INVESTIGATING POLICIES TO WIDEN PARTICIPATION: A CASE STUDY OF ONE SIXTH FORM COLLEGE IN THE NORTH WEST OF ENGLAND

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Abstract

This investigation adds to the research base by focusing on the impact of widening participation education policies that are designed to deliver social mobility over the period 2001 to 2010 at a college within the sixth form college sector. The methodology is based on the case study practice set out by Yin (1994). The research is a micro study using quantitative techniques of the effects of social inclusion policy on one college, considering the changes in various student inputs and outcomes and whether the investment was efficient and effective, using the educational production function as its theoretical basis. The creation of a college and student level database which includes a consistent measure of socio-economic background and real expenditure per student over a 10 year period has added to understanding by allowing a coherent analysis of the changes that took place; institutions need to be aware of definition changes and the importance of using consistent measures when evaluating developments over time.

Perhaps the clearest signal that widening participation educational policies have not been delivered is that, although the College has been successful in attracting a greater number of less advantaged students, it has not been successful in increasing the percentage of less advantaged students in the overall cohort if the consistent measure of socio-economic background is used. The findings on progressing to higher education, although mixed, are more positive, but there is no evidence that funding has had a positive effect, which adds support to the findings elsewhere in the literature for other sectors of a lack of a value for money for such policies. The finding that Russell Group participation fell considerably for all groups of students over the period, even those students with high prior achievement, leads this research to question whether policy intervention in the form of top-down directives, with the provision of additional finance, is an efficient and effective use of resources. It may be more appropriate to direct resources targeted at social mobility to programmes that: increase parental engagement, develop the role of 'supportive adult' in colleges and generally assist in breaking down perceived or actual social barriers.

In terms of professional development, the analysis suggested careful attention was necessary in the use of appropriate statistics: there were problems with Chi-square if the concern was with trends, but simple time series regression, although having limitations, may be more useful as a quick and easily conducted tool for management assessment of performance in some situations. Multiple regression, although more complicated, gave a detailed examination that may produce some useful management information, with the simpler linear probability model (LPM) often, but not always, preferable to logistic regression, given its easier presentation to non-specialist audiences.

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Glossary of terms

Advanced Level Performance System (ALPS)

Advanced Subsidiary (AS Level)

Advantaged Level (A Level)

Business and Technology Education Council (BTECs)

Consumer Price Index (CPI)

Education Funding Agency (EFA)

Education Maintenance Allowance (EMA)

EPF (Education Production Function)

Free School Meals (FSM)

Full-time Equivalent (FTE)

Further Education (FE)

Further Education Funding Council (FEFC)

General Certificate of Education (GCE)

Gross Domestic Product (GDP)

Higher Education (HE)

Higher Education Funding Council for England (HEFCE)

Higher Education Statistics Agency (HESA)

Higher National Diploma (HND)

Human Capital Theory (HCT)

Index of Multiple Deprivation (IMD)

Individual Learner Plans (ILPs)

Individualised Learning Record (ILR)

Information, Advice and Guidance (IAG)

Linear Probability Regression Model (LPM)

Local Education Authorities (LEAs)

Maximum Likelihood (ML)

Metropolitan Borough (MB)

Metropolitan County (MC)

Minimum Levels of Performance Reports (MLPs)

New Labour (NL)

Not in Education, Employment or Training (NEETS)

Office for Standards in Education, Children's Services and Skills (OFSTED)

Ordinary Least Square (OLS)

Qualification and Curriculum Authority (QCA)

Provider Data Self-assessment Toolkit (PDSAT)

Russell Group (RG)

Sixth Form College Association (SFCA)

Skills Funding Agency (SFA)

Super Output Area (SOA)

The Learning and Skills Council (LSC)

Universities and Colleges Admissions Service (UCAS)

Vocational Certificate of Education (VCE)

Widening Participation (WP)

1. Aims and background to the research

1.1 Introduction

This research examines the effect of, and potential difficulties in, delivering social mobility through national policy directives via the education sector, using a case study of a particular College. In particular, the research investigates, and endeavours to gain a greater understanding of, the impact of the Widening Participation (WP) policies of New Labour (NL) on social mobility over the period 2001 to 2010. This is a period of particular interest given the economic context of the period, with the exceptional increases in public spending on the education sector and how this translated into real term increases in funding per student (full-time equivalent; FTE) at the case study institution (the College). The research ultimately considers the impact of this investment in 'value for money' terms (efficient and effective) in light of OFSTED's (Office for Standards in Education, Children's Services and Skills) placing a 'value for money' judgement on individual institutions during the period in question. The research also considered lessons for the future, in the context of the College maintaining an inclusive entry policy, and expanding vocational provision. Finally, for professional development reasons, the research examined whether and, if so, which 'simple' statistical techniques are appropriate and sufficient for the analyses, or whether more complicated statistical methods are necessary, given that simplicity may be helpful in disseminating information to the lay person at work and in education research.

This chapter presents a summary of the previous literature review, conducted and assessed as module 5 for the Doctorate in Education award, which focused on research into the effects of socio-economic background on educational outcomes. This provided a background to the development of the aims and research questions for this thesis. It found that there was little direct research that examines the effects of public sector investment of the period in Further Education (FE), particularly in the sixth form sector. Fundamentally, the aim of this research is to address this shortcoming and add to understanding and knowledge through the investigation of five key research questions set out in section 1.3. This chapter then lays out the structure of subsequent chapters before providing the economic and educational context, and then continues with a description of the College and management team outlining the role and background of the Vice Principal for Finance and Resources, the author of this research. The description shows the College is committed to WP objectives and through a diverse curriculum offer and inclusive entry criteria has laid the foundations to address many of the unfavourable socio-economic characteristics in the Metropolitan Borough (MB) where

the College is located. The final section (1.9), establishes a further focus of the research, this being a contribution to professional practice in terms of using more complex statistical methods. Using this investigation as an example, the objective is to discuss whether there is benefit in using these techniques to increase understanding and improve practice, for the Researcher, senior managers and governors in colleges.

1.2 A summary of the previous literature review

The following is a précis of a previously conducted literature review; the full document is presented in appendix 1.2 but before proceeding, it is worth noting that the review only forms part of the referenced literature in this thesis. The theoretical framework supporting this research, the EPF (Education Production Function) Model, was not considered in the review, so the empirical literature supporting this model is presented in section 2.4.2. When considering student attributes other than the socio-economic background in Chapter 3, further literature is presented. The literature discussed in the review and this précis, therefore forms just part of the overall literature that was considered when developing the research aims and questions.

Notwithstanding this, the literature review is still at the heart of this research as it was concerned with understanding the background and outcomes of the WP Agenda. It outlined that NL's period in office coincided with a favourable economic climate and there were very large increases in public spending on education (Chantrill, 2013). The literature review found little evidence of direct research looking at time series data evaluating the impact of the investment in the FE sector of the period. There is evidence, however, that directing much of the growth in spending at the FE sector may have been misdirected as it comes too late in learners' development to have an impact on social mobility (Reed et al., 2005); and may not actually work as the state of the wider economy has a greater impact on participation rates in the FE sector than education spending (McVicar & Rice, 2001). Published evidence on the record on success rates nationally (Office for National Statistics, 2015), the key value for money performance measure used by NL in the FE sector, also indicates very little improvement in the period for 16-18 year-olds studying on long programmes in sixth form colleges.

The previously conducted literature review found a difficulty in establishing an appropriate definition and measurable target of social mobility; the current target is very much at the extremes, encompassing students from the poorest families to those whose parents are employed in the professions (Crawford et al., 2011). A more pragmatic approach to setting social mobility targets would be to improve social mobility for lower to middle income groups rather than the lowest socio-

economic groups; also perhaps a much longer term mind-set is required (Sutton Trust, 2008). Obtaining a consistent measure for disadvantaged students, especially over an extended time period (10 years in this research), is also problematic when a number of indexes have been used in the calculation of the WP Factor (discussed further in section 4.3.1). This study examines Russell Group (RG) participation at the College (in section 4.2.3) as an alternative measure for social mobility rather than the more challenging measure of employment in one of the recognised professions (for which data is not available at the College level).

Social capital was found to be important and refers to the social networks, systems of reciprocal relations, sets of norms, or levels of trust that individuals or groups may have, or to the resources arising from them. According to Francis and Perry (2010), many of the initiatives in education are measured through increases in attainment and overall there has been little sustained improvement with regard to the educational progression outcomes of disadvantaged groups. They point out that an increasingly segregated education system, driven via a market where the wealthy have better purchasing power (via both financial and social capital), is an impediment against the narrowing of the social class gap for attainment. Policies focusing on working class families that ignore issues around social capital could be an explanation for the apparent failure to deliver social inclusion.

Empirical evidence on the role of social capital (Bourdieu, 1977) identifies social capital as an actual or potential resource that can be used by powerful elites to retain their privilege. Coleman and Hoffer (1987), in their work on social disadvantage in schooling in the 1980s, defined social capital as a set of resources inherent in a group that in certain circumstances can overturn social disadvantage, the example being a Catholic school. As Francis and Perry (2010) point out, many policies, especially the use of the market to distribute funds, can have the perverse effect of maintaining the status quo. What perhaps is needed is an ideological framework that supports/develops the social capital of disadvantaged groups; this could be possible at a micro level as per Coleman and Hoffer (1987), but is it something that can be driven by a national policy directive?

Theories of learner development (Reed et al., 2005), were also identified as justification for carrying out a micro-level study as they indicate that, with appropriate adult involvement in the education process, learners have the motivation to achieve their full potential. Evidence suggests that there is limited awareness of the complexity of needs of the communities not participating in education (Foskett, 2002) and that NL's 'third way', including the introduction of quasi-market structures and top-down national policy directives, do not necessarily work (Macdonald & Stratta, 2001); the response of individual institutions and staff working within them (micro level factors) do

not always align themselves with policy directives. Given that evidence suggests that institutions and staff do not always respond as expected and may therefore not replace the benefits supportive families bring to the process of education, the literature review concludes that there may be real benefits in carrying out further micro-level research examining the impact of WP policies at an institutional level.

Credit constraints and family background have been used to explain the difference in college enrolment between students from high and low income families (Kane, 1996). Attempts to address these issues through student subsidies in the FE sector (i.e. the Education Maintenance Allowance; EMA) have been patchy, especially in relation to the impact on different ethnic and gender groups (Chowdry et al., 2007) and it is also far from certain that the significant investment in the EMA represented value for money. There is also research (d'Addio, 2007) that suggests that it is a characteristic of the UK labour market that inhibits progress in social mobility. The decrease in income equality during NL's period in office (Earlham Sociology Pages, 2011) in a sense supports this view.

Despite these concerns, there already exists a well-established route into HE through A Level and vocational curriculum programmes. The literature review provided evidence (Allen, 2013) that students with lower prior achievement have gained access to HE through the vocational route despite the concerns expressed by the Wolf Report (2011) on vocational provision generally. Despite the education routes being in place, the level of cognitive skills (the ability to gain meaning and knowledge from experience and information) is a factor in student achievement (Chowdry & Sibieta, 2011). Schools, particularly those in areas of social deprivation, still have a poor record in terms of maths and English GSCE scores; evidence still shows that family background is the most important factor in determining level of cognitive skills and that the education system cannot reverse the disadvantage some students' experience (Cahill & Ermisch, 2012). The literature review suggested that steering public investment to developing human capital and away from educational spending generally, as suggested by Heckman and Krueger (2005), would possibly represent a more efficient and effective use of public spending. Addressing non-cognitive skills (interpersonal skills, persistence, communication skills and other 'soft' skills), on the other hand, has been suggested as a way forward (Department for Business, Innovation & Skills, 2011b), and is a rationale given for continued investment in the education system, especially in FE, for delivering social mobility.

Curriculum change is the mechanism used by successive governments to address possible shortfalls in the education system and to make it more accessible to students and raise standards, but it can in itself, lead to dips in achievement rates (Allen, 2009). Furthermore, the inability of large

numbers of graduates to secure well paid jobs (Office for National Statistics, 2012) is probably partly a product of the economic climate, but it may also indicate that some graduates do not possess the requisite skills required by employers. The literature review provided statistical evidence that participation rates in the FE and HE sectors increased over the period; however, progression to top universities and the professions is still restricted to the more affluent social classes (HM Government, 2010).

The literature review concluded by questioning whether national policy directives designed to deliver social mobility, accompanied sometimes by large increases in funding, are the most efficient and effective use of public money. Researching the impact of social mobility policies was considered a complex area and it is by no means certain what role the education system and education spending has on social mobility. Ultimately, tackling deep-routed social issues through the education system, given the lack of success historically (Kennedy, 1997), may in the end be impractical. It could be that changes in social mobility are inter-generational and are unlikely to be influenced by short to middle-term policy directives and funding/curriculum changes. Fundamentally, the literature review outlined that NL's period in office coincided with a favourable economic climate with large increases in public spending on education (Chantrill, 2013). However, it found little evidence of case study research looking at time series data evaluating the impact of this investment, particularly in the sixth form college sector.

1.3 Aims of the research

This thesis developed from the previously conducted literature review and sections of this background chapter re-examine and expand aspects included in this earlier work that are important in setting the context for this research. The literature review suggested that the FE sector has been increasingly recognised as crucial to the economic and social wellbeing of the country and has experienced fundamental change since colleges were incorporated in 1992. NL educational policies directed at developing social mobility are the primary focus of this micro level research project and the two policies/objectives that encompassed NL's objectives of developing social mobility are:

1. To widen participation in FE.
2. To increase the number of HE places.

These two policies were implemented through the Learning and Skills Act 2000 with an overriding long-term aspiration for the education system in the UK: by 2010, 50% of school leavers 30

years and under should have experienced HE. It is recognised that this aspiration had reduced prominence when in September 2006 it was agreed that universities would be allowed to charge up to £3,000 a year in variable tuition fees, or top-up fees. The FE sector and in particular the sixth form sector, which is the focus of this research project, has been subject to considerable change. Yet despite this change, according to Bergh and Fink (2006), little has been done to examine the effects of public sector funding on FE. In terms of the sixth form sector, Lumby and Briggs (2002) state that the lack of research is even more pronounced; comparatively little is known about the management of the sector and the impact of government policies, and research that has been undertaken has tended to focus on general FE colleges, which form the majority of the sector.

The aims of the research are therefore:

1. To investigate the effects of social mobility policy at a case study college considering changes in various inputs (student attributes, year and funding variables) and outcomes (WP policy objectives).
2. To appraise whether the increased public investment is efficient and effective.
3. To consider whether there are lessons for the future.
4. To gain an understanding of, if and when, more complex statistical analyses are needed, given the usefulness of simplicity in conveying outcomes to lay people at work and to the wider educational community.
5. To provide professional development opportunities for the Researcher in the use of these more complex statistical methods.

The five key research questions to be investigated are as follows:

1. ***What are the trends in College participation and progression to HE by student attributes in the case study college?***
2. ***What are the main determinants of progression to different types of HE institutions and are some of these under the College's control?***
3. ***To what extent has the investment in the sector between 2001 and 2010 delivered value for money in the case study*** **college,** ***given the WP agenda?***
4. ***What are the implications for practice at a national and institutional level?***
5. ***To what extent do inferential statistics and more complex statistical methods add to our understanding in this area of study?***

The overarching aim of the research is to increase understanding and learn lessons for the future as social mobility remains a concern for policy makers and practitioners; the Final Report from the Panel on Fair Access (2009), for example, shows that social mobility, or the lack of it depending on the measure one uses, is still challenging. The report showed that 75% of judges, 70% of finance directors, 45% of top civil servants and 32% of MPs were independently schooled, yet only 7% of children go to a private school.

1.4 Structure of the thesis

This thesis, in Chapter 2, establishes the methodology used, looking at the rationale for adopting a case study approach to investigate the success of the WP policies, using the components and principles set out by Yin (1994). This is followed by an explanation of the theoretical framework, in this case the EPF, which provides a model to describe how educational inputs impact on educational progression outcomes and social mobility. Chapter 2 concludes with an explanation of the methods of statistical analyses deployed to test the various hypotheses derived from the theoretical models.

The source and quality of the data, what tools and packages are used, and how the data is manipulated, is presented in Chapter 3. The chapter includes a description of the variables used and presents summary descriptive statistics. The variables for the theoretical framework are further explored in Chapter 4, under the headings of educational progression outcomes and educational inputs, detailing the dependent (outcome) and independent (input) variables within the models. The literature review discussed earlier focused on FE and HE participation as the educational progression outcomes (dependent variables). This research adds to understanding by including RG participation from the College cohort as an additional educational outcome to be examined; it is argued that RG participation may well be a better proxy for social mobility than the WP policy targets. The literature review also primarily focused on socio-economic background; but this research also considered additional educational inputs, including gender, ethnicity, programme of study and prior attainment, plus year and funding variables. The rationale for using various measures for these inputs, along with empirical studies involving these variables is also discussed in Chapter 4. In particular, the measure for socio-economic background is considered. The data contains the WP Factor (uplift) measure; however, the indexes (IMD; Index of Multiple Deprivation) used to formulate this measure changed over the period and instead this research uses WP Factor (adjusted) as an alternative measure, applying IMD 2010 to all years. A detailed explanation and justification for using this measure is included in section 4.3.1.

Chapter 5 presents a descriptive analyses of the published financial and performance data for the College, the region and nationally. It lays the foundations to address question 3 ('To what extent has the investment in the sector between 2001 and 2010 delivered value for money in the case study college?') by presenting the results from the established performance measures used in the sector. It critically evaluates the standard performance measures in respect to WP objectives. The problem with finding an accurate assessment of institutional performance is examined, along with information on how the College allocated the additional resources (increases in funding per student) during the period. Chapter 5 argues that making judgements in 'value for money' terms, in the context of delivering social mobility at a macro or micro level, may in the end be subjective, difficult to measure, intangible and misunderstood (A Brief Guide to Value for Money, 2011). The chapter investigates empirical studies of school and college performance tables (section 5.3) and argues that the outcomes presented in the tables do not recognise the starting point of students, which makes any institution-to-institution or over time comparisons flawed. This research, by including additional variables such as the student attributes in the subsequent statistical analyses, is an attempt to unravel some of the complexity involved. That said, there are internal economic factors, such as how the College spent the increased funding and changes in the management team, plus external factors, such as employment levels and market forces in the education system locally, that are all likely to impact on educational progression outcomes and any value for money assessment. Chapter 5 considers, in particular, levels of capital expenditure and expenditure on pay during the period, supported by empirical evidence on the impact of this expenditure on educational outcomes. Despite the complexities involved, it should be recognised that OFSTED provided a value for money grade[1] for institutions, so it is important to analyse existing measures, especially as some are commonly used by the general public in assessing institutional performance, if not always correctly. Thus another key question in the research, question 4 ('What are the implications for practice at a national and institutional level?'), will be considered in Chapter 5, by reflecting on what the established performance measures actually measure and whether these are useful when measuring achievement of WP objectives. The theoretical model deployed in Chapter 6 can be seen as a response to the limitations with the established performance measures.

[1] OFSTED graded colleges for 'value for money' based on success rates (a factor of retention and achievement) rather than a measure of their success in social mobility terms.

In Chapter 6 the findings of the research are presented for both the 'simple' and 'complex' techniques; the evidence from the 'simple inferential techniques' are presented in section 6.2, and the findings from the multiple regression in sections 6.5 (HE progression) and 6.6 (RG participation). The simple techniques are those used on a day-to-day basis by the Researcher in professional practice, while the 'complex' techniques go further, given the many attributes that may affect educational progression outcomes and add to the complexities involved in researching social mobility, by adopting a theoretical framework using the principles of the EPF. Research question 2, is a focus of this chapter: 'What are the main determinants of progression to different types of HE institutions and are some of these under the College's control?' The EPF is deployed to test whether the probability of attaining the education outcomes of primary interest in this research are affected by the student attributes. What is of particular interest are stu0dent attributes, inputs into the EPF, which the College can control; are there decisions at a micro level that can change educational progression outcomes that will ultimately lead to social mobility? The more 'complex' statistical analysis examines progression dependent on the characteristics of the students (for instance, their ethnicity and gender or whether they are from a less advantaged background), so if the College increases the proportion of students with characteristics under-represented in HE, this is taken account of. The educational significance in these circumstances would be, for instance, a reduction in the differential in the probability of less advantaged, white, male students progressing to HE compared to more socially and economically advantaged students with the same characteristics.

In chapter 6 the research also considers time series variables, year and funding per student adjusted for inflation, as the College is concerned with the impact of the WP policies over time, acknowledging the increasing levels of funding over the period 2001 to 2010. The evidence addresses research question 3: 'To what extent has the investment in the sector between 2001 and 2010 delivered value for money in the case study college?' The evidence also informs recommendations for the future by addressing research question 4: 'What are the implications for practice at a national and institutional level?' These years are selected because they correspond to an era of increased investment in national public services by New Labour (see section 1.5) and are politically associated with the WP Agenda (Kennedy, 1997). The period is one of a coherent policy and the end of this period coincided with the start of this doctoral study, which gave an opportunity to investigate its outcomes. Pragmatically, it would have also been difficult and time consuming to add years post 2010 as the doctoral study progressed. The chapter concludes with an evaluation of the statistical methods used to address research question 5: 'To what extent do inferential statistics and more complex statistical methods add to our understanding in this area of study?' In section 6.7, the findings from the 'simple'

and 'complex' techniques are compared to provide an assessment of (1) whether the 'shortcuts' used in day-to-day activities are useful and acceptable, and (2) in what ways to they compare to the advanced statistical techniques?

Chapter 7 concludes with an assessment of how this research has added to understanding in terms of the factors affecting social mobility and whether different statistical techniques help with this understanding. Essentially, this final chapter discusses the findings of the key questions for this research as set out in section 1.3.

1.5 The macro-economic context

The 10 year period 1998 to 2008 was characterised by favourable economic conditions. According to the European Central Bank (2015), the Gross Domestic Product (GDP) in the UK grew on average by 3% per annum until the start of the recession in 2008. The Bank also reported that unemployment at the start of the period stood at 8% and in 2008 closed at 5.5%. Inflation started the period at under 2% and ended the period at 3.9%. The tight public spending in NL's first term gave way to big increases in the second term, which, led to a growing public sector deficit even before the onset of the financial crisis. After a period of financial restraint from the mid-1990s (Chantrill, 2013), public sector debt as a percent of GDP fell to 29% by 2002. From 2002 to 2008, national debt increased to 37% of GDP. This increase in debt levels occurred despite the long period of economic expansion and was primarily due to NL's decision to increase spending on health and education. Following the onset of the banking crisis (Chantrill, 2013), debt as a percentage of GDP rose to 52% by 2010. State spending on education (Chantrill, 2013) fluctuated in the 20th century[2], but in the 2000s education spending increased rapidly, rising to a peak of just over 6% of GDP in 2010. (Section 4.4.1. describes how this translated to real term increases in funding per student (FTE) at the College).

[2] Britain started the 20th century at a little less than 2% of GDP. Spending increased steadily, breaching 3% of GDP in 1946 and reaching 3.3% of GDP in 1955. Starting in 1956, education spending increased rapidly, breaching 4% of GDP in 1960 and peaking at 6.5% of GDP in 1975. During the late 1970s and the 1980s education spending declined as a percent of GDP, reaching a low of 4.25% in 1989. In the early 1990s education expanded, reaching just over 5% of GDP in 1995. In the late 1990s education spending declined to just over 4.25% of GDP in 1998.

The favourable economic conditions of the 2000s have been replaced by a more challenging economic environment and this has impacted on the education sector, with sixth form colleges in particular experiencing deep cuts to their budgets. In 2011, entitlement funding[3] was reduced from 114 hours per year to 30 hours. Sixth form colleges experienced, on average, a 10% reduction in their programme funding as a result. The new 16-19 funding formula introduced in September 2013 saw the average Sixth Form College lose 6% of its funding and the recent reduction in funding for 18 year olds will leave sixth form colleges, on average, nearly a further 1.25% worse off. These three funding cuts, combined with significant increases in employment costs[4] and ongoing funding inequalities[5] have according to the Sixth Form College Association (SFCA) left many sixth form colleges in a perilous financial state. The SFCA Funding Impact Survey shows that subjects and support available to students has already diminished, and a fourth round of funding cuts proposed after the general election in 2015 could seriously impede the ability of sixth form colleges to support their students to progress to HE or employment. The Funding Impact Survey (Kewin & Janowski, 2014) also highlighted the profound effect government cuts have had on the education of students in sixth form colleges, the support and enrichment activities that colleges can offer, and the morale and workload of staff. The SFCA consider the sector is now at a tipping point:

"As an extremely lean group of institutions, most sixth form colleges are already pared to the bone, and have very little scope to make further cuts or eke out further efficiencies." (Kewin & Janowski, 2014, p. 7)

Despite this challenging economic climate, in particular for sixth form colleges, the governments continue to encourage growth of alternative sixth form providers (particularly academy sixth forms and free schools) and offering them a range of financial benefits that are not available to sixth form

[3] Entitlement funding was intended to support tutorial and enrichment programmes for students generally on full-time programmes of study.

[4] Teachers' pensions (TPA) and Local Government pension (GMPF) employer contribution to increase by 1% per year effective 2015 and 2016; National Insurance employer contributions to increase by 2% effective 2016.

[5] Academy and school sixth forms, unlike sixth form colleges, have their VAT costs reimbursed by the Government and the average Sixth Form College pays £334,944 per year in VAT.

colleges. A combination of reduced funding and increased competition on an uneven playing field is the environment that the College has worked in since 2010, although some of the inequalities were apparent for much of the 2000s, the period of particular interest for this research.

1.6 The regional economic context

The detailed characteristics of the Metropolitan County (MC) and MB have been intentionally kept vague to protect the anonymity of the College; however, the general context is important background to the thesis and is presented in this section. The 2011 Census found that, compared to England and Wales, the MC had lower economic activity and employment rates, and higher proportions of unemployment, youth unemployment, long-term unemployment and people who have never worked. There is a wide variation across the MC in many of the measures, but the MB in which the college is situated was one of the worst performing areas in the MC and had higher rates of inactivity, unemployment, lone parent work-less-ness and dependent children in workless households.

There have been significant changes to the economic activity profile of the MC population since 2001, with the number of economically active residents rising, making up a larger proportion of the total. The largest absolute changes were the increase in part-time employees and the increase in the unemployed. The groups which saw the largest proportional increases were economically active students and again the unemployed; the increase in the unemployed highlighting the impact of the recession in the later years of the decade. These changes have shifted the profile of the economically active population in 2011 compared to 2001, with a notably smaller proportion made up of full-time employees and a larger proportion of part-time employees.

In terms of the MC's industry employment profile, a similar picture emerges; there are relatively fewer MC residents working in better paid industrial categories such as professional/scientific, information and communications and other financial services, and relatively more working in the wholesale, retail and administrative and support services industries. The MB has high levels of manufacturing industry employment, and levels of employment within the three 'public sector' industries (Education, Health and Social Work, and Public Administration) are broadly similar across the conurbation. The changes in the MC's industrial profile since 2001 include a 37% decline in manufacturing employment, part of a national decline which has disproportionally impacted on the MB given its previous high levels of employment in the skilled trades and machine operative roles.

The MC's population has become more ethnically diverse since 2001. The White British count has decreased at the same time there have been large increases in the Pakistani, other White and Black African populations. Chinese and Mixed race populations have also grown strongly since 2001, albeit from relatively low bases. The doubling of the other White group has occurred mainly since the EU enlargement in 2004 and 2008. The 2011 census reports that the population growth has been driven by immigration and births to non-White British residents. The changes from 2001-11, both in terms of percentage rises (or decreases) in populations of ethnic groups and the changes in proportion of the total composition of the MC population, are similar in pattern to what has happened nationally.

1.7 Education context

As in the previous section, the following does not provide identification to protect the anonymity of the College, but covers important aspects of context for the thesis. The MC has five universities, one being a member of the RG. The MB has five providers of 16-18 education and 15 high schools, three of which have recently converted to academies. The primary and FE sectors in the region are among the best in England (OFSTED, 2013). The proportion of children in primary schools judged good or better is the highest in England and the region has the highest proportion of good or outstanding colleges nationally. The performance of secondary schools in the region, however, is patchier, and access to good or outstanding secondary education is a 'postcode lottery' (OFSTED, 2013). Primary children known to be eligible for FSM (free school meals) performed better in Key Stage 2 tests than similar pupils in England as a whole, but there remains a large attainment gap between less advantaged children and their more affluent peers. By the age of 16, those students eligible for FSM do less well at GCSE than similar students nationally. Moreover, these young people have dramatically different chances of achieving good qualifications depending on where they attend school. In terms of the MB, the percentage of primary and secondary pupils that attended a good or outstanding school is the lowest in England and Wales and the transition from primary to secondary school can end the access to good education as children have less than a one in two chance of attending a good or outstanding secondary school (OFSTED, 2013). The gap between the MB and England has, however, narrowed year-on-year over the period.

While the region has the highest proportion of good and outstanding colleges in England, some of the largest providers are failing to provide good education and training (OFSTED, 2013). Only 20% of learners who have not achieved a GCSE grade C or above in English and mathematics at the age of 16 go on to achieve these by age 19. The performance of these colleges, in terms of GCSE

mathematics and English results, is not an encouraging signal and may add credence to evidence presented in the literature review (Bergh & Fink, 2006) that investing in the FE sector may come too late in a student's development to have an impact.

The College's OFSTED inspection results are summarised in table 1.1. In terms of public investment the results are not encouraging; after eight years of increasing investment in the education sector, resulting in real term increases in funding per student (FTE) at the College, the College was graded as 'satisfactory' ('requiring improvement', in modern day parlance). The College turns this around to an overall grade of 'good' in 2011; this was following a change in Principal and leadership team in 2008. A question here is whether the improvement was driven by levels of public sector funding or micro level factors such as changes in the management team.

Table 1.1 OFSTED inspection report findings

Grades	2004	2008	2011
Overall effectiveness	Good	Satisfactory	Good
Capacity to improve	-	Good	Good
Achievement and standards/ outcomes	Good	Satisfactory	Good
Quality of provision	Good	Good	Good
Leadership and management	Good	Satisfactory	Good
Value for money	Good	Satisfactory	Good

Source: http://www.ofstedgov.uk/inspection-reports/find-inspection-report

1.8 The institution and management team

The College currently has 2000 16-18 students on a range of courses including Advanced Subsidiary (AS) Level, Advanced (A) Level and vocational programmes at Levels 2 and 3. The College also caters for around 800 adult students per year on part-time courses and has an expanding HE programme. The College has expressed a commitment through its strategic planning documentation, as reported in the Financial Statements of the period, to excellence and is keen to maintain its position as the only specialist 16-19 provider in the MB, believing that the prospects for WP in FE and for promoting lifelong learning are improved by the additional choice and opportunities for students that the presence of a Sixth Form College brings to local people. Over many years the College has established a strong tradition of successful provision of advanced level work, for both AS/A level and vocational courses. It has deliberately built up a wide range of courses in order to provide places for students of all abilities from its partner high schools and has taken a clear decision to preserve the comprehensive range of its provision. The bulk of the College's provision comprises full-time Level 3

provision, almost entirely for 16-18 year olds. In addition to over 40 subjects offered at A and AS Level a number of Diploma and Extended Diploma programmes are available. It is interesting to note, however, that the College's mission at the start of the 2000s was 'to develop and improve the opportunities for education and training provided by the College for post-16 students' and ended the period with the vision 'to be an outstanding college and pursue excellence'. This is a telling shift in emphasis and it is important for this research and for policy makers generally to discover what the impact of this change in vision has been and the implications for social mobility.

Unlike many sixth form colleges, there is also significant adult provision ranging from Skills for Life to Higher Education programmes. The College has expressed a commitment to maintaining a dynamic and wide-ranging post-18 curriculum and works closely with its many partners in the community and beyond in order to achieve this objective. The College's post-18 courses are targeted at increasing the number of adults with maths and English qualifications and supporting adults yet to achieve at Levels 2 or 3 to study for qualifications that will support them in their career aspirations or to re-enter the jobs market. The HE courses provided are directly in response to the low numbers of residents in the MB with Level 4 qualifications. The College works in partnership with university partners to offer both full-time and part-time Foundation degrees and BA top up programmes and PGCE for post-14 teaching.

Every full-time student is allocated a Senior Tutor who oversees their progress and well-being throughout the time they are in College. The Senior Tutors are specialists in academic and pastoral guidance and have a clear remit with regards to student welfare and outcomes, achievement, retention, attendance and progression. Additional Learning Support is also available to all students to help their academic progress and to address specific learning difficulties. Careers Education and Guidance is also provided by the College, through its own staff and through external services. The College has its own Counsellor and Chaplain and also uses external services as required. Since 2010 the College has placed greater emphasis upon aspiration and has appointed a Raising Aspirations Officer to lead in this initiative establishing links with several universities, including Pembroke College, Oxford.

The College has embarked on an extensive programme in six phases of refurbishment and redevelopment in recent years that has seen a complete overhaul of all areas of the College. The College has managed and delivered all the projects whilst maintaining a strong financial position. It is currently graded as 'outstanding' for both financial health and for financial management and control as measured by Education Funding Agency (EFA) criteria.

The College has a governing body of twenty members drawn from a wide range of skills and interests including students and parents. The task of Governors is to determine the strategic direction of the College and ensure, by their oversight, that it remains financially sound and is fulfilling its chosen purpose and objectives. The Corporation, as the governing body is called, meets quarterly and works through a number of specialist committees to transact the detailed aspects of its business. The College is funded by governments through the EFA, the Skills Funding Agency (SFA) and Higher Education Funding Council for England (HEFCE). Funding is dependent on student numbers and the types of course taken. The College works to Financial Memorandums from the EFA, SFA and HEFCE and has an annual funding agreement with each of the bodies, laying down the type and amount of work to be carried out.

The College is led by the Principal (appointed April 2007) and a Senior Leadership Team. The Deputy Principal leads on Curriculum, Quality and Planning. Two Assistant Principals lead sections of the 16-18 provision and have cross college responsibilities in the areas of Teaching and Learning, Curriculum Development, and Marketing and Admissions. The Assistant Principal HE and Skills and Assistant Principal External Relations lead adult programmes and non-core activities, which include the management of an Educational Trust, which has six schools as members, their primary purpose being to raise achievement and progress within these schools. The VP Finance and Resources completes the senior leadership team and manages the finance, human resources, management information systems, IT and estates functions of the College. He has a commitment to WP objectives whilst at the same time extracting value for money from resources, thus ensuring the best outcomes for all students. The following testament to the work of the VP Finance and Resources was found in the Governance Self-Assessment document presented to Corporation, as follows:

> "As a new Corporation member I have been particularly impressed by the level of financial control, against a backdrop of difficult funding availability due to EFA limitations. This has not impaired the high standards of vision and determination to provide the highest quality facilities into the future, particularly by the VP Finance and Resources."

The Researcher has in previous professional development used basic statistical methods, such as Chi-square and 'simple' regression. Multiple regression techniques were new to the Researcher, in particular, logistic regression. In addition to understanding these more advanced statistical methods, the Researcher was keen to ensure that the results were presented in an accessible format; the Researcher has experience in presenting complex financial information to Boards, but presenting complex statistical data and the interpretation thereof is something new. This was one of the main

reasons for examining the appropriateness of the Linear Probability Model (LPM) in analysing the student level data (see chapter 7), where the output is direct from the analysis and presented directly in terms of probabilities, a readily understood mathematical concept. Research question 5 (section 1.3), recognizes the two strands of professional development connected with this research.

1.9 Contribution to professional practice

As outlined in section 1.3, question 4 of the research is to determine: 'What are the implications for practice at a national and institutional level'? In this regard, the research will first consider the contribution to the College, and sixth forms generally, around which factors in the theoretical framework used (the EPF, discussed in section 2.4) do actually matter and how this information may be disseminated and used in practice. A model containing factors under the College's control has been developed and is considered important from a policy perspective as it contains results that senior management teams and lay people on corporation boards may perceive as immediately important (and so aid dissemination). In this respect, the research has considered factors such as entry criteria and curriculum delivered; these are key levers for any institution in determining educational outcomes and may be important in WP policy. The research has contributed to understanding at a micro level by testing which of these factors in the EPF do affect outcomes for WP students. The College, for instance, has increased the portfolio of vocational programmes on offer and this research investigates the effect of this on HE progression.

The second contribution to professional practice looks at the statistical methods used in the sector and relates to question 5 in section 1.3 ('To what extent do inferential statistics and more complex statistical methods add to our understanding in this area of study?'). Essentially, are the 'shortcuts' used in day-to-day activities helpful or is there a need for the professionals to use advanced statistical techniques in their roles? Considering how statistical techniques are used in analysing data and transmitting key findings from research to practitioners is obviously important. In the Researcher's own experience, senior management teams and lay people on corporation boards have a poor grasp of statistical tools and are far more comfortable with qualitative rather than quantitative techniques. The Researcher uses Excel and Strat Pro in the course of general practice, producing descriptive analysis in a format generally accessible to managers and governors of educational institutions. The significance is often checked through simple to use statistical techniques, such as Chi-square and simple time trend regression. This research will take the statistical analysis a step further with the use of multiple regression techniques, including logistic regression (see section 2.5.4) to

determine whether they add to understanding and have policy implications in the area of study in this thesis. More advanced techniques may provide evidence of effects which are not apparent using simple techniques, particularly where there are many variables impacting on an outcome, some of which may be highly correlated (an important concern in the area of WP).

The third area of focus for professional practice is to explore findings from the educational research literature (see section 2.4.2), and consider the implications for effective strategies for WP arising from this research. If management were more aware of such findings, this may lead to consideration of different practices in the implementation of policy. The research also explores external factors in term of published performance indicators (in Chapter 5) and the possible disconnect between these and policies such as WP that have not been directly allotted such indicators. This is expected to be of importance since College leaders are likely to target the established performance measures, particularly given current reporting and inspection regimes. The theoretical model deployed in Chapter 6 is a response to limitations with the established performance measures and illustrates a possible way forward in disseminating key information to lay people in order to improve practice in terms of WP.

1.10 Conclusions

This first chapter first considered the literature review associated with this thesis, which found that there was no evidence that national policy directives to deliver social mobility have been successful and cited a number of reasons for this, not least the dominant role of the family. The review also found a potential gap in knowledge, particularly in the FE and Sixth Form Sectors, in terms of understanding the impact of education policy over an extended period. The lack of case study and time series research in this area is, therefore, an important motivation behind this research project.

The research questions to be investigated were set out followed by a chapter-by-chapter summary of the research structure. The theoretical framework to be used in the research was established and follows the principles of the EPF, with the use of student level as well as College level data to explore the research questions.

This first chapter continued with a discussion of background information as a setting for the investigation. This included a description of the College and management team, and outlined the role and background of the VP for Finance and Resources, the author of this research. The description shows that the College is committed to WP objectives, and through a diverse curriculum offer and

inclusive entry criteria has laid the foundations to address many of the unfavourable socio-economic characteristics in the MB; albeit with the College placing an increased emphasis on achievement rather than inclusivity towards the end of the decade. The research also explores the contribution to profession practice through gaining an understanding of the use of 'complex' statistical techniques and whether they add to the understanding of the Researcher and the wider College community, taking into account the literature on the impact of policy invention on education, the established performance indicators in the sector and the theoretical model deployed in Chapter 6.

Chapter 2 sets out the methodology used in this research and the rationale for using a case study, focusing on the components and principles proposed by Yin (1994). The chapter also explains how the EPF provides a theoretical framework for the formation of the hypotheses and modelling the WP outcomes, followed by a consideration of the methods of statistical analyses to be used. Assessing the appropriateness of various statistical techniques forms one of the main components of professional development for the Researcher who was previously only familiar with 'simple' statistical concepts. Of particular interest is the opportunity to use more complex statistical methods and to determine whether there is benefit in using these techniques to increase understanding.

2 Methodology

2.1 Introduction

This chapter sets out in detail the methodology used in this research project. Firstly it briefly considers the ethical aspects of the research and provides the rationale for carrying out a case study using the components and principles set out by Yin (1994). The research is concerned with modelling the impact of student attributes and other inputs on educational progression outcomes for the case study College, in this case College participation, HE progression and RG participation, with the EPF providing a theoretical framework for the research. The EPF is usually a function that maps quantities of measured inputs to a school and student characteristics to some measure of school output and is particularly relevant in terms of conventional input policies, such with the WP agenda, and the likely impact these policies have on student outcomes. The chapter continues with a discussion on the statistical methods used within this case study, highlighting strengths and limitations of using these techniques, particularly in relation to in what circumstances they may add to understanding.

2.2 Ethical considerations

The Researcher has obtained permission from the College to carry out the research project and the ethical implications concerned were considered as part of the ethics procedures of Staffordshire University, with the key issues being:

- The research is quantitative and uses secondary data largely sourced from the College. This secondary data is generated from student records that form the funding returns to the funding agencies and are audited on an annual basis by independent Auditors.
- The secondary data includes achievement data by course, but only aggregated results are reported. Differences in performance at a course level are not examined in this research, so no consent from individual teachers or students was required.
- Most of the information used on the College is available publicly, but the identity of the College has been withheld because some of the information could be considered commercially sensitive and this also avoided judgements being formed on the performance of the senior leadership team (SLT).
- The Researcher was a member of SLT throughout the period and although not individually responsible for the educational progression outcomes, holds a degree of corporate responsibility for the outcomes reported. He has endeavoured to maintain objectivity and not

allowed personal biases and opinions to 'get in the way' of the research, thus offering fair consideration to what is potentially a highly politicised area of study.

In terms of collating the secondary data, the results at a College level were sourced directly from the audited data and transferred to Excel format to ensure accuracy in transmission. For the student level data, the secondary data was manipulated to allow statistical analysis in a binary format to take place, coding into whether or not a student had a specific attribute or outcome. There was a considerable amount of manipulation involved, but every effort was made in maintaining accuracy of the data by cross checking the totals. There was also an inherent check in that there should be consistency in the findings between College level and student level data.

2.3 Method of investigation

The research strategy has used a case study approach, but aims to lift the investigation from a descriptive account of 'what happens' to a piece of analytical research that can lay claim to being a worthwhile addition to knowledge and practical application. It is beyond the scope of this research to look at the investigation at a macroeconomic level, so it used the College as the main source of secondary data to be investigated. Case study research is adopted here as it can bring a greater understanding, extend experience or add strength to what is already known through previous research on social mobility. It has allows a detailed contextual analysis of a limited number of variables and their relationships with each other, provides a basis for the application of ideas, and extension of methods and practice going forward.

Critics of the case study method believe that the study of a small number of cases (or a single case study) can offer no grounds for establishing reliability or generality of findings (Eckstein, 1975). Others feel that intense exposure to study of a specific case biases the findings and some dismiss case study research as useful only as an exploratory tool (Eisenhardt, 1989). An alternative perspective is provided by Rowley (2002) who reports that many researchers in the field of case study research suggest techniques for organizing and conducting research successfully (e.g. Stake, 1995; Simons, 2009; Yin, 1994). It is also worth noting that the research conclusions presented here attempt to inform practice going forward, in particular, with regards to value for money decisions made at an operational level with the specific aim of improving social mobility. In this regard, the research applies the EPF model, focusing on variables that the College can control to deliver educational progression outcomes consistent with achieving social mobility; as a result, this is more than just an exploratory research project.

2.3.1 Case study methodology

The goal of this research was to assess the impact of WP policies within the parameters of an individual College with the objective of addressing five research questions (see section 1.3). The focus has been at the micro level rather than a macroscopic study; WP policies are likely to have a greater or lesser impact on colleges depending on their location, but a macroscopic study would be difficult within the scope of this current research. Having said this, the College is in an area of the country that is a key target area for governments as it has historically low participation rates in post-16 education. It follows that the case study approach should have enough methodological rigour to enable the Researcher to describe, understand and explain the impact of the WP policies and make a judgment on the success of the WP agenda and likely implications for the future; especially for areas of the country where a sizeable proportion of students have been alienated from the education system in the past. The single case study approach has also been used for purely pragmatic reasons in that the detailed data requirements are readily available from the College, while retrieving data from a wider selection of colleges would have been problematic, time consuming and beyond the reach of the resources available in a professional doctorate study.

In considering whether a case study is an appropriate methodology to investigate the impact of national policy directives, it is important to understand ecological fallacy and, specifically for this research, the use of college and student level data. Ecological fallacy consists of thinking that relationships observed for groups necessarily hold for individuals (Freedman, 1999). Choosing disaggregated data through a case study approach, particularly choosing to run aggregate or individual regressions to understand aggregate impacts of a policy, depends on the following trade off: aggregate regressions lose individual level data but individual regressions add strong modelling assumptions. Some researchers suggest that the ecological correlation (where the unit of analysis is not an individual person but a group of people – College level data in this research) gives a better picture of the outcome of public policy actions. Thus, they recommend the ecological correlation over the individual level correlation for this purpose (Lubinski and Humphreys, 1996). Other researchers disagree, for instance, in evaluating the impact of state policies it is helpful to know that policy impacts vary less among the regions than do the policies themselves, suggesting that the policy differences are not well translated into results, despite high ecological correlations (Rose, 1973). In terms of the research, it is investigating the impact of the WP policies on the College, for College data it is an 'ecological' correlation and the student level data is an individual correlation. In other words, the research is estimating the relationship between policy and changes in the College's cohort: estimating

that that relationships observed for the College (and possibly sixth forms generally) necessarily hold for the individual student.

2.3.2 Case Study design

This case study research design follows the practice set out by Yin (1994), who recommended five components of research design that are important for case studies:

1. *The study's questions.* The five research questions considered in this thesis are set out in section 1.3. Essentially, the questions are concerned with trends in College participation and progression to HE by student attributes in the College and whether these educational progression outcomes can be affected by the College. The research is also concerned with evaluating the increased investment in the sector between 2001 and 2010 and whether it can be seen to have delivered value for money in delivering educational progression outcomes and ultimately social mobility at the College. Finally, the research considers professional practice and implications for how institutions operate at a national and institutional level.
2. *The study's propositions (hypotheses).* The overriding propositions to be investigated examine whether the WP policy targets (plus RG participation) are independent of, and if there are trends in, student attributes, year and funding per student (FTE) over the period 2001 to 2010 for the College. The research was developed further to estimate whether, social mobility (educational progression outcomes) was improved by increased funding for students from lower socio-economic groups (educational input) through the education system, and by testing whether student attributes that the College can control (programme of study and entry criteria), are independent of trends in educational progression outcomes (principally College participation, HE progression and RG participation for the College cohort).
3. *The unit of analysis.* The research analyses secondary College data in three ways: (1) existing published performance data (quality and financial) was investigated to inform the wider 'group' context and how the funding was spent; (2) College level data was investigated, primarily looking at the percentage of cohort over time to determine the 'educational significance', which is unusual for previous case studies and qualitative research, which tend to look at a point in time; (3) student level data was investigated, looking at the probability HE progression and RG university participation given the student's attributes, time and funding.

4. *The logic linking the data to the proposition.* Following the principle of the EPF, educational progression outcomes depend on educational inputs, which include expenditure, but also things like the quality of teaching; which in turn may be affected by student characteristics (i.e. the 'quality' of the students is also seen as an input). The EPF was used as a framework to test the propositions above, particularly with respect to those characteristics that the College can control (i.e. programme of study and entry criteria). The College is also well placed to use the EPF model in an examination of increasing social mobility as it operates in an area of the country which has historically low participation and retention rates in education and therefore represents a key target area of the WP policies.
5. *The criterion for interpreting the findings*. The statistical methods used in the research are as follows:
    a. *Existing performance data* – descriptive
    b. *College level* – descriptive, Chi-square and 'simple' regression analysis
    c. *Student level* – descriptive, multivariate regression analysis

2.3.3 Case study evidence

The strategy used here for analysing the data with a view to developing reliable conclusions, follows the four principles in Yin (1994):

1. *Address the most significant aspects of the case study.* The research focuses on College participation and progression to HE, the WP policy objectives, using college data. It also tests for RG participation as this is considered as possibly an educational outcome more closely aligned to social mobility. The research therefore focuses on the WP policy educational progression outcomes and attempts to address problems of defining and measuring social mobility by including an additional educational outcome – participation at a RG university. The research also compares and contrasts the findings of the case study against sector wide performance measures, such as: school performance tables, success rate and value added measures, and therefore considers other educational outcomes, not just those targeted by the WP Agenda.
2. *Show that the analysis relied on all relevant evidence*. The research uses a single-case design, using the College as the primary source of data, but existing performance data has been investigated through descriptive analysis to establish the wider context. The research is largely quantitative with a systematic empirical investigation of students'

attributes and progression via statistical techniques. Essentially, quantitative methods are used to seek empirical support for a number of research hypotheses.

3. *Include all major rival interpretations in the analysis*. The research investigates the correlation between different student attributes (not just socio-economic background) and the WP objectives to provide as full a picture as possible, e.g. is gender a more important variable in explaining participation in FE and progression to HE than socio-economic background? The research effectivity tests the connection between a number of educational inputs and educational progression outcomes. The research also uses various statistical techniques and examines their appropriateness. Appropriateness in this case includes both the statistical properties and the ease with which the findings can be interpreted and understood by non-statisticians.
4. *Use the Researcher's prior, expert knowledge to further the analysis.* The Researcher's knowledge of financial management and controls within the sector are a key element of the research as it concludes with a 'value for money' assessment of public investment in the period, bearing in mind that all Colleges were given a value for money grade by OFSTED during this time. The Researcher's detailed knowledge of the funding methodology also informs a new approach to measuring socio-economic background, given the changes to the definition and calculation of the WP Factor over the period. The WP Factor being the mechanism used to distribute extra funding to less advantaged students and the proxy for socio-economic background.

2.3.4 Using case studies in research

The methodological approach to carrying out a case study used here is primarily positivistic in perspective and can be characterised by the following propositions (Rowley, 2002):

1. The analytic approach to generalisation.
2. Theory should inform propositions and propositions inform data collection and analysis.
3. The Researcher acts as commentator, in representing and interpreting the case in a way that relates to previous theory.

The need for generalisation derives from a positivist approach in which generalisation on the basis of samples is the norm. Rowley (2002) states that case studies can be accepted as insights as they stand (with readers making their own interpretation and taking the ideas from the case study

into their own experience), or they can be used as a basis for formulating a working hypothesis. The aim of this research is to take this a step further and generalise the findings to similar institutions, and thus provide a steer for practitioners in these institutions. The education system is still focused on driving social mobility by directing increased funding to less advantaged students and it is important for practitioners to understand what works. What perhaps has changed from previous government regimes is that a school's performance is now being judged on how this funding was spent, and perhaps more importantly, on the impact of the said funding. The importance of this research is that it tests the impact of increases in funding for less advantaged students in the sixth form sector over a 10 year period in a MB where social mobility is a challenge, as is reflected in below average educational outcomes. If increased funding over a 10 year period did not increase participation in FE and progression to HE at the College, then generalisation of the findings would allow questions to be made regards the impact of increased funding in education to drive social mobility – are there better ways to spend public money to achieve this objective? Given that the College is in a key constituent area for the WP agenda, generalisation would also allow findings to be applied at other institutions in similar circumstances and provide a practical application of what works in improving outcomes for all students, especially in the context of a worsening economic conditions, on-going inequalities in the funding regime and an increasingly competitive climate for sixth form colleges.

The role of theory in the use of case studies is also important here as it informs the development of hypotheses. Case studies can also be used as a basis for theory development, such that theory can emerge through data collection and analysis, as suggested by Rowley (2002). The research presented here uses EPF (section 2.4) as the theoretical foundation for the hypotheses. See section 1.3 for the research questions.

The role of the Researcher is the final piece of the jigsaw in conducting a case study, especially in such a highly politicised environment as Education. This research is very much data driven and uses quantitative methods to test the significance of the findings. There is a balance to be had in terms of understanding the impact of education policies on the ground and the influence of individuals in the process of education. The conjecture here is that the VP Finance and Resources (the Researcher) is sufficiently aware of details that may be important in the analysis, whilst at the same time being dispassionate and open-minded when it comes to interpreting the findings no matter what they may say about the education process and the performance of the College throughout the period.

2.4 The education production function

The theoretical framework and the economic analysis supporting this research is the EPF; this was not considered in the literature review that preceded this thesis (see appendix 1.2) so some of the literature and empirical work supporting this theory is presented in this section. The EPF is concerned with the extent to which commonly purchased inputs to schools and colleges (e.g. class size, teacher experience and teacher education, and unpurchased inputs such as from parents and peer group effects) affect student outcomes such as achievement. The EPF is a function mapping quantities of measured inputs to a school and student characteristics to some measure of school output. This is particularly relevant in terms of conventional input policies, such as the WP agenda, and the likely impact these policies have on student outcomes. Targeted education funding may, for example, reduce earnings inequalities and so perform a valuable role in reducing inequalities in society; but it is necessary to know how much resource to employ and what targets to aim for (Belfield and Thomas, 2000).

2.4.1 The theoretical framework

From the College's perspective, the objective of the EPF is to maximise the particular educational outcome, where that maximisation is on the aggregation of student outcomes and dependent on the College's allocation of students (and associated families) and resources (such as teachers, books and buildings). The EPF is the model on which the hypotheses to be tested have been built. It is the theoretical base that gives a prior expectation of what variables affect the outcomes and in what direction and were estimated in this research to gain an understanding of the role that management can play in delivering WP objectives through changes in educational inputs. For example, can decisions made by management in regards to entry criteria and programmes of study influence educational achievement in relation to WP Policy outcomes?

The inputs considered in the EPF are not the just conventional bought inputs of teachers, books etc., or overall funding levels, but the model addresses the 'quality' of the student 'input' through ability/prior achievement, attitudes towards education, family and peer inputs. College-based policies such as such as programmes of study, interventions to improve self-esteem, and improved information, advice and guidance (IAG) can also be 'inputs' that affect the educational outcomes. That these things are of importance in affecting educational progression outcomes is strongly supported by the empirical literature; this was not examined in the previous literature review, but is considered in more detail in section 4.3. This is why there is an expectation that the progression outcomes

examined here were affected by prior achievement, socio-economic background, gender, ethnicity, etc. The EPF gives the theoretical framework for examining the student attributes and college policies in this research and given the number of variables expected to affect the outcomes, suggests that multivariate analysis may be appropriate, particularly if, as expected, some of these variables are correlated.

