lancashire, formerly Edge Hill College
University of Gloucestershire – formerly Cheltenham & Gloucester College of Higher Education
Glyndŵr University - formerly the North East Wales Institute of Higher Education
Liverpool Hope University – formerly a fully accredited institution of the University of Liverpool, then Liverpool Hope University College
Newman University College - formerly Newman College of Higher Education
University of Wales, Newport – formerly Gwent College of Higher Education then University of Wales College, Newport
University of Northampton – formerly Northampton Technical College, Nene College then University College Northampton
Queen Margaret University – formerly Queen Margaret College then Queen Margaret University College
Robert Gordon University – based in Aberdeen, formerly Robert Gordon's Technical College then the Robert Gordon Institute of Technology

Roehampton University – formerly Roehampton Institute
Southampton Solent University – formerly Southampton Institute of Higher Education
Swansea Metropolitan University – formerly Swansea Institute of Higher Education
University of Wales Institute, Cardiff - One of three universities in Cardiff
University of the West of Scotland – formerly University of Paisley
University of Winchester – formerly King Alfred's College
University of Worcester – formerly part of the University of Birmingham Department of Education then Worcester College of Higher Education
York St John University – formerly the College of Ripon and York St John then York St John College

Appendix 2 (Chapter 5): Education systems in England and Scotland

English System

The school year begins on the 1st of September. Education is compulsory for all children from the term after their fifth birthday to the last Friday in June of the school year in which they turn 16. This will be raised in 2013 to the year in which they turn 17 and in 2015 to the year in which they turn 18. In the vast majority of cases, pupils progress from primary to secondary levels at age 11; in some areas either or both of the primary and secondary levels are further subdivided. A few areas have three-tier education systems with an intermediate middle level from age 9 to 13.

The following table shows common patterns for schooling in England.

Appendix Table 1

<table>
<tr><th>Age on 1st Sept</th><th>Year</th><th>Curriculum stage</th><th colspan="3">Schools</th></tr>
<tr><td>3</td><td>Nursery</td><td rowspan="2">Foundation Stage</td><td colspan="3">Nursery school</td></tr>
<tr><td>4</td><td>Reception</td><td rowspan="3">Infant school</td><td rowspan="5">Primary school</td><td rowspan="3">First school</td></tr>
<tr><td>5</td><td>Year 1</td><td rowspan="2">Key Stage 1</td></tr>
<tr><td>6</td><td>Year 2</td></tr>
<tr><td>7</td><td>Year 3</td><td rowspan="4">Key Stage 2</td><td rowspan="4">Junior school</td></tr>
<tr><td>8</td><td>Year 4</td><td rowspan="3">Middle school</td></tr>
<tr><td>9</td><td>Year 5</td></tr>
<tr><td>10</td><td>Year 6</td></tr>
<tr><td>11</td><td>Year 7</td><td rowspan="3">Key Stage 3</td><td rowspan="4">Secondary school</td><td rowspan="5">Secondary school with Sixth Form</td></tr>
<tr><td>12</td><td>Year 8</td></tr>
<tr><td>13</td><td>Year 9</td><td rowspan="3">Upper school</td></tr>
<tr><td>14</td><td>Year 10</td><td rowspan="2">Key Stage 4 / GCSE</td></tr>
<tr><td>15</td><td>Year 11</td></tr>
<tr><td>16</td><td>Year 12</td><td rowspan="2">Sixth Form / A-level</td><td rowspan="2">Sixth form college</td></tr>
<tr><td>17</td><td>Year 13</td></tr>
</table>

Scottish System

Children start primary school aged between 4½ and 5½ depending on when the child's birthday falls. Scottish school policy places all those born between March of a given year and February of the following year in the same year group. Children born between March and August start school in August at between 5½

and 5 years old, and those born between September and February start school in the previous August at between age 4 years 11 months and 4½ years old. The Scottish system is the most flexible in the UK, however, as parents of children born between September and December can request a deferral for 1 year (not automatic, requires to be approved), whilst children born between January and February can opt to hold their child back a year and let them start school the following August. This usually allows those not ready for formal education to have an extra year at nursery school. (Funding is only available for children born in January and February).

