

**Trends in HE participation by neighbourhood: evidence
for Wales**

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1. Introduction

In 1998, up front tuition fees for degree courses were introduced in England and Wales. Although poorer students are exempt from such fees, or at least pay lower amounts, many commentators predicted that tuition fees would cause student numbers to fall. In Wales, student maintenance grants were reduced, and then abolished before being reintroduced in limited form in September 2002¹². This too was expected to depress student numbers. At the very least, critics argued, these financial changes would reduce the number of *applicants* to HE³ and it is likely that students from the poorest groups in society would be those most likely to be put off by the introduction of tuition fees. On the other hand, many economists argued that, quite apart from the efficiency and equity arguments in favour of the introduction of tuition fees for HE (see for example Barr and Crawford (1998); Dolton, Greenaway and Vignoles (1997)), the huge wage gains from a degree, combined with a relatively low tuition fee, would be unlikely to put students off going to university. This may of course be true in general but not apply to poorer credit constrained students, whose access to HE is anyway highly limited and potentially more affected by such financial changes. However, it may be argued that it is more likely that students who experience a lower quality educational experience up to the age of 16, are less likely to go to university. In other words, inequality in HE could be in fact not rooted in the HE sector itself, but would attributable to inequalities earlier in the system, particularly at GCSE (Galindo, Marcenaro and Vignoles (forthcoming)). But just because significant inequalities in educational attainment at earlier ages are observed, does not mean this inequality is unrelated to problems in HE. Students may look forward and anticipate barriers to participation in HE and make less effort in school as a result. Indeed there are many such potential barriers, not least of which is the expected cost of HE and the role of student expectations (see for example Connor et al. (2001); Jackson et al.

¹ These are means tested and are for up to £1,500pa.

² Student loans have replaced the grant system. The current maximum level of student loan is £4,930 (for students living away from home in London).

³ Given that the supply of HE places is constrained, it is possible for student demand to fall whilst overall student numbers do not. In effect the excess demand for HE might have been reduced by the introduction of tuition fees.

(2004)). Thus poorer students may put in less effort at school, particularly at GCSE, simply because they do not anticipate being able to access higher education anyway.

This report addresses the problem of equality of access to HE by poorer and richer students, which has been of long standing concern in Wales (as in other countries of the UK). Indeed there is recent empirical evidence for both England and Wales that inequality of access to HE has actually been increasing (see Blanden et al. (2002); Galindo-Rueda and Vignoles (2002); Machin and Vignoles (2003)), further increasing policy interest in this issue. This report is especially topical, given the upcoming further changes to the financial regime in HE in Wales (Rees 2005). In Wales, as in England, HEIs will be able to charge fees of up to £3,000 (up from the current level of £1,200) from 2007/8. However, unlike in England, Welsh domiciled students attending Welsh HEIs will be able to receive a £1,800 grant, which offsets the additional fees entirely. Furthermore, from 2006/7 the £1,200 fee paid by the student will not need to be paid back until after the student graduates from university (i.e. a deferred fee scheme). The Welsh government has also announced a bursary scheme to promote wider access to HE by providing targeted grants to certain groups of students at risk of not participating in HE.

The purpose of this report is to investigate the extent to which students from poorer neighbourhoods in Wales are less likely to participate in higher education, as compared to their counterparts who live in wealthier areas. We propose to determine (as best we can with the limited available data) whether the problem of unequal access to HE in Wales has been worsened by the 1998 changes in funding regime. The project will inform policy-makers about the gap in HE participation rates between richer and poorer neighbourhoods in Wales, and how this gap has changed over time. Specifically, we will analyse trends in HE participation in Welsh neighbourhoods over time for different groups of students for the period 1994-2001. Given that Wales has 40% of students studying part-time, which is a higher percentage than elsewhere in the UK, we will pay particular attention to part-time students and indeed other non traditional HE students, such as those studying at sub-degree level. From a policy perspective, it will provide policy-makers with crucially important information about the extent to which certain

groups in society, e.g. those from lower socio-economic backgrounds, are likely to have lower demand for HE, particularly following the introduction of tuition fees.

The data preparation for this project has already been carried out for an earlier Department for Education and Skills funded project (Galindo-Rueda et al. 2004), which looked at England and Wales together. From these data we have extracted information on the subset of UK HE students who are both domiciled in Wales (defined as those students with a Welsh postcode) and also attending a higher education institution anywhere in the UK. We also have data from the Census on the number of young people in each Welsh postcode and can therefore identify postcodes with low or high HE participation, given their demographic make up. These data can be combined with information on income levels across all postcodes in Wales, to give an indication of HE participation by neighbourhood income level. This enables us to explore differences in HE participation across different types of neighbourhood, as well as examine whether changes over time are different for richer and poorer neighbourhoods. Wherever possible we will also make inter country comparisons between Wales and England.