There is an argument that the alternative Human Capital Theory (HCT) is an appropriate theoretical approach at the micro (student) level, as this theory postulates that an individual bears the costs of education because there is an expectation that this investment will create a larger future stream of benefits. The theoretical base for decisions by individuals to go onto HE, for example, is usually based on HCT (Mulongo, 2015). The investigation in this thesis uses student level data, however, a primarily concern is with educational inputs the College can control, such as entry criteria and programme of study. Funding during NL's period was also, in the main, directed at educational institutions, not individuals, which suggests that a framework that puts the College at the centre is appropriate for analysis. Moreover, in an environment of scarce resources and with pressure on alternative uses of public funds, describing and explaining the link between resources and outcomes at the institutional level would be a worthwhile addition to knowledge. That said, many of the variables expected to affect the outcomes are the same in both theoretical approaches, but for the reasons stated, the EPF is considered the most appropriate theoretical framework for this study.

2.4.2 Empirical work on the EPF

Existing empirical work on the EPF provides insights into the allocation of educational expenditure, but a strong positive link between resource levels and educational outcomes has been hard to find across sectors or countries. Belfield and Thomas (2000) examined the relationship between inspection grades and resource expended by FE colleges and found that there is a size effect on performance, with larger colleges performing better than small ones. There is a much weaker relationship between per student expenditure and inspection grades. They considered that the method of research may be questionable, but concluded that findings were consistent with other research and datasets. Evidence, for example, mainly from the USA and mainly on schools, has indicated a spiralling of increased resources and static or diminishing examination scores over time (Burtless, 1996). The existing literature, according to Pritchett and Filmer (1997), tells us that inputs which provide direct benefits to educators (i.e. teacher wages) are vastly over-used relative to other inputs that contribute directly (but only) to educational output (like books or instructional materials). They also found that in some circumstances, educational reforms that shift the relative importance of

parents versus teachers in the allocation of expenditures can lead to enormous gains in the cost effectiveness of schools.

Research by Hanushek (2007) finds that current provision of schooling is very inefficient and that purchased inputs to schools, such as class size and teacher experience, bear little systematic relationship to student outcomes; this implies that conventional input policies are unlikely to improve achievement. At the same time (Hanushek, 2007), differences in teacher quality have been shown to be very important and not closely related to salaries or readily identified attributes of teachers. Related to this finding, an Institute for Public Policy Research Report (Sodha et al., 2008), highlights that very few teachers have their employment contracts terminated for poor performance, with around 5% of teachers described as poor performers by OFSTED. Failure to address poor teaching in the classroom, either arising from capability, resourcing or other factors, may well be a factor in education outcomes and perhaps one explanation for not delivering on the WP social mobility objectives. The question remains, however, can 'outstanding' teaching as measured by OFSTED overturn the dominance of family background in determining educational out comes.

Recent research in England provides evidence of a modest effect of monetary resources on school outputs, although there is a lack of studies at sixth form level. Levacic et al. (2005) investigate the effects of school resources on student attainment in secondary schools and found positive resource effects at the school level. They found modest and subject-specific positive effects from additional resources on attainment at age 14 and the results indicate that additional spending to reduce the student-teacher ratio is more effective than expenditure on additional non-teaching staff or an increase in general expenditure. For sixth form colleges where class sizes are generally smaller, (for the College circa 18), this raises the question of whether reduced class sizes would have a similar effect. When estimating the effects of school expenditure on school performance at Key Stage 4 in England over the period 2003-07, during which real per pupil expenditure increased rapidly, Mangan et al. (2011) reported a generally significant but small effect of expenditure on school performance. They found that the effect varies between specialist and non-specialist schools, with the effect on the latter being larger. Furthermore, Mangan et al. identified significant dynamics in the school improvement process and, relevant to the research in this thesis, found that spending effects increase with socio-economic disadvantage.

Recent studies in other countries have also shown a modest effect of expenditure, such as a report from Denmark by Heinesen and Graversen (2005) investigating the effect of school inputs in primary and lower secondary schools on the probability of eventually passing upper secondary or

vocational education. They find that expenditure per pupil has a statistically significant, but rather small, positive effect on educational attainment. Effects of teacher–pupil ratios are less significant, but the expenditure effects are generally higher for pupils from disadvantaged backgrounds. Similarly a study in New South Wales, Australia, that examined performance at the end of 13 years of schooling, found a modest effect (Pugh et al., 2015).

The Office of National Statistics carried out an analysis of public service output, input and productivity (Baird et al., 2010) and find from 1996 to 2009 publicly funded education productivity in the UK declined by 0.1%, but overall this marginal fall masks three periods of greater change. From 1996 to 1999 productivity grew by 7.7% with an annual average increase of 2.3%. In this period there was strong output growth, due to growth in the school age population, but only a weak growth in inputs. From 1999 to 2007 (the period of primary investigation in this research), productivity fell by 9.4%, an average fall of 1.2%. Growth in school attendance, once adjusted for quality, was outstripped by a sharp rise in inputs, mainly through the employment of more school support staff. From 2007 to 2009, productivity grew by 2.9% with an annual average increase of 1.4% as output grew faster than inputs, due mainly to relatively large improvements in pupil attainment at age 15/16 in England and Wales.

Despite some reservations, empirical findings from studies of the EPF appear to lend further credence to the findings of the literature review accompanying this thesis which suggests there are no guarantees that increased funding of the education sector leads to improvements in educational progression outcomes, or at least improvements of a size large enough to warrant the expenditure.

2.5 Methods of statistical analysis

The analysis of existing performance data in chapter 4 uses descriptive statistical methods. The rest of the research methodology is largely quantitative with a systematic empirical investigation of students' attributes and outcomes via inferential statistical techniques. The principles of the EPF are used in the research to investigate whether student attributes, in particular those the College can control, impact on educational progression outcomes. The research uses college data for College participation, HE progression and participation at a RG university as the educational progression outcomes. The latter was not a WP target as such, but is argued as being a proxy for social mobility (see section 4.2.3). The impact of the WP policies on these educational progression outcomes informed the discussion and conclusions in Chapter 8. Essentially, quantitative methods are used to

seek empirical support for a number of research hypotheses to test the impact of the WP policy objectives of the 2000s on the College, namely to raise participation in FE and HE.

Research question 5 is concerned with when various statistical methods are appropriate. The research starts with 'simple' inferential statistical techniques (Chi-square and simple time trend regression) and considers if these are suitable for the investigations in this thesis; the Researcher is more familiar with these methods and the interpretation is arguably more readily understood by the lay person. In Chapter 6, using student level data, the research considers other more complex methods and will compare and contrast the findings from these complex methods to those from the 'simple' techniques using College level data. Chapter 6 also addresses question 5 directly by enabling an evaluation of these 'complex' statistical methods and whether they add to our understanding, whilst also providing professional development opportunities for the Researcher in enabling future use of these techniques at work and in research.

2.5.1 Descriptive analysis

The research starts with a descriptive analysis of the time series secondary data held at the College level. For the most part it concentrates on percentage of cohort rather than raw student numbers to determine the 'educational significance' of the findings, i.e. has the percentage of less advantaged students increased over the period with respect to the outcomes considered? The main conclusions, however, are drawn using inferential statistics, in order to relate the findings to the population the sample is thought to represent.

2.5.2 Chi-square

The inferential analysis starts with bivariate statistics, using Chi-square tests for independence. This is regarded as a 'workhorse' statistic and is used in situations where a population is categorised in two or more ways. In this thesis the most important categorisation is by year and by less advantaged/advantaged students. For instance, if the WP policy is successful, the expectation would be for the numbers of less advantaged students at the College to increase over time relative to the numbers of advantaged students, and thus time and WP will not be independent. Further investigations examine the independence between year and variables identified as being correlated with WP in the literature (such as gender), and by variables under the management's control (such as the numbers on vocational courses). It is a test familiar to the Researcher and given research question

5, is also a statistical test that college managers and governors, and non-quantitative education researchers have previously met, or if they have not, is relatively straightforward to understand.

2.5.3 Simple time trend regression

Simple time trend regression analysis is also applied, using College level data, and is appropriate in situations where the focus is on a dependent variable and how this is related to an independent (explanatory) variable. It has the advantage that it may immediately arouse interest by management since they are primarily concerned with success/problems at College level. Here a simple time trend regression analysis is used to test whether the percentage of, for instance, less advantaged students participating in FE and progressing to HE (dependent variables) has changed over the period, with year (time) being the independent variable. In regression analysis the dependent variable in all cases is something that the research is trying to 'explain', so in the simple time trend regression of College level data the research is trying to 'explain' changes in the percentage of less advantaged (WP Factor) students participating in FE and HE by year. The analysis here directly describes the linear trend over time in the dependent variable. The estimated coefficient shows how much the dependent variable is expected to increase if the coefficient is positive or decrease if it is negative with a marginal (one unit) change in the independent variable. In addition, and similar to the Chi-square test, time trend regressions are also estimated for dependent variables identified as being correlated with WP in the literature and in the EPF (see section 2.4.2), such as gender, and variables under the management's control, for example, the percentage of students on vocational courses.

A multivariate analysis using College level data was not considered appropriate as there are only ten observations, one for each year. This means that there are few 'degrees of freedom' possible, and in this situation a high R-squared[6] value results because with few degrees of freedom there is almost a perfect fit; but there is also usually a lack of significance of all variables because there is not enough data for the technique to work properly. Indeed at the College level, using only one independent variable as in the time trend regressions resulted in is only eight degrees of freedom (10

[6] R-squared is a number that indicates how well data fits a statistical model. R-squared values range from 0 to 1 and outcomes close to 1 mean that the regression line nearly fits the data, while an R-square figure close to zero means the estimated model does not fit the data.

years in the sample, with estimates of the intercept and slope parameter). This is not ideal and may result in insignificance, although the technique itself is valid for small samples (Wooldridge, 2009). Given the small degrees of freedom, non-linear trends were also not investigated.

2.5.4 Multivariate techniques

Multivariate techniques are more complicated but enable examination of the effect of a range of factors affecting the dependent variable at the same time. This may be of importance given that empirical work on the EPF (see section 2.4.2) suggests a number of explanatory variables and it may also be the case that these variables are themselves correlated. Multivariate techniques enable examination of the effect of each of the independent (explanatory) variables, keeping the other variables constant; effectively estimating their individual effect (Mangan et al., 2010). The dependent variable in all cases is something that the research is trying to explain, so for the student level data, whether the student progresses to university or not is the dependent variable (to be 'explained') and the student attributes (socio-economic background, programme, prior achievement, gender, and ethnicity), year and the funding level, are the independent ('explanatory') variables. In other words, how is the probability of progressing to HE by a student affected by these variables? The analysis presented here is for WP students, since this is of central concern, but for comparison, it was also carried out for non-WP students. Using student level data there was not a problem with degrees of freedom as there were a large number of observations, which allows for the inclusion of a wide range of control variables that may affect the outcomes. This analysis could not be carried out for progression (or not) to FE as the Researcher had no access to data for students who chose not to attend FE (see section 3.2.1 for more details).

This research is primarily interested in the impact of WP policies on less advantaged students, so in the first instance examines changes in WP Factor (adjusted) students (the proxy for less advantaged students, see section 4.3.1), progression to HE and participating at RG universities, and looked at how they may be 'explained' by the student attributes, year and funding level. These findings were then compared with non-WP Factor (adjusted) students to provide evidence of a positive, or not, link between the level of unit resource (funding) and performance (educational progression outcomes). The variables in the multiple regressions are discussed further in chapter 3 and 4, and the research estimates the independent effect of these variables on WP Factor and non-WP Factor students' progression to HE and participating at RG. In the regression analysis, funding and year are two of the independent variables analysed and a comparison is made over the period in terms of changes in the probability of progressing to HE and to a RG university, comparing outcomes in 2002

(year 2) and 2010 (year 10). 2001 is not considered due to there being a high amount of missing data for one of the independent variables (student prior performance; section 3.2.1 discusses this in more detail).

In the student level investigations in this thesis the outcomes are binary, not continuous: the student does/does not progress to HE/RG. Statistically what is estimated is not the individual outcome but the probability of a student with particular characteristics progressing to HE/RG. The simplest method of estimation is linear regression, interpreting the outcome in terms of probabilities. This is known as the linear probability model (LPM) and it allows probabilities, which are a readily understood mathematical concept, to be determined directly from the regression results, thus providing a straightforward method of interpreting the data. However, it can lead to problematic estimates in some circumstances. In particular, if we want predicted values to estimate a probability, then values less than 0 and more than 1 make no sense, which can occur with the linear results produced by LPM (Albright et al., 2002). An alternative estimation method is logistic regression which uses a nonlinear 'S' shaped function of the explanatory variables for prediction, which constrains the probabilities to the 0-1 interval. In this research the LPM is estimated given that it is more straightforward to interpret than logistic regression, but further investigation was undertaken, using logistic regression to respond to possible limitations with the LPM.

LPM is estimated by Ordinary Least Squares (OLS) and is considerably more straightforward in interpretation than logistic regression as the marginal effect of each variable is constant, which means it is possible to interpret the regression output directly. According to Greene (2002, p. 454) the LPM should be seen as:

"…a convenient approximation to the underlying response probability. What we hope is that the linear probability approximates to the response probability for common values of the covariates. Fortunately, this often turns out to be the case."

Greene goes on to explain (p456) that the case for the linear regression model is stronger if the independent variables are discrete and only take on a few values and only dummy variables[7] are used. In this research the independent variables are largely discrete (only year and funding are not) and the research examined whether the LPM estimates are a close approximation to those using logistic regression and in what circumstances the simpler LPM model is appropriate. A simpler method is useful in presenting results to a non-specialist audience in education. This is further discussed in sections 6.5 and 6.6 which examine if the additional complication improves the estimates in this study.

The logistic regression function is detailed in appendix 2.5.1; how estimation results can be converted to probabilities is given in appendix 2.5.2. As a non-linear function, the logistic function is estimated by Maximum Likelihood (ML). For the multivariate analysis the marginal effects of changes in the variables were examined. This estimates how predicted probabilities change as the discrete independent variables change value, e.g. from female (=0) to male (=1). The marginal effect of a continuous variable (e.g. funding per FTE) measures the impact of a very small change in this on the dependent variable. The marginal effects for each variable from the LPM estimates are constant, but in the logistic regression they vary with the values of the other independent variables, given the non-linear nature of the relationship. The marginal values from the LPM and logistic regressions are compared at representative values in evaluating whether it is acceptable to concentrate on the LPM estimates.

2.5.5 Diagnostic tests

The established diagnostic test for applying Chi-square is that there should be an expected minimum value of five in at least 80% of the expected value cells and a minimum value of 1 in any expected value cell.

Estimates using OLS (as in the simple time trend regressions and the LPM) require certain assumptions about the population to be fulfilled for these estimates to have certain desirable properties and to perform statistical inference. According to Albright et al. (2002) the assumptions

[7] A dummy variable is a dichotomous variable that takes the value 1 for certain categories, 0 for all other categories e.g.1=low academic prior achievers, 0=all other academic prior achievers.

represent an idealisation of reality and are never likely to be entirely satisfied for the population in any real study. However, if the assumptions are grossly violated then the researcher should be suspicious of the statistical inference. The OLS estimates of both simple and multiple regressions are only 'Best Linear Unbiased' if the conditions below are met. 'Best' means minimum variance (a more detailed explanation is available in Wooldridge, 2009, Chapter 2). The assumptions are as follows:

1. The sample is random.
2. The model is correctly specified (including that the functional form is correct).
3. For any values of the explanatory variables, the mean of the errors is zero.
4. For any values of the explanatory variables, the variance of the error term is constant, i.e. the same for all such values (homoscedasticity).

In addition, for interpretation of statistical tests such as the 't' stat, there is an additional assumption (except for large samples where appeal can be made to the Central Limit theorem, CLT):

5. For any values of the explanatory variables, the error term is normally distributed.

In order to examine if these conditions are met, the following diagnostic checks were performed:

- The Breusch-Pagan/Cook Weisberg test for heteroscedasticity.
- The Ramsey Reset test for omitted variables (this test essentially considers if there is non-linearity that needs to be accounted for in the regression model).
- The Jarque-Bera test for normality of the error term.

In the case of the LPM it is expected theoretically that it will fail these tests given the zero/one nature of the dependent variable and that there is a good reason for rejecting linearity. This is the reason why the logistic function is often estimated as an appropriate non-linear form (details are available from Wooldridge, 2009, section 7.5). Of interest in this thesis is how close the estimates are using the LPM to the logistic despite its known problems and if this depends on circumstances. The logistic function is not too different from a linear function in the middle part of its range, so a linear estimation may be a convenient approximation as argued in section 2.5.4, but it may be very different at the extremes of the range.

The Breusch-Pagan/Cook Weisberg test examines whether the estimated variance of the residuals from a regression are dependent on the values of the independent variables, i.e. whether

heteroscedasticity is present. It tests the null hypothesis of homoskedasticity. If the p-value is below an appropriate threshold (e.g. $p<0.10$) then the null hypothesis of homoskedasticity is rejected and heteroscedasticity assumed.

The Ramsey Reset test is a general specification test for the linear regression model, i.e. it tests whether non-linear combinations of the fitted values help explain the response variable. In other words, if the non-linear combinations of the explanatory variables have any power in explaining the response variable, then the model is mis-specified. If the F value is significant, the null hypothesis is rejected, then the model suffers from mis-specification.

Unfortunately there is no small sample test available for normality therefore the research was not able to test for this when using the simple time trend regressions. The Jarque-Bera test of normality, which considers the skewness and kurtosis[8] of the error term, was conducted for the multiple regressions using student level data, although there, arguably, the sample size is large enough for appeal to the CLT in order to interpret the 't' and other statistics. It should also be noted that the other the diagnostic checks may not always reveal problems for the simple time trend regressions as the small sample size makes their detection less likely (more Type 2 errors, where there is a failure to reject a false null hypothesis).

These assumptions (and diagnostic checks) apply to the simple time trend regressions and the LPM as they are estimated using OLS. They do not apply to the logistic model as this is estimated using a different technique – ML rather than OLS. In ML estimation the same assumptions do not apply and any heteroscedasticity is automatically accounted for (Wooldridge, 2009, p578).

2.6 Conclusions

This research adopts Yin's (1994) methodology and draws conclusions using inferential statistics, thus taking an approach that should be sufficiently robust to enable it to provide a good

[8] Skewness is a measure of the lack of symmetry. A distribution is symmetric if it is the same to the left and right of the centre point. Kurtosis is a measure of whether the data are heavy-tailed or light-tailed relative to a normal distribution. Data sets with high kurtosis tend to have heavy tails, or outliers. Data sets with low kurtosis tend to have light tails, or lack of outliers (Albright et al., 2002).

assessment of the WP policies of the period. The results of the time trend regression at the College level can only be regarded as indicative given the lack of data, but the use of multivariate techniques at the student level provide the opportunity to consider the relationships in more depth and with more observations. The results can inform practice for similar institutions and may even question the effectiveness of social mobility policies at a macro level given that the College is in a key catchment area for the WP agenda.

This chapter set out the methodology of the research which looks to explain in the first instance the relationship between student attributes and changes over time, focusing on percentage of cohort (the 'educational significance'). The research proceeds by estimating the probabilities of educational progression outcomes dependent on student attributes, year and funding. The lack of detailed research in this area examining the impact of policy changes over time and the complex nature of the topic are the primary justifications for the research and the use of a case study methodology; there are multiple outcomes and many factors (inputs) that may have changed over the period, as well as changes in government policy and, given the resources available, a micro level approach is considered an appropriate methodology. The literature review accompanying this thesis (appendix 1.2) also highlighted the difficulty in establishing an appropriate measure for social mobility, so this research has tested RG participation (college cohort) as an educational outcome potentially more closely aligned to social mobility.

A key component of the research is the adoption of the EPF to provide a framework for the testing of various hypotheses. Particularly important for practice going forward is to test the impact of student attributes (inputs) the College can control in determining educational progression outcomes and, ultimately, social mobility. This chapter set out the theoretical framework and the empirical findings from studies of the EPF, which appear to lend further credence to the findings of the literature review that suggests there are no guarantees that increased funding of the education sector leads to improvements in educational progression outcomes, or at least improvements of a large enough size to warrant the expenditure.

This chapter has discussed the statistical methods that are presented in chapter 6, highlighting advantages and disadvantages of their use. At the College level the 'simple' regression test can only provide indicative findings as there only a few degrees of freedom. Also, the ecological fallacy is arguably a reason for preferring disaggregate data in this statistical analysis. For student level data, the linear output from the LPM can sometimes lead to poorer probability estimates than logistic regression, but is simpler to interpret. Logistic regression allows the option to check the output from

LPM and is used as the main source of interpretation when the LPM output appears to be problematic. There is also an inherent check between conclusions from the secondary data at a college and student level and the research highlights any contradictions in the findings from the two data sets. Any failure in the diagnostics when using simple linear regression suggests a more complex model should be explored. A failure of the diagnostics when using the LPM would steer researchers to logistic regression being the preferred method.

The thesis now proceeds with a more detailed explanation of the variables to be investigated and the associated empirical studies not directly covered in the literature review. The previous literature review focused on socio-economic status, but other factors are likely to be important and these are examined in the next chapter.

3 The Data

3.1 Introduction

This chapter considers the sources and quality of the data available, what tools and packages are used, and how the data is manipulated, and it presents summary descriptive statistics. This chapter provides a basis for Chapter 4, where the variables for the theoretical framework are further explored under the headings of educational progression outcomes and educational inputs, detailing the dependent (outcome) and independent (input) variables within the models.

3.2 The source and quality of the data

The secondary data sourced for this research derives from two areas. The first area is the College student record system, which contains all the personal and funding records for each student using data over 10 years and is a pooled data set. The second source is the College's Financial Statement which is used for the analysis in the financial review, in section 5.7, and is also used in determining the funding variable (see section 4.4.1) that is included in the statistical analysis.

3.2.1 Student record data

The student record system is sourced from Capita, which is a leading provider of support services in education, working with more than 21,000 schools and 220 HE and FE institutions. UNIT-e student management information system is the core software for student records (Capita, 2016).

UNIT-e produces the statutory reporting for the FE sector in the form of an Individual Learning Record (ILR)[9]. The FE uses the ILR to collect data about learners in the system and the learning undertaken by each of them. The data collected in the ILR is used to ensure that public money, distributed through the funding agencies, is spent in line with government targets for quality and value for money, for planning and to make the case for the sector in seeking further funding.

[9] Previously the Individual Student Record.

Outside of this thesis this data is used:

- To monitor at an individual level all learning provides delivery against allocation or contract.
- To inform local planning and provision.
- To inform national planning including policy development and modelling.
- To calculate actual funding earned.
- To monitor quality of provision and evaluate the effectiveness of providers across the sector.
- To monitor progress against government targets.
- To demonstrate the outcomes of the distribution of government funds.

The quality of the data is safeguarded through the application of the provider data self-assessment toolkit (PDSAT) and the reports generated are used by FE providers to make accurate and complete ILR data returns. The PDSAT enables the user to identify potential issues with the data recorded in the ILR data returns; a check of increasing importance is the eligibility of the student for funding. The PDSAT does not produce definitive results, but provides indicative reports based on areas of concern and risk. These reports may contain potential data anomalies that require further investigation for clarification and rectification. These reports are also used by funding agencies and external audit providers in performing assurance reviews of colleges (Skills Funding Agency, 2014).

The data in the research is pulled from the ILR fields in the UNIT-e student record database as per table 3.1:

Table 3.1 Data sourced from ILR fields and resulting data manipulation.

ILR Field	Detail breakdown	Converted to
Student ID		
Level	A Level A Level Yr1 A Level Yr2 A2 Applied GCE A2 Certificate OCR A2 Level A2 National Certificate A2 National Diploma AVCE Yr2 GNVQ Advanced National Certificate National Diploma	Academic Vocational
Start date		
End date		
Year	2001 to 2010	
Outcome	Achieved, not achieved	
Postcode		
GCSE point score	2.14 to 8.00	<4-4.9 = low prior achievement 5-5.9 = middle prior achievement 6->7 = high prior achievement
School	116 categories	
Gender	Male female	
Ethnicity	26 categories	Non White White
Destination	Apprenticeship Deceased Employment Further Education Higher Education Other School/College (Outside LEA) Seeking Employment Unknown (blank)	HE progression Other
University	131 categories including Russell Group (RG) and others	RG Participation Other
WP Factor	Yes No	WP Factor (uplift) and WP Factor (adjusted)

Table 3.2 shows that there is missing data in the data set used for one variable; for GCSE point score data the majority of the data was missing in 2001. It was considered important to include a measure of prior achievement, so year 1 was excluded from the multiple regression analysis. In other years there was no missing data for other variables and a very small number for the GSCE point scores.

Table 3.2 Record of unknowns in the data set

Unknown	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
GCSE Point scores	497	3	2	5	1	5	6	6	5	4

Another issue that affected what could and could not be investigated was the data on students who did not attend the College. In order to adequately consider what is happening overall, it is important to include a sample from the whole population of WP students. This was not a problem in considering progression to HE and RG as the data included both students who went on to these institutions and those who did not. However, for FE participation there was a problem in that no data was available for those that chose not to attend the College. Given that FE participation is an important outcome for the WP policy, it did seem important to investigate it as much as possible. Thus for FE participation the comparison was to all College students – the percentage of College students that were WP students; this will henceforth be referred to as College participation.

There is an assumption for College participation to be a valid measure of WP: that the composition of the relevant population has remained unchanged during the period. In this case, importantly, the deprivation levels in the College's locality are judged not to have changed, so the proportion of the relevant population (in the College's recruitment area) that would have been given WP Factor (uplift) status if they attended FE has remained (approximately) constant. If, for instance, the levels of deprivation in the area had decreased over the period, it may have been more difficult for the College to recruit the same proportion of WP students. The numbers of deprived students which the College could potentially recruit in different years were not available (indeed since the College does not have a fixed catchment area, it is not possible to construct such a figure).

Some indicators were available: section 1.5 discusses that there had been changes to the economic activity profile of the MC population since 2001, with the number of economically active residents rising, making up a larger proportion of the total. The economically active population in 2011 compared to 2001, however, had a notably smaller proportion made up of full-time employees and a larger proportion of part-time employees. Furthermore, changes in the MC's industrial profile since 2001 include a 37% decline in manufacturing employment, which disproportionally impacted on the MB's economic prosperity given its high levels of employment in the skilled trades and machine operative roles. Taking all these factors into consideration, it would have been unlikely that there was a large decline in potential WP Factor students in the MB over this period. It did seem appropriate to pursue and consider the percentage of College students that were WP, although it does rely on the

assumption above for it to be valid information for the management in assessing the performance of the College in terms of WP.

3.2.2 Funding data

The financial review (section 5.7) and the basis for the funding variable (section 4.4.1) are both sourced from the College's financial statements, a publically held record. The legal and governance framework of the College's Corporation was established under The Further and Higher Education Act 1992 and amended by the Apprenticeship, Skills, Children and Learning Act 2009. The Corporation complies with the Charities Act 2011, so it effectively files financial statements in a similar format to charities and is as such viewed as a non-public sector body. The accounts are audited by external auditors and the College's governance and legal structure ensures the College conducts its business:

1. In accordance with the seven principles identified by the Committee on Standards in Public Life (Committee on Standards in Public Life 1995). These are: selflessness, integrity, objectivity, accountability, openness, honesty and leadership.
2. In full accordance with the guidance to colleges from the Association of Colleges in The English Colleges' Foundation Code of Governance ('the Foundation Code').
3. Having due regard to the UK Corporate Governance Code ('the Code') insofar as it is applicable to the FE sector.

The source of the data used to determine the funding per FTE calculation detailed in section 4.4.1 is, therefore, robust and from a reliable source. The rate has been adjusted to give a funding variable that takes account of inflation in the column headed 'Real Funding per FTE' (see table 3.3), which gives the funding in £10,000s at 2005 prices.

Table 3.3 Funding variable

Year	Funding per FTE	CPI (2005 base year)	Real Funding per FTE (£0000)
2001	£2,974	94.2	0.32
2002	£3,268	95.4	0.34
2003	£3,340	96.7	0.35
2004	£3,897	98.0	0.40
2005	£3,912	100.0	0.39
2006	£4,068	102.3	0.40
2007	£4,069	104.7	0.39
2008	£4,200	108.5	0.39
2009	£4,114	110.8	0.37
2010	£4,425	114.5	0.39

Source: College's financial statements from 2001 to 2010

3.3 What are the tools packages and how is the data manipulated?

Excel and Strat Pro are the packages/tools used to manipulate the source data and table 3.1 outlines where the ILR fields are 'converted to' observations used in the research, i.e. GCSE point score, ethnicity, destinations and RG. In these cases the data is adjusted through standard Excel tools into dummy variables where appropriate. The funding variable was added to the data, as was a time trend variable and this gave the student level database. In addition, for the descriptive and graphical analysis and the simple time trend regression, the annual data yearly averages of each variable were obtained using pivot tables to create the College level data.

The Researcher recognised a possible problem in the unadjusted use by College management of the WP Factor (uplift) data from the College student record system. This variable changed in the way it was calculated during the 10 years under study (details are given in section 4.3.1) and use of the unadjusted data could possibly lead to unwarranted conclusions. Use of a consistent measure is important in examining what changes have taken place; otherwise changes may be due, or partly due, to the changing definition (Harrison, 2012). A measure that is consistent throughout the period was constructed (referred to as WP Factor (adjusted) here) and section 4.3.1 investigates whether the two measures do provide a different picture. The most important change was from a ward-based to a postcode-based measure. The 'mechanics' of developing this consistent measure were fairly straightforward; the IMD 2010 postcode list which identified WP Factor students was applied to the data in all years through 'lookup' Excel tools to tag student postcodes as WP Factor based on the 2010 IMD list. This is a 'simple' technique but this allowed an important investigation in this thesis.

Excel and Strat Pro are also the packages/tools used for the descriptive and 'simple' statistical techniques, detailed in section 2.5. For the more 'complex' multivariate techniques, SPSS software was used; logistic regression could not be estimated on the version of Strat Pro available. Table 3.4 summarises the statistical tests and gives the sample sizes.

Table 3.4 Summary of statistical tests

Test	Variables	Data	Observations
Chi-square	Association between: year and College participation, HE progression and RG participation by WP (uplift) and WP (adjusted) and other student attributes	Student level	Pivot table from 6089 student observations to 10 (years 2001 to 2010)
Simple time trend regression	Dependent variables: Proportion HE progression and RG participation by socio-economic background other student attributes Independent variable: year	College level	Pivot table from 6089 student observations to 10 (years 2001 to 2010) For prior achievement year 2001 is omitted.
Multiple regression (Linear Probability Model)	Dependent variables: HE progression and RG participation by socio-economic background Independent variables: student attributes, year and funding	Student level	WP Factor (adjusted) - 2019 student observations Non WP Factor (adjusted) – 3512 student observations
Logistic regression	Dependent variables: HE progression and RG participation by socio-economic background Independent variables: student attributes, year and funding	Student level	WP Factor (adjusted) - 2019 student observations Non WP Factor (adjusted) – 3512 student observations

3.4 Variable definitions and descriptive statistics

This section gives the definitions and descriptive statistics of the variables used in the College and student level data. Further discussion of the background to these variables, the categorisations and changes over time is given in the following chapter. Table 3.5 gives the details for the annualised data (College level) used in the time trend regressions. The variables listed are the dependent variables

in the series of regressions, except for the last variable which gives the independent variable 'time trend'.

Table 3.5 Annualised (College level) data: definitions and descriptives

Full Variable name	Description	Mean	SD
College participation by WP Factor (uplift) students	College participation by WP Factor (uplift) students as a proportion of all students	0.27	0.12
College participation by WP Factor (adjusted) students	College participation by WP Factor (adjusted) students as a proportion of all students	0.37	0.05
HE progression by WP Factor (uplift) students	Proportion of WP Factor (uplift) students who progressed to HE	0.63	0.05
HE progression by WP Factor (adjusted) students	Proportion of WP Factor (adjusted) students who progressed to HE	0.65	0.10
RG participation by WP Factor (uplift) students	Proportion of WP Factor (uplift) students who progressed to RG	0.11	0.03
RG participation by WP Factor (adjusted) students	Proportion of WP Factor (adjusted) students who progressed to RG	0.14	0.06
College participation by males	Males as a proportion of all students at the College	0.43	0.02
HE progression by males	Males as a proportion of all students at the College progressing to HE	0.61	0.04
RG progression by males	Males as a proportion of all students at the College progressing to RG universities	0.14	0.04
College participation by non-Whites	Non-Whites as a proportion of all students at the College	0.15	0.03
HE progression by non-Whites	Non-Whites as a proportion of all students at the College progressing to HE	0.82	0.03
RG participation by non-Whites	Non-Whites as a proportion of all students at the College progressing to RG universities	0.16	0.03
College participation by vocational	Students on a vocational programme as a proportion of all students at the College	0.20	0.07
HE progression by vocational	Students on a vocational programme as a proportion of all students at the College progressing to HE	0.35	0.06
RG participation by vocational	Students on a vocational programme as a proportion of all students at the College progressing to RG universities	0.02	0.02
College participation by prior achievement	Prior Achievement (high, middle, low) as a proportion of all students at the College	M 0.42 L 0.31	M 0.02 L 0.02
HE progression by prior achievement	Prior achievement (high, middle, low) as a proportion of all students at the College progressing to HE	M 0.42 L 0.22	M 0.03 L 0.02
RG participation by prior achievement	Prior achievement (high, middle, low) as a proportion of all students at the College progressing to RG universities	M 0.24 L 0.05	M 0.07 L 0.03
Year	Time trend 2001=1……2010=10		

Table 3.5 also gives the means and standard deviations of the proportions over 10 years for all the variables except those related to prior performance where these are over nine years because of the missing data in year 2001 (see section 3.2.1).

Further to table 3.1, table 3.6 gives the details of the dummy variables used in the statistical analysis of the student level data for the student attribute variables, providing definitions and proportions.

Table 3.6 Student level data: definitions and descriptive statistics for student attribute variables

Name	Variable type	Description	Proportion
WP Factor (adjusted)	Group Divisor	Yes = 1	0.36
		No = 0	0.64
HE Progression	Dependent	Yes = 1	0.61
		No = 0	0.39
RG Participation	Dependent	Yes = 1	0.13
		No = 0	0.87
Vocational	Independent	Vocational =1	0.20
		Academic = 0	0.80
Male	Independent	Male = 1	0.57
		Female = 0	0.43
White	Independent	Non White = 0	0.14
		White = 1	0.86
High prior achievement	Independent	High=1	0.27
		Other=0	0.73
Middle prior achievement	Independent	Middle=1	0.42
		Other=0	0.68
Low prior achievement	Independent	Low=1	0.31
		Other=0	0.69

The top variable in table 3.6, the division between WP/non-WP students, is not a variable in the statistical analysis but is used to divide the student data in order to estimate separate regressions since the concern in this thesis is with improvement in the outcomes for WP students. Given the sample size of 5531, with 2019 WP Factor (adjusted) students, there are large numbers on which to conduct the analysis. The next two rows are dependent variables in the analysis and indicate a relatively large proportion progressing to HE, but a much smaller proportion participating at RG universities. The other rows are the independent variables in the analysis.

In the student level data two additional variables were added (real funding per FTE and a time trend). The data used in the calculation of the funding variable are given in table 3.3 and the definition and descriptive statistics for this continuous variable is shown in table 3.7. The mean gives an average

funding of £3,800 per FTE, with moderate variations over the nine year period of the data. The definition of the time trend is also given in the table. (The sample used in the multiple regressions started in 2002, i.e. year 2, because of the missing data on prior achievement.)

Table 3.7 Student level data: definitions and descriptive statistics for continuous variables

Name	Definition and Units	Mean	SD
Funding adjusted CPI	Real funding per FTE £10,000s at 2005 prices	0.38	0.02
Year	Time trend 2001=1……2010=10	-	-

The number of observations by RG for some of the student attributes was also of concern. Table 3.8 shows that for student attributes vocational and low prior achievement, the numbers of student participating at RG was very small. The established diagnostic tests for applying Chi-square (section 2.5.5) were not fulfilled for RG participation for vocational and low point score on entry students. Also calculating annual percentages at College level to examine yearly variation seemed inappropriate on such small underlying numbers. The Chi-square tests and simple time trend regressions for vocational and low prior achievement were consequently not carried out, due to concern over the number of observations available. It is worth noting that the conditions are met for all WP Factor measures, the student attribute of primary concern in this research, but in relation to the overall number of observations, the proportions are small and are likely to be at the extremes of the distribution. As explained in section 2.5.4, this is likely to be important in terms of which multiple regression is used, i.e. whether the S-shaped output from logistic regression is able to cope with observations at the extremes of the data set.

Table 3.8 Russell Group participation by vocational, low prior achievement and WP Factor, numbers of students

Student attribute	2002	2003	2004	2005	2006	2007	2008	2009	2010
Non-WP Factor (adjusted)	23	54	47	52	15	41	35	53	63
WP Factor (adjusted)	44	35	40	31	45	33	40	17	19
Non-WP Factor (uplift)	63	83	76	60	42	55	56	45	60
WP Factor (uplift)	4	6	11	23	18	19	19	25	22
Vocational	2	1	3	2	2	5	6	2	1
Low prior achievement	6	3	7	6	2	1	2	5	2

3.5 Conclusion

This chapter has shown the secondary data underlying this research to be of high quality as it largely comes from audited sources and is used to determine College funding. For the student level data there are large sample sizes, but for the College level annual data the observations are restricted to 10 (nine for prior achievement). The research has used Excel tools (pivot tables and Strat Pro) for the College level data analysis, for the descriptive and graphical analysis and the 'simple' statistical techniques, namely Chi-square and simple time trend regression. Descriptive analysis is the method predominately used in management reports for internal use. The 'simple' statistical techniques are methods, again used on a day-to-day basis, to check the significance of the finding. For the more 'complex' techniques, namely multiple regressions, SPSS is used. The variable definitions and descriptive statistics for the theoretical framework are set out in section 3.4 and further explored, in particular considering yearly changes, in Chapter 4, under the headings of educational progression outcomes and educational inputs, detailing the dependent (outcome) and independent (input) variables within the models. Chapter 4 also considers the literature on these variables in the EPF that is not previously discussed in the literature review.

4 The variables in the theoretical model

4.1 Introduction

The methodology and theoretical framework used in this research is discussed in Chapter 2, where the appropriateness of using case study methodology is argued (using the components and principles of Yin (1994)) and the theoretical framework based on EPF is proposed through an understanding of the theory and empirical studies in the field. This chapter builds on Chapter 3 by considering the variables of the theoretical model, the educational progression outcomes and student attributes (inputs), to provide further foundation to the statistical analysis to follow in Chapter 6. The research is concerned with three educational progression outcomes (College participation, HE participation and RG participation) and seven educational inputs (socio-economic background, gender, ethnicity, programme of study, prior achievement, year and funding level) and the rationale and approach adopted in this case study is discussed in this chapter. Empirical findings related to the variables and relevant to this research, which were not addressed in the literature review conducted prior to this thesis, are examined here along with the rationale for using certain proxy variables. This chapter also provides a description of the trends in each variable at the College level and introduces the national situation as a background. Essentially, this chapter sets out the variables of the model for an investigation into the effect of educational policies on educational outcomes and social mobility.

4.2 The educational progression outcomes

The WP policies of primary concern for this research sought to increase participation in FE and HE and ultimately resolve the social mobility issues identified by the Kennedy Report (1997). The literature review to this thesis identified evidence of increased participation in FE generally, with a reduction in the population of NEETS (not in education, employment or training) towards the end of the decade (Department for Education, 2010), and evidence (Department for Business, Innovation & Skills, 2011a) of a small increase in the numbers of students attending HE having received FSM. Despite this, social mobility, as measured in terms of progression to the professions, is projected to remain a problem for very many years (HM Government, 2010). The literature review concluded that there is a problem in finding a measure of social mobility (Crawford et al., 2011), and perhaps a more pragmatic approach should be taken as changes are likely to be inter-generational (Sutton Trust, 2008). This research therefore also considered RG participation as an additional educational outcome possibly more closely aligned with social mobility, than say, the two broad measures used by the WP policies of FE and HE participation.

4.2.1 College participation

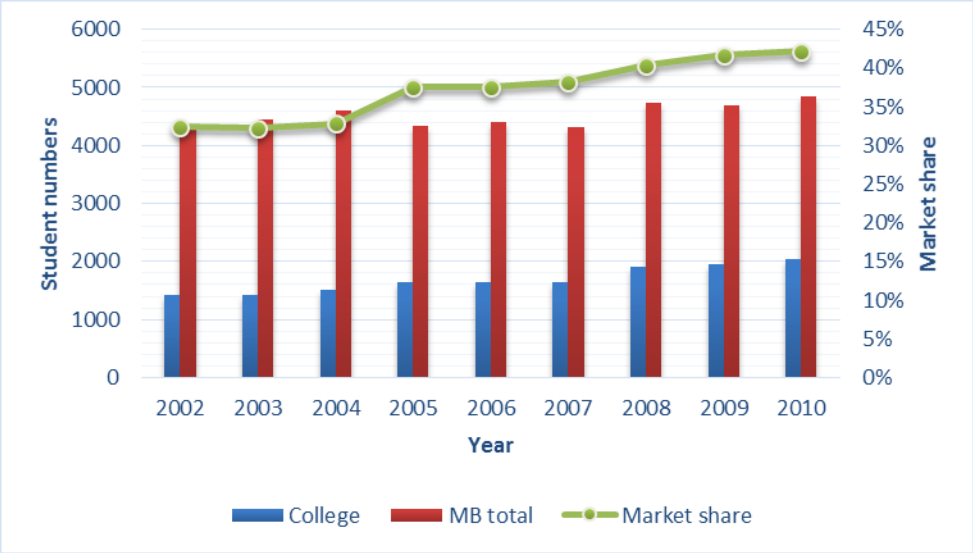
The research now considers the first of the education progression outcomes, namely, College participation. Data looking at the general population released by the Department for Education (Department for Education, 2010), see appendix 4.2.1, shows that from 1994 to the mid-2000s the percentage of the 16 to 18 population in full-time education and participating in FE remained fairly constant. From the mid-2000s there has been a steady increase in the percentage with another step rise in 2008. On face value this would represent a positive impact of the WP policies studied in this research. The impact on NEETs is, however, less encouraging with only a noticeable change towards the end of the 2000s. Consequently, the changes were predominately in the mix between employment and other forms of education/training rather than reducing the percentage of NEETS. The literature review to this thesis concluded that family background was key in determining educational outcomes; this initial analysis may suggest that the local market for jobs and education could also be important factors in post-16 education.

A concern and the 'educational significance' for this research is to see an increase in the percentage of the cohort participating in FE, particularly those students from less advantaged backgrounds. However, as explained in section 3.2.1, data on those that did not attend FE was not available to the researcher, so College participation, that is the proportion of WP students at the College, is used in the statistical analysis in section 4.3.1 and in chapter 6. These need to be considered against the FE student numbers for the College in relation to the MB. Department for Education (DfE) performance tables of the period do provide useful market information for comparison and figure 4.1 shows that the College's student numbers have increased steadily over the period. On face value this would represent a success for the WP agenda, but any pronouncement in this regard should be tempered because growth is possibly driven by increases in market share, based on the MB student population[10]. Figure 4.1 shows that the market share percentage, after remaining approximately constant from 2002 to 2004 at 32%, had increased to 42% by 2010. The market share calculation could be explained, in a conventional business sense, by the College attracting students from local competitors, but there are also likely to be other factors in the local economy that may have changed

[10] The information is sourced from the school and college performance tables published annually, but is not referenced here for confidentiality reasons.

and should be considered, such as: the overall population (demographics), the MB staying-on rates post-16, and students existing and entering the MB for their preferred institutions to consider. That said, figure 4.1 shows that the number of students studying post-16 in the MB overall has remained fairly flat, despite some year-on-year variation, whilst the College's student population (and market share) has grown over the period.

Figure 4.1 Student numbers in the MB and College, plus market share (%)



Source: School performance tables from 2001 to 2010 – National Statistics

According to Francis and Perry (2010), many of the initiatives in education have little sustained improvement with regard to the educational progression outcomes of disadvantaged groups. The extent to which the growth in student numbers can be explained by the WP agenda (i.e. growth in the number of previously disenfranchised less advantaged students) and the associated funding increases are examined in the statistical analysis to follow this chapter, but if no effect is found this would again add further credence to the presumption that market conditions for jobs and education locally explain, at least in part, the growth in student numbers at the College.

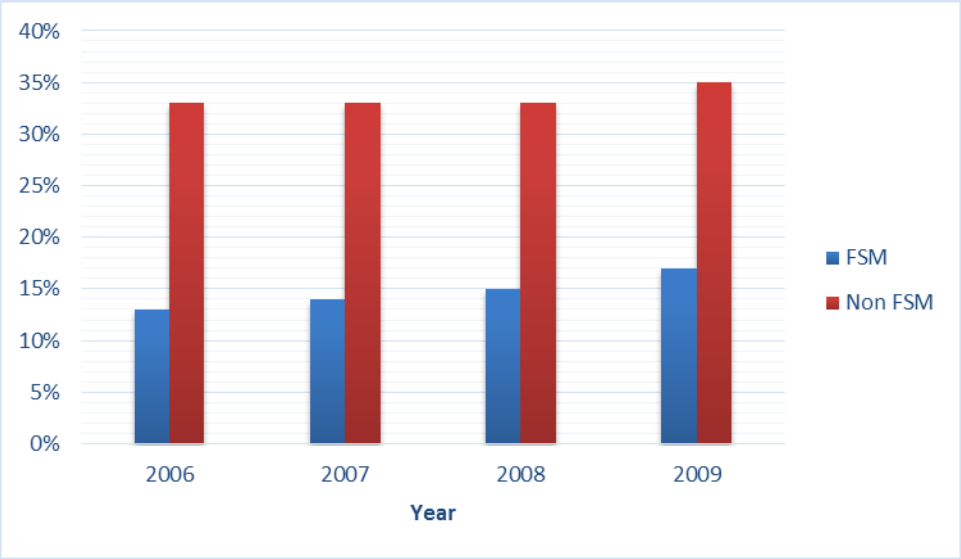
4.2.2 HE Progression

The next educational progression outcome discussed is HE progression and a report from HEFCE (2013), presents trends in participation in HE among young people in England for the academic years 1998-99 to 2011-12. The key findings show that since the late 1990s, the rate of participation in HE among young people has increased from 30% to 38%. Most of the increase has occurred since the mid-2000s, with participation rates increasing by 6%. Young participation rates in England increased between 2007-08 and 2010-11, and continued to increase subsequently. More recently, the

proportions of young people entering HE aged 18 during the 2011-12 academic year, or 19 in the 2012-13 academic year, increased by 0.5%, around half the typical increase observed during previous years. The difference in participation rates between young people living in the most advantaged and most disadvantaged areas remained large. Although young participation rates increased in both advantaged and disadvantaged areas, with increases of 16% and 52% respectively, the participation gap between them has remained broadly stable at around 40%. The participation rate of young people in the most disadvantaged areas would need to treble in order to match the rate of those from the most advantaged areas.

Further evidence from the Department for Business, Innovation and Skills (2011a), see Figure 4.2, shows that an estimated 13% of maintained school students who received FSM entered HE in 2005/06. This rose steadily to an estimated 17% in 2008/09. The estimated progression rate for students not receiving FSM also increased, but only from 33% to 35%. The gap between FSM and non-FSM rates is therefore estimated to have fallen slightly, to 18 percentage points. This analysis ignores, however, the impact of sixth form colleges, as FSMs were only provided in school sixth forms during this period.

Figure 4.2 Percentage progressing to HE receiving/not receiving free school meals (FSM)

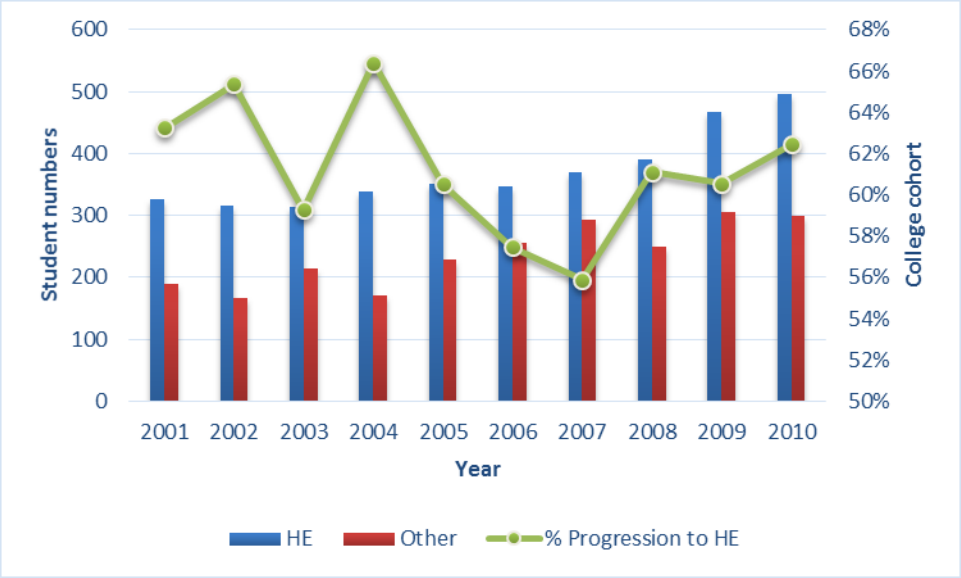


Source: Department for Business, Innovation and Skills, 2011a

From the College's perspective, figure 4.3 shows that the numbers progressing to HE has increased over the period 2001 to 2010, with particularly strong growth from 2006. On face value this would appear a positive outcome for the WP agenda, which called for an increase in HE numbers, but the 'educational significance' (see section 2.3.2) for this research is to see changes in the percentage of cohort progressing to HE by student attribute over time, not just an increase in the raw numbers.

For the whole student population (figure 4.3) the numbers have increased, but the percentage of cohort has not; the percentage of cohort progressing to HE in 2001 stood at 63% and closed the period in 2010 at 62%. The growth in students progressing to HE is, therefore, likely to be a factor of the overall increase in student numbers, which could possibly be explained by changes in the local market for jobs and education including market share (see figure 4.1), and not necessarily WP policies. It is worth noting that there are large variations year-on-year in the percentage of cohort progressing to HE (not reflected in the raw numbers progressing to HE), the percentage peaked in 2004 at 66% and dropped to 56% in 2007, but ended the period at 62%, possibly showing an increasing trend from 2007. This research looks to explain the reasons behind these large year-on-year variations (for instance, was the College recruiting more WP students or students with lower previous attainment in some years?) and whether the WP policies have been efficient and effective in delivering an increase in the percentage of cohort, in this case, progressing to HE.

Figure 4.3 College student progression (numbers) and percentage of College cohort progressing to HE



Source: College data

4.2.3 Russell group

The final educational progression outcome considered is RG participation, which is not a conventional WP policy target, but a proxy for social mobility. The membership of RG changed over the period but now represents 24 leading research-based UK universities and this most recent listing of RG universities has been applied to all years in the analysis in this thesis, see appendix 4.2.2. The research therefore considers Durham University and The University of York as RG for all years studied,

despite them only recently joining; both Universities have been consistently ranked as 'top' universities, so are argued to be important to include in the RG measure.

The RG website (Russell Pinoneering Research Group, 2014) states that the average wage premium for graduates from a RG university is 10% higher than graduates from other universities. It also states that RG universities produce 30% of the UK's science and engineering graduates and nearly 81% of doctors and dentists. Over three quarters of first degree entrants at RG universities are from state schools and colleges and around one in five of first degree entrants are from lower socio-economic groups. In 2010-11, the then 20 English RG universities are reported to have spent £111.6 million of their additional fee income on bursaries, scholarships and additional outreach activities. In 2010-11 the average bursary offered by RG universities was £1395, more than 1.5 times the average level for the sector as a whole, and more than four times the minimum bursary of £329 required by the Office for Fair Access. By 2014-15 RG universities in England spent £193.3 million on scholarships, fee waivers and bursaries aimed at the most disadvantaged, and £36.2 million on outreach activities, including working with teachers and pupils in schools, and putting on summer schools and access schemes.

Progression to RG universities has been highlighted as a potential problem in social mobility terms (Sutton Trust, 2008). It also represents a measurable educational outcome and target for social mobility to test the impact of the WP agenda. The choices students make, however, in terms of university applications are complex in nature. There are likely to be family and peer factors along with economic pressures at play, with the distance of the university from the family home being one of the practical decisions taken by students based on these underlying factors and pressures (Davies et al., 2009). In terms of employment opportunities and positive social mobility outcomes, RG universities remain highly regarded by employers with seven of the top 20 ranked (by employers) universities in the world, being RG institutions (Topuniversities, 2010); so RG participation is arguably a readily available proxy for representing social mobility and is one of the educational progression outcomes (dependent variables) tested in this research.

That said, research has not always supported the notion that attending a RG university is a good proxy for social mobility in terms of boosting graduate earnings any more than say going to a post-1992 university. Chevalier and Conlon (2003) find that graduating from a RG institution adds between 0% and 6% to a male graduate's earnings compared to graduating from former

Polytechnics[11], but research, carried out for the Department for Business, Innovation and Skills, (Walker and Zhu, 2013) shows that graduates from RG universities do earn more than their peers, but this can be explained by their better A-level results and family backgrounds rather than their university education. When controls are factored in, male RG graduates earn 2% less than those from other pre-1992 universities and only three percentage points more than post-92 university alumni. For female students, the earnings discrepancy also shrinks to statistical insignificance when controlled for family and educational background. Students from more prestigious universities earn more because of these earlier factors in their lives, not because they attended a better university.