Pupils remain at primary school for seven years. Then aged eleven or twelve, they start secondary school for a compulsory four years with the following two years being optional. In Scotland, pupils sit Standard Grade or Intermediate exams at the age of fifteen/sixteen, for normally eight subjects including compulsory exams in English, Mathematics, a Science subject (Physics, Biology or Chemistry) and a Social Subject (Geography, History or Modern Studies). It is now required by the Scottish Parliament for students to have two hours of physical education a week; each school may vary these compulsory combinations. The school leaving age is generally sixteen (after completion of Standard Grades), after which students may choose to remain at school and study for Higher Grade and Advanced Higher exams. Increasingly, students in S3 and S4 are able to take Intermediate courses, as these have become more popular and are more closely linked to Highers.

Appendix 3 (Chapter 5): Estimating models without "independent" youths

The following table contains all panel models re-estimated excluding youths living independently (i.e. with unknown parental income). It is reassuring that, particularly in the case of the preferred FE model, the coefficients are very similar to those of Table 7.4, in which the values of grants and fees are estimated for those youths with missing parental incomes.

Appendix Table 2

	(1) OLS/RE	(2) FE	(3) FD	(4) Dynamic
grant	**0.011**	**0.029**	**0.021**	**0.02**
	(0.008)	**(0.000)****	**(0.02)**	**(0.014)**
fee	**-0.017**	**-0.043**	**-0.058**	**-0.036**
	(0.014)	**(0.015)****	**(0.041)**	**(0.027)**
loan	0.021	0.053	0.042	0.05
	(0.012)	(0.015)**	(0.025)	(0.015)**
parental income	0.001	0.001	0.001	0.004
	(0.000)**	(0.001)	(0.013)	(0.001)**
white	-0.040	-0.111	0.024	0.021
	(0.025)	(0.046)*	(0.082)	(0.061)
GCSE	0.233	0.200	0.188	0.190
	(0.034)**	(0.032)**	(0.063)**	(0.058)**
father, NVQ Level 2-3[1]	-0.078	-0.062	-0.014	-0.057
	(0.031)*	(0.028)*	(0.068)	(0.063)
father, NVQ Level <2	-0.091	-0.064	-0.046	-0.127
	(0.031)**	(0.028)*	(0.062)	(0.055)*
mother, NVQ Level 2-3	-0.097	-0.097	-0.155	-0.106
	(0.046)*	(0.034)**	(0.066)*	(0.072)
mother, NVQ Level <2	-0.116	-0.100	-0.126	-0.088
	(0.038)**	(0.030)**	(0.058)*	(0.070)
unemployment rate	0.003	0.008	0.016	0.012
	(0.001)**	(0.003)*	(0.019)	(0.006)
Pt-1				0.009
				(0.049)
Pt-2				-0.052
				(0.048)
Constant	3,382.599	2,269.785		-0.545
	(1,150.027) **	(1,410.435)		(0.195)**
Time trend (lin & n-lin)	Y	Y	Y	Y
Observations	1488	1488		
R-squared	0.33	0.13		
Number of groups		144	144	144[2]

Robust standard errors in parentheses * significant at 5%; ** significant at 1%

[1] In each case, omitted category is "parent educated to >NVQ level 4"

[2] Number of instruments=141

Appendix 4 (Chapter 5): Missing parental income data in the LFS

The following table contains descriptive statistics for those who are of school-leaving age and therefore eligible for university in the LFS sample of use, but have missing parental income data, and are therefore excluded from the sample. Note that these youths live either in the parental home or in a hall of residence, so do not overlap with those youths living independently, for whom levels of grants, fees and loans are estimated.

Appendix Table 3

	All	Missing income
% all sample	-	13.7
% of all participants	16.1	15.8
% of all non-participants	83.9	84.1
ethnicity		
white (%)	85.6	72.2
non-white (%)	8.3	7.1
missing (%)	6.1	20.7
youth's education		
GCSEs >=5 (%)	47.3	46.9
GCSES < 5 (%)	49.6	49.9
missing (%)	3.1	3.2
gender		
male	51.4	52.5
female	48.6	47.4
parent's education [1]		
NVQ level 4 +	34.8	33.9
NVQ level 2 or 3	22.3	23.0
NVQ level <2	27.1	26.0
missing (%)	15.8	17.2
mean parental income £	22278.7	-
region		
england	80.4	80.9
scotland	9.1	8.3
wales	5.3	5.5
northern ireland	5.2	5.3
sample size	24732	3921

As is apparent, characteristics of those with missing parental income data are very similar to those in the remaining sample, although there is more missing information on ethnicity among this group. Parental education data is not generally found to be missing from this sample, and is similar by comparison,

suggesting excluding these missing income students from the sample will not cause sample bias.