2. Methodology and Data

Although the methods used here are identical to those used in our previous report on this issue (Galindo-Rueda et al. 2004), to aid the reader we will set out the main methodological difficulties again and explain in detail how we intend to analyse HE participation in Wales before and after the introduction of tuition fees. Methodologically, determining the true effect of tuition fees on the demand for HE is problematic given that tuition fees were introduced universally across England and Wales. There was no “experiment” to determine the impact of fees on student demand, for example by introducing tuition fees in some areas but not others, or for some groups of students but not others (as has been done for the Education Maintenance Allowance scheme). Simply looking at student numbers before and after the introduction of tuition fees is likely to be informative but quite problematic, given that there has been a secular rise in the number of HE entrants over the last 30 years. Using time series data to determine whether the rise

in student numbers has been less than it would have been without tuition fees is not likely to give statistically robust and precise estimates of the impact of tuition fees.

Our approach is therefore to analyse cross sectional differences in HE participation across different types of neighbourhood, as well as trends in HE participation over time for different groups of students. Whilst this cannot give a definitive causal impact of tuition fees on the demand for HE (i.e. we cannot estimate an elasticity of demand for higher education), it will nonetheless be able to inform policy-makers of any downturn in student demand following, for instance, the introduction of fees. Specifically it will alert policy-makers if certain groups in society, e.g. those from lower socio-economic backgrounds, are likely to have lower demand for HE following further increases in tuition fees.

The data we use comes largely from the Higher Education Statistics Agency. The data set includes limited information (gender, ethnicity, university, degree subject, home postcode etc.) on all students in HE. We have data from 1994 to 2001. As we are most interested in the impact of tuition fees on the participation of poorer students, and as the HESA data set does not contain information on the income or social class of the student's parents, we use the student's home postcode as an indicator of their socio-economic status. In this report we focus largely on students from Welsh neighbourhoods, i.e. with Welsh postcodes, although we also give results for England where appropriate. We have merged CACI Paycheck household income data into the HESA database, on the basis of each student's home postcode. CACI data is derived from a commercially produced data set, designed for marketing purposes, and based on over 4 million households⁴. This data set can provide us with an estimate of the income distribution of each postcode, since it contains information on mean income, the standard deviation of income, the number of households and the banded income distribution in that postcode. These data enable us to model HE participation by neighbourhood income level across Wales.

⁴ Further details, and an alternative use for these data, can be found in Gibbons (2001).

For a full discussion of why this methodology is appropriate see Galindo-Rueda et al. 2004. In brief, this method has many advantages. Firstly, HESA data does not contain information on the actual income level of the student's household, so it is essential to find a meaningful proxy indicator and the income level of students' neighbourhoods serves this purpose. Secondly, the use of postcode premiums to reflect the costs of attracting and teaching certain types of student is already established in the HE sector. The role of neighbourhood and environment in influencing HE participation is acknowledged, for example in the use of students' postcodes as widening participation performance indicators for individual institutions.

There are a number of technical issues that need to be discussed. Firstly, we only have income data for each postcode from CACI for two particular years (1996 and 1999). We use the more recent 1999 data and have to assume some stability in the income distribution across different postcodes over the 8-year period. In other words, we have to assume that a neighbourhood that is poor in 1999, is likely to be equally as poor in 1994 and 1998. Another issue is that clearly the number of students attending HE from a particular neighbourhood is dependent on the population in that neighbourhood, particularly the young (age 18-24) population. Thus all our models control for the population in each postcode sector, derived from Census data for 2001. We have had to assume stability of population over time. Comparisons of the 1996 and 1999 CACI data in our previous report (Galindo-Rueda et al. 2004) suggested that these assumptions are reasonable and we do not believe that they are likely to lead to substantial systematic bias. We will, however, have introduced measurement error into two explanatory variables (the income level of the neighbourhood and the population aged 18-24 in the neighbourhood).

A second issue that some postcodes have been discontinued by the Post Office during the period. We have had to drop such postcodes, constituting 3.05% of the sample⁵. A final issue is where we have missing data on postcode income levels. Where this has occurred

⁵ Some further cleaning of the data was required. We dropped outlier postcodes with very few households (<75) from our sample. This caused us to lose around 1% of postcodes from our sample.

we use 1996 income data if available or, if that is missing too, we aggregate the data up to the 4 digit postcode level and impute data on the basis of this more aggregated grouping.