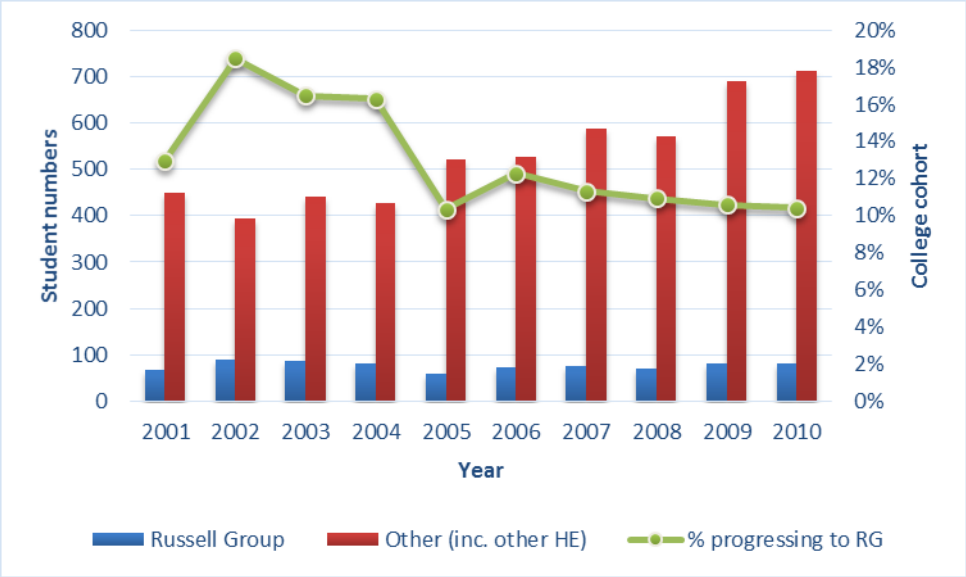
RG participation has, however, been used as a proxy for social mobility before. Findings presented to a conference examining WP and social mobility (Boliver, 2012) suggest that the access to RG universities was considered far from fair, and that little has changed over time: applicants through Universities and Colleges Admissions Service (UCAS) from lower social class backgrounds and from state schools continued to be substantially less likely to apply to RG universities than their comparably qualified peers from higher social class backgrounds and private schools. While those from state schools and from Black and Asian ethnic backgrounds who applied to RG universities, continued to be much less likely to receive offers of admission from these universities than comparably qualified applicants from private schools and the White ethnic group. Estimates based on these findings suggest that had access to RG universities been 'fair' during this period, at least 5,000 more students from non-traditional backgrounds might have entered RG universities each year; an increase of 10%.

Figure 4.4 shows RG participation over the period for the College, in terms of student numbers and percentage of cohort. The first important point to note is that the numbers progressing to RG is small, averaging 77 students per year and this may have a bearing on the findings in the statistical analyses to follow in chapters 5 to 7. The numbers have also remained fairly stable over the period, peaking at 89 students in 2002, dipping to 60 students in 2005 and ending the period on 83 students

[11] A polytechnic was a tertiary education teaching institution in England, Wales, and Northern Ireland offering higher diplomas, undergraduate degrees and post graduate education (Masters and PhDs) that was governed and administered at the national level. After the passage of the Further and Higher Education Act 1992, they became independent universities which meant they could award their own degrees.

in 2010. The second important point to note is that the percentage of cohort has gone down; after rising to a peak of 18% in 2002, it fell to 10% in 2005 and has remained close to that level since. The WP policies, in the case of the College, do appear to have had little effect on RG participation; at best, figure 4.4 shows no increase in the raw numbers participating at RG (unlike FE and HE participation where there was growth in overall student numbers), and more importantly for this research, there is a decline in the percentage of cohort participating in RG. The 'educational significance' is, however, not straightforward; the College could have increased participation on vocational programmes, most probably from students with relatively low prior achievement, which in turn could have led to a fall in RG participation. This would not necessary be an unsatisfactorily outcome for social mobility if these College policy changes have resulted in more less advantaged students participating in FE. In Chapter 7 the research analyses RG participation for students with high prior achievement and considers whether there are any differences in the probability of participation at RG over the period that are dependent on the socio-economic background for these high achieving students.

Figure 4.4 College students' participation at RG universities (numbers) and percentage of College cohort progressing to RG



Source: College data

4.3 Educational inputs – student attributes

Moving onto the educational inputs (independent variables) in the theoretical model, one of the key questions for this research is 'what are the main determinants of progression to different types of HE institutions and are some of these under the College's control?' The previously conducted literature review primarily focused on socio-economic background, but this research considered additional educational inputs, including, gender, ethnicity, programme of study and prior attainment,

plus year and funding variables. A rebalancing of the student cohort in favour of less advantaged students, and other student attributes seen to be factors in raising social mobility, is argued as the 'educational significance'.

4.3.1 Socio-economic background – WP Factor measure

The literature review to this thesis concludes that it is generally accepted that family background remains one of the key factors in determining education success (Cahill and Ermisch, 2012). In theoretical terms the importance of supportive adults (Reed et al., 2005) in the education process has been established and this role is most often carried out within the family structure. This previous literature review also finds the if colleges could replicate the role of a 'supportive adult' within institutions there could well be a positive impact on social mobility, but evidence suggests there is limited awareness of students' needs in this respect within institutions (Foskett, 2002). Socio-economic background is therefore central to the investigation and this research has used WP Factor as a proxy for socio-economic background (family background). This section details potential problems with using the unadjusted form of this measure and investigates an adjusted WP Factor measure[12].

Harrison (2012), in a seminar entitled 'WP: mapping the terrain', identifies that different 'indices of deprivation' have been codified and used to target communities with interventions designed to increase aspirations, attainment and/or applications. Little time has, however, been spent understanding what these measurements mean and whether they are fit for the purposes assigned to them. The seminar cast doubt over whether the various indices used in the 2000s measure what they are supposed to measure and whether the findings are in fact meaningful. Harrison contextualised, for the period 2000 and 2010, the confusion over measurement and targeting and how this has undermined the stated policy aim to WP. He argued that the 'lack of progress' was at least partly due to a confusion in the implementation of the policy aim, leading to the late adoption of a poor outcome measure that underestimated improvements in participation from the target groups and focused on the wrong stage of entry to HE.

[12]The conventional measure of socio-economic background of FSM, used in the school sector, is not applicable in FE as FSM were not offered during the period interest for this research. FSM were introduced into the FE sector in September 2014, offering a free meal equivalent to £2.41.

In the research in this thesis and FE generally the WP Factor is used as a measure of deprivation and family background since it was introduced into the funding methodology for 1998/99 by the Learning and Skills Council (LSC) following the recommendations of the Kennedy Report (1997). It was calculated using the Index of Multiple Deprivation based on 1992 data (IMD 1992). The IMD 1992 gave a value of relative deprivation for every ward in the country and an institution could claim the WP Factor where a student lives in a ward which is relatively deprived. For those students living in a deprived area, based on wards, they would receive a 10% funding uplift.

From 2003/04 the WP Factor was based on the IMD 2000. The IMD 2000 showed an overall reduction in the level of disadvantage for England compared with IMD 1992, but showed a widening gap between more disadvantaged and more prosperous areas (Learning and Skills Council, 2003). It was based on the following weightings:

- Income (25%).
- Employment (25%).
- Health deprivation and disability (15%).
- Education, skills and training (15).
- Housing (10%).
- Geographical access to services (10%).

The change in the pattern of disadvantage reflected in the IMD 2000 could potentially have seen a reduction in the numbers of WP students for some institutions.

A further revised measure, IMD 2004, was used from the 2008/09 academic year for determining the WP Factor. The IMD 2004 gives a value of relative deprivation for every Super Output Area (SOA). SOAs are geography designed for the collection and publication of small area statistics; previously electoral wards were used to collect the data. The revised measure is used on the Neighbourhood Statistics site and across National Statistics and is based on a slightly different weighting to the IMD 2000:

- Income (22.5%).
- Employment (22.5%).
- Health deprivation and disability (13-5%).
- Education, skills and training (9.3%).

- Crime (9.3%).
- Living environment (9.3%).

The shift from electoral wards to SOAs and the change in the weightings outlined above could potentially have impacted on the numbers of students qualifying for the WP Factor. This research has therefore calculated a revised version of the WP Factor, applying IMD 2010 to all years, in order to achieve a consistent measure for socio-deprivation throughout the period.

The key results of the IMD 2010 were:

- Over 5 million people lived in the most deprived areas in England in 2008 and 38% of them were income deprived.
- Liverpool, Middlesbrough, Manchester, Knowsley, the City of Kingston-upon Hull, Hackney and Tower Hamlets are the local authorities with the highest proportion of lower SOAs amongst the most deprived in England.
- 98% of the most deprived lower level SOAs are in urban areas but there are also pockets of deprivation across rural areas.
- 56% of Local Authorities contain at least one lower level SOA amongst the 10% most deprived in England.
- 88% of the lower level SOAs that are the most deprived in 2010 were also amongst the most deprived in 2007.

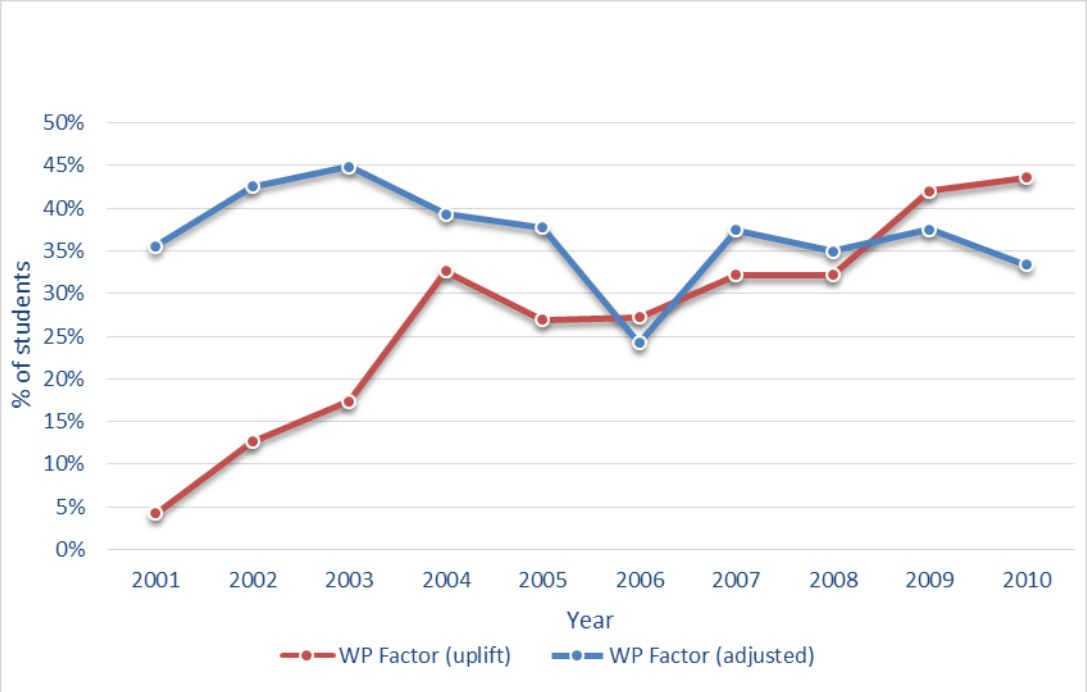
The IMD 2010 (Neighbourhood Statistical Release, 2011) is based on broadly the same methodology as the previous versions and it is possible to compare the pattern of deprivation with the pattern in 2007 overall; 66% of areas in England are in the same decile of the IMD 2010 as they were in 2007. Most of the movement occurred in the middle part of the distribution. There was less movement at the extreme ends of the distribution with about seven out of eight (88%) of the most deprived areas being in the same decile in both 2010 and 2007 and five out of six (84%) least deprived areas in the same decile.

In this section, the two measures of the WP Factor have been investigated. The first is the WP Factor as it was current in the particular year of data, which was the definition used by the government at that time. The second is the WP Factor (adjusted) measure, which uses the same index throughout the period, using. IMD 2010, as it had the particular advantage of taking out the impact of the change from analysing electoral wards to SOAs. The decision to adopt an adjusted WP Factor to measure less

advantaged students is therefore an attempt to eliminate problems by applying a consistent measure throughout the period.

The College's data for both WP Factor measures is presented in figure 4.5 and demonstrates the potential impact of the different IMD measures used; this supports the points raised previously by Harrison (2012), which highlight the difficulty in measuring and targeting less advantaged students for special support. For WP Factor (uplift) there are steep rises in the proportion of students qualifying for the WP Factor in 2004 and 2009 coinciding with the move to IMD 2000 in 2004 and IMD 2004 in 2009. As explained, this could be reflecting changes in the calculation of the index rather than changes in the underlying participation rates of less advantaged students in the overall student cohort. WP Factor (adjusted) shows more variation year-on-year, but is arguably the more appropriate measure for socio-economic background as it eliminates the impact from changes in the index used.

Figure 4.5 Percentage of WP Factor (uplift) and WP Factor (adjusted) students by year



Source: College data

Appendix 4.3 gives a detailed graphical analysis for the College by the two WP Factor measures for each of the WP Agenda targets (i.e. College participation in appendices 4.3.1 – 4.3.4 and HE progression in appendices 4.3.5 – 4.3.8), for both student numbers and percentage of cohort by socio-economic background. The further educational outcome (not an explicit WP Agenda target) argued for in section 4.2.3 – participation at RG universities – is also presented (appendices 4.3.9 – 4.3.12). These figures also add to the debate on what is an appropriate measure (index) for socio-economic

background, as they indicate different numbers and percentages, and, important for the assessment of policy in this thesis, different time profiles depending on which WP Factor measure is used. In particular, the unadjusted measure shows a strong step-like pattern in 2004 and 2009, which coincides with a change in the IMD used.

Whether these differences in the measures lead to different a conclusion when simple inferential statistics are calculated, of the kind used in a professional setting, is investigated in this thesis. These statistics were computed using both the unadjusted and adjusted measure of WP students:

1. Three Chi-square tests of association for students who participated by WP/non-WP with time (for College participation see appendices 4.3.13 and 4.3.14; for HE progression see appendices 4.3.17 and 4.3.18; for RG participation see appendices 4.3.21 and 4.3.22).
2. Three simple time trend regressions of the proportion of college students that are WP students participating (for College participation see appendices 4.3.15 and 4.3.16; for HE progression see appendices 4.3.19 and 4.3.20; for RG participation see appendices 4.3.23 and 4.3.24). This analysis used the College level data (10 observations only).

The results are summarised in tables 4.1 (Chi-square) and 4.2 (time trend regression). The diagnostics associated with the regressions would not usually be considered in a professional context but are satisfactory, apart from the functional form test on RG participation (which suggests the functional form is incorrect and thus these estimates need to be considered with caution). The results show no evidence of heteroscedasticity or incorrect functional form in all other cases, i.e. the findings are not significant, always at 10% but in most cases at 20% or lower. The diagnostics are discussed further in section 6.2.

Table 4.1 Summary of Chi-square results of the simple inferential analyses comparing WP Factor (uplift) and WP Factor (adjusted) measures (p values).

	Using WP Factor (uplift)	Using WP Factor (adjusted)
College participation	0.000	0.000
HE progression	0.656	0.000
RG participation	0.278	0.000

Table 4.2 Summary of time trend regression results comparing WP Factor (uplift) and WP Factor (adjusted) measures.

	Coefficient and P value of coefficient on the time trend	
	Using WP Factor (uplift)	**Using WP Factor (adjusted)**
College participation by WP students (proportion)	0.0383 (0.0001)	-0.0075 (0.2456)
HE progression by WP students (proportion)	-0.0120 (0.0427)	0.0071 (0.5586)
RG participation by WP students (proportion)	-0.0072 (0.0267)	-0.0178 (0.0067)
	n=10	n=10

P value in brackets

The results in tables 4.1 and 4.2 show differences, with four out of the six cases being significant[13] for one of the indices but not for the other, suggesting that use of an unadjusted measure could lead to misleading information being given to management. However, there were also differences between the results from the Chi-square and time trend regressions (which could also be problematic in a professional context), so these results are examined in more detail in what follows.

For College participation and year the Chi-square tests (table 4.1) for both the WP Factor (uplift) and the WP Factor (adjusted) data give a significant association, with p values of zero (to more than 3 decimal places). This supports the view that for students enrolling at the College, the WP Factor (uplift or adjusted) is not independent of the year of study. The result for the WP Factor (uplift) measure is perhaps expected given that the descriptive analyses in appendices 4.3.1 and 4.3.2 show a clear increase in both the numbers and percentage of students from lower socio-economic groups enrolling at the College over the period. For the WP Factor (adjusted) measure, the result is more surprising as, if we look at the graphical analyses (appendices 4.3.3 and 4.3.4), there does not appear to be a clear trend in terms of the percentage of less advantaged students enrolling. Chi-square tests, however, look for an association between the variables and significance may be the result of a trend over the period or some more complicated relationship. Examining the figures in more detail (appendix 4.3.14) it appears that large shifts in participation in 2006 (which had an exceptionally low enrolment by WP Factor (adjusted) students) and to a lesser extent in 2003 (which had a high

[13] In simple regression the R-square is also significant (as shown by the F test) if the independent variable is significant (and vice-versa).

enrolment of WP Factor (adjusted) students), may be dominating the results. In the Chi-square calculation the high 'distances of observed from expected' for these particular years are the main reason for the significant outcome. Thus the Chi-squared test, by considering the association between variables, is not necessarily identifying whether there is a trend, or indeed any sustained increase, over a period, which is the main concern here, but can be affected by large isolated year-on-year fluctuations. Although the Chi-square is significant for both measures of WP, it may be because of different underlying reasons. The WP Factor (uplift) regression estimates a significant (at higher than the 1% level) upward trend, with an approximate 4% increase in WP Factor (uplift) students per year, in line with the descriptive statistics. In contrast, for the WP Factor (adjusted) measure the estimated coefficient is negative and is insignificant; this supports the descriptive analysis and shows no increasing trend in the percentage of WP Factor (adjusted) students enrolling when using the revised measure for determining socio-economic background (i.e. using IMD 2010 for all years).

The Chi-square test for HE Participation/non-HE participation (table 4.1) for WP Factor (uplift) students does not show a significant outcome; whilst for WP Factor (adjusted) the results are significant. The WP Factor (adjusted) measure shows quite large variations year-on-year for numbers and percentage of the College cohort participating. Again, the significant outturn for the Chi-square test seems to be largely related to the large 'distance of observed from expected' in a few years, in this case 2003, 2004 (both increases) and particularly 2010 (a decrease) rather than to any specific trend over the period (appendix 4.3.18). This result supports the view that for WP Factor (adjusted) students progressing to HE, the WP Factor is dependent on the year of study, but again does not necessarily indicate a trend nor does it established the desired 'educational significance'. In the time series regressions the estimated trend is significant (at the 5% level), indicating a downward trend of over 1% per annum for WP Factor (uplift) students, but for the adjusted measure the trend is positive but insignificant.

For Russell Group participation the Chi-square results also differed between the two WP measures, for WP Factor (uplift) the results are not significant, whilst the result for WP Factor (adjusted) are highly significant. However, in the time series regressions, both measures give significant estimates, with the same (negative) sign.

The major concern at this point is whether the use of the unadjusted figure matters and importantly if use of it could give different and misleading results to management on the College's performance. The descriptive comparison and the results of the simple time trend statistical analysis suggest that using unadjusted data for the WP Factor is problematic, with step-like changes when the

changes in definitions occurred, and that use of such data in statistical analysis may lead to different results than using a consistent series. Indeed the use the unadjusted measure for College participation would have given management too rosy a picture of improvement, with the reverse for HE progression. The analysis here has also suggested possible problems in using the Chi-square statistic in presentations in a professional context when the concern is to examine whether there has been a sustained increase, an aspect that will be pursed further in Chapter 6. Given the results of the analysis presented in this section, the results presented henceforth use the adjusted measure only for WP. The conclusion of this section is that in a professional framework, it is important to spend the time (and money) to adjust for such changes in measurement.

4.3.2 Gender

Gender is expected to be one of the student attributes that affects education outcomes. Conventionally, gender would be considered outside the Colleges control, however, the MB contains two single sex schools and the boys' school in particular has been targeted by the College for special support. Applying the EPF (see section 2.4), the College is aware of gender inequalities and has provided ad hoc support to raise aspirations and outcomes at the boys' school, with the view of increasing participation at the College. The curriculum has also been developed to attract male students generally, with the introduction of Business and Technology Education Council (BTEC) qualifications in national public services and sports coaching programmes that traditionally attract more male students. Could such inputs into the EPF be associated with in improved educational outcomes for male students?

At a macro level and in policy terms, gender equality has received considerable attention. The key gender equality issues for schools, for example, were identified in the then Equal Opportunities Commission (2007) as follows:

- Challenging gender stereotypes in subject choice and careers advice.
- Pupil attainment.
- Sexual and sexist bullying and violence.

The statutory National Curriculum for compulsory education (pupils aged five to 16) aims to secure an entitlement for all pupils, irrespective of factors such as gender, class and social background. The statutory inclusion statement (National Curriculum, 2009) requires schools to respond to pupils' diverse learning needs and teachers to set high expectations and provide opportunities for all pupils

to achieve, including boys and girls. It further requires teachers, in order that they might meet the full range of pupils' needs, to be aware of the requirements of the equal opportunities legislation that covers gender.

Despite the existence of these legal frameworks there is an accepted gender gap in attainment with, on average, girls outperforming boys. This is nothing new and it was mentioned in the 1868 report of the Taunton Commission which sat from 1864 to 1868 to investigate secondary education. More recently a gap in the proportions of boys and girls gaining good grades at GCSE at age 16 was identified soon after these exams were introduced in their present form in the late 1980s. Since 1988 a significant gender gap in favour of girls has emerged. This gap quickly increased and subsequently became stable at around a 10% difference, with little variation since 1995 (Department for Education & Skills, 2007).

The gender gap varies by subject and is particularly wide in English and other subjects that are literacy based, with, on average, girls performing better than boys. The gender gap in English is evident throughout compulsory education and is largest at Key Stages 3 and 4 (ages 11 to 16). Although maths was traditionally a subject where boys performed slightly better than girls, this trend has now been reversed; girls perform slightly better than boys in maths. In contrast to English, however, the gender gap is small; the gender gap in the sciences has also traditionally been very small (Department for Education & Skills, 2007).

Looking at attainment at age 16, both the social class attainment gap (as measured by percentage point difference in attainment between those eligible and not eligible for FSM) and the gap between different ethnic groups are much greater than the gap between boys and girls. Looking at the interaction of gender and ethnicity, there appears to be systematic variation for some ethnic groups, with wider gender gaps in attainment at GCSE for Black Caribbean and other Black pupils than for other ethnic groups. White British boys eligible for FSM are a group with particularly low attainment, with only 24% gaining 5+ A*-C GCSEs (33 percentage points less than average attainment at GCSE). Black Caribbean boys eligible for FSM and White British girls eligible for FSM are also doing significantly less well than the national average with 30% and 26% less than average attainment at GCSE respectively (Department for Education & Skills, 2007).

There have been a number of policy initiatives focusing on education outcome by gender within the period being researched, see appendix 4.3.25. Although these policy initiatives are not a focus here, this research investigated changes in male participation at the College (FE and HE) over

the period. This also indirectly examined the impact of various policy decisions by the College to attract male students to the College, i.e. the introduction of vocational programmes and the inclusive entry policy. A key question for the research is to establish whether there is a consistency of findings for socio-economic background and gender; if the number or percentage of less advantaged students did not increase over the period it is probably unlikely to see increases in male participation as well.

In terms of HE participation, the rates for both men and women have increased for the population as a whole, though since the late 1990s the participation rate for women has increased more. This means that the participation gap between women and men was wider than it was 14 years ago. However, in recent years the gap has narrowed slightly and appears to be stable. Estimates for the most recent cohort suggest that young women had a participation rate that was 8% higher than young men, making them 22% more likely to progress into HE. The difference in participation rates for men and women is exacerbated when people living in the most disadvantaged areas is considered. In these areas young women have a participation rate of 23%, 6% higher than the rate for young men. This means that young women in the most disadvantaged areas are 35% more likely to participate in HE by the age of 19 than young men (HEFCE, 2013).

In relation to HE, O'Leary (2009) suggests that the differences in overall gender balance in terms of participation favours women. The much-enlarged student population has shifted from one that consisted predominantly of male school-leavers to a clear majority of women (as well as a much higher proportion of mature entrants) in less than a quarter of a century. In particular, sharp increases in female enrolments have been one of the main factors behind the expansion of HE. Barely a quarter of places were filled by women in 1963 and not much more than a third by 1980. By the turn of the millennium, around 53% of new entrants were female. By 2006-07 the percentage had risen to 55%. Research by Broecke and Hamed (2008) finds, however, no conclusive evidence of a gender difference in the likelihood of young people (18-19 year olds) participating in HE once prior attainment was controlled for. Their report emphasises that this does not mean that the gender gap in HE participation does not exist, nor that it is not large, but that no additional gender effect appears at the point of entry to HE. The report therefore recommended that efforts to reduce the gender gap in participation should predominantly be aimed at increasing the relative attainment of young men prior to entry to HE.

O’Leary (2009) states that in 2006-07 the Government’s estimate of participation in HE by the age of 30 stood at 40% (2% down on the previous year), but far in excess of the rate in earlier decades. The overall rate masks a growing disparity between the sexes: 47% of women now experience HE by

the age of 30 – up from 43% in seven years – while the equivalent figure for men has remained static at 38%. The benefits for women have been considerable and may have contributed to the prospects for social mobility. Their historic under-representation in HE has been reversed and female graduates enjoy a bigger salary premium over school-leavers than do men, although they continue to be paid less on average than men for equivalent work and take a smaller share of places in the most lucrative graduate schemes. In terms of subject choice (Thompson and Bahram, 2010), there are clear gender differences. In 2007/08, English-domiciled women had higher subject-specific participation rates for all subjects apart from: Technologies; Physical Sciences; Architecture; Building and Planning; Mathematical and Computer Science; and Engineering. Part of the explanation for the longer-term increase in the presence of women in HE lies in the changing nature of HE courses. The switch to a graduate profession in UK nursing, for example, has added more than 90,000 places in a decade to a subject where nearly 90% of the students are female. However, the main driver of growth in student numbers has been rising examination performance and increased staying-on rates in secondary education, both of which have been achieved largely through the successes of female students.

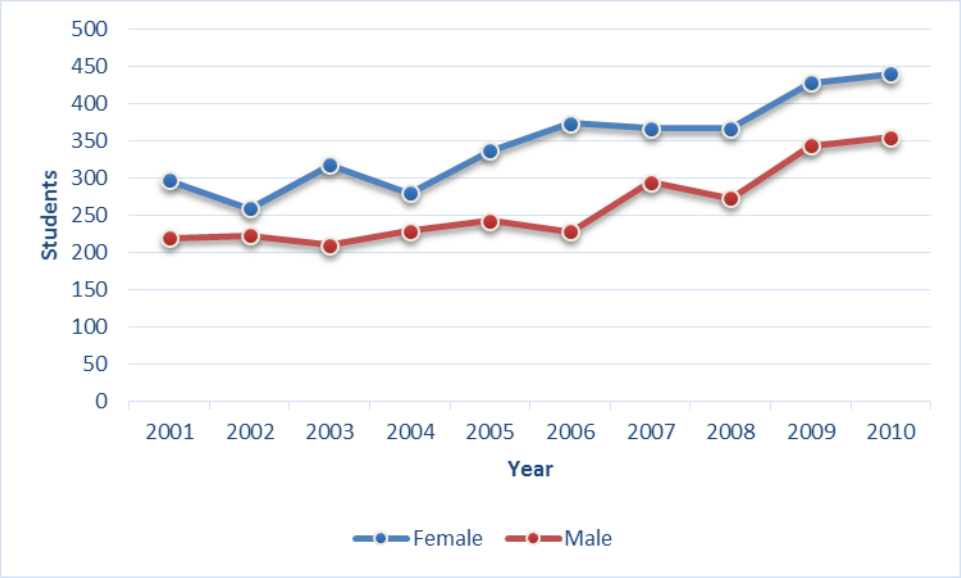
Research on gender and study outcomes has also revealed some differences in attainment in HE between men and women. Broecke and Nicholls (2007) find gender to be significant in explaining the degree classification of English-domiciled students. Females were more likely to obtain a higher degree classification than males, except when it comes to attaining a first class degree, where they found no statistically significant difference between the two sexes. The gender effect was found to be strongest at the lowest outcomes. It is also interesting to note from the A Level results for 2012, that for the first time since the introduction of the A* grade at A Level in 2010, a higher proportion of male than female entries aggregated across all subjects were awarded the top grade. It is therefore probably too easy to make assumptions on the influence of gender in the education process (Vasagar, 2012).

It is generally accepted that males are underrepresented in education post-16 and generally underperform compared to females at all levels of education. It is also widely recognised that White less advantaged males are a particularly underperforming subset. Although gender is not an input the College can directly control, as explained above, the College is located in a MB with two single sex schools and introduced curriculum options which are considered more attractive to male students; it also kept an inclusive entry policy, recognising the underperformance of males (as well as other possibly deprived groups). Although, the primary focus of this research is the socio-economic background of students participating in FE and HE, it considers the effect of gender, both as a control

variable and because for social mobility to be delivered it is anticipated that the percentage of less advantaged and male students should have increased over the period. In other words, the research is looking for consistency in findings for less advantage students and males, as the less advantaged male population is a recognised underrepresented group in post-16 education.

The College's data for gender over the period is presented in figure 4.6; this shows that the College student cohort is consistent with the literature in this field and indicates an underrepresentation of males in post-16 education. It also shows that although the number of male students may have increased over the period, the gap between males and female student numbers, despite some fluctuations year-on-year, does not seem to have narrowed. The educational significance here would be to see the percentage of male students in the cohort (particularly less advantaged males) increase as they are a recognised under-representative group in post-16 education.

Figure 4.6 Numbers of male and female students by year



Source: College data

4.3.3 Ethnicity

In FE there is a perception that ethnic minorities are underachieving and research by Foster and Willemstyn (2005) highlights that there is evidence of differences in retention and achievement rates between White and ethnic minority students. However, they question whether this in fact relates to: (1) gender, i.e. proportion of males versus females in the ethnic population is different to the general population; (2) is a consequence of statistics, i.e. colleges with very small numbers of

ethnic minority students having more statistical weighting per individual; or, (3) incomplete data because ethnicity is not-reported.

Research by Wilson et al. (2006) matches a dataset of state school students in England with linked test scores of school attainment for different ethnic groups. Controlling for personal characteristics, they found that: (1) all minority groups make greater progress than White students over secondary schooling; (2) much of this improvement occurs in the high-stakes exams at the end of compulsory schooling; (3) for most ethnic groups, this gain is pervasive, occurring in almost all schools in which these students are found. They looked at the usual factors that are invoked to explain attainment gaps: poverty, language, school quality and teacher influence, but concluded that their findings are more consistent with the importance of factors like aspirations and attitudes. They controlled for individual and neighbourhood characteristics and the results showed a varied picture in terms of levels of attainment, with a number of groups out-performing White students in the final exams. There were nevertheless some common patterns and after controlling for personal characteristics, all minority ethnic groups were shown to be making better average progress in attainment through secondary school than were White students. These gains were substantial for some groups, but only marginal for students of Black Caribbean heritage.

Although there is evidence of greater progress being made by ethnic minorities, the level of achievement is perhaps the most telling educational outcome when testing for social mobility. Wilson et al. (2006), look to explain the poorer performance by minorities. They account for poverty, which turned out to be important in the explanation. Language may play a role, but for the groups considered it seems to explain only about a third of the test score gain between the ages of 11 and 16. Differences in test marking across these ages did not arise in the dataset used. They find that tests are not neutral between people of different cultures, but it was not obvious why this lack of neutrality should fade during secondary schooling (and fade in a similar way across students from different cultures). Turning to school quality, the authors find that it was not the case that students from ethnic minorities go to higher quality schools; indeed, typically the reverse – thus the improvement happens despite this. Differences in school practices are often thought to be important, but evidence from the research does not sustain this argument as students of Indian ethnicity outperform their White peers in some 90% of the schools they both attend.

Research by Burgess, Greaves and Wilson (2009) explore the relationship between religion, ethnicity and educational attainment for young people in England. They state that the relationship between educational attainment and ethnicity has been explored in previous research, but the

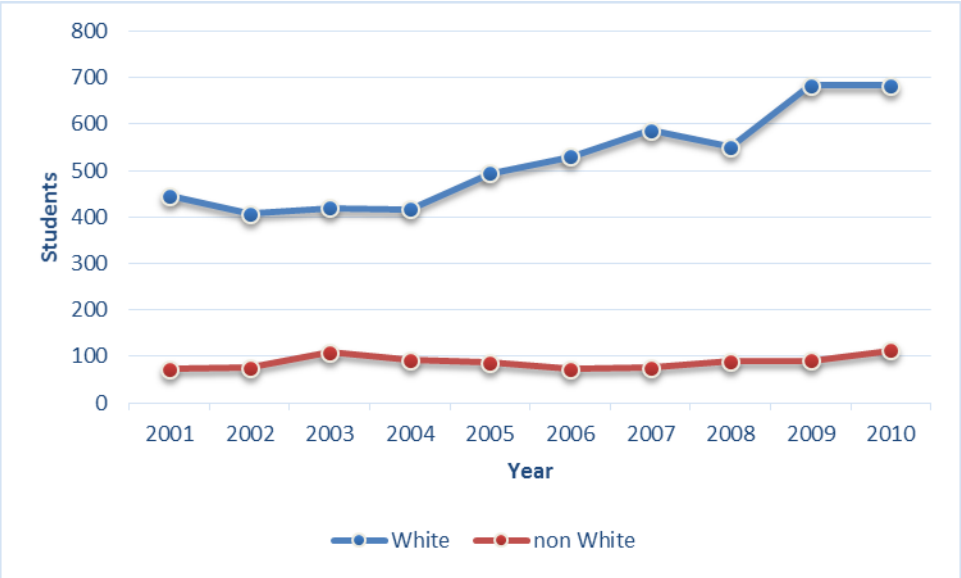
possible independent effect of religion has so far not been documented. They used multiple regression analysis to explore whether differences in attainment for religious and ethnic groups are due to correlations with other family characteristics, such as parents' level of education. They find some differences in the level of attainment between different groups; in most cases, however, there was insufficient variation in religious affiliation within ethnic groups to explore the independent impact of religion. There were some cases in which they make tentative suggestions, however, as there is some variation in religion between White students (nonreligious and Christian), Indian students (Hindu, Muslim and Sikh) and Black African students (Christian and Muslim).

In HE ethnic minorities form a growing share of undergraduate students, making up 15% of all students. This picture masks a more complex situation where rates of participation vary between different minority ethnic groups and types of institution. There are pockets of very low representation in certain subjects, in some pre-92 universities and specialist colleges, and in some more rural regions (Connor et al., 2003). Research by Broecke and Nicholls (2007) finds that participation of students from minority ethnic communities in HE is higher than for students from White communities, but the attainment of those who complete a first degree programme (as measured by class of degree) is markedly lower than that of their White peers. They point out that previous studies have shown that this difference in attainment cannot be explained by age, prior attainment, or subject of study but there has been no large scale analysis of recent cohorts which has systematically tried to control for a full range of factors in analysing the attainment of students from minority ethnic communities in HE. They selected 65,000 qualifiers from the 2004/05 Higher Education Statistics Agency (HESA) data to include English-domiciled undergraduate qualifiers who started their course of study in 2002/03. This enables them to have information about these students' prior attainment (in the form of tariff scores) as well as their socio-economic background (proxied through the IMD), whilst still including a large number of students from minority ethnic communities. They used a Partial Proportional Odds Model (a special form of Ordered Logistic Regression) to predict the likelihood of obtaining a certain degree class based upon a number of characteristics. In essence, this approach allows them to compare the odds that different groups of students face in obtaining a certain class of degree. In their model, they included a number of variables to predict HE attainment: prior attainment, subject of study, age, gender, disability, deprivation, type of HE institution attended, type of level 3 qualifications, mode of study, term-time accommodation and ethnicity. The variables they were not able to include are: type of prior institution attended; term-time work, parental income and other parental attributes; and English as an additional language. The results show that, even after controlling for the majority of factors which they would expect to have an impact on attainment, being from a minority ethnic

community (except the 'Other Black', 'Mixed' and 'Other' groups) is still statistically significant in explaining final attainment, although the gap has been significantly reduced.

The general consensus from the research literature is that non-White students do make better progress than their White counterparts, but generally achievement grades and levels of qualification are lower. HE progression, however, is high for non-White students and it is White less-advantaged males that are an under represented group in both FE and HE. The research presented in this thesis has categorised ethnicity simply in two ways, i.e. 0 = white/1 = non-white. Breaking down ethnicity further would be difficult as the sample size would have compromised the results; the majority of non-White students in the sample are from an Asian background with very small numbers being from Black and Chinese ethnic backgrounds, for example. The 'educational significance' in this case is again not straightforward; a higher proportion of non-White students would be expected to progress to HE, but research has shown that progression to RG is lower for non-White students (Boliver, 2012). The research here points to an 'educational significance' which sees an increase in the percentage of less advantaged, White, male students, progressing to FE and HE, but also an increase in the percentage of less advantaged, non-White students progressing to RG. The College data for ethnicity over the period is show in figure 4.7.

Figure 4.7 Numbers of students by ethnicity by year (non-White, White)



Source: College data

Figure 4.7 shows that the College grew in numbers of White students, but the number of non-White students has remained flat and fairly small over the period. This trend may have resulted in a fall in HE progression rates due to non-White students being more likely to progress to HE. The small

numbers involved for non-White students could be a factor affecting significance in the statistical analyses in chapters 5 to 7. Figure 4.7 may, therefore, be picking up a positive impact from WP policies in terms of progression to FE (an increase in the White male participation), but this may give a negative effect on the rates of HE progression (as a lower proportion of White males tend to progress to HE), one of the key education progression outcomes being measured.

4.3.4 The curriculum and programmes of study

Curriculum offer remains one of the key levers for colleges in meeting their strategic objectives, be it, inclusivity, maximising achievement or growing student numbers. The College used curriculum change, in particular the introduction of vocational programmes, as a mechanism to attract more students and ended the period with vocational provision in art and design, business, IT, performing arts, physical education, and national public services. The period 2001-2010 also coincided with a complete overhaul in the A Level curriculum and programmes of study. There is concern, however, that change in the educational sector has a detrimental effect on student outcomes (Allen, 2009). Adopting EPF theory terminology, curriculum offer is an educational input the College can control with the objective of maximising the EPF in terms of FE attendance, but the introduction of vocational provision could also have seen a reduction in HE progression rates at the College. The 'educational significance' in this case would be, for instance, to see a smaller decline in HE progression rates for less advantaged students on vocational programmes than for their more affluent peers also on vocational programmes.

Looking at the changes in the A Level curriculum in more detail, in September 2000, a completely adjusted A Level curriculum was introduced into the England and Wales education systems (Select Committee on Education and Skills Third Report, 2003), including a modular curriculum which required candidates to take modules as they proceeded through the course, rather than only being examined in a single examination at the end of the course. Curriculum 2000, as it was called, divided the A Level into two parts: three units at AS level which, together, equate to the first year of a traditional A Level course, and three A2 units which are awarded during the second year of study. When taken together, these six units comprise a full General Certificate of Education (GCE) A Level and form the basis for an A Level award. Generally, all students are expected to take the AS Level in Year 12 (aged 17) and then, where appropriate, continue to Year 13 (aged 18) to complete their A Level by taking the A2 examinations. The three units studied in the first year at AS level can, if the student wishes, be 'cashed in' to provide a certificated qualification in its own right. Each unit of the

award is equally weighted, with the AS and A2 programmes each accounting for 50% of the overall grade.

The first AS Level examinations were held in summer of 2001 and A2 examinations the following year. Due to the modular structure, units can be taken in January and June of the year. Initially, each unit could only be retaken once, but there is now no limit on the number of times a unit may be retaken (although, in many schools, students must pay for any subsequent re-sits themselves), and no restrictions on when this is done (i.e. it is possible to take or retake AS units during the A2 year, and vice versa). The secondary data held on achievement is for A2 results only, so the results in 2001 are based on the old methodology and from 2002 the results are based on curriculum 2000 methodology[14].

The literature review to this thesis explained that effective educational policy inventions to drive social mobility have to deliver a valuable curriculum and qualifications that lead to better labour market outcomes. Crawford et al. (2011) examines the notion that improved qualification rates and staying on post-16 (particularly in FE) will improve social mobility, as well as ensure better transitions into the labour market. They find that evidence on the value of academic qualifications such as GCSEs, A-levels and degrees was high, and part of the explanation for high wage inequality in the UK is the substantial return to such higher level qualifications. Many vocational qualifications, however, also yield a good return, particularly those at higher levels (i.e. level 3 and above) and those that are well recognised by the labour market (e.g. BTEC or HND; Higher National Diploma). Allen (2013) also find that students studying on a BTEC programme, with an average GCSE score of 5.8 or lower, are as least as likely as their A Level counterparts to progress to university. He introduced a few caveats, however, such as recognising that if value of a qualification type is declared then retention should really be factored into the analysis. The Wolf Report (2011) continued the positive message of vocational provision, stating that conventional academic study encompasses only part of what the labour market values and demands: vocational education can offer different content, different skills and different

[14] From September 2013, there is only one examination series for each year for AS and A2 and from 2015 A Levels will revert back to a linear model with a single exam in a year two of the programme

forms of teaching. Good vocational programmes are, therefore, respected, valuable and an important part of educational provision.

Curriculum change, such as the move to more vocational based provision, is the mechanism used by successive governments to address the shortfalls in the education system, make it more accessible to students, and raise standards. The introduction of module examinations and more course work were other attempts to widen participation aimed this time at making A-levels more accessible. There is a perception in the sector that curriculum change is often rushed and poorly thought through, and this is supported by research which has found a negative impact on student achievement in the immediate aftermath of curriculum change (Allen, 2009).

For the College, curriculum change has been used as a mechanism to increase student numbers, a financial imperative for the College given the increasingly competitive market in post-16 education in the MB. The introduction of public service programmes are a case in point; they are popular programmes with boys and more accessible than more conventional programmes in IT and business. The growth in vocational programmes at the College is, therefore, likely to be partly 'market forces' driven and not necessary driven by WP policies, although the outcomes could be compatible as they could both attract new and possibly previously disenfranchised students to the College.

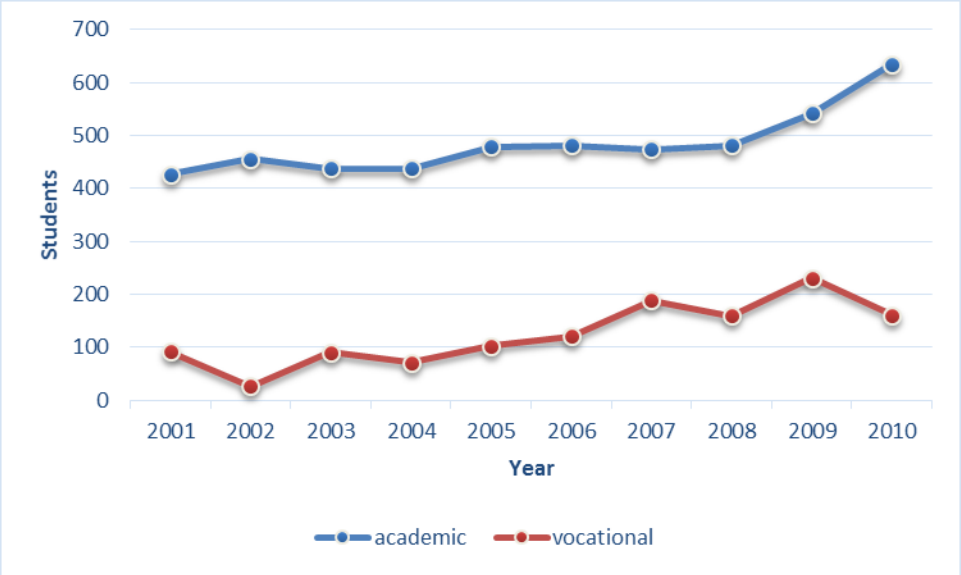
Curriculum change has also occurred within programmes, i.e. switching provision from AS/A Levels to vocational equivalents, to drive quality improvements to be reflected in published performance tables. AS level students are sometimes switched to vocational programmes if they are at risk of failure. The growth in vocational programmes in schools, often the equivalent to four or five GCSEs, was used extensively in the school sector in such a way to radically improve performance table statistics, a point appreciated in the Wolfe Report (2011). The value of these vocational programmes in social mobility terms, especially if undertaken in a purely cynical way of boosting performance statistics has been questioned by Wolfe. The research presented here addresses this complication by testing the success of vocational students progressing to HE and RG; perhaps a stronger measure of social mobility.

Curriculum change and the move to vocational programmes of study have in some part been motivated by the desire of institutions to improve student examination results and ultimately the school's performance on the national performance tables. Good results could ultimately provide a competitive advantage and financial stability in what is an increasingly competitive market in post-16 education. That said, some of the respected vocational programmes do not provide a barrier to HE

progression for less advantaged students (Allen, 2013), so the impact of curriculum change on social mobility should not be underestimated or underplayed. It would, however, be difficult to test within the scope of this research whether motivation to change the curriculum is due to market/financial or quality reasons, or a result of national policy directives arising from the WP policies.

Figure 4.8 shows the College data for programme of study; this indicates that the curriculum offer is predominately academic rather than vocational. The period, however, is characterised by a modest increase in vocational programmes, albeit with a sharp decline in 2010. The numbers attracted to vocational programmes is determined by the performance of schools in that year as well as the opportunity to choose new curriculum options provided by the College, so this could explain some of the year-on-year variation; students require at least five A to C grade GCSE's to enter an A Level programme. The overall growth is likely to be a feature of the College expanding the vocational offer over the period, but was this decision based on egalitarian WP motives or was there a strategic financial decision to increase student numbers and market share?

Figure 4.8 Numbers of students by programme of study (vocational/academic) by year



Source: College data

4.3.5 Prior achievement (point score on entry)

This research uses point score on entry as a proxy of prior achievement. This is not a measure of intelligence as it is also affected by and is a factor of family background and school performance, and possibly a number of other factors as well. The primary concern of this research is that entry policy is an operational tool used by some institutions to manage performance table scores, usually measured by student achievement. The College was seen to operate a relatively (compared to other

sixth form colleges) inclusive entry policy to A Level programmes (five A to C grades) for all of the period, so the research tested the impact of this policy on social mobility, as measured by the educational progression outcomes in section 4.2. Adopting EPF theory terminology, entry criteria is an educational input the College can control with the objective of maximising the EPF at FE, but by attracting students from the lower end of the prior achievement range this could have seen a reduction in HE progression rates at the College. The 'educational significance' in this case would be to see a smaller decline in HE progression rates for less advantaged students compared with their more affluent peers with the same prior achievement.

The section on curriculum (section 4.3.4) highlighted that vocational provision is not necessary a barrier to HE progression and is often valued by employers, so the task in hand is for policy development to focus on improving the likelihood of lower socio-economic groups taking such qualifications. This is based on the assumption that less advantaged students are more likely to have lower point scores and will be required to enrol on a vocational programme of study. Research previously examined suggests the need for earlier investment to improve educational attainment at school to allow progression to level 3 post-16 provision (Crawford et al., 2011). Cahill and Ermisch (2012), however, present findings that schools have very little impact in reversing the cognitive skills deficit of some students and showed that the gap in performance increases between Key Stage 2 and Key Stage 4 based on parents' educational background. Issues like the frequency that parents read to their children, and how they set rules and discipline, are recognised as some of the most important factors in determining social mobility. Research conducted by Wooldridge (2012) that examines gaps in school readiness in the UK and the US, found that many things seem to contribute to the gap, but the role of parenting behaviours stands out as one of the biggest single predicators. Waldfogel questions the reliance on education policies, and particularly public investment in the FE sector aimed at delivering social mobility, when parenting is perhaps the most important factor when trying to bring about change in this area.

The point score measure applies a score for each grade achieved and it was expected to see here some correlation between less advantaged students and students at the lower range of point scores. In most cases FE colleges require five good GCSEs to gain access to an A Level programmes, although for some colleges the entry criteria are much higher requiring a number of Bs and As in the mix. The College entry requirements for an AS/A Level programme were 5 A* to C grades at GCSE. Assuming students obtained Ds and Es in some subjects, a point score less than 5 could have gained

access to an AS/A Level programme. The secondary data has been banded so the point scores are represented as follows[15]:

- <4
- 4 – 4.9
- 5 – 5.9
- 6 – 6.9
- 7+

This research also categorised prior achievement into three bands (high, medium and low). Low prior achievement uses the point score range of 0 – 4.9, medium uses 5 to 5.9, and high uses 6 and over. Figure 4.9 shows the breakdown of students in these three bands over the period, excluding year 2001. This classification of point scores is the one used in subsequent statistical analyses.

Figure 4.9 Student numbers by point scores by year – categorized high, medium and low

Source: College data

Figure 4.9 shows modest growth in numbers of students in all prior achievement categories over the whole period. There is a sharp decline in low prior achievement in 2008 and 2010, coinciding with a

[15] The data shows a high amount of missing data in 2001 for this variable as a result of some data not being collected, and so for the analyses in Chapters 5 to 7, year 2001 has been excluded when considering prior achievement (there is only a very small amount of missing data in subsequent years and no additional variables added).

similar decline in numbers taking the vocational provision the same years, see figure 4.8. There is also a sharp increase in middle category prior achievement in 2010, which could mean there was an (slight) increase in school performance in that year resulting in more students qualified for the A Level programme. School performance statistics (appendix 4.3.26) show an increased number of students obtaining five GSCEs with maths and English in 2010; 50% in 2010 and 46% in 2009. The figure for 2008 is, however, unchanged from 2007 at 42%. The low category is likely to be the most volatile of all the measures in terms of College participation as it seems possible, in the case of 2010 data, that it was affected by schools' performance in that year. This is not withstanding that there are likely to be other factors at play, particularly in explaining the drop in low prior achievement (and vocational) students in 2008. This suggests that concentrating on the impact on middle income groups rather than at the extremes may be more worthwhile, assuming income levels are closely correlated to prior achievement; Sutton Trust (2008) suggests that concentrating on the extremes for an impact of policy on social mobility might well be unrealistic given that changes are likely to be intergenerational.

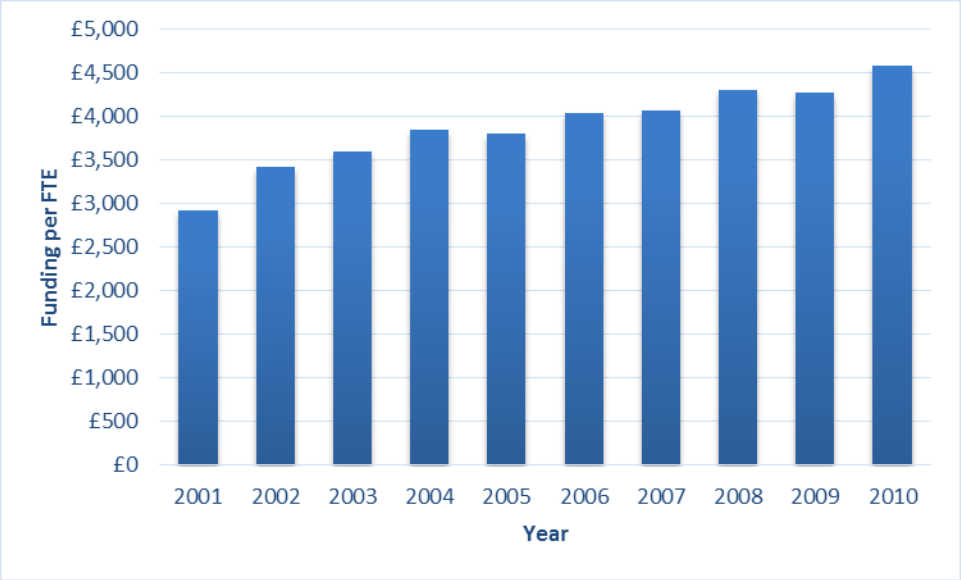
4.4 Time series variables

The research considers two time series variables, funding per student (FTE) adjusted for inflation and the 'catch-all' variable year, as the College is concerned with the impact of the policies over a period in time and the increasing levels of funding over the period 2001 to 2010. A key research question being: 'To what extent has the investment in the sector between 2001 and 2010 delivered value for money in the case study college?' The period of study is selected because it corresponds to era of increased investment in national public services by New Labour (see section 1.5), and is associated politically with the WP Agenda (Kennedy, 1997).

4.4.1 Funding

The 10 year period 1998 to 2008 was characterised by favourable economic conditions; according to the European Central Bank (2015), the GDP in the UK grew on average by 3% per annum until the start of the recession in 2008. The tight public spending in NL's first term gave way to big increases in the second term. In the late 1990s, education spending declined to 4.3% of GDP in 1998. In the 2000s, education spending increased rapidly, rising to a peak of 6.1% of GDP in 2010 (Chantrill, 2013). At a micro-level, the College (Figure 4.10) shows that the increases in public spending on education translated to an increase in funding per student (FTE). On average there was a 5% increase in funding per student (FTE) each year during this period, although there was considerable variation year-on-year.

Figure 4.10 Funding per student (FTE) in £s



Source: College's Financial Statement for the period 2000 – 2010

Despite this investment, there is evidence that investment in the FE and HE sectors may come too late in a leaner's development (Bergh & Fink, 2006) and the state of the wider economy may be a more important factor at this stage in the education process (McVicar and Rice, 2001). The impact of economics on education implies that credit constraints are still seen as important (Kane, 1996) and NL's Third Way and the quasi market structures in place in the sector have been identified as having the perverse impact of maintaining the current status quo (Francis and Perry, 2010). National policy directives to address such issues, such as the EMA, are also only seen as having limited impact (Chowdry , et al., 2007). Recognising these concerns, the research presented here has developed a funding variable sourced from the College's financial statement of the period to assess the effects of funding increases on the College and whether the impact has been more positive than current evidence would suggest.

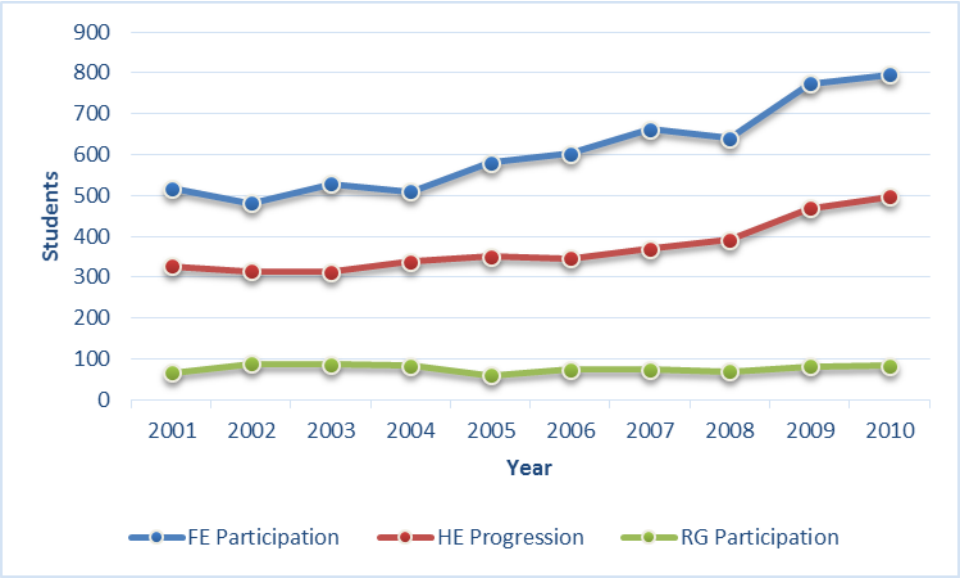
During this period the funding agencies deployed a lagged funding system, whereby growth in student numbers was not funded in the year students were enrolled, but in the subsequent year following a bidding process. The rate of change in funding per FTE fluctuated throughout the period, with the largest growth in the early years of the decade, and for years 2005, 2007, and 2009 there were real term cuts in funding, but this may have been partly due to this lagged funding system. The figures in table 4.1 reveal, despite the year-on-year fluctuations, that the funding rate increased by 49% in cash terms and over 22% in real terms, representing a 2% real term increase in funding per annum. (For the analysis in chapter 7 where 2001 is not included in the data, because of missing

observations of the prior performance variable, this increase is less, but still substantial at close to 15% in real terms). It should also be acknowledged that the funding rate per student stood at £4,425 by the end of the period; however the rate in 2015 stood at £4,000 per student, which equates to £850,000 difference in annual income based on the College cohort of circa 2000 students, which if funding is found to be an important factor in performance, has severe implications for the current environment.