Appendix 5 (Chapter 5): NVQ Level Framework

The table below describes the qualifications, both vocational and academic, by NVQ level, used in the economic models described in Chapters 6 and 7. The table is taken from Deaden et al (2002).

Appendix Table 4

Qualification variable	*LFS qualifications included*	*NVQ level*
Academic qualifications		
CSEs	CSE below grade 1	1
O-levels (grades A–C)	O-level/GCSE grades A–C	2
	CSE grade 1	
A-levels	A-level	
	Scottish Certificate of 6th Year Studies	3
	SCE Higher	
	A/S level	
Other HE qualification	Other HE qualifications below degree level	4
HE diploma	Diplomas in Higher Education	4
First degree	First Degree	5
Higher Degree	Higher Degree	5
Vocational qualifications		
'other' qualifications	YT certificate	
	SCOTVEC National certificate modules	1
	Any other qualifications	
NVQ level 1	NVQ level 1	1
	GNVQ foundation	
NVQ level 2	NVQ level 2	2
	GNVQ intermediate	
NVQ level 3–5	NVQ level 3/GNVQ	3
	GNVQ advanced	3
	NVQ level 4	4
	NVQ level 5	5
RSA low	RSA other qualifications (Stage I, II and III)	1
RSA high	RSA diploma	2
	RSA Advanced Diploma/Certificate	3
	RSA Higher Diploma	4
City and Guilds 'other'	City and Guilds 'other'/lower/part I	1
City and Guilds Craft	City and Guilds craft/part II	2
City and Guilds Adv. Craft	City and Guilds Advanced Craft/part III	3
BTEC first cert./diploma	BTEC first certificate	1
	BTEC first diploma	2
ONC/OND BTEC National	ONC/OND	3
	BTEC/SCOTVEC National	
HNC/HND BTEC Higher	HNC/HND	4
	BTEC/SCOTVEC higher	
Nursing	Nursing qualification	4
Teaching	Teaching – further education	
	Teaching – secondary education	4
	Teaching – primary	
	Teaching – level not stated	
Professional qualification	Other e.g., member of professional institute	5

Appendix 6 (Chapter 6): Higher Education Finance in England and Scotland before and after devolution

Appendix Table 5 shows maximum rates of loans, fees and grants in the UK from 1975-2005/06. These rates are applicable for all UK students including Scotland, until 2000, at which point the Scottish system departed, following devolution in 1999.

Appendix Table 5: Rates of Loans and Grants in the UK 1975-2005 (DfES)

Rates of Loans & Grants since 1975

Key
Figures in brackets = maximum full year rate of student grant
No brackets = maximum full year rate of student loan
Old = those students who started their course before September 1998
New = those students who started their course in September 1998 or later