3. Summary Statistics

Figures 1 and 2 show the numbers of students participating in HE (all years including new entrants), by gender and over time, separately for those living in Wales (i.e. with Welsh postcodes) and English domiciled students. Thus around 65,000 Welsh domiciled students were enrolled in higher education in Wales in 2001⁶. Just under 750,000 English domiciled students were enrolled in HE in the same year. It is important to remember that we are focusing on Welsh students rather than Welsh HEIs. Thus many (just over one third) of the Welsh domiciled students enrolled in HE were attending universities outside Wales.

Given that the cohort size in both Wales and England varied very little over this period⁷, the raw student numbers shown in Figures 1 and 2 will show the same trend direction as estimates of the HE participation rate. A slight stagnation of the upward trend in student numbers is evident in Wales, following the introduction of tuition fees. However, the trend then resumes its upward path, for both men and women. The trend in student numbers is similar across both Wales and England. When disaggregated by full time and part time students, a similar pattern emerges. Likewise Figures 3 and 4 show the number of students participating in HE by type of qualification, namely degree and sub-degree, and these too follow similar trends to those in Figures 1 and 2⁸.

⁶ This is consistent with the recent Rees review (2005) which found that of the 120,000 students enrolled in the 12 Welsh HEIs in 2002, just under half were not Welsh domiciled.

⁷ The Annual Abstract of Statistics, No. 139 (2003) suggests very little change in the size of the age 15-19 cohort during this period.

⁸ The number of sub-degree students in Wales is relatively small, particularly at the beginning of the period (10,000 students in 1994). This small sample size does place some limits on our analysis, as is discussed later in this report.

In conclusion, there does not appear to be a major impact from the introduction of tuition fees in Wales, at least in terms of raw student numbers. This is true of England too. Certainly student numbers have continued to rise in Wales and this is clearly good news for those concerned that tuition fees would lead to a dramatic reduction in the number of pupils attending universities. However, these simple descriptive statistics cannot identify more marginal changes in HE participation in Wales and certainly cannot identify differences in participation rates across different types of student. For example, tuition fees are not likely to impact on the behaviour of the very rich because the fees are relatively low compared to household income. Equally tuition fees may have no impact on the behaviour of students from poor backgrounds, since these students are exempt from fees. Fees may still, however, have a significant impact on the behaviour of young people from middle-income backgrounds. Thus we need to look more formally at the behaviour of students from neighbourhoods with different levels of economic prosperity to tease out any potential impact from tuition fees and other changes during this period.

4. Regression Results

In this section we use regression analysis to investigate the factors influencing HE participation amongst Welsh domiciled individuals. We analyse participation by neighbourhood, identifying differences in HE participation patterns for students from richer and poorer neighbourhoods (postcode sectors). The dependent variable in the regression model is the natural logarithm of the number of students enrolled in HE from each postcode sector (neighbourhood), although the type of student included in the dependent variable varies according to the specification of the model. For example we estimate separate models for all students, for degree students and for sub-degree students, and likewise for full and part-time students. All of the specifications include time dummies (base case is 1994/1995), allowing for national trends in HE participation over time. The ordinary least squares (OLS) regressions also include the population estimate of the number of 18-24 year olds living in each postcode. This allows for the fact that postcodes with more young people living in them are likely to have more individuals enrolled in HE.

We start in Table 1 by showing the basic OLS model, which regresses the natural logarithm of the total⁹ number of students enrolled in HE in each neighbourhood against the log of mean household income in each neighbourhood and includes interactions between this income variable and each time dummy variable. The coefficient on the mean income term in column 1 measures the average relationship in Wales between neighbourhood income level and the total number of students enrolled in HE from that neighbourhood, controlling for population size. The coefficient is highly positively significant, suggesting that in both Wales (column 1) and England (column 2) more students are enrolled in Higher Education in richer neighbourhoods. The magnitude of the results indicates that in Wales, neighbourhoods that have 1% higher mean household income levels are likely to have 1.8% more students enrolled in HE. In England, neighbourhoods with 1% higher mean household income have 1.2% more students enrolled in HE.

The fact that richer students are more likely to enrol in HE is well known and therefore it does not come as a surprise that students from richer neighbourhoods are much more likely to go to university. The issue of most concern is whether the relationship between income and HE participation has changed following the introduction of tuition fees in 1998. The interactions between neighbourhood income and year can tell us whether this relationship has changed. Larger, positive and significant interaction terms for 1999-2001 would suggest that in these later years the relationship between neighbourhood income and HE participation became stronger. In column 1, the interaction terms are all insignificantly different from zero. This implies that in Wales the relationship between neighbourhood income and total HE participation was broadly stable over the entire period. The same is not true of England, where we do observe some strengthening of the relationship between neighbourhood income levels and total HE participation for the period 1995-2000, although this relationship is not consistent from year to year.