4.4.2 Year

In this research, year is a time variable and a 'catch-all' for factors or variables that have been changing over time and are not specified elsewhere in the model; this could be factors at the college, the local area or nationally. It may also reflect aspects of the widening participation agenda that are not directly related to increases in funding and it should be acknowledged that year may also be a proxy for other changes (grade inflation, for example, which may be a factor in performance investigations and in students progressing to HE). The economy and supply side issues from universities are also possibly factors. Figure 4.11 shows that for participation at the College and HE progression there were large increases in student numbers, particularly towards the end of the period. For RG progression the numbers have remained flat, with a possible decline over the period. Previous studies based on the EPF approach using data with a time series element have generally used a time trend or time dummy variables to capture such effects.

Figure 4.11 Education progression outcomes of students by year (numbers)



Source: College data

4.5 Conclusions

The theoretical framework in this research follows the principles of EPF theory and this chapter presented empirical studies and issues related to the variables used in this model, looking at the educational progression outcomes and inputs in turn. The educational progression outcomes of primary interest are College participation, HE progression and RG participation for the College cohort; FE and HE progression were the established WP policy targets and RG participation was used as a possibly closer proxy for social mobility. In terms of the WP policy targets (educational progression outcomes), previous studies of the general population suggest that there has been little impact on College participation from less advantaged groups, and this research suggests that market forces in the jobs and education sectors may be a factor in the increased numbers overall at the College. HE progression has increased, including the numbers from less advantaged groups if measured by FSMs, but generally research indicates that inequalities in HE progression in terms of less advantaged students were largely unchanged over the period. There is some debate about whether RG participation alone is a true signal that social mobility is achieved given that students' university choices are based on complex factors. Evidence from the literature suggests that RG participation from less advantaged groups for the general population has not improved over the period 2001 to 2010 and that the UCAS application process, for whatever reason, discriminates against less advantaged students in terms of securing a place at a RG university; the finding for the College also shows a decline in this participation rate.

Problems with using the WP Factor as a proxy for less advantaged students have been highlighted, with a proposal to use a consistent measure throughout the period, i.e. IMD 2010. For College data and using the WP Factor (adjusted) measure there does not appear to be a rebalancing (narrowing) of the gap in favour of less advantaged students. The WP Factor (uplift) measure gave different results than the adjusted measure in the descriptive and time trend statistical analysis which could be misleading to management, particularly for College participation. The analysis also suggested that using the Chi-square test can be problematic where the concern is with a sustained increase, as a significant outcome may be highlighting some other form of association.

The educational inputs (student attributes) that from the literature expected to be correlated with widening participation are considered. It is acknowledged that male students are underrepresented and achieve less well than females in post-16 education, but the picture in terms of achievement and progression to the professions is perhaps less well established. For the College

there is a gender gap in favour of female students and the gap does not appear to have narrowed. In terms of ethnicity the position is even more complex given the variety of ethnic groupings and the religious breakdown within groupings, but generally progress and HE progression of non-White students is superior to White students at 18. For the College the number of non-White students remained fairly constant over the period, while White numbers have increased; this is perhaps a positive trend for social mobility in light of White male students being an underrepresented group in FE. Curriculum change is a mechanism used by governments to drive social mobility and the WP agenda, but in itself can cause achievement rates to fall. That said, research evidence suggests that vocational provision is not a barrier to HE progression and there is evidence at the College that the number of students on vocational courses increased, coinciding with an increase in the number of low prior achievement students. Numbers in the low category for prior achievement however fluctuated year-on-year, possibly due to fluctuations in schools' performances rather than policy decisions nationally or at the College. In terms of the time series variables, the College data shows an increase in funding per student (FTE), equivalent to a 2% real term increase per year, although much of the increase was front loaded to the early years of the decade. In terms of year, the 'catch-all' variable, the numbers progressing to FE and HE based on College data have increased, but the numbers participating at RG have remained fairly constant, thus representing a decline in the percentage of cohort progressing to HE.

In chapters 5 and 6 this research presents analyses of the relationships between student attributes and changes over time (year), focusing on the percentage of cohort achieving these outcomes. Year in this analysis is a 'catch all' variable rather than considering why changes have taken place, but none the less, is important as a concern in determining the efficiency and effectiveness of WP policies over time. These chapters consider each variable in turn, thus ignoring possibly important correlations between them that have been considered in this chapter. Chapter 7 investigates the probability that educational progression outcomes are explained by changes in student attributes; in this analysis a funding variable is added that considers the effects of funding increases directly. The inclusion of the variables together in the analysis enables an estimation of the effect of the independent variables having factored out correlations between them. Prior to this, Chapter 4 reports on established performance data for the College and the sector and explains the difficulty in establishing a reliable value for money measure.

5 Published performance data

5.1 Introduction

Prior to analysing the secondary data for the College, the current chapter draws on published performance data for the College, the region and nationally, acknowledging the difficulties in finding an accurate assessment of institutional performance in terms of social mobility and value for money. It should be recognised that OFSTED provided a value for money grade for institutions, so it is important to analyse existing measures, especially as some are commonly used by the general public in assessing institutional performance, although not always with due regard to their limitations. Ultimately, the aim of this chapter is to lay the foundations to address research question 3: 'To what extent has the investment in the sector between 2001 and 2010 delivered value for money in the case study college?' while establishing why further analysis is of importance.

This chapter starts with an explanation of the OFSTED grading system and outlines empirical evidence on the effectiveness of the system itself. OFSTED inspection grades are ultimately the overriding measure of an institutional performance, but school and college performance tables are universally recognised as an important quality measure in the sector, being a more regular assessment of institutions quality. This chapter investigates empirical studies of school and college performance tables, before setting out the descriptive analyses of these tables for the College, the region and nationally; essentially to determine whether there were any improvements over time. Success rates is a quality measure used in the FE sector, with exceeding the national success rate benchmark being the key target for colleges striving to achieve 'outstanding' in an OFSTED inspection. The chapter then considers 'value for money', a key concern of the research, which seeks to analyse the efficiency and effectiveness of WP policies and the associated public investment. The Advanced Level Performance System (ALPS) is a commonly used value for money measure in the sector and is the one adopted by the College, so a brief explanation on how this system operates and how the College performed over the period is given. The chapter concludes with a review of the key financial indicators that determine the financial health of the College and considers empirical evidence on the effectiveness of certain types of expenditure.

As outlined in section 1.9, the research will contribute to professional practice by examining the standard measures used in determining the performance of institutions. The measures used will be scrutinised to determine whether they have a direct bearing on WP and social mobility objectives, given the continued political rhetoric in this field. It is acknowledged that the existing performance

measures are established tools used in the sector, but limitations of these measures will be examined through a discussion of current literature and the likely impact these standards have on decision makers within institutions discussed. The concern is whether any of these measures take account of WP objectives or are appropriate to incorporate into the statistical analysis that follows in Chapter 6. Essentially, this chapter examines a possible disconnect between national policy directives (such as those for WP), performance measures used within the sector, and decision making within institutions.

5.2 OFSTED

Since September 1993, OFSTED has overseen many thousands of inspections of English schools, involving observations of hundreds of thousands of lessons and other activities, and published a vast array of reports on schools and aspects of education. The credibility of OFSTED must then rest on the accuracy of the judgements in those reports (Elliott, 2012). In the early years of OFSTED the emphasis placed on ensuring accuracy and consistency impressed many (Wilson and Gray, 1995). Nevertheless, surveys towards the end of the first round of inspection in the late '90s found as many as 35% of Heads thought the overall judgements on their schools were inaccurate (Ouston et al., 1997). Other research has suggested that, a 'good' OFSTED report for an ineffectual teacher undermines Heads' efforts to deal with underperforming teachers (Centre for the Evaluation of Public Policy and Practice, 1999). OFSTED inspections have been challenged in terms of their reliability; for example, would two different inspectors come to the same conclusions if they inspected the same school a week apart? Further doubts have been raised by accusations that inspectors had 'cut and pasted' parts of old reports into new ones and that one OFSTED contractor had appointed lead inspectors who were not qualified teachers (Elliott, 2012). It is also difficult for schools to challenge findings, despite cases where reports are inconsistent and inaccurate, providing an unfair assessment of the school (Webber, 2011).

Concerns have also been raised about OFSTED's judgements on schools with the poorest and most challenging intakes. Mortimore and Goldstein (1996) argue that, in OFSTED's own research studies, there is a poorly understood need to take account both of intake and of the uncertainty surrounding any inferences based upon test scores and examination results. There is no weighting given to the socio-economic circumstances of pupils and the current approach is not to distinguish between schools using socio-economic background as it might embed low expectations in some schools and let down less advantaged students (Webber, 2011). It has become apparent, however, that this approach has favoured schools with more advantaged intakes as they are far more likely to

receive good judgements than those serving poor areas. The difference can also be stark, as shown by Matthews and Smith (1995), who reported that 90% of schools in the two highest social contexts were judged favourably by OFSTED compared with only 10% in the two lowest social contexts. OFSTED has increasingly used contextual information, such as the number of children on FSM, to compare the performance of schools with those with similar intakes, but to little effect. Elliott (2012) states the example of a Bristol school, where exam results had improved considerably, but which only received a 'satisfactory' grade, and where the Head agreed that every school should aspire to be at least 'good', but argued it was very difficult for those in challenging circumstances. In a comparison of school residuals (the difference between a schools pupils actual and expected performance) with OFSTED inspection grades for those schools inspected since 2000, Benton et al. (2003) provide evidence that if behaviour and assessed teaching quality were removed from the OFSTED grades there is no significant relationship between the OFSTED outcomes and pupil progress when controlling for available background factors. In response, in June 2012, Michael Wilshaw announced a review into under-performance in deprived areas, focusing on how parents and educators can ensure the best possible start for pupils and why some children and young people are more affected by socio-economic and educational disadvantage than others (Burns, 2012).

The OFSTED framework for the 2000s included a judgment based upon 'The effectiveness with which the school deploys resources to achieve value for money'. The evaluation was divided into three sections as follows:

- Pupil outcomes.
- Effectiveness of provision.
- Leadership and management.

Judgments are made according to the following grade descriptors:

- Outstanding (1) – *Outcomes for individuals and groups of pupils are outstanding. There are no major shortcomings evident in the use or management of resources.*
- Good (2) – *Outcomes for individuals and groups of pupils are good. There are no major shortcomings evident in the use or management of resources.*
- Satisfactory (3) – *Outcomes for individuals and groups of pupils are satisfactory. There are no major shortcomings evident in the use or management of resources.*
- Inadequate (4) – *Outcomes for individuals and groups of pupils are inadequate or outcomes may be satisfactory or better but there are major shortcomings in the*

management of resources, such as a significant deficit or surplus or a manifest lack of economy.

It is evident from this that the grade given for value for money is dependent upon pupil outcomes. The descriptor under 'inadequate' (number 4) is important to note. Although it would be hard, if not impossible, to show that there was good value for money with satisfactory outcomes, it can work the other way round. That is, a school graded as good, for example, might have a judgment of inadequate against value for money if it could be shown that there was either 'a significant deficit' or 'surplus'. In particular, schools which have retained money for a future project will need to demonstrate very clearly why they are holding back reserves.

The College's OFSTED grades during the period are shown in section 1.7 and show a 'satisfactory' score for value for money in 2008; 'requiring improvement' in modern day parlance[16]. This represented a fall from 'good' in 2004, although the score reverts back in 2011. That is, after a number of years of large increases in public investment the College's performance (as measured by OFSTED) declined in 2008. The College's OFSTED inspection report in 2008 identifies poor response by the College in tackling quality issues in a large programme area and essentially flagged issues with teaching in some areas of the College between 2004 and 2008. The improved OFSTED grade of 'good' in 2011 could have been driven by a change in management, given that a new Principal was appointed in April 2007, rather than by policy and funding directives from government. The impact of the internal management 'issues' identified by OFSTED, and the subsequent appointment of a new Principal, as a possible input into the EPF, are not directly analysed in this research. It is also worth noting that Sodha, et al. (2008) stress that the quality of teaching cannot be ignored in terms of the impact on educational outcomes. It could also be argued that the 'issues' at the College may well have had a disproportional effect on socially deprived students, as such students are likely to have less family support to compensate for any inadequacies in teaching.

[16] OFSTED grades from 2012 – 'outstanding', 'good', 'requires improvement', 'inadequate'.

5.3 School and college performance tables

The use of school/college performance tables displaying the average point score per student and the average point score per examination entry is used extensively in the sector to assess performance, and is perhaps the most recognised measure of performance in the education sector. These tables provide information on the achievement and attainment of students of sixth form age in local secondary schools and FE colleges, and how they compare with other schools and colleges in the area and in England as a whole. Each entry gives information about the attainment of students at the end of advanced level study in A/AS and Vocational level examinations and equivalent qualifications. The tables are intended to be considered alongside other sources of information such as School Profiles, OFSTED reports and school/college prospectuses. Performance tables continue to sit at the heart of the 'accountability framework' imposed by successive governments. They are intended to focus the debate on standards and strengthen the accountability of schools and colleges. The tables are also purported to provide a reliable and accessible source of comparative information on pupil attainment and progress, absence, workforce and finance, and are a key element of enabling student and parental choice. That said, the tables do not truly reflect different student attributes within the cohort and this section indicates that they are not a reliable measure of value for money.

It is generally accepted that school performance tables are based on a narrow definition of pupil performance and according to Goldstein (1997), it is impossible to capture a school's contribution to pupils' wider education or to their social and personal development through performance tables and there are other factors, such as sex, ethnic origin and social class background, which are associated with performance in secondary schooling. Even with the use of contextual value added data, the work that schools do to narrow the achievement gap is not fully reflected in performance tables. This, therefore, gives a potentially misleading impression of the quality of schools which serve disadvantaged areas. The information provided by the tables also fails to reflect the character, ethos and catchment area of a school (ESRC National Centre for Research Methods, 2011). It is argued by the National Union of Teachers (2015), that the tables widen the gap between schools in better off communities and those in economically and socially less advantaged areas, with many good schools falling into the bottom half of the tables because they serve poorer communities. They also argue that performance tables are over-reliant on pupils' qualification or test results; this puts schools in an invidious position of teaching to the test, which in turn narrows the curriculum for pupils. Performance tables can then act as perverse incentives as schools may feel constrained to concentrate on pupils at the borderline of achieving government determined indicators of achievement. As a

result, the current approach to publishing test results does not directly raise achievement or improve schools and it does not benefit individual pupils (Confederation of British Industry, 2012).

Furthermore, there is a well-established link between child poverty and academic attainment yet performance tables fail to reflect the hard work that schools put in to try and compensate for the poverty that many children experience (Hirsch, 2007). Some schools may, as a result, be reluctant to admit children with special educational needs (SEN) or those who have behavioural problems if they feel they might affect the school's position in the tables. The National Union of Teachers (2015) state that recognising the achievements and progress of children with SEN requires a move away from narrow measures of attainment, as reported in the tables, to look at a child's all-round achievement. It is worth noting that Scotland and Northern Ireland do not publish performance tables because of, what is considered to be, their adverse effect on schools and the limited information they provide. In Scotland, according to the National Union of Teachers (2015), performance tables have never been published and this has not affected the quality of education nor parents' satisfaction with the level of information they receive. In terms of the empirical evidence, parents do not find performance tables particularly useful for choosing schools (Lea, 2008), and in some studies, the public does not support the tests and examinations on which performance tables are based; 61% of people agree that:

"so much attention is given to exam results that a pupil's everyday classroom work counts for too little"; and 64% think that "schools focus too much on tests and exams and not enough on learning for its own sake" (National Centre for Social Research, British Social Attitudes, 2010, p. 66).

It has also been found that current performance management practices may reduce real learning in schools and may most adversely affect those pupils already at risk of educational failure. It is acknowledged, however, that performance management has the potential to contribute to social inclusion if appropriate indicators are developed that help identify need and support appropriate interventions (Ozga, 2002).

Moving onto the tables themselves, during the 2000s there were two major changes in the data contained within the tables:

1. The introduction of new general and vocational A Level and Advanced Subsidiary qualifications in 2000 (Curriculum 2000) meant that the data for 2001 only included results in former A Levels and Advanced GNVQs. The first full set of results for the new

GCE and Vocational certificate of Education (VCE) A Level qualifications were issued in the summer of 2002, and were the basis for the 2002 tables.

2. In 2006, further changes were made; previously the main performance indicators published in the tables were based solely on A Level and AS examinations and Key Skills at advanced level. Achievements in certain other advanced or Level 3 qualifications – e.g. BTECs and the International Baccalaureate Diploma, were included but shown separately. In 2006, other Level 3 qualifications are included in the tables on the basis of their equivalence with A Levels.

A qualification's 'equivalence' is quantified by looking at its size and the level of challenge it poses compared to an A Level. The purpose of this is to report different types of qualifications on an equitable basis, rather than to make judgements about the value of particular qualifications, and to give schools and college full recognition for their students' level 3 achievements. The key measures in the tables throughout the period were:

- The average point score per student.
- The average point score per examination entry.

A detailed explanation of how the average point score per student is calculated is shown in appendix 5.3.1 and for the average point score per examination entry in appendix 5.3.2. Both average point score calculations are based on the cumulative achievement of students, usually over two years. The average point scores published before 2006 were based on the UCAS tariff; however, this did not extend to all approved qualifications at Level 3. The Qualification and Curriculum Authority (QCA) developed a scoring system for all Level 3 qualifications approved under Section 96 of the Learning and Skills Act 2000, so they can be included in the performance indicators in the tables. The point scoring system developed by QCA is designed for use as a means of measuring institutional performance in the tables. It is not intended that it should replace national systems used for other purposes, such as the UCAS tariff used to decide student admission to higher education. Therefore the tables from 2006 cannot be compared with those from 2001 to 2005 as they do not include the wider range of qualifications.

The criterion of points score per entry relates to the level of the grades which students achieve per A Level subject, ranging from A*-E, and it is not surprising that there is a direct correlation between achieving high grades at GCSE and achieving high grades at A Level; indeed the literature review to this thesis (appendix 1.2) indicated that an important predictor of achievement is prior attainment.

For the College and based on 2013 data, students come to the College with prior attainment in terms of GCSE grades below the national average, and yet, in terms of high grades, achieve only 2% below the national average when, if they achieved in line with averages, they would achieve 11% below. Thus the college at this point achieved 9% above what it might achieve if it were classed as average. DfE performance data for 2013 shows the College in the bottom (fourth) quartile for students' prior achievements, yet its students achieve results which put it in the second quartile, thereby demonstrating that it is achieving above average performance given its cohort of students.

The College has a higher retention rate than the average for sixth form colleges, as well as above average pass rates. The high percentage of students who achieve at least three A-levels and high average points per student is evidence of good practice at the College in terms of keeping students on full programmes (essential for progression to HE), instead of simply withdrawing those students who will achieve E or U grades at AS level. This practice is, however, expected to bring down the 'average points per entry'. A comparison with schools' average point score per entry is, therefore, not comparing like with like; schools' funding and judgements relating to quality are not based on the retention of students, schools do not tend to enter students who they think are at risk of failing the exams, thereby raising their points per entry by the non-submission of students for exams. This practice boosts both 'average points per entry' and value added.

A large number of students take A Level General Studies as an additional (4th) A Level, but may achieve a lower grade in this than in their 'core' subjects. The additional qualification serves them well for progression, yet its removal from the 'points per entry' measure increases the score by almost 2 points for the College. It would be straightforward to increase the points per entry score simply by changing the College's practice in relation to full programmes, withdrawals and additional qualifications, but it is questionable whether this would be educationally sound, particularly for those students from less advantaged backgrounds.

There is increasingly a debate nationally about the importance of Facilitating Subjects[17] . The College (2013 data) is below average for the number of students achieving three A Levels, with at least

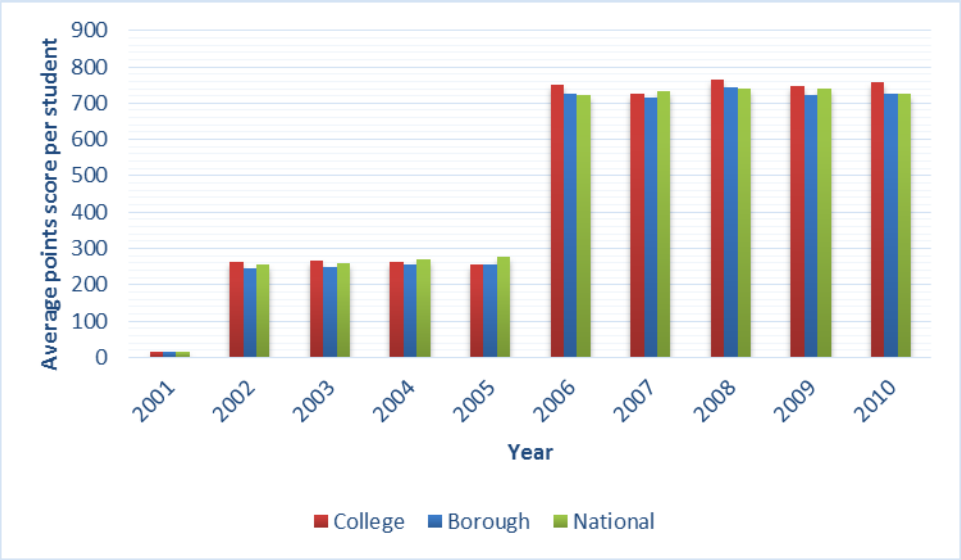
[17] Some advanced level subjects are more frequently required for entry to degree courses than others and these subjects are called 'facilitating' because choosing them at advanced level leaves open a wide range of

two in Facilitating Subjects at grades AAB or higher. This outcome is both a feature of the high grades issue discussed above and a result of the curricula and achievements of high schools in the MB from which the College enrols the majority of its students. These high schools are not high achieving in general, especially in terms of OFSTED scores (see section 1.7). Very few students actually follow a programme with at least two Facilitating Subjects. It is also inevitable that sixth form colleges, with their typical curriculum offer of over 40 A Level subjects, will have a lower proportion of students actually taking up two or more Facilitating Subjects than school sixth forms, which tend to offer fewer than 20 subjects, the majority of which are subjects taught in the lower school (including Facilitating Subjects). This is not a measure of quality or standards that can be applied across the post-16 education sector, but it is worth noting that anecdotally there are early signs that students' subject choices are moving towards Facilitating Subjects in order to boost their chances of entry to HE and in particular RG universities.

The performance table statistics are shown in figures 5.1 and 5.2 and apart from the step-like pattern reflecting the different scoring systems, there does not appear to be any major shifts in the pattern of scores. Figure 5.1 shows that in terms of average point score per student, the College slightly out performs local and national averages. However, in figure 5.2, which shows point score per examination entry, the College is below local and national averages. Essentially, the College performs best at keeping students on programmes, but this has an impact on achievement levels.

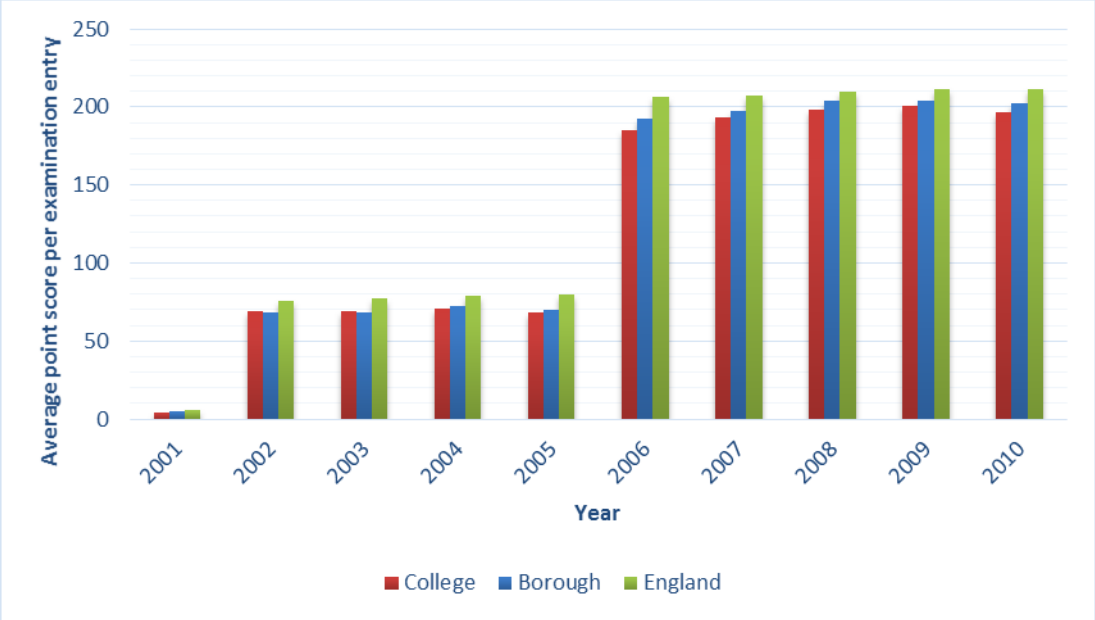
options for university study. These facilitating subjects are: biology, chemistry, English literature, geography, history, physics, modern and classical languages, maths and further maths.

Figure 5.1 Sum of average point score per student for the College, metropolitan borough and nationally



Source: MB school and college performance tables

Figure 5.2 Sum of average points score per examination entry for the College, metropolitan borough and nationally



Source: MB school and college performance tables

Thus, although performance tables are the most recognised system for judging the performance of schools and colleges, the system can be seen to be flawed as it does not recognise the make-up of the student cohort. In particular, it does not allow or recognise differences in prior attainment and family background which are acknowledged to be key attributes in determining educational progression outcomes (see for, instance, Levacic and Woods, 2002). Nor do they recognise the particular situation of sixth form colleges and the additional requirements put on them

in terms of progression. However, in terms of the College, the results have not seen a large improvement over the period despite the increase in public investment in the sector.

Recently there are signs that governments are willing to address the short comings of the tables with the inclusion of a value added measure and the performance of students in particular circumstances, i.e. students claiming FSM, however, the tables remain a statement of an institution's performance in achievement terms. Further complications arise in the sixth form sector where judgements are based on success rates, which include retention as a key element of the calculation. Schools are able to remove students from post-16 programmes without penalty, but this is not an option for sixth form colleges, which makes school and college comparisons based on performance tables flawed. This aspect is examined in more detail in the following sub-section.

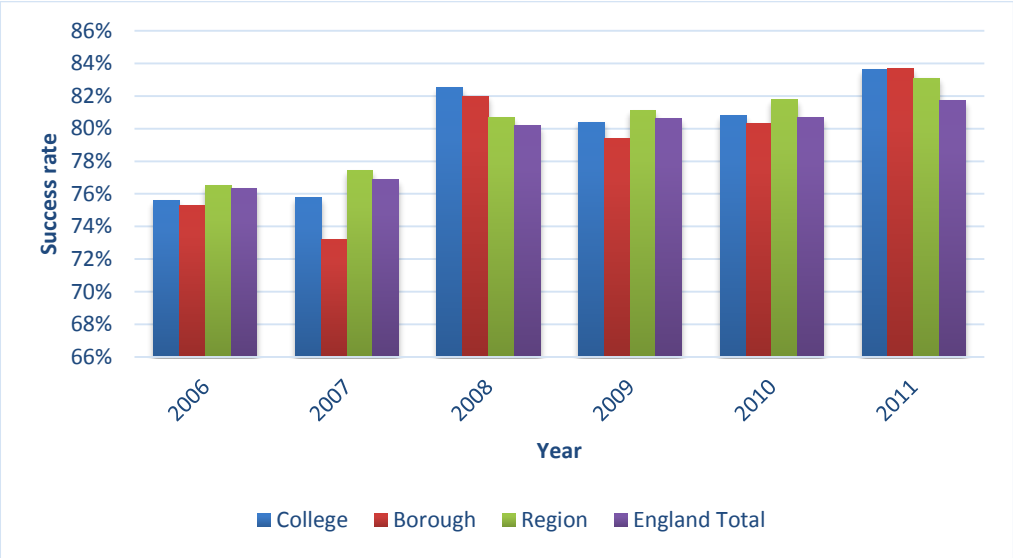
5.4 Success rates

In the FE sector, success rates (which are a factor of retention and achievement) were used to measure institutions' performance in value for money terms throughout much of NL's tenure in office (becoming operational in 2005). Success rates are used as a principal measure in reviewing the quality of delivery for qualifications and cohorts of learners. In management and strategic terms, improvement in success rates is the key indicators of quality improvement. Continued improvement in success rates remains one of the most powerful indicators of effectiveness and value for money. Success rates formed an important aspect of the governments' Framework for Excellence initiative and Skills Strategy for providers to reach Public Sector Agreement targets. The LSC produced annually Minimum Levels of Performance reports (MLPs), which examine provider performance against minimum success rate targets for different types of provision (50% FE long, 60% FE short, 85% FE very short, and 40% for WBL Frameworks). These MLP targets were based on traditional 'leavers' success rates.

Success rates were calculated here by multiplying retention rates and achievement rates; an explanation and example of the calculation is shown in appendix 5.4.1. Most approaches to improving success rates (York College, 2012) have focussed upon improving retention and tracking of progress as well as improving teaching and learning. Parallel measures have also concentrated on continuous assessment and targeting learners' progress using Individual Learner Plans (ILPs). Although success rates are perhaps a more rounded measure of an institutions performance than just raw achievement data, there is still no allowance for different student characteristics, such as family background and prior achievement.

Figure 5.3 shows the success rates for the College set against the MB, regional and national figures. Success rates came into force for the 2005/6 academic year and the College's overall scores increase substantially by 2011, although year-on-year changes were quite erratic. The College outperformed the MB in all years except 2011. The performance against the region and England was more mixed and no clear trends emerge. The performance of the College has varied between above and below the national and regional benchmark, but in all categories, success rates increased over the period.

Figure 5.3 Success rates for the College, metropolitan borough, regional and national



Source: College data

Success rates are a better measure of effectiveness and efficiency than performance tables as they include retention of students in the analysis; this is something missing from performance tables that purely register achievement of those who finish a course. This makes comparisons with school sixth forms a flawed comparison as school sixth forms are not measured by success rates and are able to withdraw students who are in danger of failing without penalty. This will artificially inflate school sixth form achievement statistics compared to sixth form colleges. Sixth Form College benchmarks are an establish quality measure used in the sector, but they are similarly flawed to performance tables in that they do not account for student attributes. Ignoring the difficulties with applying relative measures with other sixth form colleges, some of which are highly restrictive in terms of intake, the College has seen an increase in success rate performance over the period (figure 5.3), which is not necessary the case in the performance table data (figures 5.1 and 5.2). It could be argued therefore, that, using the success rate measure, increased public investments in the sector has had some impact on the outcomes in the College (although the effect on widening participation is not measured by this series).

5.5 Value for money

'Value for money' is a term that can be used to assess whether or not an organisation has obtained the maximum benefit from the goods and services it both acquires and provides, within the resources available to it. Achieving value for money is often described in terms of the 'three Es' – economy, efficiency and effectiveness. Value for money is based not only on the minimum purchase price (economy) but also on the maximum efficiency and effectiveness of the purchase (A Brief Guide to Value for Money, 2011). Value for money does make intuitive sense, especially in an educational setting, but is harder to pin down in practice (Saunders, 1998). This was evident in the FE sector during the period 2001 to 2010, where there was no formal objective value for money measure (or target) of student and institution performance.

In the current age of austerity with large funding cuts, it is increasingly important that resources are directed to where they have the most impact. It is a feature of the current OFSTED regime that schools need to demonstrate, for example, where the Pupil Premium Funding was spent, and perhaps more importantly the impact of this expenditure. This is in the context of future funding levels which are set to decline to below £4,000 per student, which equates to pre-2004 levels in monetary terms. Proportionately less advantaged students may get more of this shrinking pot, but for practitioners the realities of working in this environment are not only demonstrating the impact of additional funding for less advantaged students, it is about managing with less.

The drive for further efficiency savings by the recent governments could mean that inclusivity and delivering WP objectives may take a back seat; managing the financial health of the institution becomes the priority by maintaining a competitive advantage through maximising performance table statistics. It is interesting to note that the change in the College's vision from one of inclusivity to one that proclaims the pursuit of excellence (see section 1.8). This is a telling shift in emphasis given the continued emphasis of central governments to address social mobility through enhanced funding for

less advantaged students, such as the Pupil Premium Funding and disadvantaged funding applied in the FE sector[18].

The challenge for research, in terms of the contribution that value added can make to understanding school effectiveness and improvement, according to Saunders (1998) is to:

1. Isolate the pupil and school level factors which are associated with better or worse performance but are still undiagnosed.
2. Derive better models of what makes schools effective for different groups of pupils, especially those who are at greatest risk of underachievement.
3. Have a better theoretical grasp of the role of institutional and local 'climate' or micro-politics in school change and improvement.
4. Know how to involve teachers more deeply in action research so that teaching and learning processes in the classroom become a central instead of a peripheral aspect of this area of research.
5. Getting across key messages from the huge body of research findings in ways that make sense and are coherent and accessible to education managers and practitioners.

The research presented in Chapter 6 addressed many of the challenges for research expressed by Saunders. It investigated what student and College level factors impact on performance; developed models based on the EPF to gain a greater understanding on what does and does not work in practice; investigated the impact of education policy on less advantaged students in a relatively derived area of the country; and, evaluated various statistical methods which may aid dissemination to managers and lay people in the sector. The research did not focus directly on the impact of teaching (point 4 above), although it included curriculum change within the model.

[18] Disadvantaged funding recognises that some students require additional support to participate, and achieve full participation and improved attainment. This is a single budget that institutions use as they see fit and is based on economic deprivation and prior achievement – it came into effect in 2013.

5.6 A Level Performance System (ALPS)

The College uses a value added system called ALPS[19], which is used extensively in sixth form college sector. ALPS reports (Alkemygold Ltd, 2016) are designed to give a school or college analysis on how they have performed against national benchmarks at student, subject and overall level in terms of value added (where value added is in terms of current examination compared to previous examination performance).

The levels of analysis in the reports are based on the following performance indicators:

- Analysis of students banded by prior attainment – students are grouped by prior GCSE attainment to measure outcome performance against benchmarks.
- Provider A Level value added score – overall score for school and college taking into account performance by subject and student.
- Student performance – progression report – full report summary of students who complete 2 or more AS levels but not 2 or more A Levels.

Institutions are ultimately provided an overall grade of one to nine under broad curriculum headings as per table 5.1.

[19] The ALPS system, which reports on value added based on a National Dataset of 250,000 students, 700,000 A Levels and 1,500 schools and colleges. The reports use a grading and colour coding system for various indicators and benchmarks, typically kept for three to four years to allow schools and colleges to compare performance over time against a stable benchmark. The current A Level benchmark uses the complete 2010 national data set from the Department for Education, so there is a national comparison built in to the reports. However, this benchmark is not independent of other factors that may affect the outcomes, e.g. ethnicity and gender, or indeed social background, at least directly.

Table 5.1 ALPS grading system

Colour	Grade	% Range	Description
Red	1	≥the best in the benchmark	Outstanding
	2	90-99%	Outstanding
	3	75-89%	Excellent
Black	4	60-74%	Very good
	5	40-59%	Satisfactory to good
	6	25-39%	Below average
Blue	7	10-24%	Less than satisfactory
	8	1-9%	Relatively poor
	9	Below bottom of benchmark	Poor

Source: ALPS training January 2015 delivered by Martin Rostron

The College's overall score (see table 5.2) in 2002 was a grade 7 for A Level which equates to the bottom 25% of Colleges, while AS was graded a 2, i.e. in the top 10% of Colleges; there was no score for BTEC courses at this time. The College improved over the period for A Level, ending the period in the top 25% A Level. The AS measure showed considerable fluctuations, initially worsening considerably, but reverting back to 2002 levels by the end of the period. BTECs were included in the measure from 2009 and the College was in the top 10% for ALPS.

Table 5.2 Overall ALPS grades by programme

	2002	2003	2004	2005	2006	2007	2008	2009	2010
A	7	5	4	4	4	5	4	3	3
AS	2	6	5	3	4	4	2	2	2
BTEC	-	-	-	-	-	-	-	2	2

Source: College records (see table 5.1 for grading system)

Public sector investment may therefore have impacted on the ALPS score, which is perhaps a better measure of quality than say performance tables and success rates (discussed in sections 5.3 and 5.4 respectively) as it accounts for the starting point of each student in terms of examination performance. As discussed in the literature review to this thesis (Cahill and Ermisch, 2012), schools have very little impact in reversing the cognitive skills deficit of some students, yet the ALPS scores are showing the College being in the top 10% for AS and BTEC and top 25% for A Levels when prior achievement is taken into account in determining a measure of institutional performance. In social mobility terms, the College is 'adding value' to students' educational outcomes, compared to most institutions.

Furthermore, ALPS indirectly to some extent accounts for less advantaged students, as prior achievement and family background are closely linked (Cahill and Ermisch, 2012). However, low prior

achievement may also be due, for instance, to lower intelligence, prior schooling or peer effects (section 4.3.5). Certainly the low prior achievement students at the college, as recognised by ALPS, are not necessarily all registering as less advantaged if the WP Factor measures are used. The literature, although generally welcoming value added measures (ALPS being a value added system used by a number of sixth form colleges), as an improvement on unadjusted performance tables, there is general support of the view, however that taking account of prior performance does not fully account for the effect of family background on performance. For instance, Benton et al. (2003) state that:

"Taking attainment into account does not clear away all extraneous factors; it is clear, for example that factors such as social deprivation have an impact, even on value added progress measures." (p. 3)

There is also been a criticism that the assumption that the mean GCSE score (which is used in ALPS) is not the best predictor of A level grades (Bell, 2000). In addition, Sutton Trust (2008) has recognised the need for a more pragmatic and long term view in measuring social mobility.

ALPS, however, represents a valuable institution-to-institution comparison indicator and may also be to some extent an indicator for social mobility as prior achievement is accounted for in the analysis. Including students' ALP scores in the model estimated in the next chapter would have been a useful addition to knowledge; however, as table 5.2 shows, ALP scores for vocational programmes were not available for most years. From 2015 the College does record student ALPS target grades and outturns on the student data base, so including ALPs in the model would be possible in future research and may improve the estimation of the WP performance. However, by itself, it does not address WP objectives directly, as it solely relies on point scores as the 'starting point'; other variables such as family background, gender and the type of programme followed need to be included in a model designed to consider WP and social mobility.

5.7 Financial review

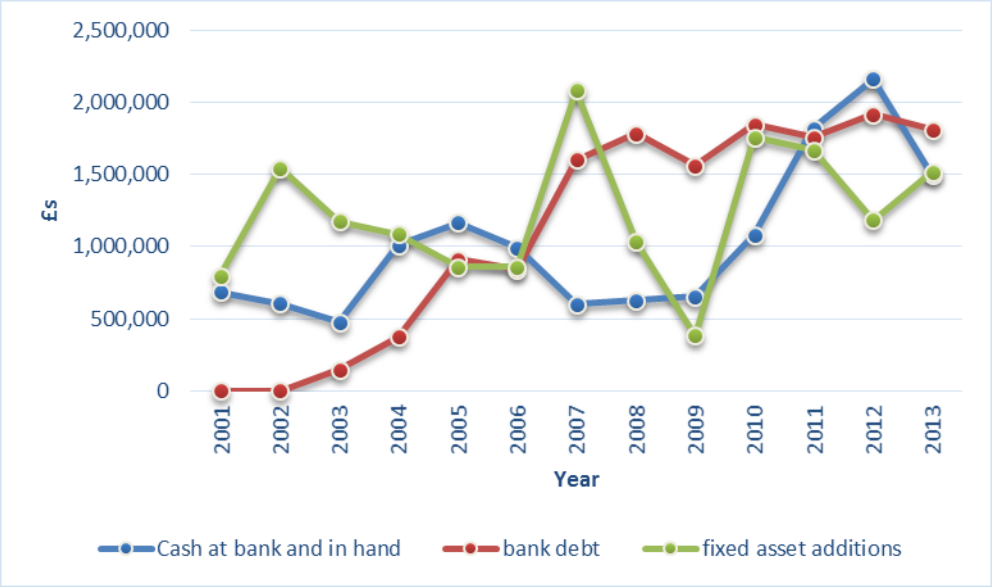
In 1992, following the Further and Higher Education Act (1992) (the Act) all FE Colleges and sixth form colleges became incorporated. By virtue of the Act, all colleges received funding from the Further Education Funding Council (FEFC), whose name changed to the LSC in 2000. As part of this process, colleges became independent bodies and their solvency became the sole responsibility of their governing bodies. This replaced the previous system whereby colleges were funded, and to a large extent controlled, by Local Education Authorities (LEAs). This analysis involves a financial review

of the College for the period 2001 to 2010, which is the same time period for the statistical analyses that follows in Chapters 5 to 7. In this way, comparison can be made between the financial data and expenditure decisions made by the College and the student secondary data used.

5.7.1 Cash/liquidity and capital investment

In cash/liquidity terms, the College (figure 5.4) has been strong, with an average cash balance of £970,000 at the end of each financial year. The College invested heavily over the period in new buildings and equipment; nearly £12 million. This was part funded by increased borrowing and the level of debt at the end of the period stood at £1.8M. Most of the capital investment was funded from reserves (cash generated over the period), although there were grants made available from the funding Councils over the period and the total value of these grants stood at £1.8 million in 2010.

Figure 5.4 Liquidity and investment, £s



Source: College Financial Statements

Public investment in terms of the increased funding per student (FTE) and capital funding in the period allowed the College to invest heavily in facilities for students, but little is known about how the condition of school facilities affects academic outcomes. Research in city and state tests in the USA (Duran-Naruchi, 2008) examines the role of school attendance as a mediator in the relationship between facilities in disrepair and student grades. Data on building condition and results from standardized tests were analysed using a sample of 95 elementary schools in New York City. Variables related to academic achievement such as ethnicity, socio economic status, teacher quality, and school size were used as covariates. In run-down school facilities, students attended less days on average and had lower grades in standardized tests. Duran-Naruchi provides empirical evidence of the effects of

building quality on academic outcomes and considered the social justice issues related to this phenomenon.

A review of the literature in the UK (Higgins et al., 2005) found that it is extremely difficult to come to firm conclusions about the impact of learning environments because of the multi-faceted nature of environments and the subsequent diverse and disconnected nature of the research literature. There is clear evidence that extremes of environmental elements (for example, poor ventilation or excessive noise) have negative effects on students and teachers and that improving these elements has significant benefits. Once school environments come up to minimum standards, however, the evidence of effect is less clear-cut. Their evaluation suggests that the nature of the improvements made in schools may have less to do with the specific elements chosen for change than with how the process of change is managed. The ownership of innovation, in contrast to the externally imposed solution, appears to tap directly into motivational aspects which are key factors in maximising the impact of change. They propose that changing the environment is still 'worth doing' if it is done as a design process.

In terms of the school built environment, they conclude that:

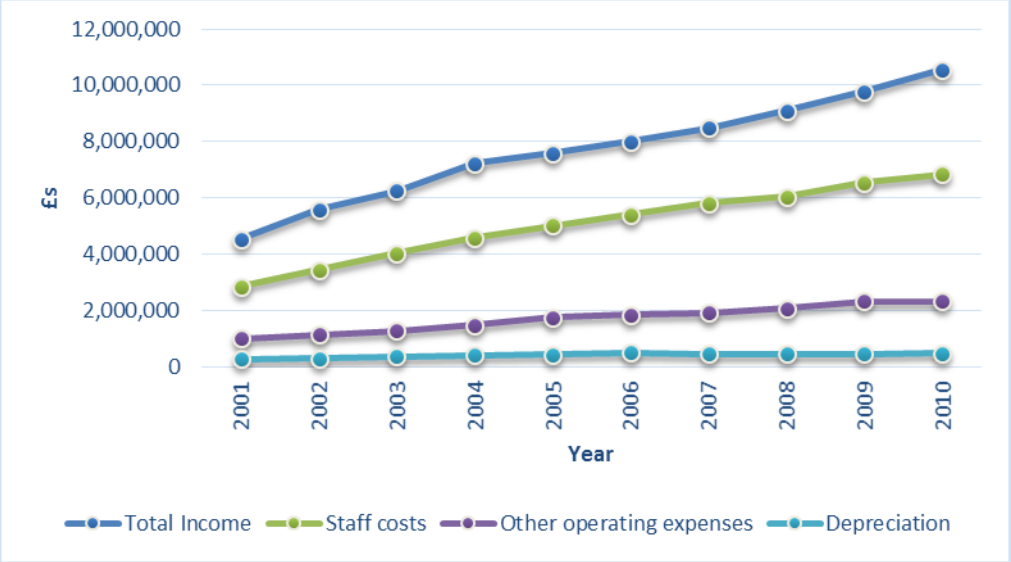
- There is strong, consistent evidence for the effect of basic physical variables (air quality, temperature, noise) on learning.
- Once minimal standards are attained, evidence of the effect of changing basic physical variables is less significant.
- There is conflicting evidence, but forceful opinions, on the effects of lighting and colour.
- Other physical characteristics affect student perceptions and behaviour, but it is difficult to draw definite, general conclusions.
- The interactions of different elements are as important as the consideration of single elements.
- There appears to be a strong link between effective engagement with staff, students and other users of school buildings and the success of environmental change in having an impact on behaviour, well-being or attainment.

5.7.2 Income and expenditure

The College was financially strong throughout the period, operating with annual surplus each year at an average of £485,000 over the 10 year period. The period is characterised by large increases

in income each year with 133% growth in income over the period, see figure 5.5. This favourable financial position was predominately a factor of the growth in student numbers, see appendix 5.7.1 which sets out the student number position for full-time, part-time and FTE students. Expenditure levels also increased considerably over the period, with pay expenditure increasing by 141% and other operating expenditure increasing by 135%, both slightly more than the income growth in the period. Despite the increased investment in fixed assets, depreciation costs only increased by 81%.

Figure 5.5 Income and expenditure account, £s

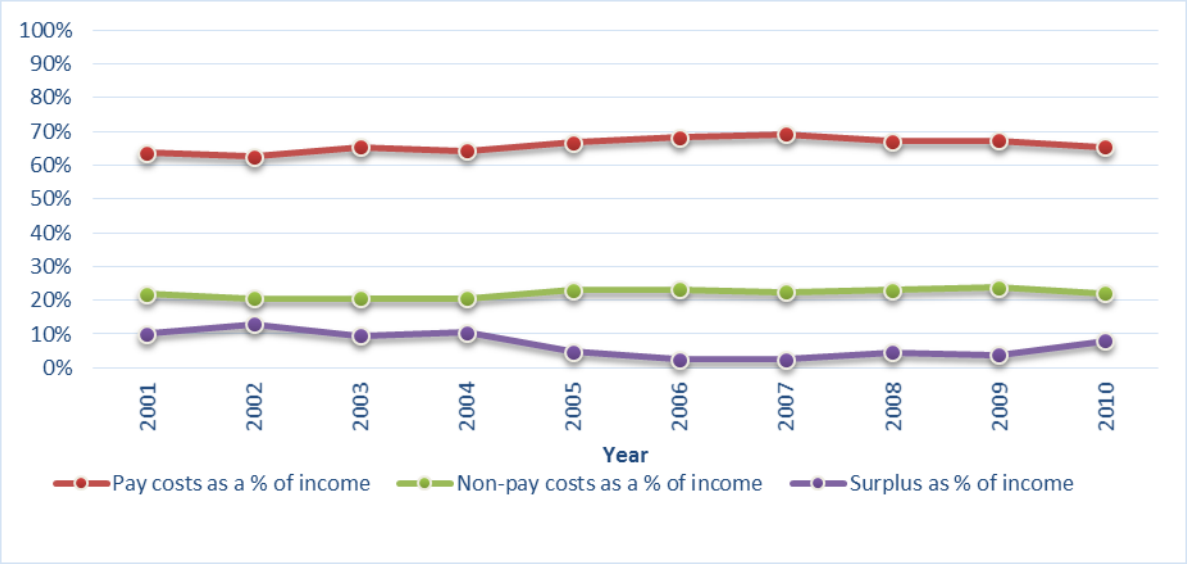


Source: College Financial Statements

Figure 5.6 shows three key financial indicators for the College, all represented as a percentage of income. The percentage spent on pay fluctuated over the period, from 63% to 68%, but there was no trend other than perhaps a small year-on-year decline from 2007. Non-pay costs are around 20%, but again there are no identifiable trends over the period other than a dip in 2010, coinciding with a similar dip in pay costs. The Financial Statements for that year identified that the College was acting proactively to respond to funding cuts post-2010 and this resulted in a spike in the surplus for that year. The surplus as a percentage-to-income would indicate that the early part of the decade represented the more favourable funding climate with the highest percentage surpluses to income. From 2005 to 2009 the surpluses-to-income percentages were the lowest of the period, perhaps indicating a less favourable funding climate, but the percentages were still in line with the financial objectives of the College. It is difficult to draw too many conclusions as to the relative funding positions year-on-year as colleges do have the option to build up reserves in the year to fund building projects or restructure programmes, as was the case for the College in 2010. Overall, the average surplus-to-

income percent for the period was 7%, which is above the notional target set by the College of 3% and therefore represents a strong financial position throughout the period.

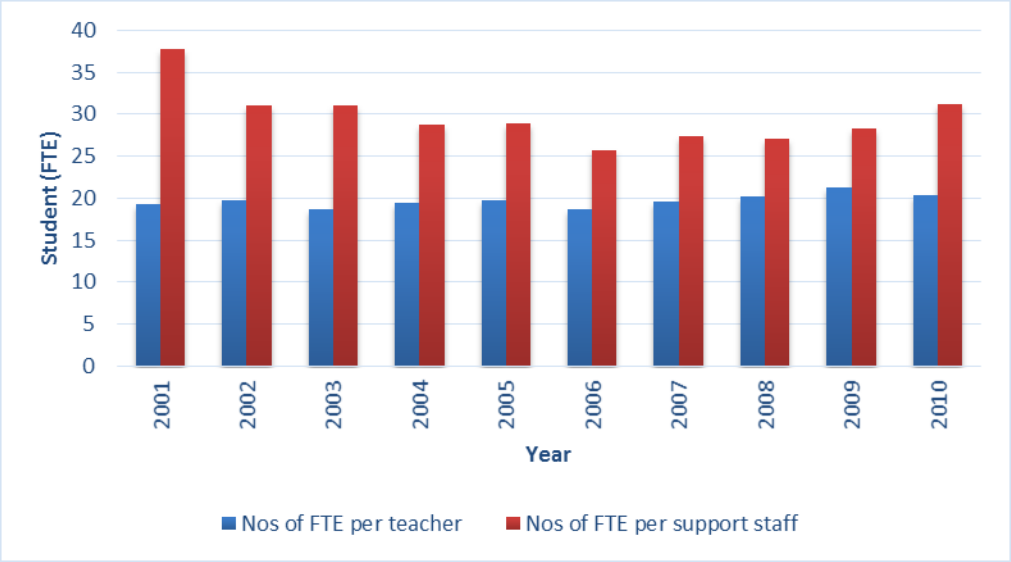
Figure 5.6 Financial indicators, percent



Source: College Financial Statements

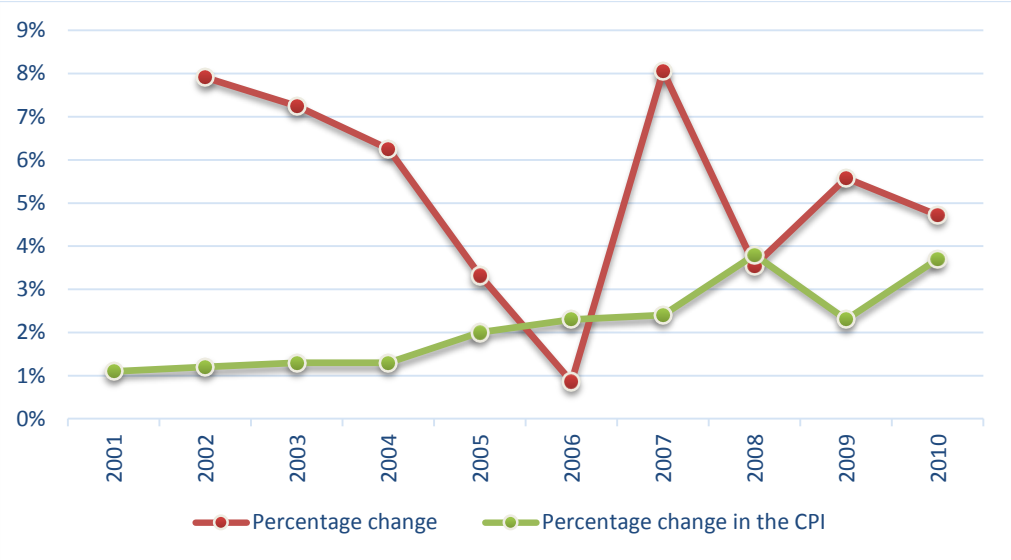
The number of student FTEs per teacher, figure 5.7, remained fairly flat over the period, indicating that there was no major shift in class sizes. For support staff the findings fluctuate quite extensively over the period; in the first half of the decade the student FTE ratio to support staff fell. This means the numbers of support staff increased in relation to student numbers and there are no apparent explanations for this or for the corresponding decrease from 2006. This may be an indication that support roles were added as funding per student (FTE) was increasing at the largest rate at the start of the decade (figure 4.10). A possible issue is the type of support staff role, either teaching support or administrative support, but given the current debate about the lack of impact of certain teaching support roles (Coe, 2013), it is far from certain that expanding teaching support roles would have more impact than spending the same amount on increasing the number of qualified teachers in the classroom. The average salary increased each year and in most years this was above the rate of inflation (figure 5.8).