Year	Parental Home		London		Elsewhere	
	£		£		£	
1975/76	(570)		(810)		(740)	
1976/77	(675)		(955)		(875)	
1977/78	(785)		(1,145)		(1,010)	
1978/79	(870)		(1,315)		(1,100)	
1979/80	(985)		(1,485)		(1,245)	
1980/81	(1,125)		(1,695)		(1,430)	
1981/82	(1,180)		(1,825)		(1,535)	
1982/83	(1,225)		(1,900)		(1,595)	
1983/84	(1,275)		(1,975)		(1,660)	
1984/85	(1,435)		(2,100)		(1,775)	
1985/86	(1,480)		(2,165)		(1,830)	
1986/87	(1,510)		(2,246)		(1,901)	
1987/88	(1,567)		(2,330)		(1,972)	
1988/89	(1,630)		(2,425)		(2,050)	
1989/90	(1,710)		(2,650)		(2,155)	
INTRODUCTION OF 'MORTGAGE-STYLE' STUDENT LOANS						
1990/91	330+(1,795)		460+(2,845)		420+(2,265)	
1991/92	460+(1,795)		660+(2,845)		580+(2,265)	
1992/93	570+(1,795)		830+(2,845)		715+(2,265)	
1993/94	640+(1,795)		940+(2,845)		800+(2,265)	
1994/95	915+(1,615)		1375+(2,560)		1150+(2,040)	
1995/96	1065+(1,530)		1695+(2,340)		1385+(1,885)	
1996/97	1260+(1,400)		2035+(2,105)		1645+(1,710)	
1997/98	1290+(1,435)		2085+(2,160)		1685+(1,755)	
INTRODUCTION OF TUTION FEES AND INCOME-CONTINGENT STUDENT LOANS						
1998/99	1325+(1480)	Old	2145+(2225)	Old	1735+(1810)	Old
	2325+(480)	New	3145+(1,225)	New	2735+(810)	New
1999/00	1360+(1515)	Old	2200+(2280)	Old	1780+(1855)	Old
	2875*	New	4480*	New	3635*	New
2000/01	1395+(1555)	Old	2255+(2335)	Old	1825+(1900)	Old
	2950*	New	4590*	New	3725*	New
2001/02	1395+(1555)	Old	2255+(2335)	Old	1825+(1900)	Old
	3020*	New	4700*	New	3815*	New
2002/03	1465+(1625)	Old	2365+(2450)	Old	1915+(1990)	Old
	3090*	New	4815*	New	3905*	New
2003/04	1500+(1530)	Old	2420+(2420)	Old	1960+(1960)	Old
	3165*	New	4930*	New	4000*	New
2004/05	1535+(1705)	Old	2480+(2570)	Old	2005+(2090)	Old
	3240*+(1000)	New	5050*+(1000)	New	4095*+(1000)	New
STUDENTS CURRENTLY IN THE SYSTEM						
2005/06	1535+(1745)	Old	2480+(2635)	Old	2005+(2140)	Old
	3320*+(1000)	New	5175*+(1000)	New	4195*+(1000)	New

* 25 per cent of which is means tested

Appendix Table 6 contains information for Scotland, for 2002, following readjustment of fees, loans and grants which occurred over the period 2000-2001.

Appendix Table 6 Rates of loans and grants in Scotland, 2002 (The Scottish Government)

Annual parental income*	Parental support	Bursary	Loan	Total supportpackage
10,240	-	2,050	2,365	4,415
15,000	-	1,263	3,152	4,415
20,000	-	695	3,209	3,905
20,480	45	644	3,216	3,905
25,000	547	150	3,208	3,905
30,000	1,102	-	2,803	3,905
35,000	1,658	-	2,247	3,905
40,000	2,213	-	1,692	3,905
45,000	2,897	-	1,008	3,905
50,000 and above	3,135	-	770	3,905

Appendix 7 (Chapter 7): Dynamic model selection

Appendix Table 7 shows a number of specifications tested in the dynamic model selection. The first column shows the preferred specification. Columns 2-3 show the specification using different lag lengths as instrumental variables for the lagged dependent variables. In each case, these models fail to identify the loan, fee and grant variables.

Column 4 shows the specification with lagged grant, fee and loan variables as well as lagged dependent variables. None of the lagged explanatory variables are found to be significant.

Finally, Column 5 displays an alternative specification for the composite net costs variable. The lagged variable is not found to be significant.

Note, full set of explanatory variables is present in each case but suppressed for ease of reading.

Appendix Table 7 Alternative specifications of Dynamic models

	(1) preferred specification	(2) lags 2,3	(3) lags 2,4	(4) lagged X	(5) lagged net costs
P t-1	-0.078	0.008	-0.027	0.047	0.054
	(0.025)**	(0.081)	(0.081)	(0.040)	(0.087)
P t-2	-0.103	-0.036	-0.026	-0.012	-0.023
	(0.025)**	(0.029)	(0.031)	(0.035)	(0.030)
grant	0.022	0.023	0.023	0.039	
	(0.011)*	(0.015)	(0.016)	(0.019)*	
grant t-1				-0.030	
				(0.029)	
fee	-0.039	-0.022	-0.024	-0.040	
	(0.012)**	(0.027)	(0.027)	(0.035)	
fee t-1				0.033	
				(0.023)	
loan	0.047	0.036	0.039	0.034	
	(0.014)**	(0.017)*	(0.017)*	(0.022)	
loan t-1				-0.017	
				(0.021)	
net costs					-0.072
					(0.021)**
net costs t-1					0.035
					(0.019)
Constant		-0.340	-0.283	-0.300	-0.220
		(0.172)*	(0.182)	(0.181)	(0.170)
Obs.	1582	1582	1582	1582	1582
Groups	144	144	144	144	144

Robust standard errors in parentheses
* significant at 5%; ** significant at 1%

Appendix 8 (Chapter 9): Scottish Funding Council and Higher Education Funding Council Subject Breakdowns

Appendix Tables 8-9 contain detailed funding information for universities in England and Scotland, according to HEFCE and SFC rules.