⁹ Specifically this includes all postgraduate, degree and sub-degree students regardless of mode of study.

Columns 3 and 4 of Table 1 include the same variables but use a fixed effects formulation. This fixed effects model simply tests whether, *within* each postcode, participation is increasing over time. The purpose of using a fixed effects approach is to remove factors that might affect cross-sectional differences in HE participation across postcodes, and therefore confound trends over time (e.g. education levels in the neighbourhood). The fixed effects model should remove all differences in HE participation across postcodes that are down to fixed characteristics of the postcode that we do not observe and are not explicitly included in our model. In Column 3, the interactions between income and year remain largely insignificant despite the fixed effects formulation. Only in 1998 in Wales do we observe a sudden increase in the strength of the relationship between neighbourhood income level and total HE participation. This contrasts sharply with England, which saw a distinct strengthening of the relationship between neighbourhood income level and HE participation, particularly at the beginning of the period. Table 1 therefore suggests that total HE participation in richer English neighbourhoods increased more rapidly during the early 1990s, as compared to total HE participation in poorer English neighbourhoods. This was generally not the case in Welsh neighbourhoods however, where the growth in HE participation was similar for richer and poorer neighbourhoods. The timing of the trends in England suggests that causes other than tuition fees may well be responsible. The continuing decline in the real value of student grants in England during that period might be one possible culprit but it is not clear why this would not have affected Welsh students since student grants were only re-introduced in 2002 in Wales.

So far we have investigated total HE participation, including postgraduates and sub-degree students. Table 2 focuses specifically on first degree students, at whom tuition fees were largely targeted. For first-degree students there is a stronger relationship between neighbourhood income and the likelihood of being enrolled in a first degree than was the case for the entire HE student body. Furthermore, this relationship is considerably stronger for Welsh domiciled students, suggesting that socio-economic background is more strongly associated with first degree HE enrolment in Wales. Thus in Wales a 1% increase in mean neighbourhood income is associated with a 2.1% higher

first degree participation level. In England, a 1% higher mean neighbourhood income level is associated with a 1.3% increase in the numbers enrolled on first-degree courses in HE. In Table 2, column 1, which is the OLS regression, the interactions between income and year are insignificant in Wales. This confirms the results of Table 1, namely that there was no strengthening of the relationship between neighbourhood income and first degree HE participation in Wales during this period. This finding holds up even in the fixed effect specification, whereas for England we do see some strengthening of the link between neighbourhood income and first degree HE participation in the fixed effect model.

One might also expect that full and part-time students would be differently affected by the introduction of tuition fees and abolition/ reduction of grants. This might be particularly important in Wales where a higher proportion of students are part-time. Thus in Tables 3 and 4, we consider all¹⁰ full-time and part-time students respectively. The pattern for full time students shown in Table 3 is similar to that observed in Tables 1 and 2, namely that there is a strong link between neighbourhood income level and full time HE participation but that it only increased in strength in England during the period. To help the reader, the results have also been shown graphically in Figure 5. Figure 5 shows an index of student numbers enrolled in HE by type of neighbourhood, showing the richest neighbourhoods (5th quintile of the income distribution), midrange neighbourhoods (3rd quintile) and poor neighbourhoods (1st quintile). The figure therefore is a visual representation of the growth in HE participation by type of neighbourhood. The gap in HE participation between rich, middle and poor postcodes is normalised to zero for 1994. Figure 5 shows that full time HE participation in poor and rich neighbourhoods in Wales had similar growth rates, i.e. the graphs for rich and poor neighbourhoods stay close together for the entire time period. This contrasts to England where the rich neighbourhoods (top 5th quintile graph) had more rapid growth in full time HE participation, as compared to poorer neighbourhoods (the lines diverge during the time period).

¹⁰ Postgraduate, first degree and sub-degree students are included in this specification.

The situation for part-time students is very different. Even in the OLS regression in column 1 of Table 4, there is some evidence that the relationship between neighbourhood income and part-time HE participation strengthened in Wales, particularly in 1997 and 1999 (it appears to have also increased in 1996 and 1998 but the standard errors are large and the coefficients statistically insignificant). The fixed effect model in column 3 of table 4 confirms this finding, showing a clear increase in the strength of the relationship between neighbourhood income level and part-time HE participation in Wales for the period 1996-1999. A similar pattern is observed for part-time English domiciled students. Again this can be observed graphically in Figure 6. Figure 6 shows quite clearly that in Wales between 1996 and 2000, there was a divergence between rich and poor neighbourhoods. In other words during this period part-time HE participation grew more rapidly in the richer neighbourhoods than in poor ones. The lines converge at the end of the period, suggesting that by 2001 richer and poorer neighbourhoods in Wales had similar rates of growth in part time HE participation.