Figure 5.7 Number of students (FTE)/staffing



Source: College Financial Statements

Figure 5.8 Percentage increase in salaries and CPI



Source: College Financial Statements

Initiatives to reduce class size to boost achievement are thought to derive from research that has demonstrated moderate learning gains from class size reductions. Glass and Smith (1979) and later Slavin (1990) carried out extensive reviews of the literature and are in agreement that most reported studies are flawed, either because they fail to make adjustments for key factors, such as prior achievement in purely cross sectional observational studies or because of sampling inadequacies. Evidence from studies using the EPF only found a weak effect on educational outcomes (see section 2.4.2) and Levacic et al. (2005) found modest effects for reducing class size in schools. Pritchett and Filmer (1997) argue that inputs such as teacher wages are vastly over-used relative to other inputs that contribute directly to educational output (e.g. books or instructional materials).

5.8 Conclusion

This chapter starts with an explanation of the OFSTED grading system and shows the erratic performance of the College in terms of OFSTED grades of the period, perhaps partly a reflection of changes in the management team in 2007. Empirical evidence on the OFSTED inspection system highlights potential issues with consistency and a failure with the system in that it does not address differences in the characteristics of student intake between institutions. School and college performance tables are universally recognised as an important quality measure in the sector, being a more regular assessment of institutions' quality than OFSTED inspections. This chapter investigated empirical studies of school and college performance tables and suggests that outcomes presented in the tables do not recognise the starting point of students, which makes any institution-to-institution comparisons flawed (or even over time comparisons at the same institution). The chapter then set out descriptive analyses of these tables for the College under study here, as well as for the region and nationally, essentially to determine whether there was any improvements over time; no signs of real progress being made were found. Success rates are a quality measure used in the FE sector, with exceeding the national benchmark for success rate being the key target for colleges striving to achieve 'outstanding' in an OFSTED inspection. Success rates are considered a more 'rounded' measure as they allow for retention not just achievement, but students' characteristics are again ignored. The College performed strongly in success rate terms, showing signs of improvement over the period and performing above benchmark. However, it is noted that these measures do not consider the performance of an institution with respect to WP.

This chapter then considered 'value for money', a key concern of the research, which seeks to analyse the efficiency and effectiveness of the WP policies and the associated public investment, but identified finding a suitable measure as being a real issue. ALPS is, however, a commonly used value for money measure in the sector and is the one adopted by the College, so this thesis gave a brief explanation on how this system operated and showed that the College improved over the period, ending the period in the 'excellent' and 'outstanding' categories for value added. This is not a system driven by policy directives from central governments, such as the school and college performance tables and success rates, but is a system still used by OFSTED inspectors in judging overall performance of institutions, although overall achievement is still likely to be the main determining factor in OFSTED inspections. Although in terms of evaluating WP policies, the ALPS measure is arguably an improvement on the previous two measures considered (school performance tables and success rates); given that previous attainment is correlated with less advantaged students, it still does not

directly address the WP objectives. In addition, ALPS could not be used during this period as part of a more complex model for assessing WP (such as the one developed in the next chapter) because the measure did not cover vocational students at the College for much of the period being analysed.

This chapter concluded with a financial review of the College, setting out the key financial indicators determining the 'outstanding' grade for financial health throughout the period. The main conclusion from this review is that the public investment in the education sector appears to have been invested in facilities and increasing pay levels. Empirical evidence from the literature is equivocal in regards to the impact of public investment in these areas and education generally, suggesting perhaps a small impact overall.

Overall, there appears to be some inconsistencies between the various measures; performance table, success rates and ALPS did not, for example, reflect the 'satisfactory' OFSTED grade in 2008; performance tables showed little change, whilst ALPS and success rates showed an improved performance over the period. Importantly for this thesis given its research questions, none of these measures are directed at considering achievements in WP, the aspect pursued in the following chapters, although the ALPS measure was argued as better in this respect than the other indicators. The financial review has found that the College operated successfully in financial terms; operating with sizable surpluses, generating sufficient cash to invest heavily in facilities and allowing pay levels of staff to increase by more than inflation Consumer Price Index (CPI).

Making judgements on value for money at a macro or micro level may in the end be subjective, difficult to measure, intangible and misunderstood. The practice of looking at raw scores for achievement may be problematic and so this research extends the analysis to include various student attributes, some of which the College can control. Such measures are not necessarily designed to directly consider success or failure in terms of WP, although changes in them may be associated with disadvantaged or underperforming students, and thus including such variables in the analysis enables greater understanding of how the College performed over the period. The analysis is complicated as there are internal economic factors, such as how the College spent increased funding and changes in the management team, plus external factors such as employment levels and market forces in education system locally; all are likely to impact on educational progression outcomes and any value for money judgement. These points are considered further in Chapter 7. Before this, Chapter 6 investigates the College's performance given the WP policies and public investments of the period, developing an alternative statistical approach, which includes a wider range of variables to the established performance measures considered in this chapter. This model will also consider year and

funding variables directly, thus providing evidence of how the College performed over time and whether the funding was efficiently and effectively spent in terms of delivering WP objectives; something the established performance measures used in the sector cannot do.

6 Statistical analysis

6.1 Introduction

The research in this chapter examines both the 'educational' as well as statistical significance of College participation, and subsequent progression to HE and participation at a RG university, focusing on the student attribute socio-economic background as measured by the WP Factor (adjusted). Simple statistics results for the socio-economic background measured by the WP Factor (both WP Factor (uplift)/ WP Factor (adjusted)) were presented in section 4.3.1 as there was a concern over the use of the unadjusted measure. It was argued that the WP Factor (adjusted) measure should be used as it eliminated the effect of changes in the IMD applied. Given the differences in using the two WP Factor measures and the argued need for a consistent series (see section 4.3.1), in what follows, the WP Factor (adjusted) measure is used to account for deprivation. For 'educational significance' of the WP policy to be supported, the results are expected to show a rebalancing of the student cohort with an increased percentage of less advantaged students progressing through the College to HE, preferably to RG universities. The research also looks at other student attributes and considers whether changes in the composition of attributes other than deprivation impact on educational progression outcomes over the period 2001 to 2010.

This chapter first presents the evidence from the descriptive and the 'simple' inferential statistics – Chi-square and simple regression – which are the methods used in current practice. For the simple regression it is acknowledged (section 2.5) that the analysis at College aggregate level could only provide indicative findings due to there being few 'degrees of freedom'. The bivariate time series analysis may also not reveal the effects of the individual variables of concern, such as curriculum changes, but only describes the overall outcome of changes to all the variables (Albright et al., 2002). Sections 6.3 to 6.6 use multivariate analysis to counter these criticisms and includes a funding variable to examine the relationship between changes in resources and performance directly. Section 1.9 highlighted the intended contribution to professional practice in the use of statistical tools and whether they can add to understanding and improve decision making with regards to WP policy objectives. In section 6.7, the findings for the 'simple' and 'complex' techniques are compared to provide an assessment of whether the 'shortcuts' used in day-to-day activities are useful.

6.2 Evidence from the 'simple' statistical techniques

This section presents the results for the graphical analysis and the two simple statistics that are used by the Researcher in a 'professional' context (Chi-square and simple time trend regression); this is in order to compare and contrast what can be gained from these statistics compared to more complex methods (LPM and logistic regression). The main concern is establishing whether or not there was a sustained increase in the proportion of WP students participating at the College, progressing to HE or participating at RG and, if so, what were the driving forces behind this. The simple graphical and inferential statistical analyses from which the percentage of WP students over time can be estimated have been presented in section 4.3.1 (with detailed results in Appendix 4.3). However, the concern in that section was with examining possible problems in using the unadjusted measure of the WP Factor, not with, as here, the success of the College in terms of outcomes for WP students.

Although of lesser importance, the 'simple' analyses also examined connections between other student attributes (in the EPF), which are correlated with WP, and time, on the grounds that management may be interested in these trends, particularly those such as vocational/non-vocational students.

The descriptive graphical analyses for these other attributes are presented in appendices 6.2.1 – 6.2.12. Most of these graphs do not show any clear increase in the percentage of cohort for the three educational outcomes, although College participation for vocational students (appendix 6.2.7) does suggest a slight increase and male participation at RG a slight decline (appendix 6.2.3).

Table 6.1 gives a summary of the Chi-square results for the WP Factor (adjusted) and for other student attitudes (characteristics) associated with progression (as discussed in section 2.5.5 this statistic is not given if the requirements for the particular Chi-square test are not met in the sample). In considering the use of the WP Factor (uplift) versus the revised WP Factor (adjusted) measure in section 4.3.1, the Chi-square was found to be problematic where the concern is with identifying a sustained increase, as here, as the test is only of association and a significant figure can be a result of having a few outlying years in the data. Furthermore, the direction of the association is not considered. However, the Chi-square may still be of some use to management if used with caution in identifying 'outlier' years which can be further examined. As discussed in section 4.3.1, the significant Chi-square values for WP Factor (adjusted) are largely the result of considerable differences between observed and expected in a few of the years and, in the case of RG participation, association is from a negative relationship. For instance, the significant result for HE progression for the Chi-square test seems to be

largely related to the large 'distance of observed from expected' in years 2003, 2004 (both increases, see appendix 4.3.18) and particularly 2010 (a decrease), rather than to any specific trend over the period. This Chi-square result thus supports the view that for WP Factor (adjusted) students progressing to HE, the WP Factor (measuring socio-economic background) is dependent on the year of study, but this does not necessarily indicate a trend nor does it establish the desired 'educational significance'.

For the other characteristics only three Chi-square statistics are significant at the 5% or higher level[20]. For male participation at a RG university there was a highly significant outcome, but the figure in appendix 6.2.3 suggests that the association may be in terms of a decline, although there are also large differences of the observed to the expected values in two particular years (2002 and 2004, see appendix 6.2.17). The test of non-White/White students for College participation is significant with a particularly high distance of observed from expected value in 2003 (appendix 6.2.19). The test also gives a significant association between programme and year for participation at the College, but again this is largely the result of large 'distance of observed from expected' values for 2002, 2004, 2007 and 2009 (see appendix 6.2.25).

Table 6.1 Chi-square results (p values)

	College Participation	HE Progression	RG Participation
WP Factor (adjusted)	0.000	0.000	0.000
Gender	0.116	0.261	0.003
Ethnicity	0.000	0.861	0.535
Programme	0.000	0.183	-[a]
Prior achievement	0.077	0.206	-[a]

[a] *Expected minimum value of 5 in at least 80% of the cells and a minimum value of 1 in any cell not fulfilled for RG participation for vocational and low point score on entry students.*

Simple time trend regression, when considering the WP Factor measures in section 4.3.1, was found to be a more useful technique than Chi-square for considering trends. The time trend results for WP Factor (adjusted) are given in table 6.2. The diagnostics associated with these regressions are generally acceptable. The results show no evidence of heteroscedasticity or incorrect functional form

[20] Details are in the appendices for the education outcomes College participation, HE progression, and RG participation: gender 6.2.13, 6.2.15, 6.2.17; ethnicity 6.2.19, 6.2.21, 6.2.23, programme of study 6.2.25 6.2.27 (College and HE only); prior achievement 6.2.29, 6.2.32 (College and HE only).

in all but one case, i.e. the findings are not significant at the 10% level (and in most cases not at the 20%). However, these could be 'false negatives', given the low degrees of freedom. The exception is the functional form test on RG participation, which suggests the functional form is incorrect and thus these estimates need to be considered with caution.

The regressions cast doubt on the success of WP policies/objectives, and therefore on the effectiveness of increased spending in the education sector in WP. The results indicate that there has been no significant trend in the proportion of the WP students compared to non-WP students attending the College or in the proportion of WP students progressing to HE. For RG participation the results indicate a significant 2% decline per annum over the period.

Table 6.2 Proportion of WP Factor (adjusted) students – simple time trend regression summary

	WP Factor (adjusted) College Participation		WP Factor (adjusted) HE Progression		WP Factor (adjusted) RG Participation	
	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value
Constant	0.409	0.000	0.608	0.000	0.249	0.000
Year	-0.008	0.246	0.007	0.559	-0.018	0.007
R-square	0.1640		0.045		0.622	
F	F(1,8)=1.57 (0.246)		F(1,8)=0.37 (0.559)		F(1,8)=13.16 (0.007)	
Heteroscedasticity	$\chi^2(12)=0.13$ (0.714)		$\chi^2(12)=0.03$ (0.8611)		$\chi^2(12)=0.03$ (0.868)	
Functional Form	F(3,5)=2.27 (0.199)		F(3,5)=2.54 (0.170)		F(3,5)=7.07 (0.025)	
Sample Size	n=10		n=10		n=10	

Probabilities in brackets

Time trend regressions were also run for the other student attributes that were expected from the literature to be correlated with WP (section 4.3)[21]. The diagnostics (given in the appendices) for homoscedasticity and functional form are acceptable in most cases (22 of the 26 tests carried out[22]). That is, the null hypothesis is accepted at the 10% level (and in three out of these four problematic

[21] For the education outcomes College participation, HE progression, and RG participation see: male, appendix 6.2.14-6.2.18; non-White 6.2.20-6.2.24; vocational 6.2.26,-6.2.28; prior achievement (low/middle) 6.2.30 -6.2.35.

[22] The exceptions are: Male and non-white – homoscedasticity not rejected at 5% but are at 10% for RG; vocational – functional form not rejected at 5% but is at 10% for HE; low prior achievement – homoscedasticity not rejected at 5% but is at 10% for HE.

cases the null hypothesis would be accepted at the 5% level). (Note these would not generally be referred to in professional practice, but it does mean that the results in these problematic cases need to be treated with caution). The general conclusion to be drawn from the time trend examination of the other student attributes (see table 6.3), is that there was no significant time trend in the percentage of male, non-White, and low prior achievement students attending the College, progressing to HE or attending a RG, and this is consistent with there being no indicative change in the balance of cohort in favour of less advantaged students. That said, it is worth noting that the results indicate a small shift to vocational programmes for College participation, which given the introduction of vocational courses at the College, is of some interest to management (although, as noted above, they would not generally be made aware of the problem with the functional form in this regression). A possible issue is that vocational programmes have not necessarily been taken by less advantaged students and participation in them could have been influenced by changes in IAG. The curriculum offered by the College is an input the College can control and this may have been a factor in increasing overall numbers (the multiple regression analysis in the following section controls for this issue). For the remaining student attributes, the evidence is suggesting little change in the proportions of these educational inputs that may have a direct impact on social mobility, as measured by the educational progression outcomes, HE progression and RG participation, which are the particular focus of this research. Overall, the analysis in this section supports the view that the simple time series regression analysis may add to the management information provided by graphs, but that use of Chi-square may confuse, rather than add, if the concern is with the identification of trends.

Table 6.3 Time trend estimates for student attributes at College participation, HE progression and RG participation

Dependent Variable	College Participation		HE Progression		RG Participation	
(proportions)	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value
Male	0.0009	0.7671	-0.0070	0.0650	-0.0074	0.0536
Non White	-0.0049	0.1278	0.0000	0.9898	-0.0001	0.9780
Vocational	0.0170	0.0192	-0.0003	0.9648	-[a]	-[a]
Low prior achievement	-0.0011	0.7493	-0.0012	0.6586	-[a]	-[a]
Middle prior achievement	0.0018	0.6283	0.0019	0.7083	-0.0116	0.2507
Sample size	n=10 (n=9 prior ach.)		n=10 (n=9 prior ach.)		n=10 (n=9 prior ach.)	

[a] *Regressions not conducted due to small number of underlying observations, see section 3.4*

6.3 The multivariate model

The advantages and disadvantages of using regression analysis are set out in section 2.5, but helpful for this chapter is that both regressions (LPM and logistic) allow the estimation of probabilities, a readily understood mathematical concept (although only the LPM does this directly). As explained in section 2.5, the LRM estimates the probability of progression to HE or RG of an individual student with particular characteristics. It enables examination of the effect of each of the independent (explanatory) variables, keeping the other variables constant, i.e. estimating their independent effect. This research is primarily interested in the impact of WP policies on less advantaged students, so examines changes in WP Factor (adjusted) students' progression to HE and participation at RG universities (the dependent variables) and how they may be 'explained' by the student attributes, year and funding. These findings are compared with non-WP Factor (adjusted) student data to provide evidence, or not, of a positive link between student attributes, year, the level of unit resource (educational inputs), and performance (here, performance is defined as the educational progression outcomes, HE progression and RG participation).

The models examined in this research are founded on the EPF (see section 2.4), which is used here as a framework to estimate the probability of educational progression given particular student attributes. The dependent variables (educational progression outcomes) to be examined are students progressing to HE and participating at a RG university; regressions for College participation were not carried out due to the lack of data on students that did not attend the College. The independent variables (educational inputs) are explained in detail in section 4.3. Of particular interest are ones that the College can control (i.e. programme of study and entry criteria). The research is especially concerned about changes over the period 2001 to 2010 and the increase in funding arising from the WP policies, thus the variables year and funding in real terms are also considered in the regression. The variable year is a time trend, which estimates the effect of changes over time other than funding. Data for 2001 (which has the Year value 1) has been omitted as there are a high number of unknowns in that year for prior achievement in the data, as discussed in section 3.2.1. As well as concern with the overall probabilities for different types of students, the hypotheses to be examined with this model are:

- ***That the probability of WP Factor (adjusted) students progressing to HE is independent of the student attributes, year and funding.***
- ***That the probability of WP Factor (adjusted) students participating at a RG university is independent of the student attributes, year and funding.***

The student attributes included in the model are seen as affecting the 'quality' of the student input into the EPF. For instance, if the College takes in an increased proportion of low or even middle prior achieving students, it is likely to be more difficult to achieve improvements in HE and RG participation rates. On the other hand, given findings in the literature (Wilson et al., 2006), taking in an increased proportion of non-White students may make it easier to achieve improvement in HE progression. Considering the student attributes the College can control (curriculum programmes and entry criteria), the College's policies to introduce more vocational provision and maintain an inclusive entry policy, arguably are likely to lead to a fall in HE progression, other factors being constant. In this context, multivariate analysis is a useful statistical method to understand the differences in educational outcomes for WP Factor and non-WP Factor students in assessing the effect of funding changes and in relation to the student attributes the College can control.

The following model is estimated, giving the probability (p) separately for WP/non-WP students and for HE progression/RG participation using the LPM:

$$\mathbf{p = \alpha_0 + \alpha_1 Vocational + \alpha_2 Male + \alpha_3 White + \alpha_4 Year + \alpha_5 (low\ prior\ achievement) + \alpha_6 (high\ prior\ achievement) + \alpha_6 (funding\ adjusted\ CPI) + u}$$

where u is the random error term.

For the logistic estimation, the independent variables are the same, but the dependent variable is the log of the odds:

$$\mathbf{\ln(p/1-p) = \beta_0 + \beta_1 Vocational + \beta_2 Male + \beta_3 White + \beta_4 Year + \beta_5 (low\ prior\ achievement) + \beta_6 (high\ prior\ achievement) + \beta_6 (funding\ adjusted\ CPI) + \varepsilon}$$

where ε is the random error term and ln the natural logarithm.

6.4 Initial comparison of LPM and Logistic estimates

LPM and logistic regression analyses were both undertaken and as discussed in section 2.5, the LPM is more straightforward in interpretation but logistic regression is also undertaken here to explore possible limitations with the output from the LPM. Thus the approach in this chapter is initially to compare LPM and logistic regression estimates in terms of signs (positive/negative), significance and approximate size. Where they are similar, the LPM is taken as a good approximation and the LPM model is used to interpret the results more fully. As discussed in section 2.5, the case for the LPM is stronger if the independent variables are discrete and only take on a few values, and only dummy

variables are used. In this research most, but not all, of the independent variables are dummies (the time trend and the funding variables are the exceptions). The logistic regression in this chapter is principally carried out as a check on the findings from the LPM, but this is considered important, given the possible limitations with the LPM. This may be of importance in examining RG participation (see section 3.2.1), where we would expect participation to be at the extremes of the distribution, and in such cases, the LPM estimates are likely to be more problematic.

Table 6.4 sets out the estimates from the LPM and logistic regressions, so that an initial check can be carried out to ascertain consistency in the findings (fuller details of the results are given in sections 6.5 and 6.6, including the sample sizes and diagnostics). The concern here is whether the estimates of the effects of the variables, and hence the predicted changes, are similar using the LPM and the logistic model. A direct comparison can be made in terms of signs and significance. However, it is not possible to carry out a direct comparison between the sizes of the coefficients from the output as these indicate different things. The coefficients for a multiple regression explain directly the change in the probability of the variable against the base case[23] with all other factors being constant, whilst the coefficients for a logistic regression are not the probabilities but the change in the logit (the log of the odds) for each unit change in the predictor, see section 2.5 for a fuller explanation. However, a rough comparison of the magnitudes can be achieved by dividing the logistic coefficients by four (Greene, 2002). This procedure is carried out and the results given in table 6.4 in the columns headed LR adjusted.

Table 6.4 indicates that for progression to HE, the signs and significance of the variables are the same for the LPM and logistic regressions; the sizes of the effects are also of a similar magnitude when comparing the LPM with the LR adjusted. For progression to RG, the signs of the variables are also the same for the LPM and logistic regressions, but the sizes of the effects, although of a fairly similar magnitude for some variables, are not so close for many others; the same variables are significant but the level of significance also varies between the two estimates for a number of variables. This suggests that in what follows, the straightforward interpretation given by the LPM is a reliable approximation in the case of progression to HE, but less so for progression to RG universities.

[23] The base in this case being a female, non-White, academic, middle level of prior achievement student.

The same analysis was carried out for non-WP Factor (adjusted) students similarly and the sign and significance were consistent both for HE and RG, but again the results for RG were not so close in terms of their magnitude (appendix 6.4.1). The lack of consistency in the magnitude of the estimates is likely to be because the number of students participating at RG from the WP Factor (adjusted) and non-WP Factor cohorts is low (table 3.8) and likely to be at the extreme of the distribution where the difference between the linear output from LPM and the S-shaped output from logistic regression is typically the greatest.

Table 6.4 Comparing the output from the LPM and logistic regression for WP Factor (adjusted) students

Independent variables	HE Linear Probability Model	HE Logistic Regression	Logistic Regression adjusted	RG Linear probability model	RG Logistic Regression	Logistic Regression adjusted
(Constant)	1.067 (0.000)	2.915 (0.007)	-	-0.294 (0.046)	-6.825 (0.000)	-
Vocational	-0.166 (0.000)	-0.768 (0.000)	-0.192	-0.004 (0.833)	-0.278 (0.407)	-0.070
Male	-0.051 (0.101)	-0.274 (0.080)	-0.069	0.001 (0.925)	0.012 (0.937)	0.003
White	-0.273 (0.000)	-1.677 (0.000)	-0.419	-0.042 (0.029)	-0.476 (0.014)	-0.119
Year	0.024 (0.000)	0.129 (0.000)	0.032	-0.022 (0.000)	-0.251 (0.000)	-0.063
low prior achievement	-0.088 (0.001)	-0.400 (0.001)	-0.100	-0.050 (0.006)	-1.016 (0.001)	-0.254
high prior achievement	0.203 (0.000)	1.197 (0.000)	0.299	0.202 (0.000)	1.898 (0.000)	0.475
funding adjusted CPI	-0.810 (0.164)	-3.803 (0.200)	-0.951	1.435 (0.000)	16.327 (0.000)	4.082

P value is in brackets.

6.5 Progression to HE

The results of the two regressions for HE progression by WP and non-WP (adjusted) students are given in table 6.5. The results for the LPM are the estimated effects 'other things being constant', that is, the analysis has the effect of isolating the effect of a particular variable from others which may be correlated with it. The multiple regression coefficients for the student attribute variables, which are dummy variables taking the values 1 or 0, explain the change in probability for that variable against

the base. In this case, the base student against which comparisons are made is: non-vocational, non-White, female, with middle range prior achievement.

The R-squared is not high for either regression, but this is to be expected with a 0/1 dependent variable where the regression is estimating probabilities. However, it is highly significant as shown by the F statistic. Diagnostic tests for the LPM indicate significant outcomes and thus provide evidence for rejection of homoscedasticity, correct functional form and normality. These problems with the LPM are expected in a dummy dependent variable regression, as discussed in section 2.5.4. However, the purpose of carrying out the multiple regression here is to compare whether estimated effects are similar to the logistic, despite the known limitations, given it is easier for interpretation in a professional context. The direct estimates from logistic regression are not in a readily understood format (giving the log of the odds), unlike LPM. A question this research seeks to answer is whether these simpler techniques, such as LPM, can provide reasonable estimates for decision making by managers and lay people working in the education sector.

The results estimate that if WP Factor (adjusted) students have undertaken vocational subjects, or are White or have low prior achievement, the probability of HE progression is lower: all these variables are significant at $p = 0.00$. Unsurprisingly, for high prior achievement the results show a relatively strong positive change; compared to the base (of middle prior achievement), high prior achievement increased the probability of going to HE by 0.20. The time trend (year) is also highly significant, with an estimated increase in the probability of going on to HE of over 0.02 per year, but funding is not significant. For non-WP Factor (adjusted) students the results are the same for sign and significance, and similar for size, except for year and males. For year, progression reduces over time, with the probability of going to HE decreasing by a little lower than 0.01 a year ($p = 0.03$). The result for male non-WP Factor (adjusted) students is not significant, in contrast to male WP Factor (adjusted) students, which indicates a 0.05 reduction.

Table 6.5 Progression to HE: WP Factor (adjusted) and non-WP Factor (adjusted) students (LPM)

Independent variables	Progression to HE WP Factor (adjusted)		Progression to HE non-WP Factor ((adjusted)	
	Coefficient	p-value	Coefficient	p-value
(Constant)	1.067	.000	.776	.000
Vocational	-.166	.000	-.223	.000
Male	-.051	.010	.001	.942
White	-.273	.000	-.263	.000
Year	.024	.000	-.007	.033
low prior achievement	-.088	.001	-.110	.000
high prior achievement	.203	.000	.183	.000
funding adjusted CPI	-.810	.164	.345	.461
R-Square	.152		.157	
F	F(7, 2015)=51.63 (0.000)		F(7, 3504)=93.05 (0.000)	
Homoscedasticity	$\chi^2(12)$=54.82 (0.000)		$\chi^2(12)$=30.14 (0.000)	
Functional Form	F(3,5)=10.28 (0.000)		F(3,5)=5.37 (0.001)	
Normality - Skewness/ Kurtosis	p=0.000/0.000		p=0.000/0.000	
Sample size	n=2019		n=3870	

Probability in brackets

Another point to be draw from table 6.5 is the lower negative effect on HE progression (vocational programmes) for WP Factor (adjusted) students compared to non-WP Factor (adjusted) students (0.17 compared to 0.22). Similarly, for low prior achievement there is slightly less of a negative effect for WP students compared to non-WP Factor (adjusted) students (0.09 compared to 0.11). This suggests that for educational inputs the College can control, namely the curriculum and entry criteria, the negative effects on HE progression may be reduced for WP Factor (adjusted) students. This is reinforced by the findings for year, which show a positive effect on HE progression for WP Factor (adjusted) students compared to a negative effect for non-WP Factor (adjusted) students. The funding variable introduced into the model, however, does not provide a significant outcome for either WP Factor or non-WP Factor (adjusted) students, so funding does not appear to have itself increased participation; the WP policies and associated increases in funding has not contributed to the favourable outcome relative to non-WP (adjusted) students.

In examining the results in more detail, specifically looking at the changes between 2002 and 2010, it is evident that year (the time variable) is a 'catch-all' for factors or variables that have been changing over time and are not specified elsewhere in the model; they could be factors at the College, the local area or nationally. Table 6.6 shows that year has a positive effect on WP Factor (adjusted) students but the effect on non-WP Factor (adjusted) students is negative. Funding shows a negative effect for WP Factor (adjusted) students and a positive effect for non-WP Factor (adjusted) students,

but is not significant in either case. This makes it more likely that changes over time result from local College-based polices or teaching that somehow affects WP Factor (adjusted) students positively, rather than being a result of national policy directives accompanied by increases in funding. In other words, there may have been a redistribution of resources within College (using the term 'resources' in the broad sense of the term), and these are responsible for the positive effect on HE progression for WP Factor (adjusted) students. It is also worth repeating that there has been a lack of time series research in the FE sector in particular, so these positive effects for year for WP Factor (adjusted) students are an addition to knowledge and would suggest the need for further research to unravel what factors are behind this change. Table 6.6 (using the example of a male, white, vocational, middle prior achievement student) gives the probability of going to HE in 2002 and 2010 shows a substantial increase in the probability of WP Factor (adjusted) students progressing to HE (from 0.35 to 0.50), which is a positive outcome for the WP agenda[24]. For non-WP Factor (adjusted) students (see appendix 6.5.2) there was a decline in the probability from 0.39 to 0.36, which is an indication that there has been a rebalancing of the cohort, with WP Factor (adjusted) students having a higher probability of going to HE.

Table 6.6 HE Progression: WP Factor (adjusted) students, year 2 and year 10 comparison (using LPM estimates)

	Coefficient	Year 2002	Year 2010
(Constant)	1.067	1	1
Vocational	-0.166	1	1
Male	-0.051	1	1
White	-0.273	1	1
Year	0.024	2	10
low prior achievement	-0.088	0	0
high prior achievement	0.203	0	0
funding adjusted CPI	-0.81	0.34	0.39
Probability		0.350	0.501

[24] Appendix 6.5.1 shows how the probability figures in tables 6.6 and 6.7, and 6.9 to 6.11 were calculated, using this case as the example.

Following the same approach as in the LPM analysis in table 6.6, the probabilities from the logistic regression are given in table 6.7[25]. These show an increase in the probability of WP Factor (adjusted) student progressing to HE from 0.30 to 0.50 over the period from 2002 to 2010, similar to the LPM case. For non-WP Factor (adjusted) students (appendix 6.5.3) there is a decline from 0.38 to 0.34, very close to the output from LPM for non-WP Factor (adjusted) students. The logistic regression, therefore, also supports a positive outcome with more WP Factor (adjusted) students progressing to HE of a size indicated by the simpler LPM.

Table 6.7 HE Progression: WP Factor (adjusted) students, year 2 and year 10 comparison (using logistic regression estimates)

	Coefficient	Year 2002	Year 2010
(Constant)	2.915	1	1
Vocational	-0.768	1	1
Male	-0.274	1	1
White	-1.677	1	1
Year	0.129	2	10
low prior achievement	-0.4	0	0
high prior achievement	1.197	0	0
funding adjusted CPI	-3.803	0.34	0.39
Probability		0.302	0.501

The marginal effect of a variable can be taken direct from the LPM output and these are constant; the change in probability does not vary with the student's other characteristics. This is not the case with logistic regression where the direct output gives the effect on the log of the odds and the marginal effect of a variable is not constant, but varies with the student's other characteristics. Given the closeness of the logistic regression results to the LPM above, only the marginal effects of the student attributes the College can control, i.e. vocational courses and low prior achievement are

[25]The diagnostic checks discussed for the LPM do not apply to the logistic regression estimates as this is estimated by ML, not OLS, as discussed in in section 2.5.5.

further explored here, for chosen cases of the other variables[26]. The logistic regression marginal effects for 2002 and 2010 for vocational and low prior achievement students are given in appendices 6.5.5 and 6.5.6, taking the chosen case of a WP Factor (adjusted), male, White student. The marginal effect of taking a vocational course for a medium prior achieving student is -0.18 in 2002 and -0.18 in 2010, compared to -0.17 using the LPM (table 6.6). For low prior achievers (compared to middle achievement) who are vocational students the marginal effect is -0.08 for 2002 and -0.1 for 2010, compared to -0.09 estimated by the LPM[27] (table 6.6). Given the consistency between the results from the two types of regression, it is therefore arguably safe to use the LPM output in forming the main conclusion for HE progression; that there has been a shift in the cohort over the period, with more WP Factor (adjusted) students progressing to HE.

6.6 RG participation

The LPM regression results can be problematic as the model is a straight line rather than 'S' shaped; this can give impossible estimated probabilities outside the 0-1 interval. The findings for RG have produced a few estimated negative probabilities for individual students, so logistic regression here provides not only a check on the regression, but is also the basis of the interpretation. Figures set out in table 6.4 show that for RG participation, the signs and significance for the two regressions are consistent; however, the differences in adjusted coefficient sizes are considerably larger than for HE progression. This is likely to be because of the low numbers progressing to the RG universities.

Details of the LPM regressions, including the diagnostics are given in table 6.8. As in the case of HE progression, the R-squares are not high, as expected with a 0/1 dependent variable where the regression is estimating probabilities, but the F statistic indicated that they are highly significant. As with progression to HE, the diagnostic tests are significant and thus provide evidence of heteroscedasticity, incorrect functional form and lack of normality. As explained in section 2.5.5, these problems with the linear functional form are expected in a LPM dummy dependent variable

[26] An example of the computation required is given in appendix 6.5.4; this presents calculation for the marginal effect of being a vocational student in 2002 with the other characteristics the same as the base case.

[27] In both years, since the marginal effects are constant in the LPM.

regression. However, in this case, these results, along with the differences in the estimates found in section 6.4, gives credence to logistic regression being the preferred statistical tool in research for this part of the investigation.

However, given the ease of interpretation of the LPM, this research starts with interpreting these estimates, whilst acknowledging that better estimates may be achievable with logistic regression. In terms of RG participation and WP Factor (adjusted) students (see table 6.8), only year, low, high prior achievement, and funding are highly significant, while being White is significant at the 5% level. The estimate is that White WP Factor (adjusted) students have a 0.04 lower probability of participating at RG than non-White students. For WP Factor (adjusted) students, unsurprisingly, the probability of low prior achievement students progressing to a RG university is lower (by 0.05) and for high prior achievement is considerably higher (0.26) than for medium prior achievement students. For non-WP Factor (adjusted) students, the signs, size and significance for prior achievement are similar to those for WP students. This suggests that high prior achievers from underprivileged backgrounds (when assessed using the WP Factor (adjusted)) are not disadvantaged as such in terms of access to RG universities. However, the probability of such students progressing to a RG university fell as the years progressed (by 0.02 a year).

For WP Factor (adjusted) students funding had a positive effect with a marginal increase in the probability by 0.014 every £100 per FTE, so although positive, the increase is small. Year is not significant and funding shows a negative effect for RG participation of non-WP Factor (adjusted) students. The findings for funding are interesting; funding has a positive effect on WP Factor (adjusted) student participation at RG but a negative effect for non-WP Factor (adjusted) students. Male is a significant variable only in the non-WP Factor (adjusted) regression, with the probability increasing by 0.04 for males (compared to females) and decreasing by 0.05 for Whites (compared to non-Whites).

Table 6.8 RG Progression: WP Factor (adjusted) and non-WP Factor (adjusted) students (LPM)

Independent variables	Participation RG WP Factor (adjusted)		Participation RG non-WP Factor (adjusted)	
	Coefficient	p-value	Coefficient	p-value
(Constant)	-.294	.046	.518	.000
Vocational	-.004	.833	-.017	.246
Male	.001	.925	.040	.000
White	-.042	.029	-.050	.001
Year	-.022	.000	.000	.949
low prior achievement	-.050	.006	-.051	.000
high prior achievement	.262	.000	.264	.000
funding adjusted CPI	1.435	.000	-1.099	.000
R-Square	.170		.167	
F	F(7, 2015)=58.77 (0.000)		F(7, 3504)=100.35 (0.000)	
Homoscedasticity	$\chi^2(12)$=769.55 (0.000)		$\chi^2(12)$=1421.07 (0.000)	
Functional Form	F(3,5)=6.89 (0.000)		F(3,5)=23.68 (0.000)	
Normality – Skewness/Kurtosis	p=0.000/0.000		p=0.000/0.000	
Sample size	n=2019		n=3870	

Probabilities in brackets

In terms of overall probabilities, examining the same case as in the previous section is arguably not appropriate as we would expect the probabilities for middle prior achievement and vocational students progressing to a RG university to be fairly low. The research therefore considered the case of a student who is male and White, as before, but with high prior achievement and taking a non-vocational course. The results for WP Factor (adjusted) students showed a considerable decline in the probability of attending a RG university (from 0.37 in 2002 to 0.27 in 2010; table 6.9). For non-WP Factor (adjusted) students (appendix 6.6.1) there was a decline from 0.40 to 0.34 and this was smaller than for WP Factor (adjusted) students. Thus, these estimates suggest that although funding has a positive effect on RG participation for such WP Factor (adjusted) students, but the effect is small and other changes over time, modelled here as the year dummy, outweigh the positive effect of increased funding.

Table 6.9 RG Participation: WP Factor (adjusted) students, year 2 and year 10 comparison (using LPM estimates)

	Coefficient	Year 2002	Year 2010
(Constant)	-0.294	1	1
Vocational	-0.004	0	0
Male	0.001	1	1
White	-0.042	1	1
Year	-0.022	2	10
low prior achievement	-0.05	0	0
high prior achievement	0.262	1	1
funding adjusted CPI	1.435	0.34	0.39
Probability		0.371	0.267

For the same case (that is of a high prior achieving, non-vocational, male, White student), the probability estimates from the logistic regression in table 6.10 decline, but more dramatically, from 0.41 to 0.17 from 2002 to 2010. For non-WP Factor (adjusted) students, however, there was a decline from 0.50 to 0.35 (appendix 6.6.2). Given the discussion above, we would take these estimates to be more reliable than that from the LPM.

Table 6.10 RG Participation: WP Factor (adjusted) students, year 2 and year 10 comparison (using logistic regression estimates)

	Coefficient	Year 2002	Year 2010
(Constant)	-6.825	1	1
Vocational	-0.278	0	0
Male	-0.012	1	1
White	-0.476	1	1
Year	-0.251	2	10
low prior achievement	-1.016	0	0
high prior achievement	1.898	1	1
funding adjusted CPI	16.327	0.34	0.39
Probability		0.410	0.174

For WP Factor (adjusted) students, the marginal effect of vocational is insignificant in both the LPM and the logistic regressions, thus the marginal effect is not compared; only 13 WP Factor (adjusted) students on vocational programmes participated at RG over the period 2002 to 2010, which would make investigation of this variable unreliable. The marginal effect of high prior achievement

(compared to middle achievement) in the LPM regression is 0.26 (table 6.9) for WP Factor (adjusted) students. Taking the male, White, non-vocational case, the marginal effect on participating at RG of being a high achiever in the logistic regression is 0.32 in 2002 against 0.14 in 2010 (table 6.14). This is an important finding, suggesting that the probability of high achieving WP Factor (adjusted) students participating at RG fell considerably over the period. There was an even greater fall for non-WP Factor (adjusted) students (appendix 6.6.3) with the marginal effect estimated at 0.37 in 2002 and 0.28 in 2010.

Table 6.11 RG Participation: marginal effect high achievement, WP Factor (adjusted) students – from logistic regression estimates

	Coefficient	Year 2002	Year 2002	Year 2010	Year 2010
(Constant)	-6.825	1	1	1	1
Vocational	-0.278	0	0	0	0
Male	-0.012	1	1	1	1
White	-0.476	1	1	1	1
Year	-0.251	2	2	10	10
low prior achievement	-1.016	0	0	0	0
high prior achievement	1.898	1	0	1	0
funding adjusted CPI	16.327	0.34	0.34	0.39	0.39
Probability		0.410	0.094	0.174	0.031
Marginal effect			0.315		0.143

6.7 Academic perspective versus the professional day-to-day approaches

This section now considers how successful the various statistical techniques used are in analysing data and whether the 'shortcuts' – the 'simple' techniques used in day-to-day activities – are statistically justifiable and acceptable. As reported in section 1.9 this is in the context of the Researcher's own experience, which suggests that senior management teams and lay people on corporation boards have a poor grasp of statistical tools and are far more comfortable with qualitative rather than quantitative techniques. By definition the 'simple' techniques are easy to use and can be operated through standard Excel software tools. Initially the results from the two 'simple' inferential techniques are compared and the results are summarised in table 6.12 for ease of referral. Following this, a comparison of the 'simple' and 'complex' approaches is considered in tables 6.13 and 6.14.

Table 6.12 Comparison of significance levels in simple technique results (Chi-square and simple time trend regression)

	College Participation		HE Progression		RG Participation	
	Chi-square	Simple time trend regression	Chi-square	Simple time trend regression	Chi-square	Simple time trend regression
WP Factor (adjusted)	0.000	0.246	0.000	0.559	0.000	0.007
Males	0.116	0.767	0.261	0.065	0.003	0.054
non-Whites	0.000	0.128	0.861	0.989	0.535	0.978
Vocational	0.000	0.019	0.183	0.965	-	-
Prior achievement	0.077	L 0.749 M 0.628	0.206	L 0.659 M 0.708	-	L - M 0.251

Table 6.12 shows some differences in what was significant in the Chi-square tests and in the simple time trend regressions, particularly for the most important variable for management in this investigation: the WP Factor. Importantly, the time trend regression also identifies the direction of the effect – in this case it was positive for College participation and HE progression, and negative for RG participation. As discussed in sections 4.3.1 and 6.2, generally the simple time trend regression was considered a more reliable measure than Chi-square in terms of the investigation in this thesis as it examines a time trend, while Chi-square tests examine an association, which may indicate a sustained increase, but which may also be the result of many other patterns. The time trend regressions were supportive of the graphical analysis, but the Chi-square was not always so. In one important area in this research – the introduction of vocational programmes – both 'simple' techniques are showing significant and consistent effects, the association being largely a sustained increase over time. In using and presenting such statistics in a professional context, care must be taken, however, to match their use to the issue of concern.

The multiple regression using student level data for College participation could not be carried out due to the lack of information being available on students not attending the College, see section 3.2.1. The simple time trend regression was therefore carried out on the split of WP/non-WP students attending the College (rather than WP students progressing/not progressing to FE). In section 3.2.1 it was argued that this may be acceptable, given it seemed unlikely that there had been any large change in the WP student population in the catchment area. WP at FE level was one of the objectives of NL's policy (see section 1.3), thus providing analysis of changes at this educational level was of direct importance to management. This does provide some justification for using 'simple' techniques, while being aware of any caveats, in situations where there are limited resources (for example, of data, time and money).

This comparison continues by comparing the simple time trend results for WP with the multiple regression results. Table 6.13 summarises the estimated coefficient values and significance levels for the time trend (adjusted), and the LPM and logistic (as in table 6.6) for comparison. For HE progression the results differ considerably in significance and size in the simple time trend compared to the more advanced techniques – the 'simple' results would give a misleading picture to management of lack of success. For RG participation, the results are all negative and highly significant, but the size of the estimated coefficient is considerably larger in the logistic regression (and in section 6.3 it was argued this was likely to be the more reliable). However, in terms of the message to management, all three methods indicate a size of decline that is very problematic given the WP agenda.

Table 6.13 Comparison of the time trend estimates from the different forms of regression.

	HE progression	RG participation
Simple time trend	0.007 (0.559)	-0.018 (0.007)
LPM	0.024 (0.000)	-0.022 (0.000)
Logistic	0.032 (0.000)	-0.063 (0.000)

Of arguably more importance to management is the estimated overall change in the probabilities for WP students over the period, which in the multiple regression cases takes account of the effect of the other variables in the regressions. The simple time trend regression was carried out using 10 years data, but the multiple regressions only nine, because of missing data on prior performance (as discussed in section 3.2). For comparison here in the simple time trend regression, the estimated overall change in the proportion of students progressing to HE and participating at RG over a nine year period is given (table 6.14). Given that the logistic estimations are non-linear, the values have to be calculated for students with particular characteristics. In table 6.14 the same cases are taken as in tables 6.9 for HE (middle prior achievement, vocational, male, White) and table 6.10 for RG (high prior achieving, non-vocational, male, White student).

Table 6.14 Overall change in proportion/probability progressing to HE and participating at RG of WP Factor (adjusted) students over the nine year period

	HE progression	RG participation
Simple time trend	0.017	-0.017
LPM	0.151	-0.104
Logistic	0.199	-0.236

All the estimates have the same sign; however for HE progression, the simple time trend estimate is considerable lower than the more advanced techniques. For RG participation, the simple time trend regression again gives an estimate below the LPM and logistic. As above, the signals to management from presenting the simple time trend are different enough from the more advanced techniques to be of concern.

In terms of characteristics other than WP, the simple time trend regression tells us whether there is a significant trend in the proportion of students with these characteristics going to the College, and then on to HE and RG from the College (i.e. the proportions of students with these other characteristics were the dependent variables). They may well be of interest to management (for instance, in terms of examining enrolments) for considering whether their policies in terms of attracting male students appear to be working, or considering the progression of certain groups they have been targeting (for instance, vocational students).

In the multiple regressions the concern is different; it is how these other student attributes affect HE/RG participation compared to the base student (i.e. whether the student has a given characteristic, or not, is an independent, not dependent variable). This could be important for management in identifying groups of students that are leading to improvement, or not, in their overall performance (as judged by the indicators considered in chapter 5) as well as the overall change over the period. For instance, in section 6.5 the results estimate that if WP Factor (adjusted) students have undertaken vocational subjects, or are White or have low prior achievement, the probability of HE progression is lower. The more complex methods identify why the changes in progression are taking place and do give additional information that may be useful, such as the introduction of other variables important in this context, for example, funding. The simple methods may compliment this more complex analysis, providing information on trends in proportions of students with different characteristics, rather than the probability of students with those characteristics progressing to HE and RG.

The investigation has also been concerned with whether, moving onto more complex techniques, the simpler to interpret LPM can be used. The results given by LPM and logistic regression were compared in section 6.5 and 6.6 and for HE the results were comparable. However, for RG participation, where the observations are likely to be at the extremes of the distribution, the results from logistic regression found a much larger effect in this case and are likely to be more accurate. Despite problems with the diagnostics (see tables 6.5 and 6.8) the LPM gave very similar predictions

for HE, so it is arguably legitimate to present the simpler LPM to management, if the checks outlined in this research indicate they are similar.

This comparison between use of the different statistical methods and the associated results has identified potential difficulties using Chi-square, and it is important that it is used correctly in a professional setting. Since the concern in this investigation was largely with trends, it was considered inappropriate. With the simple time trend regression the conclusions are more complex. Using College level data it is not possible to use the more advanced techniques given the small sample size. Examining College level data may be useful for management, for instance in assessing how particular policies are attracting students. However, the comparisons above do suggest that simple regression may not always be identifying important information for management, and where the data is reasonably easily available and time permits, multiple regression should be employed. Furthermore, for research papers and external publication the more 'complex' tests are needed as they add a more nuanced picture of what is affecting educational outcomes. The LRM, however, does have the potential to bridge the gap between the 'simple' and 'complex' techniques, if care is taken in its use as proposed in section 6.4, as the output is in probabilities, a readily understood concept, and the marginal effect can also be sourced direct from the output.

6.8 Conclusions

The regression methods find some increase in the proportions/probabilities of WP (adjusted) students participating at the College and progressing to HE. However, no evidence was found of a positive effect from the increased funding for progression to HE, in line with the weight of the previous literature that increased funding is not an effective mechanism for improving social mobility. For RG progression, a decline in the proportions/probabilities of WP (adjusted) students participating was found, although there was a small positive effect of funding for WP Factor (adjusted) students. The multiple regressions did highlight some positive signals for HE progression for WP Factor (adjusted) students, but there appears to be a decline in the probability of non-WP Factor (adjusted) students progressing to HE. It could be argued that there is a positive value for money outcome as these findings may be the result of resources being redirected to the area of greatest need, but the data available for this study did not allow this to be pursued further. This positive value for money outcome could be a valuable addition to knowledge and would suggest the need for further research to unravel what factors (possible College-based, including policies and teaching/support strategies) are behind the

variable ‘year’ in this model. For RG participation, a proxy for social mobility, the results are stark for the College, with large declines for all students, and no suggestion of improvements in social mobility.

The comparison of the various statistical techniques used in the research suggests that professionals need to be careful in the use of Chi-square, but that in giving College-level information, simple time trend regression may be useful for disseminating information to managers within tight time constraints. However, in terms of progression to HE, the simple time trend would not have given the more positive message to management achieved by the more advanced techniques; while for participation at RG, the message, although consistent in sign and significance, was not as negative. Therefore, where the data is available and the matter is of importance, the more advanced techniques are arguably more reliable and also give a more nuanced picture. In many cases the LPM is the preferred option as it has the potential to bridge what have been viewed as ‘simple’ and ‘complex’ techniques in this research; the output is in probabilities – a readily understood concept – and the marginal effect can be sourced direct from the output (but it does need to be checked against the more complex logistic regression before use).

7 Conclusions and discussion

7.1 Introduction

This thesis has investigated the effects of NL's WP policy in one case study College. The main concern was establishing whether there has been a significant change in College participation, progression to HE and RG participation, over time in response to the WP policies for the period 2001 to 2010. The research looked to explain the relationship between student attributes and changes in these educational progression outcomes and to assess whether there were any linkages to the apparent failure to deliver social mobility. The research was particularly concerned with the WP policies of the period and how they impact on less advantaged students, given the large public investment over the period, equivalent to a 22% real term increase in funding per student (FTE). Using a case study methodology and a variety of statistical techniques, the findings are arguably applicable to similar institutions and given that the College is considered a key constituent for delivering social mobility, based on its location and student intake, the findings could also inform future research on why social mobility remains an issue to this day. This chapter considers whether there are any lessons for the future, in the context of the College maintaining an inclusive entry policy and expanding vocational provision.

This chapter reiterates the research questions and relates the important findings from each chapter to them and looked to provide evidence from the College cohort on the efficiency and effectiveness of NL Government WP policies and the associated public investment over the period 2001 to 2010. The professional development of the Researcher is also considered. This is followed by a summary of the key additions to knowledge and policy recommendations arising from the research.

7.2 Research findings

Chapter 1 provided the background to the research by summarising the literature first presented in a review that accompanies this thesis (appendix 1.2); this concluded that there is a potential gap in knowledge, particularly in the FE and sixth form sectors, in terms of understanding the impact of education policy over an extended period. The lack of case study and time series research in this area was one of the main justifications for this research. The aims of the research are set out in chapter 1; the research questions are:

1. ***What are the trends in College participation and progression to HE by student attributes in the case study college?***
2. ***What are the main determinants of progression to different types of HE institutions and are some of these under the College's control?***
3. ***To what extent has the investment in the sector between 2001 and 2010 delivered value for money in the case study* college, *given the WP agenda?***
4. ***What are the implications for practice at a national and institutional level?***
5. ***To what extent do inferential statistics and more complex statistical methods add to our understanding in this area of study?***

The literature review to this thesis identified evidence of increased participation in FE in the general population and a reduction in NEETS (Department for Education & Skills, 2007), and also evidence (Department for Business, Innovation & Skills, 2011a) of a small increase in the numbers of students attending HE having received FSM. Despite this, social mobility, as measured in terms of progression to the professions (HM Government, 2010) is projected to remain a problem for very many years. The review concluded, in relation to research question 2 above, that:

- It is generally accepted that family background remains one of the key factors in determining education success (Cahill & Ermisch, 2012).
- If the role of a supportive adult could be replicated within institutions there could well be a positive impact on social mobility, but evidence suggests there is limited awareness of students' needs in this respect within institutions (Foskett, 2002).
- There is evidence that investment in the FE and HE sectors may come too late in a leaner's development (Bergh & Fink, 2006) and the state of the wider economy may be a more important factor at this stage of the education process (McVicar & Rice, 2001).

The review also provided a background to the investigation of question 4, as the literature provides evidence that credit constraints are important in determining post-compulsory education pathways and that:

- NL's Third Way and the quasi market structures in place in the sector have been identified as having the perverse impact of maintaining the current status quo (Francis & Perry, 2010).

- National policy directives to address such issues, such as the EMA, are only seen as having limited impact (Chowdry et al., 2007).

Chapter 1 also provides important background information on the College, demonstrating that it operated in a relatively deprived MB, thus making it important for the successful implementation of WP policies and an appropriate choice for a case study in this context. The chapter provided a description of the College and management team, which showed a diverse curriculum offer and inclusive entry criteria that may help address the unfavourable socio-economic characteristics in the MB. However, the College placed an increased emphasis on achievement rather than inclusivity towards the end of the decade, as reflected in the change to the College's mission statement. This illustrates that implementing policies through national directives may be problematic; actions 'on the ground' may not always be as expected nor necessarily analogous with these directives (an aspect considered later in relation to question 4). Chapter 1 lays the foundation to the contribution to profession practice, which is achieved through gaining an understanding of the use of 'complex' statistical techniques and whether they add to understanding of the Researcher and the wider College community, taking into account of literature looking at the impact of policy invention on education, the established performance indicators in the sector, and the theoretical models deployed in Chapter 6.

Chapter 2 sets out the case study research design; this follows the practice set out by Yin (1994) who recommends five components of research design. To place this investigation on a sound footing, the research systematically applied Yin's recommendations to case study methodology. In section 2.4 the EPF is put forward as a theoretical basis and framework for the analyses in chapters 6 and 7, which primarily address questions 1 and 2. Particularly important (for addressing research question 2 but also for practice going forward; question 4) is to test the impact of student attributes (inputs) the College can control in determining educational progression outcomes, and ultimately, social mobility. The empirical findings from previous studies based on the EPF (section 2.4.2) lend further credence to the findings from literature that has used other approaches (section 1.2), namely: there are no guarantees that increased funding on the education sector leads to improvements in educational progression outcomes, or at least improvements of a size large enough to warrant the expenditure. The quality of teaching was identified in the review of previous studies as a variable important in determining educational outcomes (Sodha et al., 2008) but this is not necessarily a monetary resource issue and may disproportionally affect less advantaged students. The quality of teaching is not a variable in the model analysed here given that lack of available data, but is likely to

have been a factor in education outcomes over the period and could be the subject of future investigation.

The statistical methods used in the investigation are also discussed in Chapter 2, and provide an introduction to the issues considered in research Question 5. Given the Researcher's background and the need to present findings in education to non-specialist audiences, a preference was given for 'simple' methods where appropriate. However, when considering the statistical methods to be used in this research (section 2.5) various reasons for preferring student rather than College level data and the use of more complex statistical techniques were given. It was acknowledged that 'simpler' methods may give similar estimates to more complicated procedures in many situations, but this was not always the case. The chapter concludes with a description of the diagnostic checks used.