Appendix Table 8 HEFCE price group codes (English and Northern Irish institutions)

Higher education institutions	
Cost centre	**Price group(s)**
1 Clinical medicine	A, B
2 Clinical dentistry	A, B
3 Veterinary science	A, B
4 Anatomy and physiology	B
5 Nursing and paramedical studies	C
6 Health and community studies	C
7 Psychology and behavioural sciences	C
8 Pharmacy and pharmacology	B
10 Biosciences	B
11 Chemistry	B
12 Physics	B
13 Agriculture and forestry	B
14 Earth, marine and environmental sciences	B
16 General engineering	B
17 Chemical engineering	B
18 Mineral, metallurgy and materials engineering	B
19 Civil engineering	B
20 Electrical, electronic and computer engineering	B
21 Mechanical, aero and production engineering	B
23 Architecture, built environment and planning	C
24 Mathematics	C
25 Information technology, systems sciences and computer software engineering	C
26 Catering and hospitality management	C
27 Business and management studies	D
28 Geography	C
29 Social studies	D
30 Media studies	Media studies
31 Humanities	D
33 Design and creative arts	C
34 Education	C, D
35 Modern languages	C
37 Archaeology	C
38 Sports science and leisure studies	B, C, D
41 Continuing education	D
99 Cost centre not assignable	D

Appendix Table 9 Scottish Funding Council price group codes (SFC)

High (cost factor 1.6)	
Clinical Laboratory Sciences	(1)
Anatomy	(6)
Physiology	(7)
Pharmacology	(8)
Pharmacy	(9)
Biological Sciences	(14)
Agriculture	(15)
Food Science and Technology	(16)
Veterinary Science	(17)
Chemistry	(18)
Physics	(19)
Earth Sciences	(20)
Environmental Sciences	(21)
Computer Science	(25)
General Engineering	(26)
Chemical Engineering	(27)
Civil Engineering	(28)
Electrical and Electronic Engineering	(29)
Mechanical, Aeronautical and Manufacturing Engineering	(30)
Mineral and Mining Engineering	(31)
Metallurgy and Materials	(32)
Intermediate (cost factor 1.2)	
Community-based Clinical Subjects	(2)
Hospital-based Clinical Subjects	(3)
Clinical Dentistry	(4)
Pre-clinical Studies	(5)
Nursing	(10)
Other Studies and Professions Allied to Medicine	(11)
Psychology	(13)
Pure Mathematics	(22)
Applied Mathematics	(23)
Statistics and Operational Research	(24)
Built Environment	(33)
Geography	(35)
Economics and Econometrics	(38)
Linguistics	(56)
Archaeology	(58)
Library and Information Management	(61)
Art and Design	(64)
Sports Related Subjects	(69)
Low (cost factor 1.0)	
Town and Country Planning	(34)
Law	(36)
Anthropology	(37)
Politics and International Studies	(39)
Social Policy and Administration	(40)
Social Work	(41)
Sociology	(42)
Business and Management Studies	(43)

ctd over

Low (cost factor 1.0), ctd	
Accounting and Finance	(44)
American Studies	(45)
Middle Eastern and African Studies	(46)
Asian Studies	(47)
European Studies	(48)
Celtic Studies	(49)
English Language and Literature	(50)
French	(51)
German, Dutch and Scandinavian Languages	(52)
Italian	(53)
Russian, Slavonic and East European Languages	(54)
Iberian and Latin American Languages	(55)
Classics, Ancient History, Byzantine and Modern Greek Studies	(57)
History	(59)
History of Art, Architecture and Design	(60)
Philosophy	(62)
Theology, Divinity and Religious Studies	(63)
Communication, Cultural and Media Studies	(65)
Drama, Dance and Performing Arts	(66)
Music	(67)
Education	(68)

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