It would appear therefore that if there is any change in the relationship between socio-economic background and the likelihood of going to university, perhaps due to the introduction of tuition fees and other financial changes, it is most relevant in Wales for *part-time* students. Further investigation suggested that part-time first-degree students did not seem to be so affected, and that they did not experience a significant and sustained increase in the strength of the relationship between neighbourhood income and HE participation (Table 5). This caused us to investigate sub-degree students more closely. One needs to be aware however, that the number of Welsh domiciled sub-degree students is relatively small (10,000) and that this does limit our investigation somewhat. Table 6 shows similar models to those discussed above but focusing on sub-degree full time students, whilst Table 7 focuses on sub-degree part-time students.

Table 6 suggests that there was some strengthening of the relationship between a student's neighbourhood income level and the likelihood of participating in full-time sub-degree level HE, particularly for the period 1996-1998. Interestingly the reverse is true in England, where the coefficients on the interaction terms are actually negative from 1998

onwards. This implies that there was a larger increase in full-time sub-degree participation in England in poorer neighbourhoods as compared to richer neighbourhoods. This might reflect some shift from first-degree study to sub-degree study in poorer English neighbourhoods. Figure 7 confirms this graphically, showing the decline in the growth in sub-degree full time study in Wales during the mid 1990s and the fact that HE participation grew more rapidly in richer neighbourhoods than in poorer ones. For England, the reverse is true.

Figure 8 shows quite dramatically that in both Wales and England there was a much greater increase in part-time sub-degree HE participation in richer neighbourhoods, as compared to poorer neighbourhoods, at least up to 2000/01. This is confirmed in Table 7. Given that policy-makers have viewed part-time and sub-degree study as being one potential mechanism by which one can widen access to HE, this is a particularly worrying finding. Although it is somewhat reassuring in Wales that the trends in HE participation for richer and poorer, part-time and sub-degree, students converge again at the end of the period. It is not clear the causes of this and further investigation into the experience of these types of students during this period is needed.

5. Conclusions and Policy Discussion

A key policy question is whether there has been a negative impact on the attempt to widen participation in higher education from the introduction of tuition fees and other HE finance reforms. Specifically, what has been the pattern of HE participation before and after these financial reforms and how does this participation vary by different type of student. In this report we focus particularly on whether HE participation in the 1990s grew more rapidly for those living in richer neighbourhoods as compared to those from poorer backgrounds.

Our principle findings are of great policy interest. Specifically, the good news for policy-makers in Wales is that the introduction of tuition fees appears not to have substantially depressed the overall demand for higher education. This is true in England also. In Wales

there was little evidence that full time and degree level HE participation in poorer neighbourhoods had been particularly depressed during the 1990s. More specifically, full time and degree level HE participation grew similarly in rich and poor Welsh neighbourhoods during the period. This contrasts with the situation in England, which saw more rapid growth in full time and degree level HE participation in richer neighbourhoods. An open question is whether the announced re-introduction of grants in Wales may have helped the situation there, as compared to the situation in England.

However, further investigation suggested that patterns of part-time and specifically sub-degree level part-time HE participation have varied during the period. Between 1996-2000, there was a significant widening of the gap in part-time and sub-degree level HE participation between poorer and richer Welsh neighbourhoods. This means that in Wales the already steep relationship between income level and HE participation got stronger during the period that tuition fees were introduced, although this effect was largely felt by part-time and sub-degree level students.

In conclusion, our main finding is that during the 1990s participation in part-time and sub-degree HE study grew more strongly in richer Welsh communities than in poorer ones. The patterns we observe do not however, suggest that tuition fees in and of themselves are the main potential cause of this trend. Much of the strengthening of the link between neighbourhood income level and part-time/sub-degree HE participation occurred earlier in the period i.e. before 1998. We may speculate that it was the prospect of tuition fees and the fall in the real value of student grants during this period, that influenced student behaviour, rather than the introduction of fees specifically, but we have no evidence on this. Either way, the finding that part-time and sub-degree HE participation grew more strongly in richer neighbourhoods is obviously worrying for those committed to widening access to HE in Wales, given that part-time and sub-degree study is viewed by many as the main method of widening access to HE (Rees, 2005). Differences in funding methods across part-time and full-time students, and the potential equity problems this gives rise to, have been the subject of extensive policy discussion

(Dearing, 1996; Rees, 2005) and our report reinforces the case for further consideration of the financial position of part-time and indeed sub-degree students.