Chapter 3 considers the secondary data underlying this research and finds it to be of high quality as it largely comes from an audited source and is used to determine College funding. For the student level data there are large sample sizes, but for the College level annual data, the observations are restricted to 10 (nine for prior achievement). The research has used Excel tools (pivot table and Strat Pro) for the College level data analysis, which is referred to as the 'simple' techniques, namely Chi-square and simple time trend regression. Descriptive analysis is the method predominately used in management reports for internal use, but the 'simple' inferential techniques are methods used, on a day-to-day basis, to check the significance of the findings to ensure that the interpretation is statistically accurate. For the more 'complex' techniques, namely multiple regression, SPSS is used. The variable definitions and descriptive statistics for the theoretical framework are set out in section 3.4 and generally show that there are large numbers of observations on which to conduct the analysis.

Applying the EPF framework, the variables used in the study are discussed in Chapter 4, along with existing empirical evidence on their effects on the educational outputs of primary concern (FE, HE and RG participation); this chapter thus gives a background for interpreting the evidence on research questions 1 and 2. In terms of the outcomes (the dependent variables), prior research indicates that FE and HE progression has increased (sections 4.2.1 and 4.2.2), including for the numbers from less advantaged groups (when using FSMs as the measurement scale), but generally the literature indicates that inequalities in HE progression in terms of less advantaged students were largely unchanged over the period. There is some debate as to whether RG participation alone is a true signal that social mobility is achieved, given that students' university choices are based on complex factors, but Chapter 4 proposed the use of RG participation as an additional WP measure.

Evidence from the literature suggests that RG participation from less advantaged groups has not improved over the period 2001 to 2010.

Considering the educational inputs (student attributes), importantly Chapter 4 identifies problems with using the WP Factor current at the time as a proxy for less advantaged students and instead proposes the use of a consistent measure throughout the period (IMD 2010). Using College data and the WP Factor (adjusted) measure there does not appear to be a narrowing of the gap in favour of less advantaged students. For the College there is: a gender gap in favour of female students and the gap does not appear to have narrowed over time; the proportion of White students has increased, perhaps a positive trend for social mobility in light of White male students being an underrepresented group in FE; however, the HE progression of non-White students is superior to White students at 18. Curriculum change is a mechanism used by governments to drive social mobility and the WP agenda, but in itself can cause achievement rates to fall (Allen, 2013). That said, evidence from this research suggests that vocational provision is not a barrier to HE progression and there is evidence that the number of students on vocational courses increased at the College, coinciding with an increase in the number of low prior achievement students. Chapter 3 importantly introduces two additional variables into the model to address question 3 directly. Section 4.4.1 considers the funding, devising a consistent measure of real expenditure per FTE, necessary given the inflation over the period of study. The other variable is year, the 'catch-all' variable for changes other than finance over time.

Chapter 5 considered, through a descriptive analysis, the established performance data used in the sector and in terms of these measures the picture for the College is mixed and inconsistent. Importantly for this research, these findings highlight concerns for question 4:

- In none of these measures is the characteristics of the learner fully accounted for when considering achievements, which means that such established measures do not provide appropriate evidence for the research questions of this thesis.
- These measures were still seen as important to respond to by the College, thus giving rise to a potential conflict with WP policy objectives.
- The changes in the College's management team and the appointment of a new Principal in 2007 could have explained, at least in part, a change in focus away from WP objectives towards a greater focus on performance table statistics and Ofsted grades.

- The failure to address the WP agenda explicitly in the performance tables, by not considering the starting points of students, does not provide an incentive to institutions to implement WP national policy directives.
- The OFSTED inspection in 2008 highlights a failure on the part of the College to address longstanding performance issues in one large department.

Chapter 5 also considered question 4, in terms of steering practice at a national and institutional level. The research has found that established performance measures do not have a direct bearing on WP and social mobility objectives. The research found a possible disconnect between national policy directives (such as those for WP), performance measures used within the sector, and decision making within institutions. In terms of evaluation WP policies, while the ALPS measure is arguably an improvement on the established government measures considered, given that previous attainment is correlated with less advantaged students, it still does not directly address the WP objectives. The research offers, in Chapter 6, an alternative statistical approach, which includes a wider range of variables to the established performance measures considered in Chapter 5. This model also considers year and funding variables, directly providing evidence of how the College performed over time and whether the funding was efficiently and effectively spent in terms of delivering WP objectives; something the established performance measures used in the sector cannot do.

Chapter 5 also includes a financial review of established performance indicators (section 5.7). This found that the College operated successfully in financial terms; operating with sizable surpluses and generating sufficient cash to invest heavily in facilities. The analysis found that the public investment in the education sector, for the College at least, appears to have been invested in facilities and increasing pay levels. Importantly for question 3, empirical evidence from the literature is equivocal in regards the impact of public investment in these areas and education generally, suggesting perhaps a small positive impact on educational outcomes.

Chapter 6 contains detailed inferential statistical analyses of students' attributes and outcomes; these are aimed at answering research questions 1 and 2. The chapter also compares and contrasts the simple techniques used in professional practice with more advanced techniques, thus investigating research question 5. The principles of the EPF are used here to investigate whether student attributes, in particular those the College can control, impact on educational progression outcomes (i.e. on College participation, HE progression and participation at a RG university for the College cohort). Essentially, the methods used here empirically investigate the impact of the WP policy

objectives of the 2000s on the College, namely to raise participation in FE and HE, and ultimately to increase social mobility.

In terms of the statistical methods used, the Chi-square test confirms the descriptive analyses that showed considerable variation in some years, however, significance in this test does not necessarily indicate a trend, important in terms of research question 5. The results from the simple time trend regression, however, suggest:

- The clearest signal that NL Government WP policies have not been successful is that while the College appears to have attracted a greater number of less advantaged students, it has not been successful in increasing the percentage of less advantaged students in the overall cohort.
- The increase in numbers of less advantaged students participating at the College for is likely to have resulted from increases in market share rather than from the success of any specific WP initiatives.
- HE progression shows no increase in the percentage of less advantaged students in the cohort.
- There was a 2% decline in the percentage of less advantaged students attending a RG university (although the findings must be taken with caution because of the low numbers attending RG universities from the College at any point in time).

Chapter 6 also considered other student attributes that have been linked to being a less advantaged student, considering the trends at the College level. These give an indication of the changes proportions of students with different characteristics linked to WP over the period. The general conclusions to be drawn from these analyses are that:

- Support for the findings from the literature for less advantaged students as there was no evidence of more White, male or low prior achievement students progressing to HE or participating at RG over the period.
- The percentage of vocational students participating at the College increased over the period by just under 2% a year. Thus there are some signs that curriculum change (an input the College can control), specifically the introduction of vocational provisions, could lead to increased participation, but the percentage of these students progressing to HE and participating at a RG university did not significantly change.

The educational progression outcomes analysed here are not perhaps the most appropriate measures for social mobility when vocational programmes are being considered. The shift towards vocational provision may have made it more difficult for the College to achieve increases in HE and RG progression over the period and of primary issue for this research is that growth in the percentage of students on vocational programmes has not seen a corresponding increase in the percentage of WP Factor (adjusted) students.

In Chapter 6, using student level data, the research considers other, more complex methods, as these address limitations with the 'simple' techniques using College level data. Chapter 6 also addresses research question 5 directly by enabling an evaluation of these 'complex' statistical methods and whether they add to our understanding, whilst also providing professional development opportunities for the Researcher in enabling future use of these techniques at work and in research. The findings for HE indicated a more positive picture in terms of progression of WP students than the simple time trend, while the findings for RG, although qualitatively similar indicated a more negative picture. There is no support for increased government funding having improved HE progression. This is in line with literature that has looked at other types of educational institutions and used other methods, which has not found a value for money effect. However, a small effect on WP students on participation at an RG university was identified, which may be worthy of further investigation Also, the 'complex' techniques showed some positive effects that were not picked up in the simple time trend regressions on proportions of WP students, which did not examine the independent effects of changes to the variables.

For HE progression and responding directly to research question 2, the evidence suggests that:

- For educational inputs the College can control, namely the curriculum and entry criteria, the negative effect on HE progression from the College developing vocational programmes and maintaining inclusive entry criteria, may be reduced for WP Factor (adjusted) students compared to non-WP students.
- The variable year (the time variable which is a 'catch-all' for factors that have been changing over time and are not specified elsewhere in the model) shows a positive effect on WP Factor (adjusted) students, while the effect on non-WP Factor (adjusted) students is negative at the 5% level of confidence.

In terms of the implications for practice at a national and institutional level, research question 4:

- There is no evidence that funding has affected HE progression, but the variable year has shown a positive effect suggesting it more likely that the changes over time are local college-based polices (i.e. policies impacting on the quality of teaching and student support programmes) that are somehow affecting WP Factor (adjusted) students positively, rather than national policy directives accompanied by increases in funding.
- For RG participation, a proxy used in this thesis for social mobility, the results are stark that the probability of being a high achieving student participating at a RG university has declined over the period. The decline is considerable for both WP Factor (adjusted) students and non-WP students.
- Using logistic regression, RG participation overall is also estimated to decline for WP Factor (adjusted) students and this decline is considerably larger than when using LPM regression.

The focus on this case study College is limited somewhat because it does not obtain qualitative data looking at the motivations of senior managers. It is fair to say that the emphasis placed on the WP agenda, particularly in the FE sector, diminished over the period and was characterised by the introduction of HE tuition fees and side-lining of the 50% target for HE participation. This was perhaps reflected in the College as well; section 4.2.1 highlighted likely growth in market share and the possible impact of the jobs market on participation and section 1.8 presented the change in vision from an inclusivity agenda, to one of striving for excellence. It is difficult to collect data on, or test for that matter, the underlying motivations of politicians and managers and this may partly explain why there has been little direct research testing the impact of this on WP policies over an extended period.

The statistical literature (section 2.5) identified potential difficulties with using the Chi-square test and simple time trend regression, so the research also used multivariate techniques, testing student level data. The findings suggest that Chi-square is not a suitable technique for identifying trends, but it may be useful in identifying changes in particular years that could be connected to particular events. Given the lack of statistical background of most in education management and research (and indeed the Researcher's inclination given his background), the preference in terms of multivariate statistical methods used would be to concentrate on the output from the LPM; it requires little manipulation and outputs are expressed in probabilities. The research supported the view of Wooldridge (2009) that in many circumstances there is little between LPM and logistic estimates, so the former is preferred for presentation to a non-specialist audience and this is something that could

be borne in mind by other researchers in the field. It is clear, however, from the findings in Chapter 6, that there are considerable differences in estimates between the LPM and logistic regression ('complex techniques') at the extremes of the data distribution, due to the 'S' shaped output against the linear output from LPM, and theoretically the logistic regression results are those preferred. This will need to be considered in future analysis and reporting.

Considering research question 3 directly, overall the evidence here suggests that investment in the sector between 2001 and 2010 did not deliver value for money in the case study College and more widely there is little evidence that increased public sector spending on FE can deliver social mobility, with the literature review to this thesis highlighting family background as being a major factor in determining educational progression outcomes. Despite the increase in real term funding per student (FTE), see section 3.2.2, evidence provided on the outcomes in Chapter 6 showed no direct effect of such increases on progression to HE (and only a small positive effect for WP students on RG participation). These findings would suggest that resolving social mobility issues through central government policy interventions, accompanied by increases in public spending, may be problematic. Essentially, public spending directed at the education sector is not necessarily an effective or efficient mechanism for delivering social mobility given that the evidence here is consistent with much of the literature in finding a lack of support for a substantive positive effect of funding increases. Notwithstanding this, it is worth noting that there has been a small shift to vocational programmes at the College but these programmes have not necessarily been taken by less advantaged students and uptake could have been influenced by changes in IAG. The curriculum offered by the College is an input the College can control and this may have been a factor in increasing overall numbers, likewise the policy to keep an inclusive entry policy. Chapter 6 found some signs that curriculum change, specifically the introduction of vocational provisions, could lead to increased HE progression for less advantaged students relative to advantaged students. Also for the variable year, there was a positive effect on HE progression for WP Factor (adjusted) students, possibly suggesting there were micro level factors within the College, but not funding, driving the improvement. One of these micro level factors could be the quality of teaching (see section 5.2 and the results of the 2008 OFSTED inspection), and a more robust and effective approach in dealing with the under-performance of teachers could well yield improvements in educational progression outcomes for less advantaged students in particular; this is not necessarily a 'monetary resource' issue. It could also be connected to pastoral care programmes in College, which may provide or supplement the 'supportive adult' role to less advantaged students.

7.3 Additions to knowledge

The additions to knowledge found whilst undertaking this thesis are summarised as follows:

1. There is a potential gap in knowledge, particular in the FE and Sixth Form College sectors, in terms of understanding the impact of education policy over an extended period and at a case study level.
2. Changes in management teams and the strategic directions of institutions can lead to actions 'on the ground' that may not always be as expected or necessarily analogous with national policy directives.
3. Performance data used in the sector can provide a mixed and inconsistent picture and, importantly for this research, none of these measures fully account for the characteristics of the learner when achievement is considered. Yet despite this, they were still seen as an important issue for the College, thus giving rise to a potential conflict with WP policy objectives.
4. The creation of a student level database which includes a consistent measure of the WP Factor and real expenditure per FTE over a 10 year period has added to understanding by allowing a coherent analysis of the changes that took place. Institutions need to be aware of definition changes and the importance of using consistent measures when evaluating developments over time.
5. Perhaps the clearest signal that government WP policies have not been delivered is that, although the College has been successful in attracting a greater number of less advantaged students (possibly by increasing market share), it has not been successful in increasing the percentage of less advantaged students in the overall cohort if the WP Factor (adjusted) measure is used.
6. There was no evidence that changes in funding over the period were effective in increasing HE progression in the College. This adds to the literature that has examined other types of educational institutions and has used other methods, which also found either no, or only a small, positive effect.
7. There were some signs that curriculum change (an input the College can control), specifically the introduction of vocational provisions, could lead to increased HE progression for less advantaged students relative to advantaged students also on vocational programmes.

8. ‘Year’ was shown to have a positive effect on HE progression for less advantaged students, whilst funding was not significant, which suggest that there may be micro-level factors in play within the College which have not been fully accounted for here; could good teachers and pastoral care programmes be providing the role of ‘supportive adult’ to some less advantaged students? This investigation raises the need for further study of such micro programmes (both within the College and more widely).
9. Maintaining an inclusive entry policy has no impact on the percentage of less advantaged students participating at the College, or progressing to HE.
10. RG participation at the College has fallen considerably for all groups of students, even those students with high prior achievement, over the period. Increases in funding were not seen to increase HE progression, but were seen to have a small positive effect on RG participation for WP Factor (adjusted) students; but this analysis was based on small numbers and so the findings need to be taken with caution, but are worthy of further investigation.
11. The analyses using ‘work horse’ tests such as Chi-square and simple time trend regression found problems with Chi-square if the concern was trends. Simple time series regression can be used to support graphical analysis in situations where data for more complicated techniques is unavailable. The analysis here indicated that it could give results that differ from the more complex techniques to an extent that may be important for management; however, it may be useful as a quick and easily conducted tool for management assessment of performance in certain circumstances.
12. Multivariate techniques, in particular here multiple regression, although more complicated and time consuming than simple time series regression, gives a more detailed examination that may produce more reliable estimates and some useful additional management information. The output from LPM expressed directly in probabilities is often the preferable method for presentation to non-specialist audiences as it is simpler than, and in many cases provides estimates very close to, logistic regression (although it will always be necessary for the Researcher to check that the findings from a logistic regression are similar in the particular investigation, especially for small samples and for data at the extremes of the distribution).

The thesis has provided the Researcher professional development opportunities as follows:

1. The Researcher had a good understanding of Chi-square and simple time trend regression, but had only a limited understanding of the data formatting requirements and applications of the LPM. Logistic regression was a statistical tool completely new to the Researcher and represented a steep 'learning curve'.
2. The Researcher has gained a greater understanding of the College in relation to WP outcomes and now has a better understanding of what does and does not work in terms of how scarce resources should be allocated in the future.
3. The research highlighted gaps in knowledge to be addressed in the future, i.e. why has RG participation declined over the period for all students at the College? Is a similar pattern found in other local educational establishments or in those with a similar intake?

7.4 Policy recommendations

The key policy implications from this research are:

1. Policy intervention in the form top-down directives, with the provision of additional finance is not always an efficient and effective use of resources. This thesis provides no support for the expectations that blanket allocation of resources to improve the College site and increasing staff pay levels will impact on social mobility and suggests that other micro level factors may be at play; the quality of teaching and pastoral care programmes being just two examples worthy of further research.
2. If monitoring and inspection is applied to colleges, a policy considered of importance (such as WP) and the subject of funding needs to be explicitly brought within this framework. Otherwise there is likely to be distortion towards the more closely measured targets (such as the school and college performance tables). Any such monitoring needs to be based on consistent statistical series.
3. Given this, the performance monitoring being applied in the school sector, such as evaluating how the pupil premium funding is spent and the impact of this investment, should be extended to the college sector as this could incentivize colleges to address social mobility issues directly.
4. Colleges (and other institutions), in using statistics over time for internal management examination of progress (and any monitoring programme), need to be careful to use consistent series.

5. Vocational programmes should be expanded as they potentially offer an opportunity to increase participation in FE; these programmes are also less of a barrier to HE progression for less advantaged students.
6. An explicit performance target for all FE and sixth form colleges to increase participation at RG universities may be worth applying, particularly for those from less advantaged groups. It is worth investigating whether targeting specific schools/colleges in low participation areas may be more effective than the current policy to increase WP through the fair admissions process to universities.
7. The College studied here should institute a review/investigation as to why RG participation has declined; further research could extend this review to other colleges in similar areas, in order to address this problem.
8. It may be more appropriate to direct College resources targeted at social mobility to programmes that: increase parental engagement, develop the role of 'supportive adult' in colleges and generally assist in breaking down perceived or actual social barriers. This may also apply more generally in the sector.
9. Inferential statistics may be helpful to College management in their appraisal of performance, but care needs to be taken in considering what is appropriate given the suitability of the techniques, the costs and the background of the intended audience.

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1 Appendix – Chapter 1

1.2 Literature review

Investigating New Labour's policies to widen participation between 2001 and 2010: A Literature Review

By

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EdD

Introduction

The Further Education (FE) sector has been increasingly recognised as crucial to the economic and social wellbeing of the country and has experienced fundamental change since incorporation in 1993. It has experienced a move from LEA control to that of a quango, the Further Education Funding Council (FEFC) and it has been subject to a funding methodology which has exacted efficiency targets year on year. Following the Kennedy Report (1997) further demands for change were made. New Labour (NL) shifted the emphasis from a competitive approach to a more collaborative culture, focusing on widening participation (WP), inclusion and service to the local community. The White Paper 'Learning to Succeed' (1999) introduced yet more change, including a new system for the management of the sector, the Learning and Skills Council (LSC), which assumed responsibility in 2001 for ensuring the sufficiency and quality of provision and for funding. NL's mantra of 'Education, Education, Education' heralding a 'third way', which tried to reconcile right-wing and left-wing politics by advocating a varying synthesis of right-wing economic and left-wing social policies (Bobbio and Cameron, 1997), was distilled into four policy aims in the last decade (Blunkett, 1999):

- modernising the comprehensive system
- raising standards
- developing pre-school education
- developing social inclusion

Educational policies directed at developing social inclusion will be the focus of this literature review and the two policies that encompassed NL's aims of developing social inclusion are as follows:

- proposals to widen participation in FE, and
- proposals to increase the number of HE places.

The two policies (above) were implemented through the Learning and Skills Act 2000 with an overriding long-term aspiration for the education system in the UK: by 2010, 50% of school leavers thirty years and under should have experienced HE. It is recognised that this aspiration had reduced prominence when in September 2006 it was agreed that universities would be allowed to charge up to £3,000 a year in variable tuition fees, or top-up fees.

This literature review will present research in the context of the two social inclusion policies and the overriding aspiration set out above, whilst being mindful of a proposed micro study of the

effects of social inclusion policy on one college, considering the changes in various outcomes and whether the investment in the 2000s was efficient and effective. There are a number of frameworks that could be used to analyse the social inclusion policies, but the traditional PEST analysis (Slomon and Sutcliffe, 2001), looking at the political, economic, socio-cultural and technological factors, would seem appropriate ; the featured social inclusion policies have clear political, economic and social-cultural factors driving them, technological factors probably less so, but still a factor if curriculum, skills and employment can be considered under the heading of technological.

This literature review will, in section 2 (the political context), look at the ideological framework of NL's policies for developing social inclusion. This discussion explains the policy context with reference to the historical perspective of policies focusing on social inclusion. It will discuss whether NL's 'third way' for distributing public funding, in particular the use of market forces and the value of social capital in the education system are an explanation for the apparent failure to deliver social inclusion.

In section 3 (the economic context) the literature review will outline that NL's period in office coincided with a favourable economic climate and large increases in public spending on education. An economics based investigation will be carried, focusing on the impact of public spending on educational outcomes and ultimately social mobility. A definition of value for money will also be presented along with detail on how value for money measures were applied in FE. The section concludes with an example where NL's investment in the sector was poorly handled.

In section 4 (the social-cultural context) the literature review will first set out the problem of establishing an appropriate definition and measurable target for social inclusion. Section 4 goes onto to examine theories of learner development and whether investment in the education sector is the best mechanism to deliver social mobility. Research on the impact of student subsidy schemes, income equality and the labour market will also be presented. The section ends with a review of statistical data at a national level.

In section 5 (the technological context) the literature highlights that there already exists a well-established route into HE through A Level and vocational curriculum programmes. The impact of cognitive skills on the education system will be examined, in terms of providing a possible explanation why the established programmes of study are still inaccessible to large numbers of students. The literature review will then look at curriculum change, the mechanism used by successive governments

to address perceived shortfalls in the education system. The section concludes by looking at the job prospects for recent graduates and the difficulty many are finding in securing well-paid jobs.

Political context

Policy ideology

Ideologically, the two social inclusion related policies set out in the introduction are social democratic policies (Hill, 1999), which are based on the traditions of redistribution and financing through the agencies of local and national state. The main principles of social democracy are, according to Heffernan (1997), full employment, the welfare state, redistributive taxation as a positive social good and the use of Keynesian economics as a means of controlling the economy.

According to Hill (1999) NL actually spread the frontiers of neo-liberalism in education in its promotion of the business ethic and privatised control over schooling and education. Neo-liberalism seeks to transfer control of the economy from public to the private sector under the belief that it will produce a more efficient government and improve the economic health of the nation (Cohen, 2007). The financial independence of institutions in the FE and HE sectors during NL's period in office could be viewed as a continuation of most of the structural aspects of the Conservative's Education Reform Act 1988. In particular the importance of market forces in the distribution of funds by NL is an ideology akin to the neo-conservatives which is an intellectual and political movement in favour of political, economic, and social conservatism that arose in opposition to the perceived liberalism of the 1960s (Ball and Dagger, 2012).

According to Hill (1999) one of the key characteristics of neo-liberal and neo-conservative ideologies is the overall low levels of public expenditure. A particular focus for the final research project and this literature review is how effective and efficient the increased levels of spending on education in NL's period in office were (set out in section 3). Especially as it seems to contradict the low levels of public spending ethos of the neo-liberals and neo-conservatives and is more associated with the social democratic ideologies of 'old' Labour.

Historical context

The notion of social inclusion in the context of educational policy has been around since the 1800s. The 1858 Royal Commission (The Newcastle Commission) recognised the benefits of education and recommended the rising levels of public money for education be continued, but suggested that such support should be dependent upon a system of 'payment by results'. Post war, the 1944 Education Act (Butler) had a commitment to the creation of a fairer society as one of its key principles

– the principle of equality of opportunity. Following the 1964 general election the Labour Party introduced more widely comprehensive education which was designed to break down class barriers. In the 1970s, there was a sense that the education system was not meeting the needs of the economy. The introduction of vocational courses was designed fundamentally to reduce high youth unemployment rather than a specific aim to deliver social inclusion, although this indirectly could have been the outcome if successful. The technology context (section 5) will highlight research (Allen, 2013) that indicates that vocational programmes have enabled less academically successful students at 16 to progress to HE. Again the Education Reform Act 1988 was more concerned with the needs of the economy rather than a specific aim of increasing social inclusion. The principles of the free market were the emphasis at this time. Standards of education were also a key feature, characterised by the policies such as: the local management of schools; giving greater control of budgets to schools; FE colleges becoming independent corporations in 1992; and the expansion of the inspection regime (OFSTED).

Social inclusion has therefore been a policy aim, in one format or another, from the 1800s, and many of the instruments used are reminiscent of policies which can again be seen to harp back to the 1800s, e.g. performance related pay. NL's policies on social inclusion could be argued as a continuation of Labour's post war policies, yet it is clear from the Kennedy Report (1997), one of the key drivers behind NL education policies, that despite a number of attempts post war to address social inclusion, it still remained problematic. One could argue that the post war educational policies focused on addressing social mobility issues, prior to NL, have not delivered social inclusion and has essentially perpetuated the class divide, Kennedy (1997, p9) states:

"Yet the shocking fact is that support for students is heavily weighted towards those who personally go on to benefit most from their education and whose family circumstances are most favourable to continuing in education. One fifth of the households which have the highest incomes in our country receive more in educational subsidies than those forming either of the bottom two fifths".

Social capital

Social capital refers to the social networks, systems of reciprocal relations, sets of norms, or levels of trust that individuals or groups may have, or to the resources arising from them. According to Francis and Perry (2010) many of the initiatives in education are measured through increases in attainment and overall there has been little sustained improvement with regard to the educational outcomes of disadvantaged groups. They went on to point out that an increasingly segregated

education system, driven via a market where the wealthy have better purchasing power (via both financial and social capital), mitigates against the narrowing of the social class gap for attainment. Policies focusing on working class families that ignore issues around social capital could be an explanation for the apparent failure to deliver social inclusion.

Empirical evidence on the role of social capital in society is thin, but Bourdieu (1977) identifies social capital as an actual or potential resource that can be used by powerful elites to retain their privilege. Coleman and Hoffer (1987), in their work on social disadvantage in schooling in the 1980s, defined social capital as a set of resources inherent in a group that in certain circumstances can overturn social disadvantage, the example being a Catholic school. As Francis and Perry (2010) point out above, many of the policies, especially the use of the market to distribute funds can have the perverse effect of maintaining the status quo. What perhaps is needed is an ideological framework that supports/develops the social capital of disadvantaged groups; it may be able to be done at a micro level as per Coleman and Hoffer (1987), but is it something that can be driven by a national policy directive?

The 'third way'

The implementation of NL's 'third way' approach to education policy can also be seen to have had the contrary effect of penalising institutions that operate an inclusive enrolment policy. Naidoo (2000) analysed HE reform and argued that a wide range of countries have responded to forces associated with globalisation by adopting a 'third way' political approach. Presenting the reform of HE in Britain as a case study, Naidoo outlined the important financial and other support measures devised by NL to distribute opportunities for study more evenly across society. It looked at the quality assurance measures, which restructured the HE terrain within a quasi-market framework, and at the same time compelled universities to compete against other universities for funding and status. Naidoo illustrated how the institutionalisation of the quality assurance mechanisms inhibited the workings of measures aimed at WP in the system as a whole. He concludes that the implementation of the 'third way' approach to HE reform serves to penalise the very institutions which recruit students with the greatest social and educational need. Interaction of the measures for WP and quality assurance is therefore likely to lead to a HE system that is heavily stratified along the lines of prior educational and social disadvantage. There are parallels in the FE sector with the reliance on performance tables and a data driven OFSTED inspections, which drives some institutions to use restrictive entry criteria to boost performance table scores at the expense of inclusivity.

Macdonald and Stratta (2001) examined where local (micro level) decision making can mitigate against national policy directives. The article examined tutors' responses to non-traditional students in an institution with a well-established access policy. The responses reveal that the emphasis was on helping students to adjust to the existing undergraduate provision rather than engaging in a radical rethink on possible approaches appropriate to a more diverse population. The article concludes that the current top-down approach to policy implementation should be modified; account needs to be taken of how tutors interact with students and interpret policy initiatives.

In recent research on sixth form colleges, Allen (2013) found there is a relationship between prior attainment and student outcomes in terms of leaving a course early, failing a qualification, passing with a low grade and passing with a high grade. The exact nature of this relationship, however, varies from subject to subject. This means that when judging the performance of institutions and departments, it is not possible to rely on a qualification type benchmark to tell the whole story. There are subjects where students in the lower bands are far more likely to have successful outcomes than they are in other subjects. There are also subjects where middle-banded students are far more likely to secure a high grade than they are in others.

There could be very real benefit, therefore, in carrying out further micro level research on the impact of NL's policies in terms of delivering social inclusion and value for money at an institutional level. It can have advantages that can better judge performance by having a better understanding of, say subject related differences, but also in that the society setting is narrower. Difference, for instance, in taxation policies and public/private expenditure patterns, employment possibilities and earnings after the education etc. may be expected to differ considerably across countries and even regions within countries. All of these factors may impinge on the enrolment and attainment rates, so there is a role for a case study approach in further research. It could also help unravel some of the social capital factors and institutional decision making factors which could explain the apparent failure to deliver social inclusion over what is in a historical perspective very many years. Research could be twofold: testing of hypotheses for a case study college and considering worthy investigations for a wider population.

Economic context

Economic performance and public spending on education

The 10 year period 1998 to 2008 was characterised by favourable economic conditions. According to European Central Bank (2010) the Gross Domestic Product (GDP) in the UK grew on average by 3% per annum until the start of the recession in 2008. The Bank also reported that unemployment at the start of the period stood at 8% and in 2008 closed at five and a 0.5%. Inflation started the period at under 2% and ended the period at just under 4%. The tight public spending in NL's first term gave way to big increases in the second term, which, led to a growing public sector deficit even before the onset of the financial crisis. After a period of financial restraint from mid 1990s (Chantrill, 2013), public sector debt as a percent of GDP fell to 29% by 2002. From 2002 to 2008, national debt increased to 37% of GDP. This increase in debt levels occurred despite the long period of economic expansion and was primarily due to NL's decision to increase spending on health and education. Following the onset of the banking crisis (Chantrill, 2013) debt as a percentage of GDP rose to 52% by 2010.

Economics based investigations

Education economists analyse both what determines or creates education and what impact education has on individuals and the societies and economies in which they live. Historically a great deal of emphasis has been placed on determining outcomes to educational investment and the creation of human capital. The primary emphasis (Bergh and Fink, 2006) being to identify opportunities for improved efficiency, equity, and quality of education, and promote effective education reform processes; to help improve knowledge of what drives education outcomes and results; and to better understand how to strengthen the links of education systems with the labour market.

There are also questions for Government on what sector to direct spending and where the funding should be directed within sector budgets. To increase enrolment in FE, Bergh and Fink (2006) provide evidence that spending on primary and secondary education had to increase and public subsidies of FE itself do not appear to significantly affect the enrolment decision. This is interesting given that the focus of NL's increased investments (Chowdry and Sibieta, 2011) was the FE sector. Investment in the school sector was also primarily directed at capital spending through the Building Schools for the Future programme, but there is a lack of studies on the effect of capital spending.

Perhaps a greater focus on teaching and learning in the classroom at school, by way of say reduced class sizes, would have been a better use of the investment? Levacic et al. (2005) find, for example, modest and subject-specific effects from additional resources on attainment at age 14 and additional spending to reduce the student-teacher ratio is more effective than expenditure on additional non-teaching staff or an increase in general expenditure.

Evidence from Chowdry and Sibieta (2011) suggests that the socio-economic gap in HE participation is driven largely by differences in secondary school attainment, and hence by participation decisions at age 16, rather than by attainment and participation decisions at age 18. Mandl (2008) also found that there is no clear link between spending on education and the observable performance of students. In HE (Bergh and Fink, 2006), the opportunity cost of foregone earnings is seen as a bigger cost and is only marginally affected by public spending, which supports NL's approach of placing less emphasis on HE funding.

There is very little research looking at trends over time in the FE sector. Whitfield and Wilson (1991) present a time series analysis of the socio-economic factors influencing the propensity of 16-year-olds to stay on in full-time education in England and Wales. The econometric methodology employed relies on co-integration (a technique that removes spurious correlations) and `general to specific' techniques. The results suggest that the main factors influencing staying on are the rate of return to education, the changing social class structure, unemployment rates and the introduction of special employment and training measures such as the Youth Training Scheme. McVicar and Rice (2001) examined time-series evidence relating to participation rates in FE in England and Wales, also using co-integration analysis, and identified a long-run statistical relationship in the data consistent with an augmented human-capital model. The rapid growth of participation is largely attributable to the improvements in GCSE attainment, coupled with the expansion of HE in the 1990s. McVicar and Rice found that fluctuations in labour demand play a significant role in determining the movements of participation rates over time, and the substantial rise in youth unemployment of the early 1990s contributed to the growth in participation at this time.

NL's reliance on increasing FE spending (Chowdry and Sibieta, 2011) may therefore have been misplaced, as evidence suggests that economic factors and school attainment play a more significant role in a student's decision to stay on in education and ultimately progress to HE. The previous analysis on participation rates also only partly addresses the issue of whether the investment was efficient and effective and represented value for money; there is a need to look at achievement and progression to HE and ultimately employment as well.

Value for money

'Value for money' is a term that can be used (University of Cambridge, 2011) to assess whether or not an organisation has obtained the maximum benefit from the goods and services it both acquires and provides, within the resources available to it. Achieving value for money is often described in terms of the 'three Es' - economy, efficiency and effectiveness. Value for money is based not only on the minimum purchase price (economy) but also on the maximum efficiency and effectiveness of the purchase.

In the FE sector success rates (a factor of retention and achievement) was used to measure institutions' performance in value for money terms throughout much of NL's tenure in office, resulting in an OFSTED grade for value for money on a four point scale of 'unsatisfactory', 'satisfactory', 'good', and 'outstanding'. The final assessment of value for money takes account of the financial health of the institution, but the overall grade was ultimately determined by the performance in terms of success rates. Institutions were scored/judged by OFSTED on success rate performance against sector benchmark, and to achieve the top score of 'outstanding', institutions had to exceed sector benchmark irrespective of the composition of the student body in terms of socio-economic background, prior attainment, ethnicity, etc.

Table 1 shows the success rates for all sixth forms (in England) for 16-18 students on long courses, such as AS and A Level. It is interesting to note that success rates remain fairly flat during the period 2005 to 2011, indicating no real improvement in quality as judged in OFSTED terms. Although, there was some growth over the five years (7%) would it be possible to judge the period a success in value for money terms based purely on this data? The data presented does not extend to looking at the socio-economic groupings, what types of programmes were being studied (academic or vocational) and whether the qualification led to HE progression or meaningful employment. All of which would have been useful data in being able to support a judgement on whether NL's investment in the education system represented value for money. In making judgements on value for money at a macro or micro level (University of Cambridge, 2011) some elements may be subjective, difficult to measure, intangible and misunderstood. Judgement may, therefore, be required when considering whether value for money has been satisfactorily achieved or not. The practice of looking at raw scores may be problematic (Goldstein and Thomas, 1996) and it would be important to extend the analysis to include student attributes (such as gender, ethnicity, programme of study, qualifications on entry and level of social deprivation) and exclude external factors such as changes in the employment levels and market forces in education locally for example.

Table 1 - Sixth Form success rates (long courses – 16-18)

	2005/6	2006/7	2007/8	2008/9	2009/10	2010/11
16-18 students' long course success rates (%)	83.1	84.5	85.2	85.0	84.4	84.2
Starts (000's)	517	533	535	555	562	555

Source: dataservice.org.uk

Research detailed above suggests that there is no clear evidence that increased public sector spending on FE can deliver social inclusion, with economic factors and prior school attainment probably being more significant. There is also a debate to be had on whether the vast sums invested in the education sector and FE in particular were managed effectively; the success rate data may suggest no real improvement in value for money and in July 2009 the Public Accounts Committee (Learning and Skills Council, 2012) described the LSC's handling of its college building programme as 'catastrophic mismanagement'. It resulted in nearly three billion pounds of debt, with 144 colleges having to be terminate building contracts abruptly, and leaving many colleges with huge financial penalties for breach of contract with civil engineering companies. Twenty three colleges had debts of more than 40% of their annual income, with some facing possible financial collapse. Looking at the impact of the increased investment at an institutional level may, therefore, be useful.

Social-cultural context

Definition

Social inclusion is not an easy concept to define (Crawford et al., 2011) but is often used to refer to the ability of individuals from disadvantaged backgrounds to move up in the world, akin to the notion of equality of opportunity. This could even be taken a step further by introducing positive discrimination e.g. setting lower university entrance targets for state school students. It is difficult, however, for policymakers to target social inclusion directly, and policies that we might expect to affect the key drivers of social inclusion, including income, education and occupation are spread across government departments. There are also political challenges in pursuing a relative definition of social inclusion, which could imply downward mobility for children from rich/middle income families; does HE participation rate for individuals from higher socio-economic status backgrounds need to decline relative to the HE participation rate for lower socio-economic groups? Finally there is a party political perspective, in that policy interventions under government control require investments which may only reap rewards in terms of inter-generational mobility some years down the line.

The measure used for determining social inclusion is also relevant here, given that much of the data set out below indicates improvements in participation and progression to HE. It could be the case (Crawford et al., 2011) that the measures or definitions of social inclusion are very much at the extremes, from students from the poorest families to those whose parents are employed in the professions. A more pragmatic approach would be to improve social inclusion for lower to middle income groups rather than the lowest socio-economic groups; perhaps a much longer term mind set is required. Progression to Russell group universities has been highlighted as a social inclusion problem (Sutton Trust, 2008) and thus improving this can be argued as a target and is an area of particular interest in the future research study.

Human development

The academic field of human development draws on research to formulate theories of how children and adolescents grow. The theories provide concepts for thinking about the processes of developmental change. One of the messages of these (Reed et al., 2005) is that young people have a tremendous potential for growth, yet it is clear that educational policies to drive social inclusion have failed, especially when viewed over a historical perspective.

The learning theory model (Fester and Skinner, 1957) proposes that the key to learning is the reinforcements that the teacher uses to shape behaviour. If in a specific situation an experimental subject's behaviour was followed by a reward, researchers found that the subject was likely to repeat that behaviour again. Rewards are much more effective than punishment in shaping behaviour. Frieire (1970), however, argues that learners in this situation are in a passive and dependent role and they do not have ownership of the learning process, which could ultimately make them feel alienated and unmotivated.

The constructivist model (Piaget, 1936) postulates that learners are not passive but creatively adapt to their environment. In other words young people do not need to be made to learn, they are highly motivated to do it. If the shortcoming of the learning theory model was that it risked removing the learner's ownership of the learning process, a risk of this model is that when learning is turned over completely, the learner may flounder. A middle ground is collaborative learning theory (Vygotsky, 1962) where learners are active in cooperation with others.

Feelings and emotions that occur in these relationships are also important to the process of human development. Relationship theories (Mahler et al., 1975) acknowledge that humans are intrinsically needy and emotional creatures. Many adherents to these theories believe that a child's core patterns of emotional regulation are laid down in the first five years of life and these cannot easily be reshaped. None the less, secure relationships with adults outside the family can make a significant difference (Rhodes, 2002). Sociological theories (Berger and Luckmann, 1966), on the other hand, see humans as social creatures and norms and identities are acquired through social interactions. Young people learn by watching others, being reinforced for following norms and sometimes from being sanctioned for doing wrong.

A common theme across these theories (except early learning theory) is that development occurs through a process in which learners are active agents in the process and they drive the development (Reed et al., 2005). Essentially learning theory tells us that when learners are engaged, experience ownership and can see an unobstructed path ahead, their energy for positive development will result.

Education system, institutions and individuals

The academic field of human development would suggest that adults within the FE sector could play a role in allowing all learners to achieve their potential. The education system, institutions

and individuals working within the system may, however, actually inhibit adults in allowing them to adopt the role of 'supportive adult'; institutions and individuals working in the system have their own set of beliefs, which are not necessarily aligned to government policy. Employees working in the FE sector, for example, may have their own prejudices, which could work against Government and institutional targets, even the very notion of educational targets being an anathema for some teachers. Is it realistic, therefore, to expect adults within the FE sector to be able to play the pivotal role in student development, given the range of belief systems and social pressures they face? At an institutional level did the WP agenda remain a high priority throughout the period or was it, for example, overtaken by the requirement to obtain favourable OFSTED scores in the face of increased competition?

There has been some research on how institutions and individuals working in the education sector respond to educational policy. NL's WP agenda, for example, places financial imperatives on FE sector colleges to re-focus their institutional vision and their marketing strategy. Foskett (2002) argues at first sight WP may be seen as essentially a marketing issue, with two key challenges: (1) facilitating choice involves enabling an engagement with learning for those who have considered FE but have rejected it because of economic, social, cultural or community barriers; (2) increasing demand requires colleges to reach out to those for whom engagement with learning has traditionally never been part of their lifestyle horizons. Both are new, but recognisable, marketing objectives which colleges can address. According to Foskett pursuing traditional FE marketing models based simply on 'selling' and a functional view of marketing is destined for failure. WP is inherently a challenge to internal institutional culture that requires colleges to change fundamentally their modus operandi, their view of the world and their values. The article explores in the context of FE the relationship between WP as a concept and policy, the developing marketing perspective of institutions, and the emerging cultural challenges that face senior managers in colleges. Drawing on case study evidence from a number of FE colleges, the article examines how far colleges are responding to this ideological and management imperative. The article concludes that WP is firmly established as both a moral and strategic imperative at senior level in FE. There is not yet much evidence, however, of this culture permeating more widely through institutions because of the dominance of a project view of WP and limited awareness of the complexity of needs and wants in the diverse group of communities that are currently non-participants in FE.

Student subsidies

Government policy on social inclusion has rarely focused on learner development or the roles and responses of individuals in the process, but has tried to address the social factors arising from low income through providing student subsidies, i.e. the Education Maintenance Allowance (EMA). Research undertaken by the Institute of Fiscal Studies (Chowdry, 2007) looking into the impact of the EMA on participation and achievement in post compulsory education had two main aims: the first aim was to support previous research into the impacts of the EMA pilots on participation; the second aim was to extend the body of research by examining the impact of the pilots on attainment, and breaking down all the impacts for different groups of young people. Overall, Chowdry found that participation analysis of the Year 1 and Year 2 pilots provided mixed results, with no consistent story appearing except that estimates are generally weaker than the ones found in previous studies. The key findings on attainment indicated that in the Year 1 and Year 2 pilot areas, females were two and a half percentage points more likely to reach the Level two and three thresholds, while males were around two percentage points more likely to do so. Both males and females saw improvements in average A-level tariffs of roughly 4.5% of the base level.

The most striking finding was the attainment of ethnic minorities and these experienced strong and significant increases in the pilot areas. Black females stood with strong and significant improvements on every single indicator of attainment that were measured. The gains among Black males and Asians as a whole – while perhaps slightly weaker and more sporadic – were still considered impressive overall. Another positive impact from the research is that males and females in relatively disadvantaged areas experienced higher participation and attainment and that these improvements were considered nontrivial relative to their base levels. For males in the most deprived areas, however, the impacts were quite sparse and weak. According to Chowdry (2007), these individuals, along with the lowest prior achieving males and females, may represent areas where support in pre- and post-16 education needs to be strengthened further so that improvements in participation are followed by improvements in qualifications. Chowdry did not comment on whether the impact, although positive in some respects, represented value for money in terms of the half a billion pound price tag.

Credit constraints and family background have been used to explain the difference in college enrolment between students from high and low income families. The former hypothesis suggests that incomplete financial markets, that do not offer uncollateralised loans for human capital investment, prevent poor students from enrolling in college, whereas students from high income families can rely

on their family endowments (Kane, 1996). The fact that the EMA increased post-16 participation to some degree, suggests that some credit constraints may operate in the UK education system. Lochner and Monge-Naranjo (2012) reviewed studies of the impact of credit constraints on the accumulation of human capital and found that credit constraints are increasingly important for schooling and they highlight the importance of early childhood investments. Evidence overall from HE directly, however, suggests that credit constraints do not play a large role in determining either HE applications or participation (Chowdry and Sibieta, 2011), conditional on prior attainment and other characteristics. Chowdry and Sibieta do acknowledge, however, that they could not rule out that the fear of debt or low aspirations may have some impact on how students engage with the compulsory schooling system or that at higher levels of fees and credit constraints may not become a problem. They do conclude that policies which seek to address credit constraints are unlikely in and of themselves to radically reduce the socio-economic gap in education achievement and hence long-run outcomes, including social inclusion.

Earlier research evidence (Pennell and West, 2005) on the possible impact of the HE reforms in England on participation by students from lower socio-economic backgrounds, suggests that financial issues constrained choice of institution and place of study for lower-income students, and financial problems were commonly cited as reasons for dropping out of HE. They found the greatest difference in debt levels to be linked to family background, with students who were poor before they entered university leaving university with the largest debts. Pennell and West went on to state that school leavers who are least debt-averse are more likely to go to university than those who are anti-debt; the latter include those from the lowest socio-economic groups and certain Black and minority ethnic groups. Students who work in term-time were also found to achieve less academically and those who work in term-time are more often those from lower socio-economic groups or minority ethnic groups. Pennell and West conclude, in contrast to Chowdry and Sibieta (2011), by suggesting that the evidence indicates that financial payments and grants are likely to be the most promising way forward to increase participation in HE among those from lower socio-economic backgrounds.

Fredriksson (1997) in his research on economic incentives and the demand for HE found that enrolment rates can be explained by the private return to HE, which decreased in Sweden from the late 60s to the early 80s and then increased slightly. Fredriksson also found a small positive effect of a study allowance scheme. An empirical analysis of college enrolment in the Netherlands (Huijsman et al., 1986) found that per capita income, future earnings and financial aid has a positive effect on

male enrolment, whereas tuition fees and foregone earnings exert a negative effect. For females the signs of the coefficients are the same for all the variables except tuition fees and financial aid.

In a study of German data, Laurer (2002) found the decision to attend HE depends on the ratio of marginal cost and marginal return expected from HE. If this ratio is below a certain threshold, the individual will choose to participate in HE. In a simulation exercise, the impact of selected variables on this threshold, and thus on the participation probability, is quantified. The results suggest the presence of financial constraints are binding on participation in HE and that the participation decision responds to some extent to return expectations in terms of labour market outcome and to financial incentives such as student support.

On balance it appears that student incentive schemes do have a positive impact on HE participation. Studies looking at incentive schemes in FE (Chowdry, 2007) do support the view that it is important to include gender and ethnicity as controls in any study as these groups may be differently affected. The focus of previous research tends to be on participation, future research looking at achievement, programme type (academic or vocational), subject and university choice would be valuable in understanding the impact (effectiveness) of student incentive schemes in delivering social mobility.

Income inequality and labour market

The use of student incentive/financial support schemes is partly to address the relationship between income inequality and social inclusion. Schutz et al. (2000) found that the relationship between income inequality and social inclusion tends to be stronger if one considers income measures of social inclusion as opposed to those based on education. If you measure social inclusion using an index of educational opportunity (defined as the effect of family background on student performance), then there does not appear to be a strong relationship between income inequality and social inclusion. On the other hand, if you measure social inclusion using intergenerational income elasticity (i.e. the extent to which parents' income predicts their children's income), then a much stronger relationship emerges, with high income inequality countries invariably experiencing lower social inclusion.

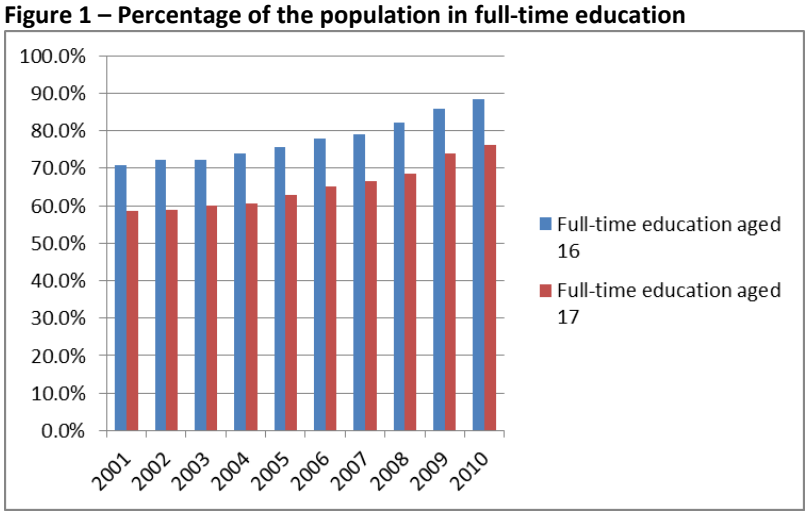
The mechanisms through which income influences social inclusion are complicated, but the key point (d'Addio, 2007) here is that the UK labour market has particular features that inhibit social inclusion. It was perhaps unrealistic to expect NL would introduce radical egalitarian measures to

reverse the increased economic inequalities of 1979-1997. In the event (Earlham Sociology Pages, 2011) income inequality changed only slightly under NL but the increases in income inequality from 2005/6 to 2007/08 meant that income inequality was in fact slightly greater than when Labour came to power in 1997, an outcome which certainly contradicted the traditional social democratic commitment to gradually increasing economic equality and also raises questions over the effectiveness of NL's educational policy to drive social inclusion.

Statistical Evidence

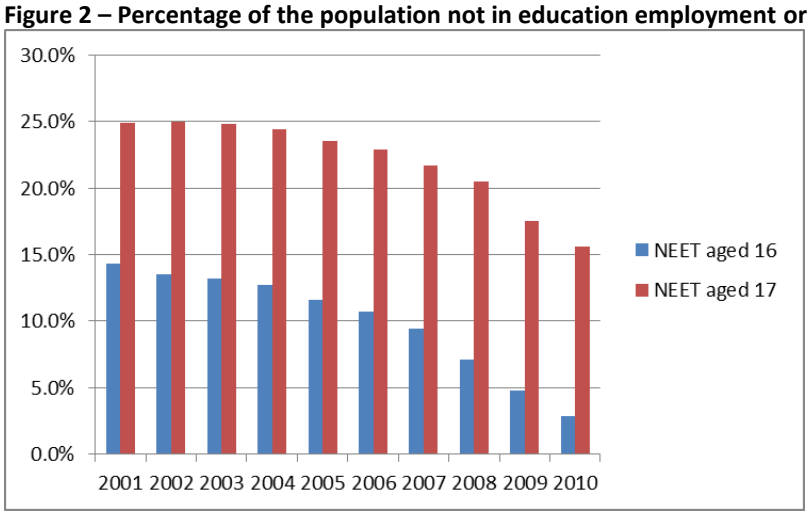
HE participation (Kennedy, 1997) from lower socio-economic groups has historically been low despite the expansion in FE and HE provision. The Panel on Fair Access (HM Government, 2010) has recently reported that access to the professions, perhaps the best definition of social mobility, is still problematic for lower socio-economic groups. Evidence from National Statistics Data 2010 (figures 1, 2 and 3), however, indicates the possible success of the NL's era in office; the percentage participation in FE increased, the number of NEETS fell and the percentage of students claiming free school meals (FSM) progressing to HE increased. Figure 3 shows that an estimated 13% of maintained school students who received FSM entered HE in 2005/06. This rose steadily to an estimated 17% in 2008/09. The estimated progression rate for students not receiving FSM also rose, but with a smaller increase, from 33% to 35%. The gap between FSM and non-FSM rates is therefore estimated to have fallen slightly, to 18 percentage points. This analysis ignores the impact of sixth form colleges as FSMs are only provided in school sixth forms. Table 1 (see economic context section) shows that there were 550,000 students on level three programmes in 2008/9 attending sixth forms not represented in this analysis.

Figure 1 – Percentage of the population in full-time education



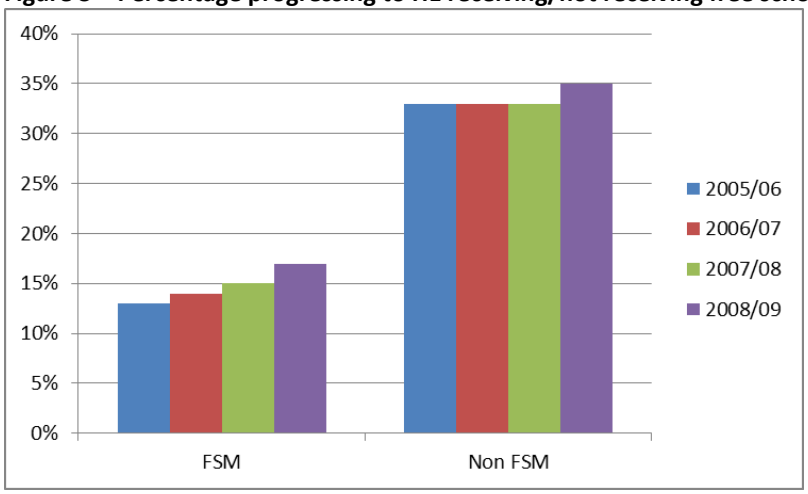
Source: (Office for National Statistics, 2015)

Figure 2 – Percentage of the population not in education employment or training (NEETS)



Source: (Office for National Statistics, 2015)

Figure 3 – Percentage progressing to HE receiving/not receiving free school meals (FSM)



Source: (Department for Business, Innovation & Skills, 2011b)

Despite the evidence to the contrary, the Final Report from the Panel on Fair Access (2009) shows that social inclusion, or the lack of it depending on the measure one uses, is still challenging. The report states that exam achievements of school children have improved significantly, more people are on apprenticeship programmes, far more people from low-income families are now going to university, but advancement to a profession is still problematic for lower socio-economic groups. The report showed that 75% of judges, 70% of finance directors, 45% of top civil servants and 32% of MPs were independently schooled, yet only 7% of children go to a private school.

The theory of human development tells us that the reason for the apparent failure to deliver social mobility (as measured by the employment in the professions) may not necessarily be a lack of aspiration on part of the learner, so what are the factors are at play here? This literature review tells

us perhaps what is not working in the process; i.e. developing the role of supportive adults within the education system and to some extent the effectiveness of student incentive/financial support schemes in the FE sector. What is clear here is the complexity of the process, not least finding an appropriate definition and measure for social inclusion.

Technological context

The Curriculum

Effective educational policy inventions to drive social inclusion have to deliver a valuable curriculum and qualifications that lead to better labour market outcomes. Crawford et al. (2011) examined the notion that improved qualification rates and staying on post-16 (particularly in FE) will improve social inclusion, as well as ensure better transitions into the labour market. They found that evidence on the value of qualifications suggests the following:

- The value of even basic skills is high in the UK labour market. In particular, there is evidence that the rate of return to basic numeracy and literacy is higher in the UK than in competitor countries, suggesting a shortage of these skills.
- The value of academic qualifications, such as GCSEs, A-levels and degrees is also high, and part of the explanation for high wage inequality in the UK is the substantial return to such higher level qualifications.
- Many vocational qualifications also yield a good return, particularly those at higher levels (i.e. level 3 and above) and those that are well recognised by the labour market (e.g. HND or BTEC).
- The value of newer lower level vocational qualifications, such as NVQ2, is minimal on average, though it varies by sector. These qualifications are taken disproportionately by students from lower socio-economic groups.

Allen (2013) also found that students studying on a BTEC programme, with an average GCSE score of 5.8 or lower, are as least as likely as their A Level counterparts to progress to university. This is a really positive conclusion, as it clearly indicates a value to BTEC qualifications in terms of progression to higher levels of study. He introduced a few caveats, however, such as recognising that if value of a qualification type is declared then retention should really be factored into the analysis.

Schools

Since qualifications are already available to those willing and able to take them (e.g. A-levels), policy development needs to focus on improving the likelihood of lower socio-economic groups taking such qualifications, which given the research previously examined suggests the need for earlier investment to improve educational attainment at school. This section will first investigate whether

individuals' cognitive skills, the ability to gain meaning and knowledge from experience and information, determines whether these qualifications are accessible to all learners. The empirical and indeed the theoretical evidence (Crawford et al., 2011) is clear that interventions which are made earlier in a child's development are: (1) likely to be more effective in boosting a child's cognitive achievement, and (2) may be a necessary requirement if a child is to develop good cognitive skills and have successful economic and non-economic outcomes. The ability to learn and make sense of new information is, according to Crawford et al. (2011), crucial to successful learning, and developing cognitive skills is likely to be an important route through which social inclusion can occur. Individuals can acquire more education as a consequence of interventions that improve their cognitive skill; they can go on to gain higher levels of qualification and hence earn relatively more than they would otherwise have done. Crawford found that the gap in cognitive skills remains pretty constant up to the age of 14. Cahill and Ermisch (2012) presented findings that reinforce the point that schools have very little impact in reversing the cognitive skills deficit of some students and they show that the gap in performance increases between Key Stage 2 and Key Stage 4 based on parents' educational background. Children of better-educated parents go to better schools, but taking out the school effect, parental background makes a big difference. Sometimes, however the most persistent, self-disciplined, adaptable and reliable students and professionals outperform those with higher cognitive abilities, according to Heckman and Krueger (2005). There are likely to be micro level factors at play in terms of how teachers and students react and how efficiently increased funding is spent at the institutional level and these may go some way to explain the differences in schools performance.

Parenting

Things like the frequency that parents read to their children and how they set rules and discipline are likely to be important in determining social inclusion. Research conducted by Waldfogel (2012) examining gaps in school readiness in the UK and the US found that many things seem to contribute to the gap. The role of parenting behaviours, however, stands out here as one of the biggest single predicators. Evidence indicates (Cahill and Ermisch, 2012) that the children of educated parents are 5.5 times more likely to be at university at 19 than those from the group of parents with a low education. Even the medium educated group are 1.5 times more likely than the low education group to progress to university. Fairer access to university requires interventions well before GCSE or age 16 and Cahill and Ermisch (2012) feel that more equal access to good schools could make some difference, but it would not eliminate the effects of parental background on performance in school. This all goes to question the reliance on education policies and particularly NL's public investment in

the FE sector to deliver social mobility when parenting is perhaps the most important factor when trying to bring about change in this area.

Heckman and Krueger (2005) examined the ways in which human capital policies can address inequality in income and wealth in the US. Taking it as a given that potentially low-income workers would benefit from more human capital in the form of market skills and education, they discuss which policies would be most effective in providing it. The recommendations offered place less emphasis on reducing inequality and more on efficiency. They argue that investments should be targeted toward young children and away from less-skilled adults. Citing evidence that cognitive and non-cognitive deficits appear early in life, they argue that human capital policy should focus on families, not just schools, and they emphasize the need for policy evaluations to account for a full range of costs, including the efficiency costs associated with taxation and the loss of programmes that could have been funded in the absence of chosen human capital programs.

To counter the argument from Heckman and Krueger (2005) there is a view that the development of non-cognitive skills, including interpersonal skills, persistence, communication skills and other 'soft' skills, later in life may be the answer to delivering social mobility through education policy. Those who develop non-cognitive skills are more likely to develop cognitive skills, but not necessarily the other way around. Some individuals do not develop these skills early on in life, but evidence (Department for Business, Innovation and Skills , 2011b) suggests that these skills can be learned and could be a justification for NL's increased spending on the FE sector. In general the evidence available to date suggests that intervention to influence brain development in later years is theoretically possible and that later investments in non-cognitive skills are potentially more productive than interventions in cognitive skills (Department for Business, Innovation and Skills , 2011b). For example, evidence (Jackson et al., 2007) that interventions that change students decisions at key points, such as staying on in full-time education beyond 16 could have an impact on educational outcomes and hence social mobility.

The students

As part of their participation in FE, students face a multitude of literacy demands: through the bureaucracies of the college, the pedagogic content of their courses, the textual nature of assessment, and the development of new practices of reading and writing relating to their intended workplaces (Fowler, 2008). Drawing upon evidence from research with students and staff at four FE colleges in England and Scotland, Fowler presents the argument that students actively participate within this

textual world. They elect to engage with some texts and to ignore others, depending upon the value they judge the text to have, the relevance they think it holds to their lives or course they are studying, and the extent to which they are able to access the text and its meanings. This challenges a popular deficit discourse which assumes FE students' lack of literacy: rather than seeing the student as the 'problem' behind the lack of engagement with some texts, the text can be seen as the 'problem' if it has failed to engage the student.

Curriculum change

Curriculum change is the mechanism used by successive Governments to address the shortfalls in the education system and to make it more accessible to students and raise standards. The introduction of module exams and more course work, for example, were aimed at making A-levels more accessible. NL's management of the process, however, has been found to have a negative impact on student achievement. For example, as part of a national A-level Performance Statistics project (ALPS), an extensive analysis of the performance of students taking full time A-level, AS-level and BTEC national courses was undertaken. In a briefing paper from ALPS (Allen, 2009) looking at AS performance since 2001, three low points in performance – 2001, 2006 and 2009 – were found to be present and each of these years corresponds with significant curriculum change.

A key feature of curriculum change during NL's period in office was the expansion of vocational provision. The Wolf Report (Wolf, 2011) states that conventional academic study encompasses only part of what the labour market values and demands: vocational education can offer different content, different skills and different forms of teaching. Good vocational programmes are, therefore, respected, valuable and an important part of our educational provision. This report went on to highlight that many 16 and 17-year-olds move in and out of education and short-term employment. They are moving between the two in an attempt to find either a course which offers a real chance for progress, or a permanent job, and are finding neither. The staple offer for between a quarter and a third of the post-16 cohort is a diet of low-level vocational qualifications, most of which have little to no labour market value. Among sixteen to nineteen year olds, the Report estimates that at least 350,000 get little to no benefit from the post-16 education system.

The Wolf Report highlights the importance of English and maths GCSE (at grades A*-C) which are fundamental to young people's employment and education prospects. Yet less than 50% of students have both at the end of Key Stage 4 (age 15/16); and at age 18 the figure is still below 50%. Only 4% of the cohort achieved this key credential during their 16-to-18 education. Worse, the funding

and accountability systems established by NL create perverse incentives to steer 16+ students into inferior alternative qualifications. The report concludes that many of England's 14 to 19 year olds do not progress successfully into either secure employment or higher-level education and training. Many of them leave education without the skills that will enable them to progress at a later date. In summary the report presented a damning indictment of NL's educational policies designed to delivery social inclusion, particularly in their application to the FE sector.

Employment

The Office for National Statistics (2012) reports that the percentage of recent graduates (completed within the last six years) employed in lower skills jobs has increased from around 26.7% in 2001 to 35.9% in 2011. This may partly be explained by the apparent success of the WP agenda in terms of raw numbers progressing through HE. The Office for National Statistics reports that over the same period the population of recent graduates who are no longer in education has increased by over 41%, or 438,000, and currently stands at 1.5 million. In an earlier study Chevalier and Conlon (2003) found that graduating from a Russell group institution adds between 0% and 6% to a male graduate's earnings compared to graduating from a modern university. Furthermore, seven of the top twenty ranked universities in the world, as ranked by employers, are Russell Group institutions (Topuniversities, 2010). The failure of some graduates to obtain well paid jobs is likely to be impacted by the economic climate, but could also be an indication that the education system may not be delivering the skilled work force required by employers. Social inclusion policies of NL which solely intended to increase participation in FE and HE do not necessarily lead to a more equitable distribution of wealth in the form of well-paid jobs. The literature suggests here that considering Russell group attendance and choice of subject at college may affect social mobility. It would be appropriate for research at the micro level to take account of such factors.

Conclusion

The FE sector has been subject to considerable change, yet despite all this change, according to Bergh and Fink (2006), little has been done to examine the effects of public funding on FE. In terms of the sixth form sector (the area to be researched in the final investigation), Lumby et al. (2002) state the lack of research is even more pronounced; there is comparatively little known about its management and the impact of government policies and the research that has taken place has tended to focus on general FE colleges, which form the majority of the sector. This literature review attempted to draw on research under the headings of the political, economic, social-cultural and technological context (PEST analysis) to see whether the debate has moved on since the early 2000s. The focus being on the impact of NL's educational policies designed to deliver social mobility and whether the investment in the sector was efficient and effective.

This literature review has, in section 2 (the political context), looked at the ideological framework of NL's policies for developing social inclusion. It discussed whether NL's 'third way' for distributing public funding, in particular how the use of market forces and the value of social capital in the education system are an explanation for the apparent failure to deliver social inclusion. It presented research (Francis and Perry, 2010) that indicates that market forces could have the perverse effect of preserving the status quo and what is needed is an ideological framework that supports/develops the social capital of disadvantaged groups. Furthermore there is evidence (Macdonald and Stratta, 2001) that NL's 'third way' including the introduction of quasi-market structures and top-down national policy directives do not necessarily work; the response of individual institutions and staff working within them (micro level factors) do not always align themselves with policy directives. Given that evidence suggests that institutions and staff do not always respond as expected, there may be real benefits in carrying out further micro-level research examining the impact of the WP policies at an institutional level.

In section 3 (the economic context) the literature review outlined that NL's period in office coincided with a favourable economic climate and that there were very large increases in public spending on education. There does not appear to be any direct research, however, looking at time series data evaluating the impact of NL's considerable investment in the FE sector. Section 3 provided evidence that directing much of the growth in spending at the FE sector may have been misdirected as it: (1) comes too late in learners' development to have an impact of social inclusion; and (2) may not actually work as the state of the wider economy has a greater impact on participation rates than

education spending. The record on success rates (Dept. for Education and Skills, n.d.), the key value for money performance measure used by NL, indicates very little improvement in the period for 16-18 year-olds in sixth form colleges studying on long programmes. Future research at the micro level could consider how the increased investment in FE impacted 'on the ground' in terms of how resources were spent (e.g. smaller class sizes, capital spending), and outcomes given students' backgrounds.

Section 4 (the social-cultural context) set out the problem of establishing an appropriate definition and measurable target for social inclusion. It could also be the case that the measures or definitions of social inclusion are very much at the extremes, encompassing students from the poorest families and to those whose parents are employed in the professions. A more pragmatic approach to setting social inclusion targets would be to improve social inclusion for lower to middle income groups rather than the lowest socio-economic groups; perhaps a much longer term mind set is required. Section 4 goes onto to examine theories of learner development, which indicate that with appropriate adult involvement in the education process learners have the motivation to achieve their full potential. Evidence (Foskett, 2002) suggests, however, that there is limited awareness of the complexity of needs of the communities not participating in education. There is evidence, however, of increased participation in FE and a reduction in NEETs. There is also evidence of a small increase in the numbers of students attending HE having received FSMs. Despite this, social inclusion, as measured in terms of progression to the professions (HM Government, 2010) is projected to remain a problem for very many years. There is, therefore, a possible conflict between what the theory states is possible and what is being achieved in practice. This literature review puts forward family income and individuals' perception of debt as possible explanations for the failure to deliver social inclusion. Attempts to address these issues through student subsidies in the FE sector (i.e. the EMA) have been patchy, especially in relation to the impact on different ethnic and gender groups. It is also far from certain that the significant investment in the EMA represented value for money. There is also research (d'Addio, 2007) that suggests that it is a characteristic of the UK's labour market that inhibits progress in social inclusion. The decrease in income equality during NL's period in office in a sense supports this view. The social-cultural context is a complex area and it is by no means certain what role the education system and education spending has on social inclusion. The impact of NL's policies on social inclusion is mixed at best and would certainly benefit from further research. At the very least, it would be helpful to establish a definition and measurable target for social inclusion which would then, hopefully, allow research to establish whether NL's investment in the education sector represented value for money.

Section 5 (the technological context) highlights that there already exists a well-established route into HE through A Level and vocational curriculum programmes. There is evidence (Allen, 2013) that students with lower academic ability have gained access to HE through the vocational route despite the concerns expressed by the Wolf Report (2011) on vocational provision generally. The impact of cognitive skills on the education system was examined in terms of the role of schools, parenting and students themselves. Schools, particularly those in areas of social deprivation, still have a poor record in terms of maths and English GSCE scores and evidence set out in section 5 suggests that family background is the most important factor in determining the level of cognitive skills and that the education system cannot reverse the disadvantage some students' experience. Steering public investment to developing human capital and away from educational spending generally (Heckman and Krueger, 2005) would possibly represent a more efficient and effective use of public spending. Addressing non-cognitive skills, on the other hand, has been suggested as a way forward and a rationale for continued investment in the education system to deliver social inclusion. Curriculum change is the mechanism used by successive Governments to address possible shortfalls in the education system and to make it more accessible to students and raise standards, but these changes can lead to dips in achievement rates (Allen, 2009), a possible sign of poor management of the change process. The inability of large number of graduates to secure well paid jobs is probably partly a product of the economic climate, but it may also indicate that some graduates do not possess the skills required by employers. Further research on the outcomes from various educational pathways promoted during NL's period in office may be valuable in unearthing possible shortfalls in the education system in terms of delivering social inclusion.

Finally, tackling deep routed social issues through the education system, given the lack of success historically, may in the end be impractical. Although statistical evidence (see section 4) shows that participation rates improved during NL's period in office, progression to top universities and the professions is still restricted to the more affluent social classes. It could be that changes in social inclusion are inter-generational and are unlikely to be influenced by short to middle-term policy directives and funding/curriculum changes. It is generally accepted that family background remains one of the key factors in determining education success and in section 4 the importance of supportive adults in the education process was laid out. This role is most often carried out within the family structure, but where it is missing can institutions provide this support perhaps through pastoral care programmes? So understanding how institutions spent the increased funding (if it transpired that this was the case) may be a valuable in gaining a greater understanding of the apparent failure of the education system to deliver social inclusion.

A micro study of the effects of social inclusion policy on one college, considering the changes in various outcomes and whether the investment in the 2000s was efficient and effective is a suggested way forward. The research could be twofold: testing of hypotheses for a case study college and considering worthy investigations for a wider population. The following questions are considered the starting point for this future research.

What are the trends in participation, achievement and progression to HE over the period 2001 to 2010 at the case study college? The student attributes to be investigated being: gender, ethnicity, programme of study, qualifications on entry and level of social deprivation.

To what extent has the investment in the sector delivered value for money (efficient and effective) at the case study college? The key variables investigated being: success rates, school performance tables, HE progression to Russell group universities, valued added and financial data.

How does the evidence from the case study institution relate to national statistics?

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2 Appendix – Chapter 2

2.5 Methods and statistical analysis

2.5.1 Logistic regression function

Suppose that X_1 through X_k are the potential explanatory variables (student attributes). Specifically a logistic regression model estimates the function:

$$\boldsymbol{p = 1/(1 + e^{-(\beta_0 + \beta_1 X_1 + \cdots \beta_k X_k)})}$$

Essentially, the logistic function is a 's-shaped' curve where large negative values of x the function approaches 0 and large positive value of x approach 1.

2.5.2 Probability from a logistic estimation

The estimates given in logistic regression are for the coefficients of the exponential ($\boldsymbol{\beta_0, \beta_1 \ldots \beta_k}$) in the above formula. These give directly not the probability but the log of the odds ratio:

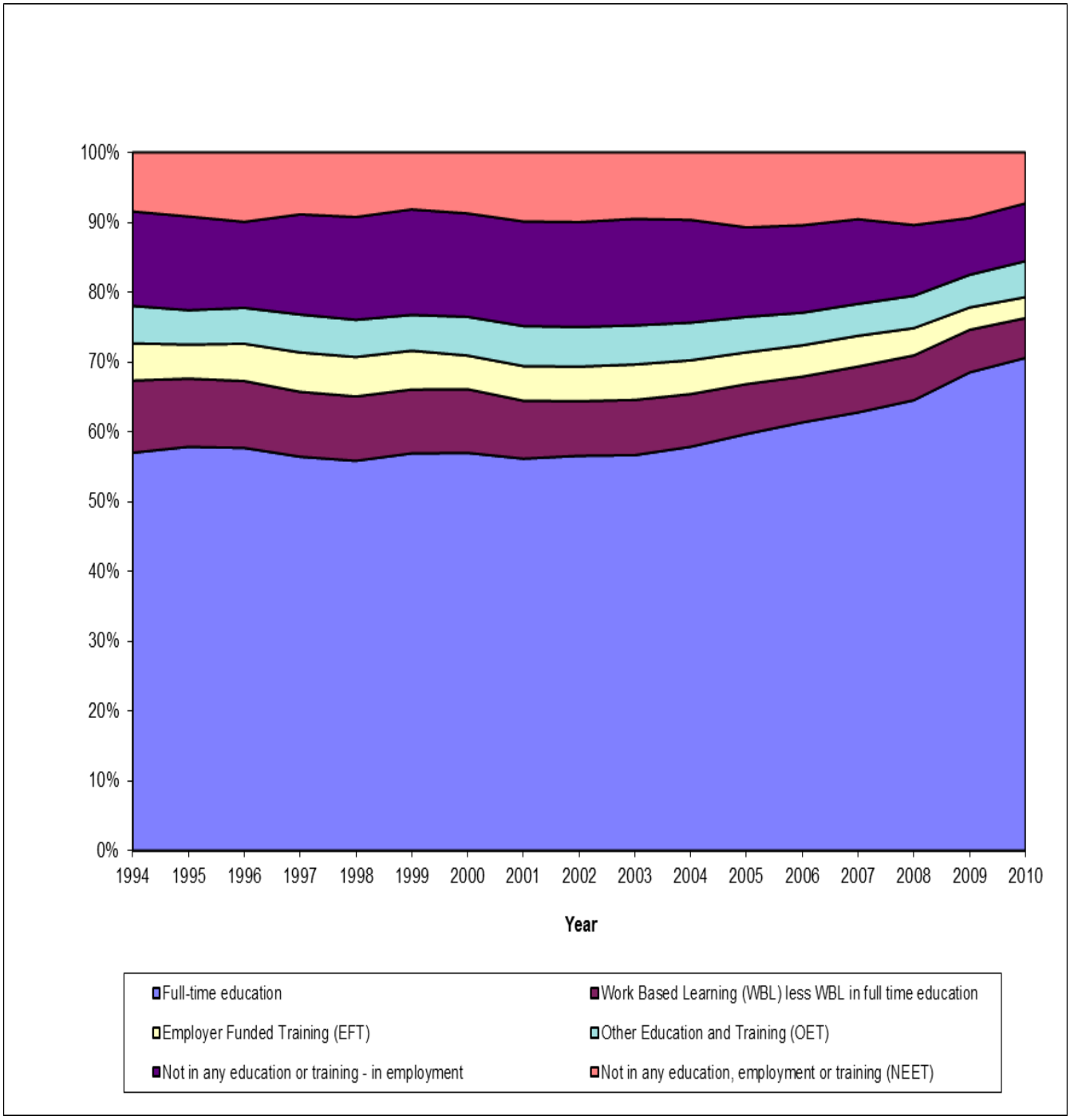
$$\boldsymbol{1n\ (p/1 - p) = \beta_0 + \beta_1 X_1 \ldots \beta_k X_k}$$

Taking the antilogarithm of this gives the ratio (p/1 – p) is called the odds ratio, which can be then straightforwardly solved algebraically for the probability.

4 Appendix – Chapter 4

4.2 Education progression outcomes

4.2.1 College participation of 16-18 year olds in education and training, England, 1994 to 2010



Source: https://www.gov.uk/government/statistics/participation-in-education-training-and-employment-by-16-to-18-year-olds-in-England

4.2.2 RG universities

Cardiff University

Durham University

Imperial College

King's College London

London School of Economics

Newcastle University

Queen Mary University of London

Queen's University Belfast

University College London

University of Birmingham

University of Bristol

University of Cambridge

University of Edinburgh

University of Exeter

University of Glasgow

University of Leeds

University of Liverpool

University of Manchester

University of Nottingham

University of Oxford

University of Sheffield

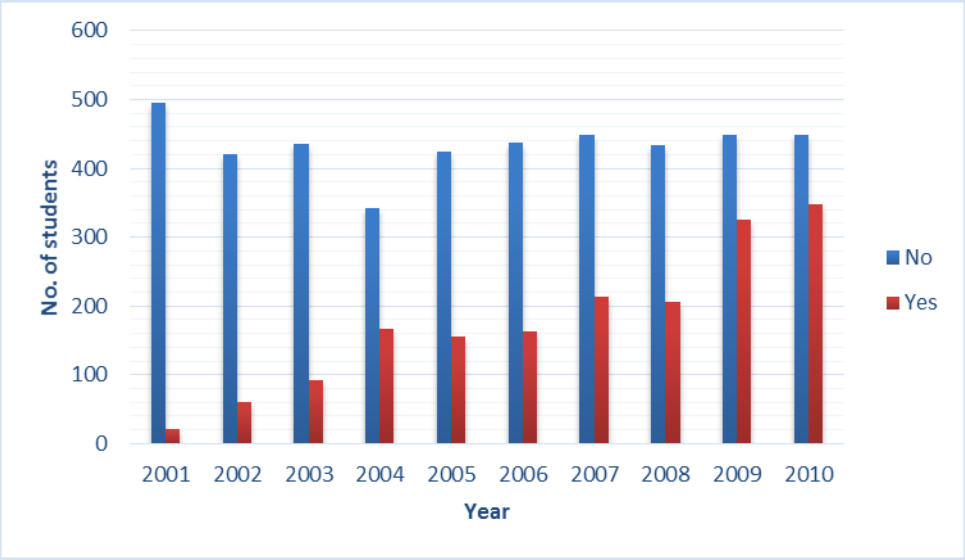
University of Southampton

University of Warwick

University of York

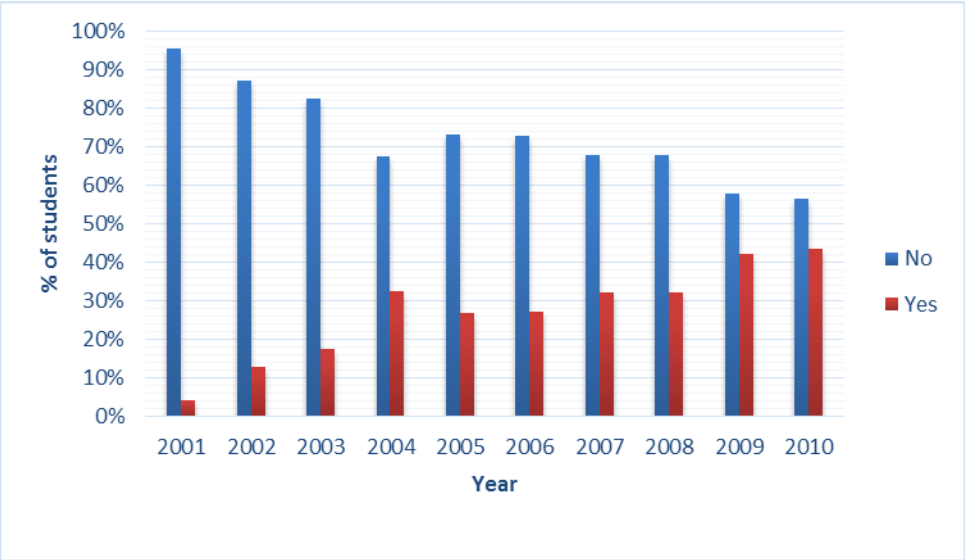
4.3 Educational inputs

4.3.1 College enrolments per year by WP Factor (uplift) students



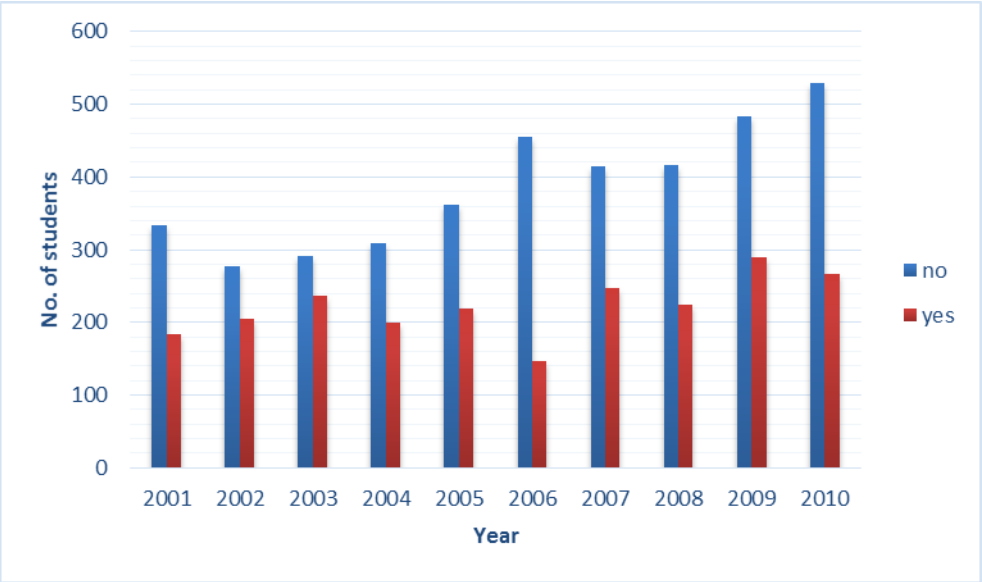
Yes = Students qualifying for the WP (uplift), i.e. from a less advantaged socio-economic background

4.3.2 Percentage of College enrolments per year by WP Factor (uplift) students



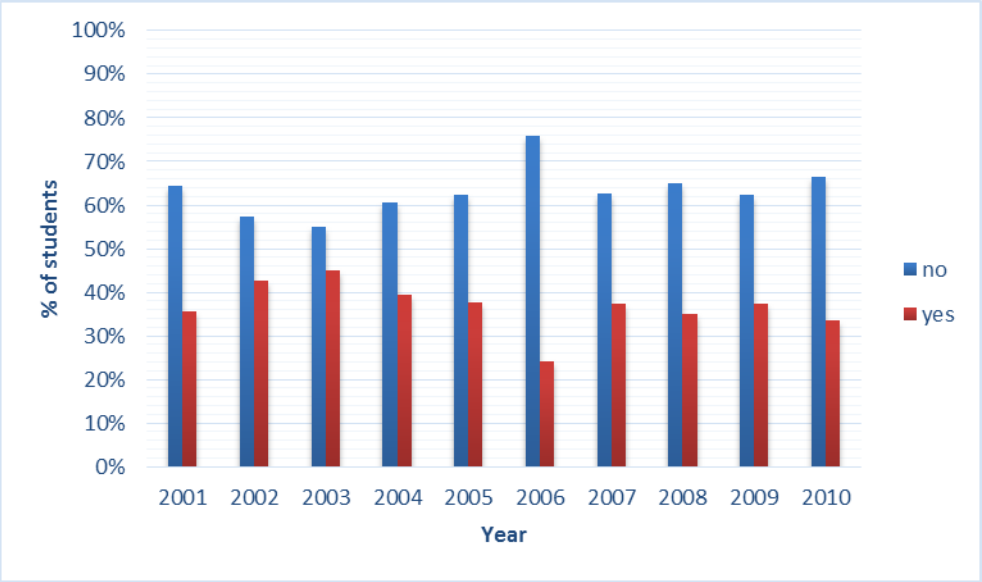
Yes = Students qualifying for the WP (uplift), i.e. from a less advantaged socio-economic background

4.3.3 College enrolments per year by WP Factor (adjusted) students



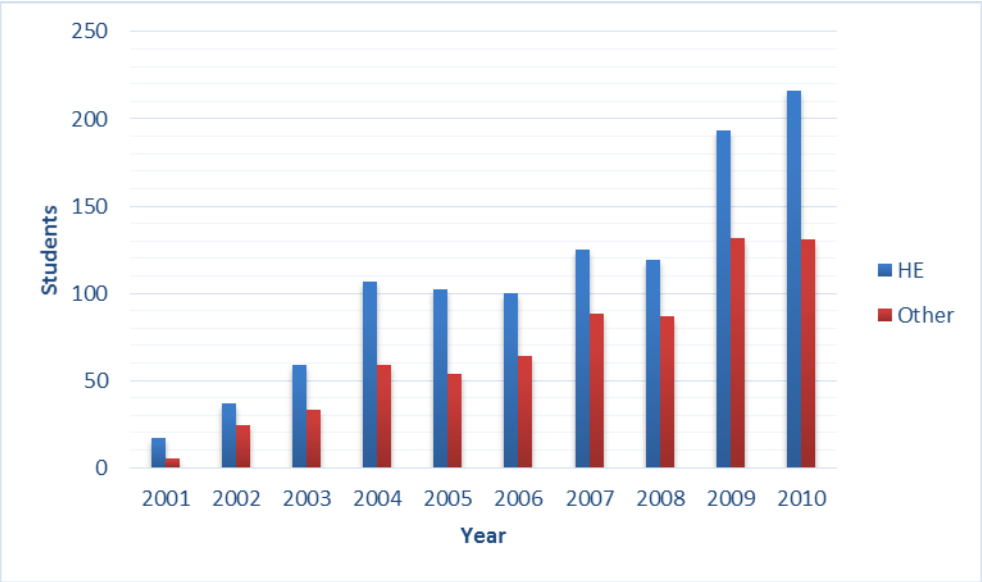
Yes = Students qualifying for the WP (adjusted), i.e. based on IMD 2010

4.3.4 Percentage College enrolments per year by WP Factor (adjusted) students



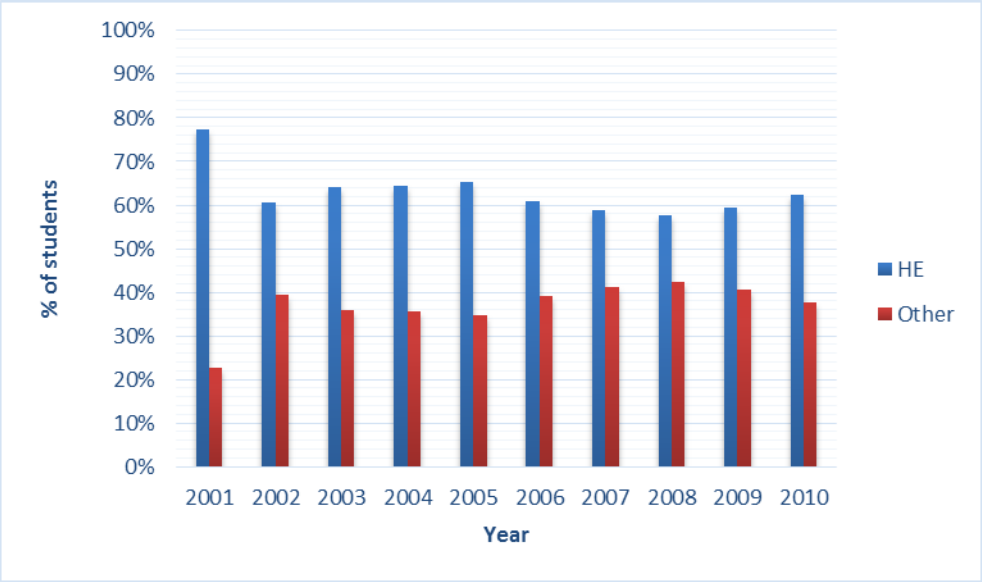
Yes = Students qualifying for the WP (adjusted), i.e. based on IMD 2010

4.3.5 HE progression per year by College WP Factor (uplift) students



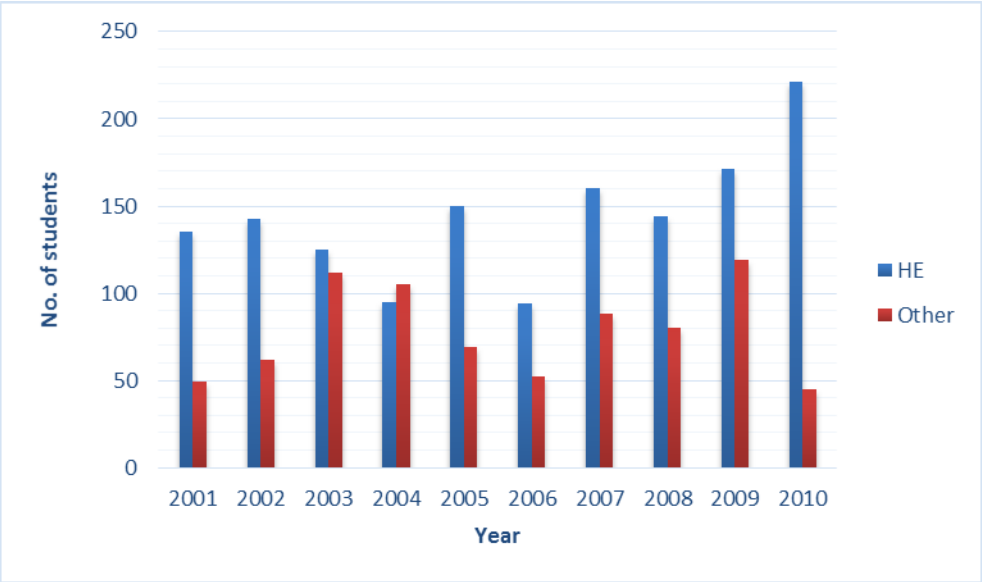
Other = non-HE routes of progression, including employment or training programmes such as apprenticeships.

4.3.6 Percentage HE progression per year by College WP Factor (uplift) students



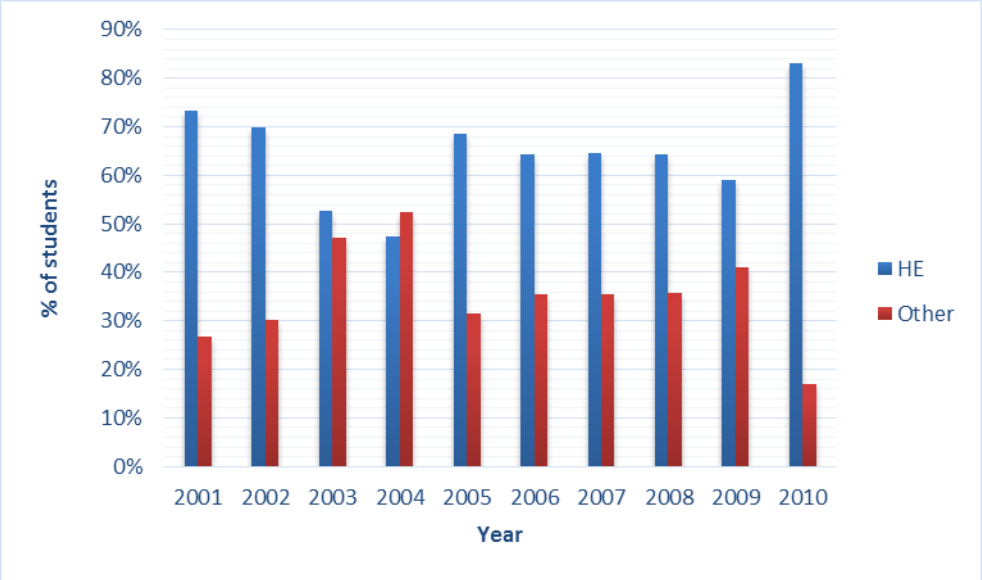
Other = non-HE routes of progression, including employment or training programmes such as apprenticeships.

4.3.7 HE Progression per year by College WP Factor (adjusted) students



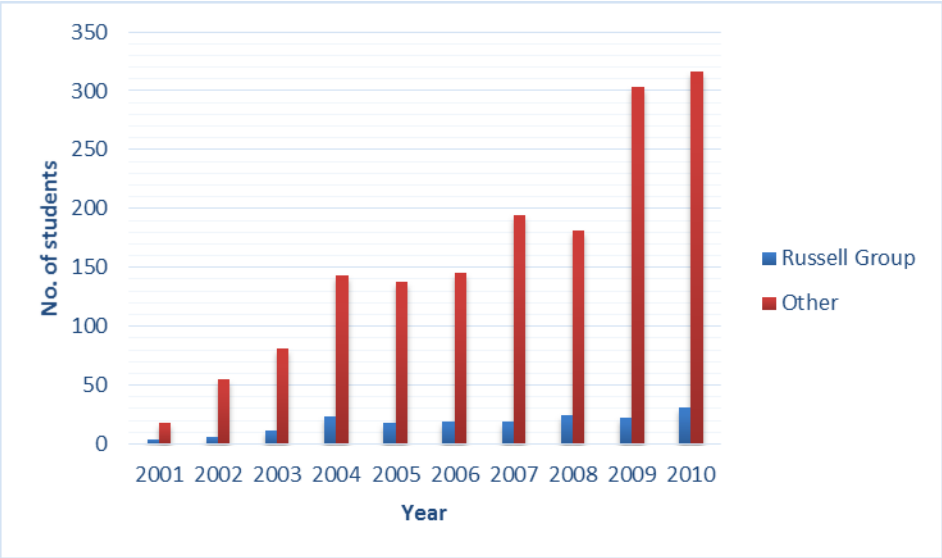
Other = non-HE routes of progression, including employment or training programmes such as apprenticeships.

4.3.8 Percentage HE Progression per year by College WP Factor (adjusted) students



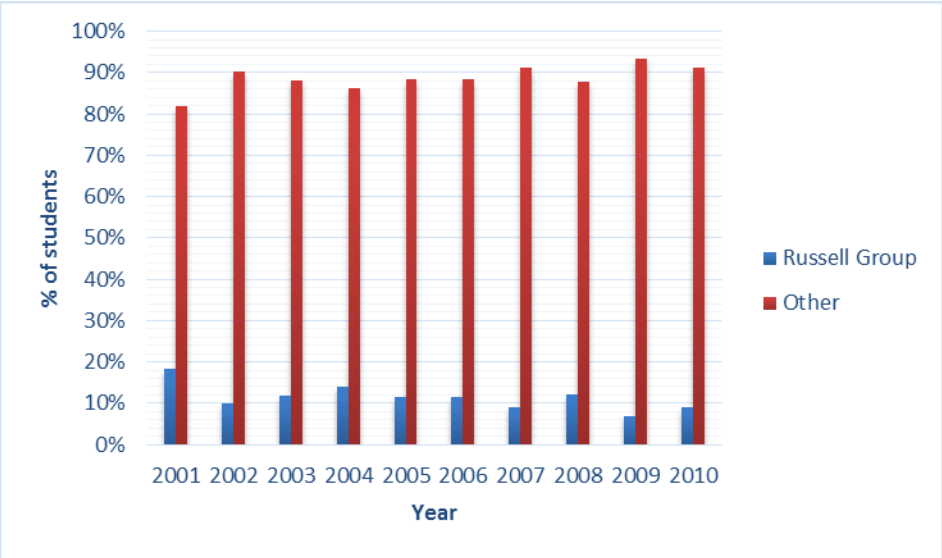
Other = non-HE routes of progression, including employment or training programmes such as apprenticeships.

4.3.9 RG participation per year by College WP Factor (uplift) students



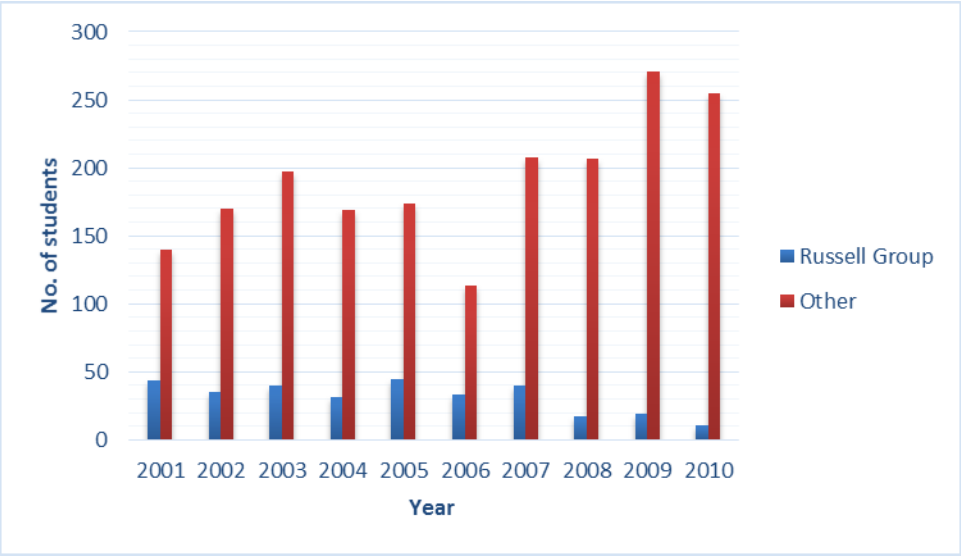
Other = Other HE and non-HE routes of progression, including employment or training programmes such as apprenticeships.

4.3.10 Percentage RG participation per year by College WP Factor (uplift) students



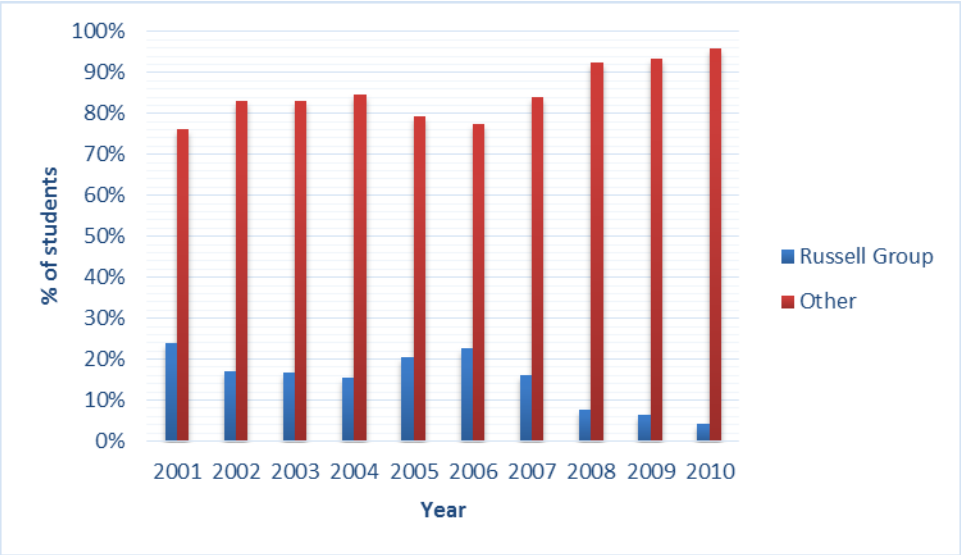
Other = non-HE routes of progression, including employment or training programmes such as apprenticeships.

4.3.11 RG participation per year by College WP Factor (adjusted) students



Other = non-HE routes of progression, including employment or training programmes such as apprenticeships.

4.3.12 Percentage RG participation per year by College WP Factor (adjusted) students



Other = non-HE routes of progression, including employment or training programmes such as apprenticeships.

4.3.13 Chi-square College participation by socio-economic background – WP Factor (uplift)

Original counts, with row totals shown at right and column totals below in bold .

495	22	**517**
421	61	**482**
436	92	**528**
343	166	**509**
424	156	**580**
438	164	**602**
449	213	**662**
434	206	**640**
448	325	**773**
449	347	**796**
4337	**1752**	**6089**

Expected counts

368.243	148.757
343.313	138.687
376.078	151.922
362.544	146.456
413.115	166.885
428.785	173.215
471.521	190.479
455.852	184.148
550.583	222.417
566.965	229.035

Distances of observed from expected

43.633	108.011
17.579	43.517
9.548	23.635
1.054	2.608
0.287	0.710
0.198	0.490
1.076	2.663
1.047	2.593
19.113	47.313
24.544	60.759

Chi-square test statistic

410.378

P value 0.000

Percentage of cells with less than 5 expected count = 0, no value <1

4.3.14 Chi-square College participation by socio-economic background – WP Factor (adjusted)

Original counts, with row totals shown at right and column totals below in bold

333	184	**517**
277	205	**482**
291	237	**528**
309	200	**509**
361	219	**580**
456	146	**602**
414	248	**662**
416	224	**640**
483	290	**773**
530	266	**796**
3870	**2219**	**6089**

Expected counts

328.591	188.409
306.346	175.654
335.582	192.418
323.506	185.494
368.632	211.368
382.615	219.385
420.749	241.251
406.766	233.234
491.297	281.703
505.916	290.084

Distances of observed from expected

0.059	0.103
2.811	4.903
5.923	10.329
0.650	1.134
0.158	0.276
14.075	24.548
0.108	0.189
0.210	0.366
0.140	0.244
1.147	2.000

Chi-square test statistic

69.373

P value 0.000

Percentage of cells with less than 5 expected count = 0, no value <1

4.3.15 College participation: Results of simple time trend regression for WP Factor (uplift) proportion of cohort

Summary measures

Multiple R	0.9302
R-Square	0.8652
StErr of Est	0.0486

ANOVA table

Source	df	SS	MS	F	p-value
Explained	1	0.1213	0.1213	51.3651	0.0001
Unexplained	8	0.0189	0.0024		

Regression coefficients

	Coefficient	Std Err	t-value	p-value	Lower limit	Upper limit
Constant	0.0602	0.0332	1.8142	0.1072	-0.0163	0.1368
Year	0.0383	0.0053	7.1669	0.0001	0.0260	0.0507

Heteroscedasticity $\chi2(12)=1.25$ (0.264)
Functional Form $F(3,5)=1.62$ (0.297)

4.3.16 College participation: Results of simple time trend regression for WP Factor (adjusted) proportion cohort

Summary measures

Multiple R	0.4050
R-Square	0.1640
StErr of Est	0.0541

ANOVA table

Source	Df	SS	MS	F	p-value
Explained	1	0.0046	0.0046	1.5697	0.2456
Unexplained	8	0.0234	0.0029		

Regression coefficients

	Coefficient	Std Err	t-value	p-value	Lower limit	Upper limit
Constant	0.4087	0.0369	11.0634	0.0000	0.3235	0.4939
Year	-0.0075	0.0060	-1.2529	0.2456	-0.0212	0.0063

Heteroscedasticity $\chi2(12)=0.13$ (0.714)
Functional Form $F(3,5)=2.27$ (0.199)
N=10

4.3.17 Chi-square HE progression by socio-economic background – WP Factor (uplift)

Original counts, with row totals shown at right and column totals below in bold.

17	5	**22**
37	24	**61**
59	33	**92**
107	59	**166**
102	54	**156**
100	64	**164**
125	88	**213**
119	87	**206**
193	132	**325**
216	131	**347**
1075	**677**	**1752**

Expected counts

13.499	8.501
37.429	23.571
56.450	35.550
101.855	64.145
95.719	60.281
100.628	63.372
130.693	82.307
126.398	79.602
199.415	125.585
212.914	134.086

Distances of observed from expected

0.908	1.442
0.005	0.008
0.115	0.183
0.260	0.413
0.412	0.654
0.004	0.006
0.248	0.394
0.433	0.688
0.206	0.328
0.045	0.071

Chi-square test statistic

	6.822
P value	0.655598

Percentage of cells with less than 5 expected count = 0, no value <1

4.3.18 Chi-square HE progression by socio-economic background – WP Factor (adjusted)

Original counts, with row totals shown at right and column totals below in bold.

135	49	**184**
143	62	**205**
125	112	**237**
95	105	**200**
150	69	**219**
94	52	**146**
160	88	**248**
144	80	**224**
171	119	**290**
221	45	**266**
1438	**781**	**2219**

Expected counts

119.239	64.761
132.848	72.152
153.585	83.415
129.608	70.392
141.921	77.079
94.614	51.386
160.714	87.286
145.161	78.839
187.932	102.068
172.379	93.621

Distances of observed from expected

2.083	3.836
0.776	1.428
5.320	9.796
9.241	17.015
0.460	0.847
0.004	0.007
0.003	0.006
0.009	0.017
1.525	2.809
13.714	25.251

Chi-square test statistic

	94.148
P value	0.000

Percentage of cells with less than 5 expected count = 0, no value <1

4.3.19 HE progression: Results of simple time trend regression for WP Factor (uplift) proportion of cohort

Summary measures

Multiple R	0.6480
R-Square	0.4199
StErr of Est	0.0452

ANOVA table

Source	Df	SS	MS	F	p-value
Explained	1	0.0118	0.0118	5.7918	0.0427
Unexplained	8	0.0164	0.0020		

Regression coefficients

	Coefficient	Std Err	t-value	p-value	Lower limit	Upper limit
Constant	0.6969	0.0309	22.5616	0.0000	0.6256	0.7681
Year	-0.0120	0.0050	-2.4066	0.0427	-0.0235	-0.0005

Heteroscedasticity $\chi2(12)=3.80$ (0.51)
Functional Form $F(3,5)=5.52$ (0.048)
N=10

4.3.20 HE progression: Results of simple time trend regression for WP Factor (adjusted) proportion of cohort

Summary measures

Multiple R	0.2109
R-Square	0.0445
StErr of Est	0.1051

ANOVA table

Source	Df	SS	MS	F	p-value
Explained	1	0.0041	0.0041	0.3725	0.5586
Unexplained	8	0.0884	0.0110		

Regression coefficients

	Coefficient	Std Err	t-value	p-value	Lower limit	Upper limit
Constant	0.6082	0.0718	8.4708	0.0000	0.4427	0.7738
Year	0.0071	0.0116	0.6103	0.5586	-0.0196	0.0337

Heteroscedasticity $\chi2(12)=0.03$ (0.8611)
Functional Form $F(3,5)=2.54$ (0.170)
N=10

4.3.21 Chi-square RG participation by socio-economic background – WP Factor (uplift)

Original counts, with row totals shown at right and column totals below in bold.

4	18	**22**
6	55	**61**
11	81	**92**
23	143	**166**
18	138	**156**
19	145	**164**
19	194	**213**
25	181	**206**
22	303	**325**
31	316	**347**
178	**1574**	**1752**

Expected counts

2.235	19.765
6.197	54.803
9.347	82.653
16.865	149.135
15.849	140.151
16.662	147.338
21.640	191.360
20.929	185.071
33.019	291.981
35.255	311.745

Distances of observed from expected

1.393	0.158
0.006	0.001
0.292	0.033
2.231	0.252
0.292	0.033
0.328	0.037
0.322	0.036
0.792	0.090
3.677	0.416
0.513	0.058

Chi-square test statistic

	10.962
P value	0.278322

Percentage of cells with less than 5 expected count = 5%, no value <1

4.3.22 Chi-square RG participation by socio-economic background – WP Factor (adjusted)

Original counts, with row totals shown at right and column totals below in bold.

44	140	**184**
35	170	**205**
40	197	**237**
31	169	**200**
45	174	**219**
33	113	**146**
40	208	**248**
17	207	**224**
19	271	**290**
11	255	**266**
315	**1904**	**2219**

Expected counts

26.120	157.880
29.101	175.899
33.644	203.356
28.391	171.609
31.088	187.912
20.726	125.274
35.205	212.795
31.798	192.202
41.167	248.833
37.760	228.240

Distances of observed from expected

12.240	2.025
1.196	0.198
1.201	0.199
0.240	0.040
6.225	1.030
7.269	1.203
0.653	0.108
6.887	1.139
11.936	1.975
18.965	3.138

Chi-square test statistic

	77.865
P value	0.000

Percentage of cells with less than 5 expected count = 0, no value <1

4.3.23 RG participation: Results of simple time trend regression for WP Factor (uplift) proportion of cohort

Summary measures

Multiple R	0.6917
R-Square	0.4784
StErr of Est	0.0241

ANOVA table

Source	Df	SS	MS	F	p-value
Explained	1	0.0043	0.0043	7.3375	0.0267
Unexplained	8	0.0046	0.0006		

Regression coefficients

	Coefficient	Std Err	t-value	p-value	Lower limit	Upper limit
Constant	0.1532	0.0165	9.3096	0.0000	0.1153	0.1912
Year	-0.0072	0.0027	-2.7088	0.0267	-0.0133	-0.0011

Heteroscedasticity $\chi2(12)=2.05$ (0.152)
Functional Form $F(3,5)=1.30$ (0.370)
N=10

4.3.24 RG participation: Results of simple time trend regression for WP Factor (adjusted) proportion of cohort

Summary measures

Multiple R	0.7886
R-Square	0.6219
StErr of Est	0.0446

ANOVA table

Source	Df	SS	MS	F	p-value
Explained	1	0.0262	0.0262	13.1568	0.0067
Unexplained	8	0.0159	0.0020		

Regression coefficients

	Coefficient	Std Err	t-value	p-value	Lower limit	Upper limit
Constant	0.2490	0.0305	8.1641	0.0000	0.1786	0.3193
Year	-0.0178	0.0049	-3.6272	0.0067	-0.0292	-0.0065

Heteroscedasticity $\chi2(12)=0.03$ (0.868)
Functional Form $F(3,5)=7.07$ (0.025)
N=10

4.3.25 Policy initiatives focusing on education outcome by gender within the period being researched:

Raising Boys' Achievements was a project funded by the then Department for Education and Skills (DfES) from 2000 to 2004. It looked at ways of raising achievement across a range of primary, secondary, and special schools. Working with over 60 schools across England, the research team aimed to identify and evaluate strategies which are particularly helping in motivating boys.

Reading Champions is a department for children, schools and families (DCSF) initiative, which aims to find and celebrate positive male role models for reading. Schools invite boys and men who are influential with pupils to become Reading Champions. These Champions encourage other boys to get into reading by running their own positive reading activities and promotions.

The Gender Agenda, which ran from 2008 to 2009, aimed to improve gender-related performance of certain groups of under-performing girls and boys. The outcomes of the programme included: a guidance document on what works; a publication which seeks to dispel myths about gender and education; and a paper which summarises research carried out into schools that had consistently closed or narrowed the attainment gap between boys and girls in English.