However, it is important to recall that in this analysis we cannot talk about causality. For example, we do not control for students' prior attainment (at area level) and thus we cannot be sure whether we are observing increasing socio-economic inequality on entry into HE or the results of increasing inequality emerging far earlier in the education system. In models of HE participation, achievement at A level is the main determinant of access to HE for people from all socio-economic groups, and A level performance is strongly linked to prior disadvantage. For example, Galindo-Rueda, Marcenaro and Vignoles (forthcoming) support the idea that the substantial social class educational inequality observed in the 90s in higher education in the UK occurred largely as a result of inequalities earlier in the education system, i.e. before the age of 16. Our results should therefore be read as indicative only.

6. References

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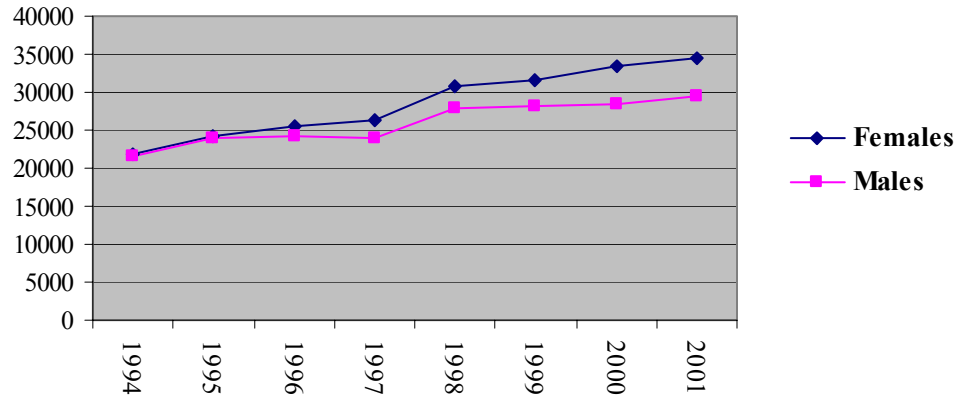
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Figure 1

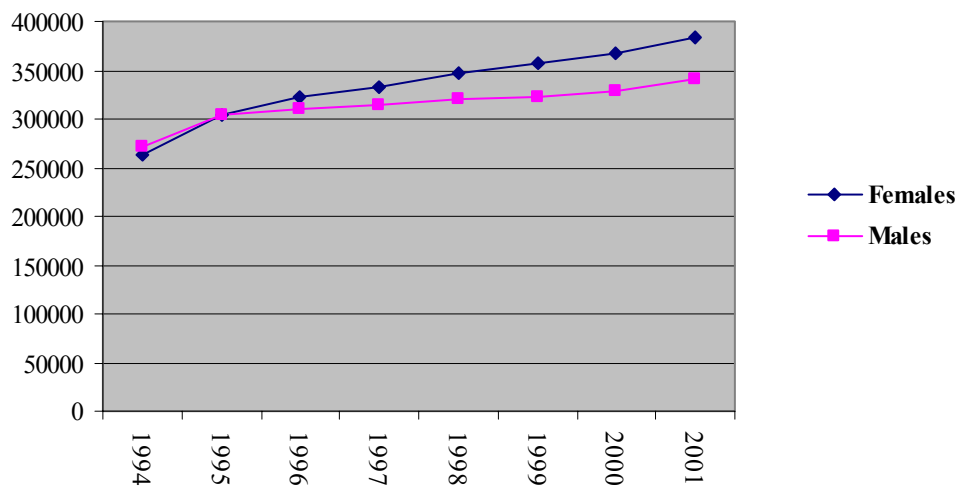
HE participation Wales (overseas excluded), by gender



* Higher Education Statistics Agency Data. Excludes overseas students. Includes full and part-time students, sub-degree, degree and postgraduate.

Figure 2

HE participation England (overseas excluded), by gender



* Higher Education Statistics Agency Data. Excludes overseas students. Includes full and part-time students, sub-degree, degree and postgraduate.

Figure 3

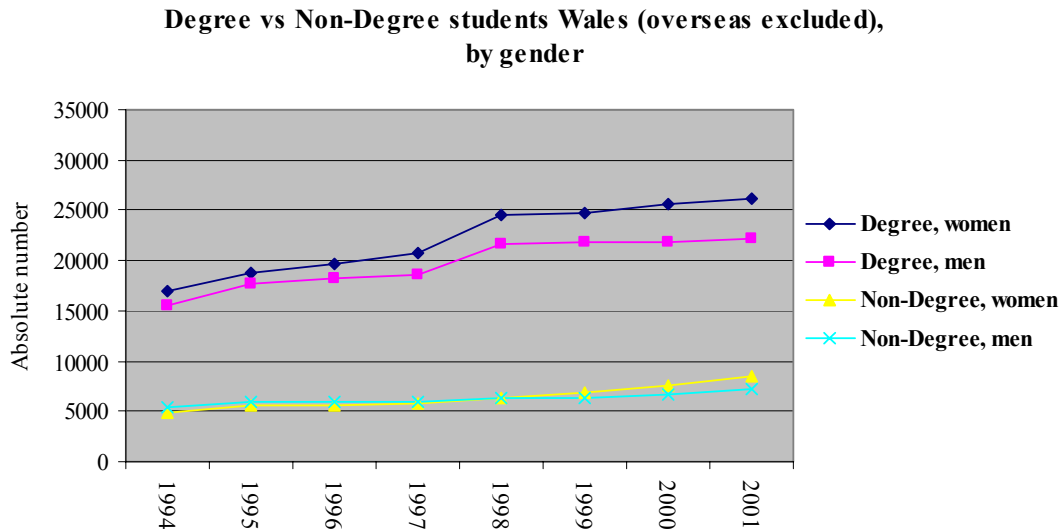
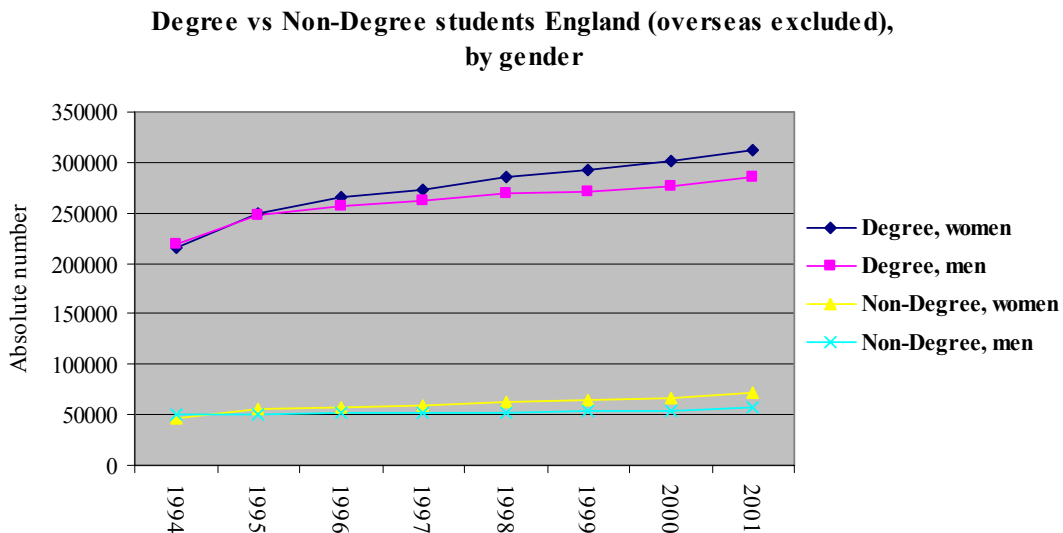
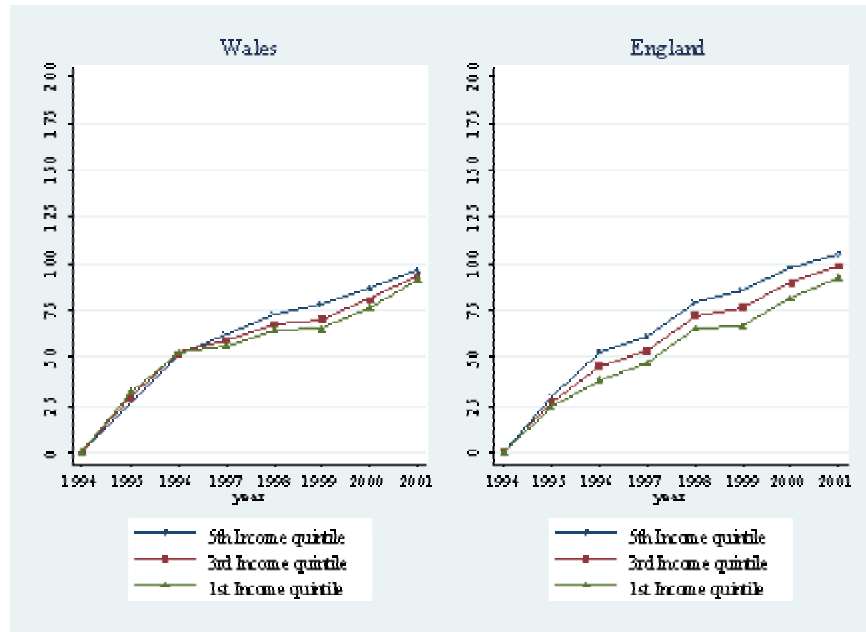