Boys into Books, which ran in 2007 and 2008, provided funding from the Department for Children, Schools and Families to provide booklists, books and supporting materials aimed at encouraging boys aged 5 to 14 to read.

4.3.26 Percentage of 15 year old pupils achieving 5+A*- C (including English and maths)

	2003	2004	2005	2006	2007	2008	2009	2010
LA Average	33.30%	33.70%	36.80%	38.40%	41.80%	41.80%	45.50%	49.70%
England Average	41.90%	42.60%	44.30%	45.30%	46.30%	47.60%	49.80%	53.50%

Source: National Statistics

5 Appendix – Chapter 5

5.3 School performance tables

5.3.1 Average point score per student

The average point score per student is calculated as the sum of the points awarded to each 16-18 year old student, using the new QCA point scoring system, divided by the total number of 16-18 year old students at the end of study towards General and Vocational A/AS or equivalent Level 3 qualifications. For example:

- If student A achieves 2 General A Levels at grade B, a Vocational A Level at grade C and a General AS pass at grade D, they would score 780 points (240 + 240 + 210 + 90).
- If student B achieves 1 Vocational Double Award at grade AB and a Vocational A Level at grade B, and a Key Skill at Level 3, they would score 813 points (510 + 240 + 63).
- If student C attempts 1 General A Level and receives a grade U but has passed the AS in the same subject with grade B, and achieves a distinction in a BTEC National Award, they would score 390 points (120 + 270).

Average point score per student in the institution is the sum of each student's points over the total number of 16-18 year old students.

5.3.2 Average point score per examination entry

The average point score per examination entry is calculated as the sum of the points awarded to each 16-18 year old student, divided by the total number of qualification entries. For this calculation, a General or Vocational A Level and a BTEC is each equivalent to one entry, a Vocational A Level Double Award is equivalent to two entries, a General or Vocational AS level is equivalent to half an entry, and a Key Skill at Level 3 is equivalent to 0.3 of an entry. Where a student has attempted an A Level and failed, but they have been awarded an AS in the same subject, the A Level entry is still counted. So student C above would be treated as having 2 entries and not 1.5.

Using the above example:

Average point score per examination entry equals the sum of each student's points over the sum of each student's entries as follows:

(780 813 + 390) / (3.5 + 3.3 + 2) = 225.3 points

5.4 Success rate

5.4.1 Success rate calculation/example

If a cohort of learners has a retention of 80% and achievement of 80% (0.8 x 0.8) x 100, this would show a success rate for the period of time being measured of 64% (0.64). Retention is a measure of the number of learners in a cohort or group completing a programme divided by number of starters. If we take, for example, a cohort of 75 learners who started a learning aim and 15 left by the end of the programme then this would produce retention of 80% as follows:

(60 ÷ 75) x 100 = 80%

Similarly, achievement for a group of learners is measured by dividing the number of learners achieving a qualification by the number who complete the qualification. For instance, if 5 learners of the 60 who complete failed, from the cohort in the example above, then from the 75 starters, 60 completed and 55 achieved producing 91.6% achievement:

(55 ÷ 60) x 100 = 91.6%.

For this cohort the success rate would be 73% as follows:

(0.8 x 0.916) x 100 = 73%

Starters – 75

Completers – 60

Retention – 80%

Registered – 60

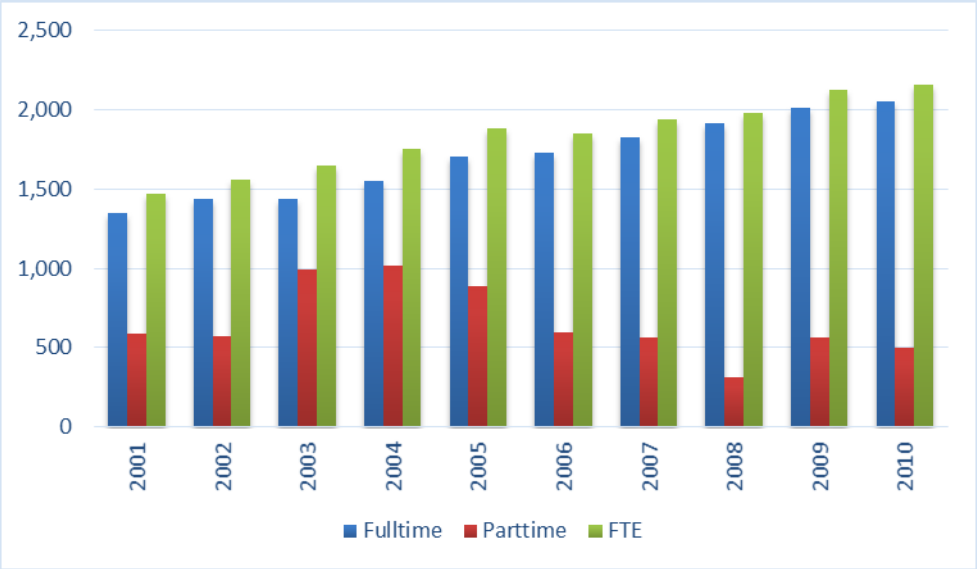
Achievers – 55

Achievement – 91.6%

Success rates – 73%

5.7 Financial review

5.7.1 Student full-time, part-time and FTE numbers

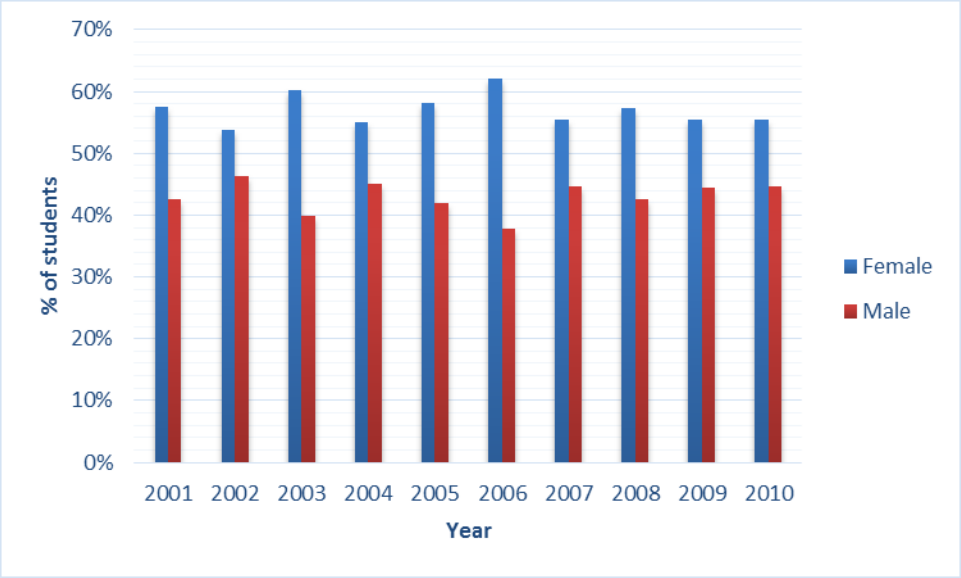


Source: College Financial Statements

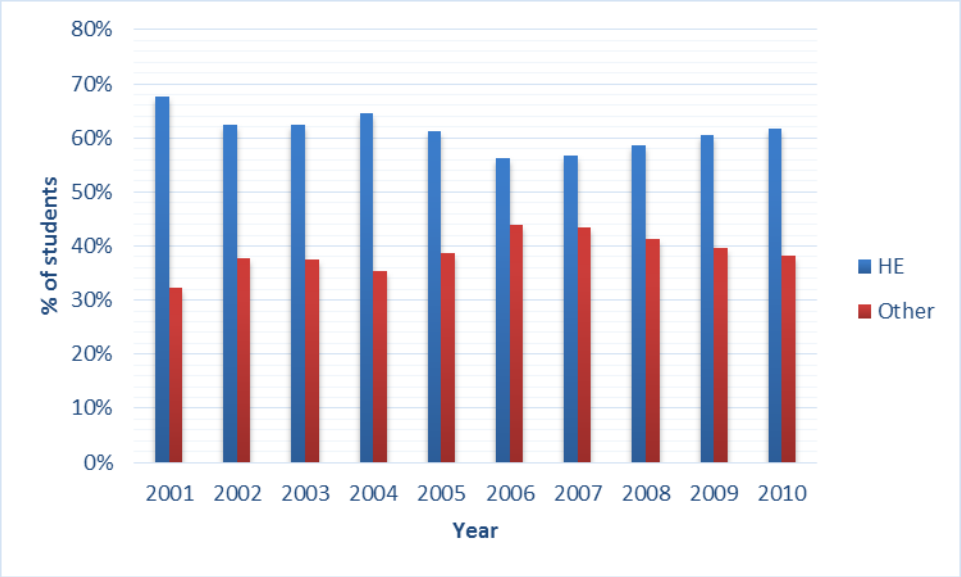
6 Appendix – Chapter 6

6.2 Evidence from the descriptive and 'simple' inferential techniques

6.2.1 College participation per year by gender

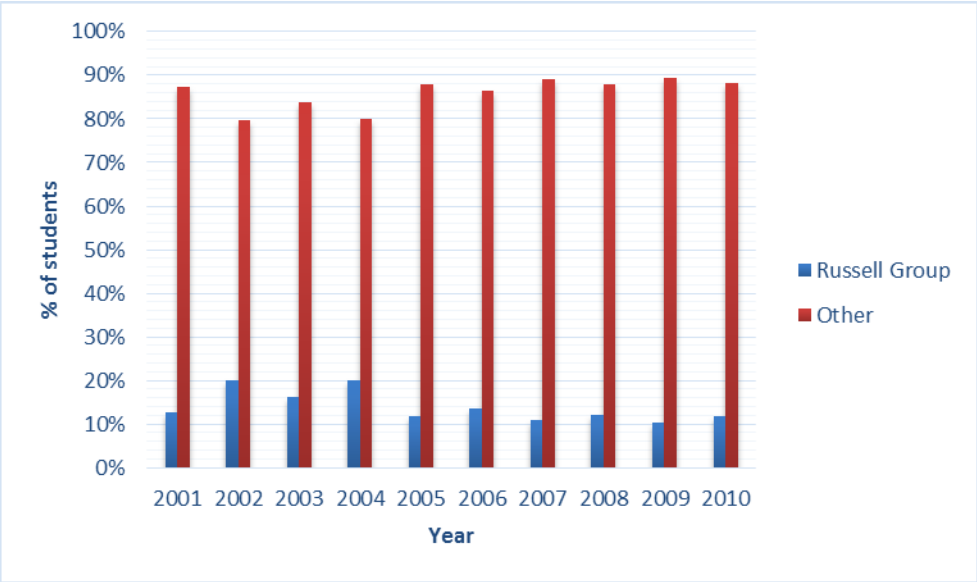


6.2.2 HE participation per year by College male students



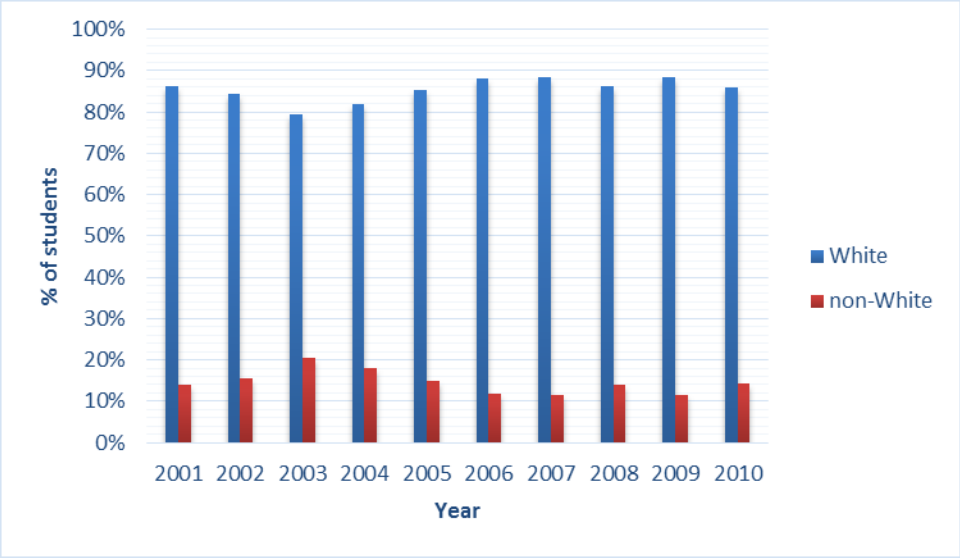
Other = non-HE routes of progression, including employment or training programmes such as apprenticeships.

6.2.3 RG participation per year by College male students

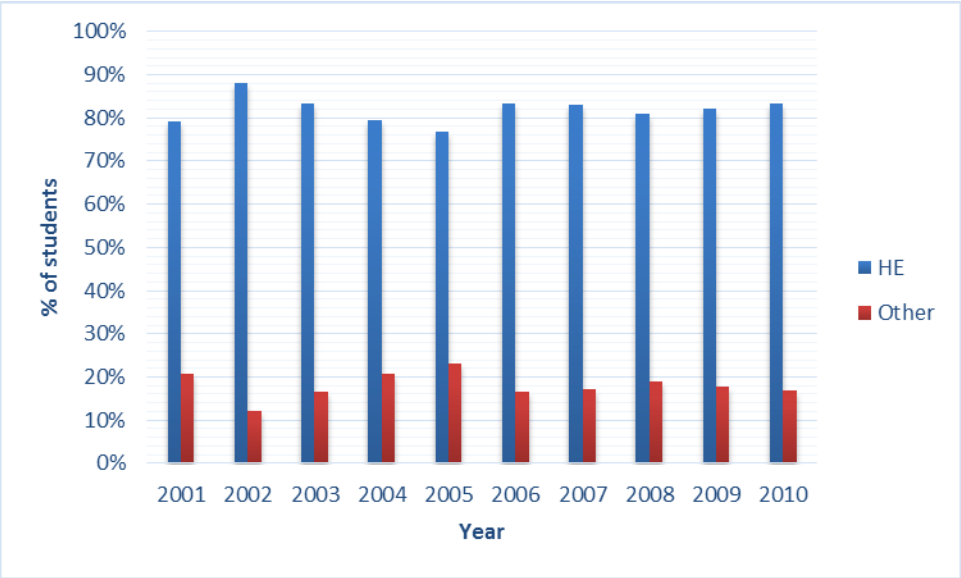


Other = Other HE and non-HE routes of progression, including employment or training programmes such as apprenticeships.

6.2.4 College participation per year by non-White/White students

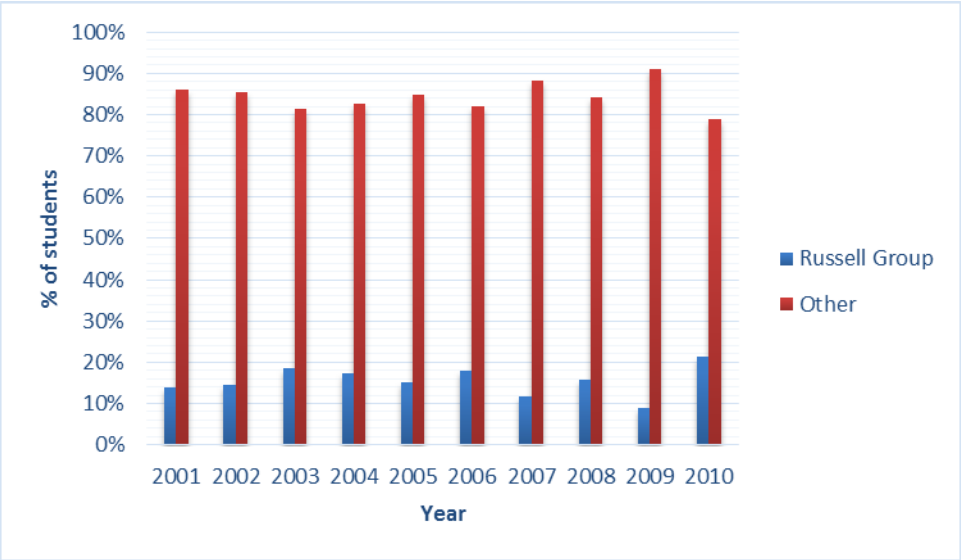


6.2.5 HE progression per year by College non-White students



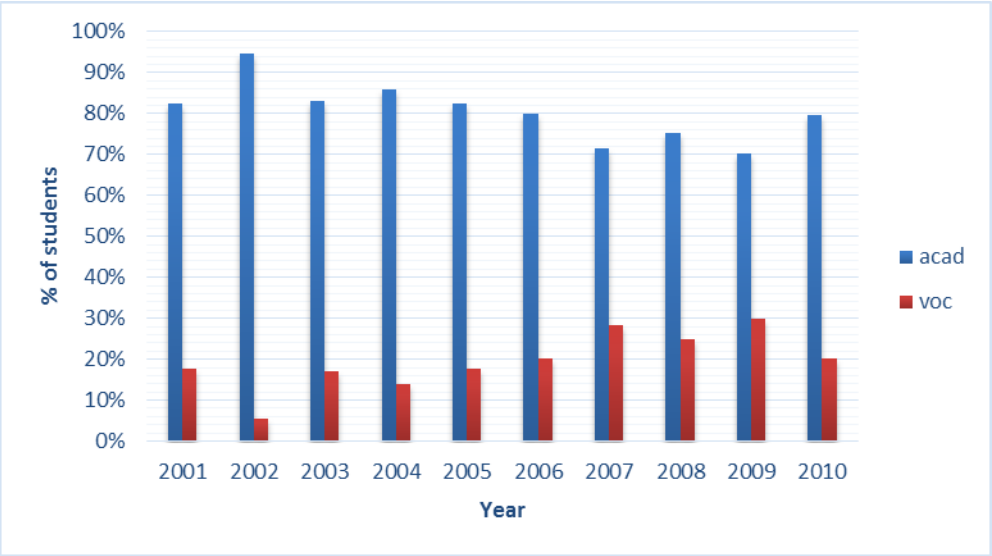
Other = non-HE routes of progression, including employment or training programmes such as apprenticeships.

6.2.6 RG participation per year by College non-White students

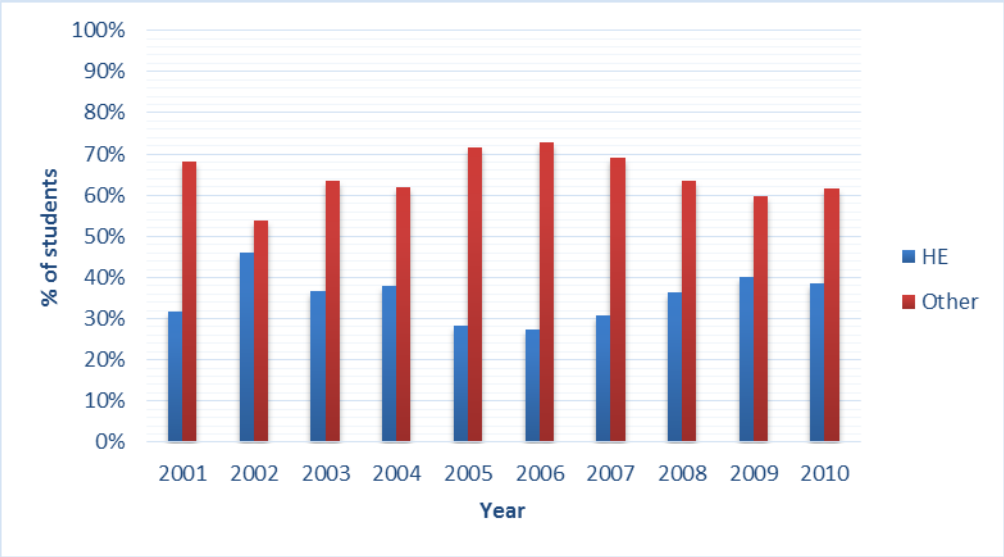


Other = Other HE and non-HE routes of progression, including employment or training programmes such as apprenticeships

6.2.7 College participation per year by programme type

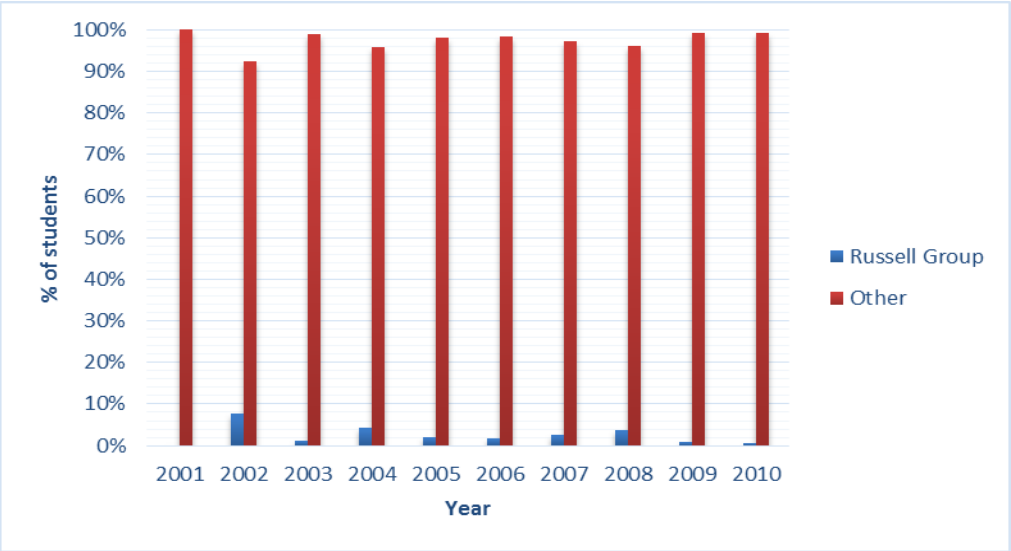


6.2.8 Percentage HE progression per year by College vocational programme students



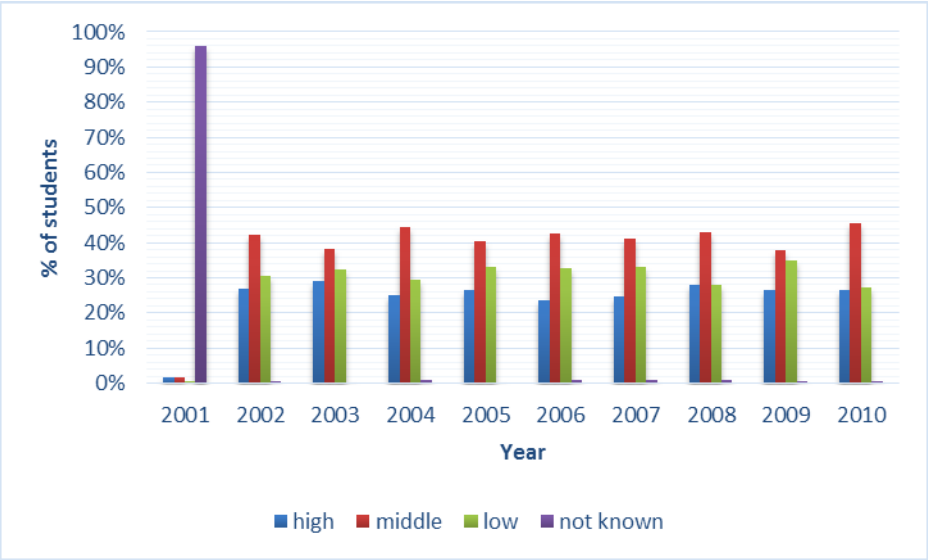
Other = non-HE routes of progression, including employment or training programmes such as apprenticeships.

6.2.9 RG participation per year by College vocational programme students

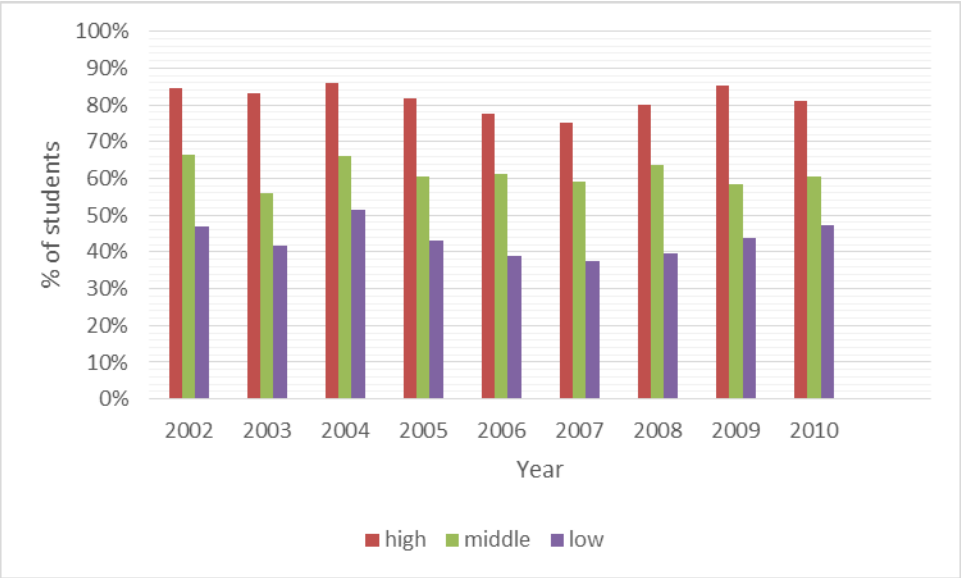


Other = Other HE and non-HE routes of progression, including employment or training programmes such as apprenticeships.

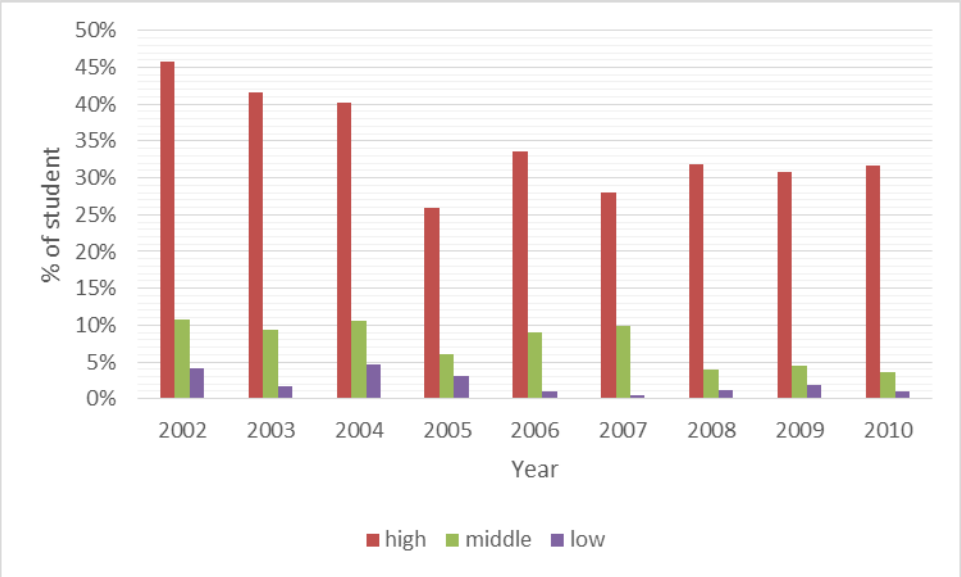
6.2.10 Percentage College participation by prior achievement of students



6.2.11 Percentage HE progression by prior achievement of College students



6.2.12 Percentage RG participation by prior achievement of College students



6.2.13 Chi-square College participation by gender

Original counts, with row totals shown at right and column totals below in bold.

297	220	**517**
259	223	**482**
318	210	**528**
280	229	**509**
337	243	**580**
374	228	**602**
367	295	**662**
367	273	**640**
429	344	**773**
441	355	**796**
3469	**2620**	**6089**

Expected counts

294.543	222.457
274.603	207.397
300.810	227.190
289.985	219.015
330.435	249.565
342.969	259.031
377.152	284.848
364.618	275.382
440.390	332.610
453.494	342.506

Distances of observed from expected

0.020	0.027
0.887	1.174
0.982	1.301
0.344	0.455
0.130	0.173
2.808	3.717
0.273	0.362
0.016	0.021
0.295	0.390
0.344	0.456

Chi-square test statistic

	14.174
P value	0.116264

Percentage of cells with less than 5 expected count = 0, no value <1

6.2.14 College participation: Results simple time trend regression for male proportion of cohort

Summary measures

Multiple R	0.1077
R-Square	0.0116
StErr of Est	0.0272

ANOVA table

Source	Df	SS	MS	F	p-value
Explained	1	0.0001	0.0001	0.0939	0.7671
Unexplained	8	0.0059	0.0007		

Regression coefficients

	Coefficient	Std Err	t-value	p-value	Lower limit	Upper limit
Constant	0.4246	0.0186	22.8119	0.0000	0.3817	0.4675
Year	0.0009	0.0030	0.3064	0.7671	-0.0060	0.0078

Heteroscedasticity Functional Form N=10	$\chi^2(12)=0.37$ (0.543) $F(3,5)=0.56$ (0.664)

6.2.15 Chi-square HE Progression by gender

Original counts, with row totals shown at right and column totals below in bold.

149	71	**220**
139	84	**223**
131	79	**210**
148	81	**229**
149	94	**243**
128	100	**228**
167	128	**295**
160	113	**273**
208	136	**344**
219	136	**355**
1598	**1022**	**2620**

Expected counts

134.183	85.817
136.013	86.987
128.084	81.916
139.673	89.327
148.211	94.789
139.063	88.937
179.927	115.073
166.509	106.491
209.814	134.186
216.523	138.477

Distances of observed from expected

1.636	2.558
0.066	0.103
0.066	0.104
0.496	0.776
0.004	0.007
0.880	1.376
0.929	1.452
0.254	0.398
0.016	0.025
0.028	0.044

Chi-square test statistic

	11.219
p value	0.261022

Percentage of cells with less than 5 expected count = 0, no value <1

6.2.16 HE progression: Results simple time trend regression for male proportion of cohort

Summary measures

Multiple R	0.6029
R-Square	0.3635
StErr of Est	0.0297

ANOVA table

Source	Df	SS	MS	F	p-value
Explained	1	0.0040	0.0040	4.5682	0.0650
Unexplained	8	0.0071	0.0009		

Regression coefficients

	Coefficient	Std Err	t-value	p-value	Lower limit	Upper limit
Constant	0.6504	0.0203	32.0059	0.0000	0.6035	0.6973
Year	-0.0070	0.0033	-2.1373	0.0650	-0.0146	0.0006

Heteroscedasticity	$\chi^2(12)=0.15$ (0.702)
Functional Form	$F(3,5)=2.27$ (0.198)
N=10	

6.2.17 Chi-square RG participation by gender

Original counts, with row totals shown at right and column totals below in bold.

192	28	**220**
178	45	**223**
176	34	**210**
183	46	**229**
214	29	**243**
197	31	**228**
263	32	**295**
240	33	**273**
308	36	**344**
313	42	**355**
2264	**356**	**2620**

Expected counts

190.107	29.893
192.699	30.301
181.466	28.534
197.884	31.116
209.982	33.018
197.020	30.980
254.916	40.084
235.905	37.095
297.258	46.742
306.763	48.237

Distances of observed from expected

0.019	0.120
1.121	7.131
0.165	1.047
1.120	7.120
0.077	0.489
0.000	0.000
0.256	1.630
0.071	0.452
0.388	2.469
0.127	0.806

Chi-square test statistic

	24.607
p value	0.003438

Percentage of cells with less than 5 expected count = 0, no value <1

6.2.18 RG participation: Results simple time trend regression for male proportion of cohort

Summary measures

Multiple R	0.6244
R-Square	0.3899
StErr of Est	0.0299

ANOVA table

Source	Df	SS	MS	F	p-value
Explained	1	0.0046	0.0046	5.1130	0.0536
Unexplained	8	0.0071	0.0009		

Regression coefficients

	Coefficient	Std Err	t-value	p-value	Lower limit	Upper limit
Constant	0.1808	0.0204	8.8661	0.0000	0.1338	0.2279
Year	-0.0074	0.0033	-2.2612	0.0536	-0.0150	0.0001

Heteroscedasticity	$\chi^2(12)=3.27$ (0.071)
Functional Form	F(3,5)=2.22 (0.204)
N=10	

6.2.19 Chi-square College participation by ethnicity – White/non-White

Original counts, with row totals shown at right and column totals below in bold.

445	72	**517**
407	75	**482**
420	108	**528**
417	92	**509**
494	86	**580**
530	72	**602**
586	76	**662**
551	89	**640**
683	90	**773**
683	113	**796**
5216	**873**	**6089**

Expected counts

442.876	74.124
412.894	69.106
452.299	75.701
436.023	72.977
496.843	83.157
515.689	86.311
567.087	94.913
548.241	91.759
662.172	110.828
681.875	114.125

Distances of observed from expected

0.010	0.061
0.084	0.503
2.306	13.781
0.830	4.959
0.016	0.097
0.397	2.373
0.631	3.769
0.014	0.083
0.655	3.914
0.002	0.011

Chi-square test statistic

	34.496
p value	0.000

Percentage of cells with less than 5 expected count = 0, no value <1

6.2.20 College participation: Results of simple time trend regression for non-White proportion of cohort

Summary measures

Multiple R	0.5149
R-Square	0.2651
StErr of Est	0.0260

ANOVA table

Source	Df	SS	MS	F	p-value
Explained	1	0.0020	0.0020	2.8859	0.1278
Unexplained	8	0.0054	0.0007		

Regression coefficients

	Coefficient	Std Err	t-value	p-value	Lower limit	Upper limit
Constant	0.1728	0.0178	9.7121	0.0000	0.1318	0.2139
Year	-0.0049	0.0029	-1.6988	0.1278	-0.0115	0.0017

Heteroscedasticity Functional Form N=10	$\chi^2(12)=1.06$ (0.3022) $F(3,5)=3.73$ (0.100)

6.2.21 Chi-square HE progression by ethnicity – White/non-White

Original counts, with row totals shown at right and column totals below in bold.

57	15	**72**
66	9	**75**
90	18	**108**
73	19	**92**
66	20	**86**
60	12	**72**
63	13	**76**
72	17	**89**
74	16	**90**
94	19	**113**
715	**158**	**873**

Expected counts

58.969	13.031
61.426	13.574
88.454	19.546
75.349	16.651
70.435	15.565
58.969	13.031
62.245	13.755
72.892	16.108
73.711	16.289
92.549	20.451

Distances of observed from expected

0.066	0.298
0.341	1.541
0.027	0.122
0.073	0.331
0.279	1.264
0.018	0.082
0.009	0.041
0.011	0.049
0.001	0.005
0.023	0.103

Chi-square test statistic

	4.685
p value	0.860867

Percentage of cells with less than 5 expected count = 0, no value <1

6.2.22 HE progression: Results of simple time trend regression for non-White proportion of cohort

Summary measures

Multiple R	0.0047
R-Square	0.0000
StErr of Est	0.0327

ANOVA table

Source	Df	SS	MS	F	p-value
Explained	1	0.0000	0.0000	0.0002	0.9898
Unexplained	8	0.0086	0.0011		

Regression coefficients

	Coefficient	Std Err	t-value	p-value	Lower limit	Upper limit
Constant	0.8189	0.0223	36.6385	0.0000	0.7673	0.8704
Year	0.0000	0.0036	0.0132	0.9898	-0.0083	0.0084

Heteroscedasticity Functional Form N=10	$\chi^2(12)=2.67$ (0.102) $F(3,5)=0.80$ (0.544)

6.2.23 Chi-square RG Participation by ethnicity – White/non-White

Original counts, with row totals shown at right and column totals below in bold.

10	62	**72**
11	64	**75**
20	88	**108**
16	76	**92**
13	73	**86**
13	59	**72**
9	67	**76**
14	75	**89**
8	82	**90**
24	89	**113**
138	**735**	**873**

Expected counts

11.381	60.619
11.856	63.144
17.072	90.928
14.543	77.457
13.595	72.405
11.381	60.619
12.014	63.986
14.069	74.931
14.227	75.773
17.863	95.137

Distances of observed from expected

0.168	0.031
0.062	0.012
0.502	0.094
0.146	0.027
0.026	0.005
0.230	0.043
0.756	0.142
0.000	0.000
2.725	0.512
2.109	0.396

Chi-square test statistic

	7.987
p value	0.535486

Percentage of cells with less than 5 expected count = 0, no value <1

6.2.24 RG participation: Results of simple time trend regression for non-White proportion of cohort

Summary measures

Multiple R	0.0101
R-Square	0.0001
StErr of Est	0.0375

ANOVA table

Source	df	SS	MS	F	p-value
Explained	1	0.0000	0.0000	0.0008	0.9780
Unexplained	8	0.0113	0.0014		

Regression coefficients

	Coefficient	Std Err	t-value	p-value	Lower limit	Upper limit
Constant	0.1560	0.0256	6.0834	0.0003	0.0969	0.2151
Year	-0.0001	0.0041	-0.0285	0.9780	-0.0096	0.0094

Heteroscedasticity Functional Form N=10	$\chi^2(12)=3.81$ (0.051) $F(3,5)=2.03$ (0.229)

6.2.25 Chi-square College participation by programme of study – vocational/non-vocational programmes

Original counts, with row totals shown at right and column totals below in bold

426	91	**517**
456	26	**482**
438	90	**528**
438	71	**509**
478	102	**580**
481	121	**602**
474	188	**662**
481	159	**640**
542	231	**773**
635	161	**796**
4849	**1240**	**6089**

Expected counts

411.715	105.285
383.843	98.157
420.475	107.525
405.344	103.656
461.885	118.115
479.405	122.595
527.186	134.814
509.667	130.333
615.582	157.418
633.898	162.102

Distances of observed from expected

0.496	1.938
13.565	53.044
0.730	2.856
2.631	10.288
0.562	2.199
0.005	0.021
5.366	20.983
1.612	6.305
8.795	34.394
0.002	0.007

Chi-square test statistic

165.800
4.62E-31

Percentage of cells with less than 5 expected count = 0, no value <1

6.2.26 College participation: Results simple time trend regression for vocational students proportion of cohort

Summary measures

Multiple R	0.7188
R-Square	0.5166
StErr of Est	0.0527

ANOVA table

Source	Df	SS	MS	F	p-value
Explained	1	0.0237	0.0237	8.5506	0.0192
Unexplained	8	0.0222	0.0028		

Regression coefficients

	Coefficient	Std Err	t-value	p-value	Lower limit	Upper limit
Constant	0.1017	0.0360	2.8261	0.0223	0.0187	0.1847
Year	0.0170	0.0058	2.9241	0.0192	0.0036	0.0303

Heteroscedasticity Functional Form N=10	$\chi^2(12)=0.04$ (0.844) F(3,5)=1.84 (0.257)

6.2.27 Chi-square HE progression by programme of study – vocational/non-vocational programmes

Original counts, with row totals shown at right and column totals below in bold

29	62	**91**
12	14	**26**
33	57	**90**
27	44	**71**
29	73	**102**
33	88	**121**
58	130	**188**
58	101	**159**
93	138	**231**
62	99	**161**
434	**806**	**1240**

Expected counts

31.850	59.150
9.100	16.900
31.500	58.500
24.850	46.150
35.700	66.300
42.350	78.650
65.800	122.200
55.650	103.350
80.850	150.150
56.350	104.650

Distances of observed from expected

0.255	0.137
0.924	0.498
0.071	0.038
0.186	0.100
1.257	0.677
2.064	1.112
0.925	0.498
0.099	0.053
1.826	0.983
0.567	0.305

Chi-square test statistic

	12.576
p value	0.182734

Percentage of cells with less than 5 expected count = 0, no value <1

6.2.28 HE: Results simple time trend regression for vocational students proportion of cohort

Summary measures

Multiple R	0.0161
R-Square	0.0003
StErr of Est	0.0619

ANOVA table

Source	df	SS	MS	F	p-value
Explained	1	0.0000	0.0000	0.0021	0.9648
Unexplained	8	0.0306	0.0038		

Regression coefficients

	Coefficient	Std Err	t-value	p-value	Lower limit	Upper limit
Constant	0.3562	0.0423	8.4277	0.0000	0.2588	0.4537
Year	-0.0003	0.0068	-0.0456	0.9648	-0.0160	0.0154

Heteroscedasticity	$\chi^2(12)=0.56(0.454)$
Functional Form	F(3,5)=10.30 (0.014)
N=10	

6.2.29 Chi-square prior College participation by prior achievement – high/ medium/ low

Original counts, with row totals shown at right and column totals below in bold.

129	147	203	**479**
154	170	202	**526**
127	150	227	**504**
154	191	234	**579**
143	198	256	**597**
164	219	273	**656**
179	180	275	**634**
205	269	294	**768**
212	218	362	**792**
1467	**1742**	**2326**	**5535**

Expected counts

126.954	150.753	201.293
139.411	165.545	221.044
133.580	158.621	211.798
153.459	182.225	243.316
158.229	187.891	250.880
173.867	206.459	275.674
168.036	199.535	266.429
203.551	241.708	322.740
209.912	249.262	332.826

Distances of observed from expected

0.033	0.093	0.014
1.527	0.120	1.641
0.324	0.469	1.091
0.002	0.423	0.357
1.466	0.544	0.104
0.560	0.762	0.026
0.715	1.913	0.276
0.010	3.082	2.559
0.021	3.921	2.557

Chi-square test statistic

	24.609
p value	0.077031

Percentage of cells with less than 5 expected count = 0, no value <1

6.2.30 College participation: Results simple time trend regression for low prior achievement proportion of cohort

Summary measures

Multiple R	0.1300
R-Square	0.0169
StErr of Est	0.0267

ANOVA table

Source	df	SS	MS	F	p-value
Explained	1	0.0001	0.0001	0.1203	0.7389
Unexplained	7	0.0050	0.0007		

Regression coefficients

	Coefficient	Std Err	t-value	p-value	Lower limit	Upper limit
Constant	0.3198	0.0225	14.2002	0.0000	0.2666	0.3731
year	-0.0012	0.0034	-0.3468	0.7389	-0.0093	0.0070

Heteroscedasticity Functional Form N=9	$\chi^2(12)=2.61$ (0.107) $F(3,5)=0.43$ (0.745)

6.2.31 College participation: Results simple time trend regression for middle prior achievement proportion of cohort

Summary measures

Multiple R	0.1855
R-Square	0.0344
StErr of Est	0.0269

ANOVA table

ANOVA table

Source	df	SS	MS	F	p-value
Explained	1	0.0002	0.0002	0.2496	0.6327
Unexplained	7	0.0051	0.0007		

Regression coefficients

	Coefficient	Std Err	t-value	p-value	Lower limit
Constant	0.4069	0.0227	17.9364	0.0000	0.3532
year	0.0017	0.0035	0.4996	0.6327	-0.0065

Heteroscedasticity Functional Form N=9	$\chi^2(12)=0.35(0.556)$ $F(3,5)=0.88\ (0.523)$

6.2.32 Chi-square HE Progression by College prior achievement – high/ medium/ low

Original counts, with row totals shown at right and column totals below in bold

109	69	135	**313**
128	71	113	**312**
109	77	150	**336**
126	82	142	**350**
111	77	157	**345**
123	82	161	**366**
143	71	175	**389**
175	118	172	**465**
172	103	219	**494**
1196	**750**	**1424**	**3370**

Expected counts

111.082	69.659	132.259
110.728	69.436	131.836
119.245	74.777	141.977
124.214	77.893	147.893
122.439	76.780	145.780
129.892	81.454	154.654
138.055	86.573	164.373
165.027	103.487	196.487
175.319	109.941	208.741

Distances of observed from expected

0.039	0.006	0.057
2.694	0.035	2.691
0.880	0.066	0.453
0.026	0.217	0.235
1.069	0.001	0.863
0.366	0.004	0.260
0.177	2.801	0.687
0.603	2.035	3.052
0.063	0.438	0.504

Chi-square test statistic

	20.323
p value	0.206045

Percentage of cells with less than 5 expected count = 0, no value <1

6.2.33 HE progression: Results simple time trend regression for low prior achievement proportion of cohort

Summary measures						
	Multiple R	0.2185				
	R-Square	0.0477				
	StErr of Est	0.0473				
ANOVA table	ANOVA table					
	Source	df	SS	MS	F	p-value
	Explained	1	0.0008	0.0008	0.3509	0.5722
	Unexplained	7	0.0157	0.0022		
Regression coefficients						
		Coefficient	Std Err	t-value	p-value	Lower limit
	Constant	0.4549	0.0399	11.3932	0.0000	0.3605
	Year	-0.0036	0.0061	-0.5924	0.5722	-0.0181

Heteroscedasticity Functional Form N=9	$\chi^2(12)=2.85$ (0.091) F(3,5)=0.13 (0.941)

6.2.34 HE progression: Results simple time trend regression for middle prior achievement proportion of cohort

Summary measures						
	Multiple R	0.2985				
	R-Square	0.0891				
	StErr of Est	0.0358				
ANOVA table	ANOVA table					
	Source	df	SS	MS	F	p-value
	Explained	1	0.0009	0.0009	0.6848	0.4352
	Unexplained	7	0.0090	0.0013		
Regression coefficients						
		Coefficient	Std Err	t-value	p-value	Lower limit
	Constant	0.6364	0.0302	21.0993	0.0000	0.5651
	Year	-0.0038	0.0046	-0.8275	0.4352	-0.0147

Heteroscedasticity Functional Form N=9	$\chi^2(12)=0.00$ (0.953) $F(3,5)=1.02$ (0.471)

6.2.35 RG participation: Results simple time trend regression for middle prior achievement proportion of cohort

Summary measures						
	Multiple R	0.8123				
	R-Square	0.6598				
	StErr of Est	0.0186				
ANOVA table	ANOVA table					
	Source	df	SS	MS	F	p-value
	Explained	1	0.0047	0.0047	13.5742	0.0078
	Unexplained	7	0.0024	0.0003		
Regression coefficients						
		Coefficient	Std Err	t-value	p-value	Lower limit
	Constant	0.1284	0.0157	8.1707	0.0001	0.0912
	Year	-0.0089	0.0024	-3.6843	0.0078	-0.0146

Heteroscedasticity Functional Form N=9	$\chi^2(12)=0.35$ (0.556) F(3,5)=0.88 (0.523)

6.4 Comparing the output from LPM and logistic regression

6.4.1 Comparing the output from the LPM and logistic regression for non-WP (adjusted) students

	Non-WP HE LPM	Non-WP HE Logistic	Logistic adjusted	Non-WP RG LPM	Non-WP RG Logistic	Logistic adjusted
(Constant)	0.776 (0.000)	1.402 (0.101)		0.518 (0.000)	2.165 (0.81)	
Vocational	-0.223 (0.000)	-0.985 (0.000)	-0.246	-0.017 (0.246)	-0.833 (0.014)	-0.208
Male	0.001 (0.942)	0.005 (0.948)	-0.001	0.040 (0.000)	0.440 (0.000)	0.110
White	-0.263 (0.000)	-1.479 (0.000)	-0.370	-0.050 (0.001)	-0.527 (0.001)	-0.132
Year	-0.007 (0.033)	-0.034 (0.04)	-0.009	0.000 (0.949)	0.000 (0.996)	0.000
low prior achievement	-0.110 (0.000)	-0.4970 (0.000)	-0.124	-0.051 (0.000)	-1.371 (0.000)	-0.343
high prior achievement	0.182 (0.000)	0.952 (0.000)	0.238	0.264 (0.000)	1.90 (0.000)	0.475
funding adjusted CPI	0.345 (0.461)	1.828 (0.431)	0.457	-1.099 (0.000)	-11.762 (0.001)	-2.94
Hetero **Functional Form** **N= 3512**	$\chi^2(1)=30.14$ (0.000) F(3,3501)= 5.37 (0.001) N=3512	N=3512		$\chi^2(1)=1421$ (0.000) F(3,3501)= 23.6 (0.000) N=3512	N=3512	

6.5 Progression to HE

6.5.1 HE Progression: probability calculations from LPM and logistic regression estimates – example of WP Factor (adjusted) students, 2002 and 2010

WP LPM	Co.	Year 2	Probability	Co.	Year 10	Probability
(Constant)	1.067	1	=B4*C4	1.067	1	=E4*F4
vocational	-0.166	1	=B5*C5	-0.166	1	=E5*F5
male	-0.051	1	=B6*C6	-0.051	1	=E6*F6
white	-.273	1	=B7*C7	-.273	1	=E7*F7
year	0.024	2	=B8*C8	0.024	10	=E8*F8
low prior achievement	-0.088	0	=B9*C9	-0.088	0	=E9*F9
high prior achievement	0.203	0	=B10*C10	0.203	0	=E10*F10
funding adjusted CPI	-0.810	0.34	=B11*C11	-0.810	0.39	=E11*F11
			=SUM(D4:D12)			=SUM(G4:G12)
WP Logistic	**Co.**	**Year 2**	**Probability**	**Co.**	**Year 10**	**Probability**
(Constant)	2.915	1	=B17*C17	2.915	1	=E17*F17
vocational	-0.768	1	=B18*C18	-0.768	1	=E18*F18
male	-0.274	1	=B19*C19	-0.274	1	=E19*F19
white	-1.677	1	=B20*C20	-1.677	1	=E20*F20
year	0.129	2	=B21*C21	0.129	10	=E21*F21
low prior achievement	-0.4	0	=B22*C22	-0.4	0	=E22*F22
high prior achievement	1.197	0	=B23*C23	1.197	0	=E23*F23
funding adjusted CPI	-3.803	0.34	=B24*C24	-3.803	0.39	=E24*F24
			=SUM(D17:D25)			=SUM(G17:G25)
			=EXP(D26)			=EXP(G26)
			=D27/(1+D27)			=G27/(1+G27)

6.5.2 HE Progression: non-WP Factor (adjusted) students, 2002 and 2010 comparison, using LPM estimates

	Coefficient	Year 2	Year 10
(Constant)	0.776	1	1
Vocational	-0.223	1	1
Male	0.001	1	1
White	-0.263	1	1
Year	-0.007	2	10
low prior achievement	-0.11	0	0
high prior achievement	0.183	0	0
funding adjusted CPI	0.345	0.34	0.39
Probability		0.394	0.356

6.5.3 HE Progression: non-WP Factor (adjusted) students, 2002 and 2010 comparison, using logistic regression estimates

	Coefficient	Year 2	Year 10
(Constant)	1.402	1	1
Vocational	-0.985	1	1
Male	0.005	1	1
White	-1.479	1	1
Year	-0.034	2	10
low prior achievement	-0.497	0	0
high prior achievement	0.952	0	0
funding adjusted CPI	1.828	0.34	0.39
		0.377	0.335

6.5.4 HE Progression: marginal effect calculation from logistic regression estimates – example of vocational for WP Factor (adjusted) students

WP Logistic	Co.	Year 2	Probability	Co.	Year 2	Probability
(Constant)	2.915	1	=B2*C2	2.915	1	=E2*F2
vocational	-0.768	1	=B3*C3	-0.768	0	=E3*F3
male	-0.274	1	=B4*C4	-0.274	1	=E4*F4
white	-1.677	1	=B5*C5	-1.677	1	=E5*F5
year	0.129	2	=B6*C6	0.129	2	=E6*F6
low prior achievement	-0.400	0	=B7*C7	-0.400	0	=E7*F7
high prior achievement	1.197	0	=B8*C8	1.197	0	=E8*F8
funding adjusted CPI	-3.803	0.34	=B9*C9	-3.803	0.34	=E9*F9
			=SUM(D2:D10)			=SUM(G2:G10)
			=EXP(C11)			=EXP(F11)
Probability			=C12/(1+C12)			=F12/(1+F12)
Marginal effect						=C13-F13

6.5.5 HE Progression: marginal effect vocational, WP Factor (adjusted) students, 2002 and 2010, using logistic regression estimates

	Coefficient	Year 2	Year 2	Year 10	Year 10
(Constant)	2.915	1	1	1	1
Vocational	-0.768	1	0	1	0
Male	-0.274	1	1	1	1
White	-1.677	1	1	1	1
Year	0.129	2	2	10	10
low prior achievement	-0.4	0	0	0	0
high prior achievement	1.197	0	0	0	0
funding adjusted CPI	-3.803	0.34	0.34	0.39	0.39
Probability		0.302	0.482	0.501	0.684
Marginal effect			-0.181		-0.183

6.5.6

6.5.7 HE Progression: marginal effect low prior achievement, WP Factor (adjusted) students, 2002 and 2010, using logistic regression estimates

	Coefficient	Year 2	Year 2	Year 10	Year 10
(Constant)	2.915	1	1	1	1
Vocational	-0.768	1	1	1	1
Male	-0.274	1	1	1	1
White	-1.677	1	1	1	1
Year	0.129	2	2	10	10
low prior achievement	-0.4	1	0	1	0
high prior achievement	1.197	0	0	0	0
funding adjusted CPI	-3.803	0.34	0.34	0.39	0.39
Probability		0.225	0.302	0.402	0.501
Marginal effect			-0.077		-0.099

6.6 RG Participation

6.6.1 RG Participation: non-WP Factor (adjusted) students, 2002 and 2010 comparison, using LPM estimates

	Coefficient	Year 2	Year 10
(Constant)	0.518	1	1
Vocational	-0.017	0	0
Male	0.04	1	1
White	-0.05	1	1
Year	0	2	10
low prior achievement	-0.051	0	0
high prior achievement	0.264	1	1
funding adjusted CPI	-1.099	0.34	0.39
Probability		0.398	0.343

6.6.2 RG Participation: non-WP Factor (adjusted) students, 2002 and 2010 comparison, using logistic regression estimates

	Coefficient	Year 2	Year 10
(Constant)	2.165	1	1
Vocational	-0.833	0	0
Male	0.44	1	1
White	-0.527	1	1
Year	0	2	10
Low prior achievement	-1.371	0	0
High prior achievement	1.901	1	1
Funding adjusted CPI	-11.762	0.34	0.39
Probability		0.495	0.352

6.6.3 RG Participation: marginal effect high achievement, non-WP Factor (adjusted) students-2002 and 2010, using logistic regression estimates

	Coefficient	Year 2	Year 2	Year 10	Year 10
(Constant)	2.165	1	1	1	1
Vocational	-0.833	0	0	0	0
Male	0.44	1	1	1	1
White	-0.527	1	1	1	1
Year	0	2	2	10	10
low prior achievement	-1.371	0	0	0	0
high prior achievement	1.901	1	0	1	0
funding adjusted CPI	-11.762	0.34	0.34	0.39	0.39
Probability		0.495	0.128	0.352	0.075
Marginal effect			0.367		0.277