Figure 4



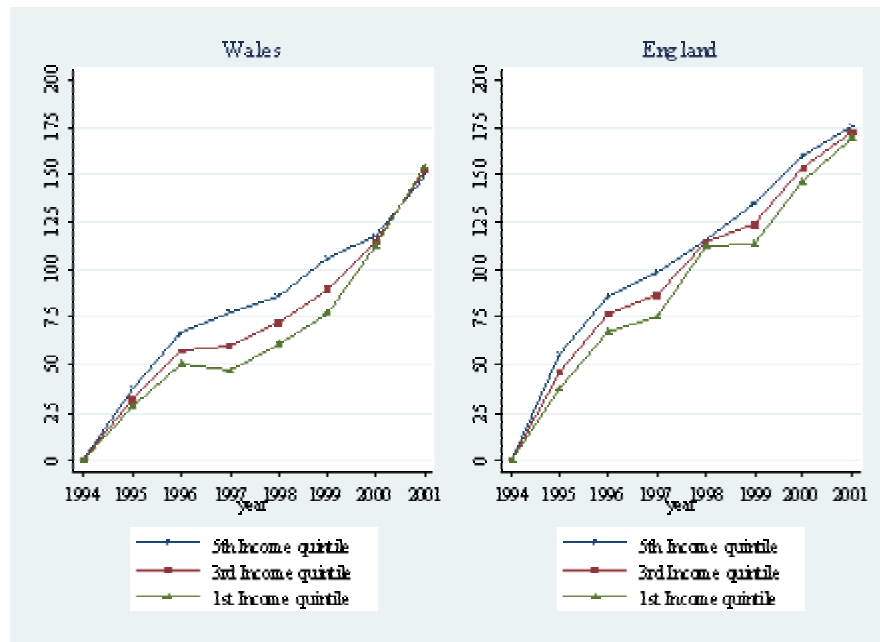
* Higher Education Statistics Agency Data. Excludes overseas students. Includes full and part-time students.

Figure 5: Predicted HE participation ratio for full time students by country and year



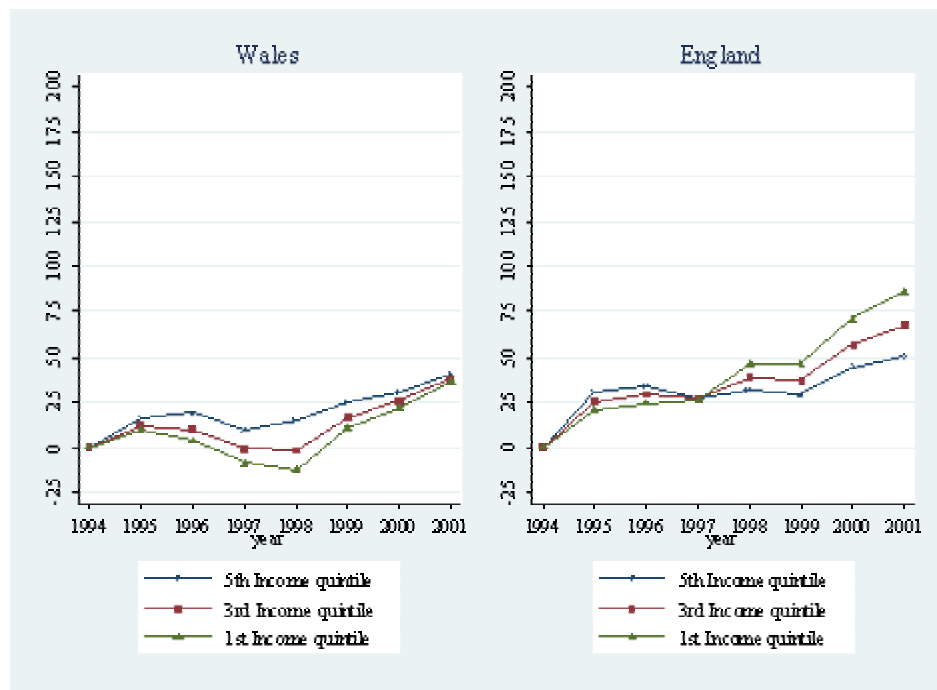
Source: Based on fitted values from Fixed effects estimates in Table 3. Regression gives predicted value for natural logarithm of number of full time students enrolled in HE for each postcode. The figure above shows an index of predicted student numbers enrolled in HE for postcodes in the 5th, 3rd and 1st quintiles, where the value of the index takes the value of zero in 1994.

Figure 6: Predicted HE participation ratio for part-time students by country and year



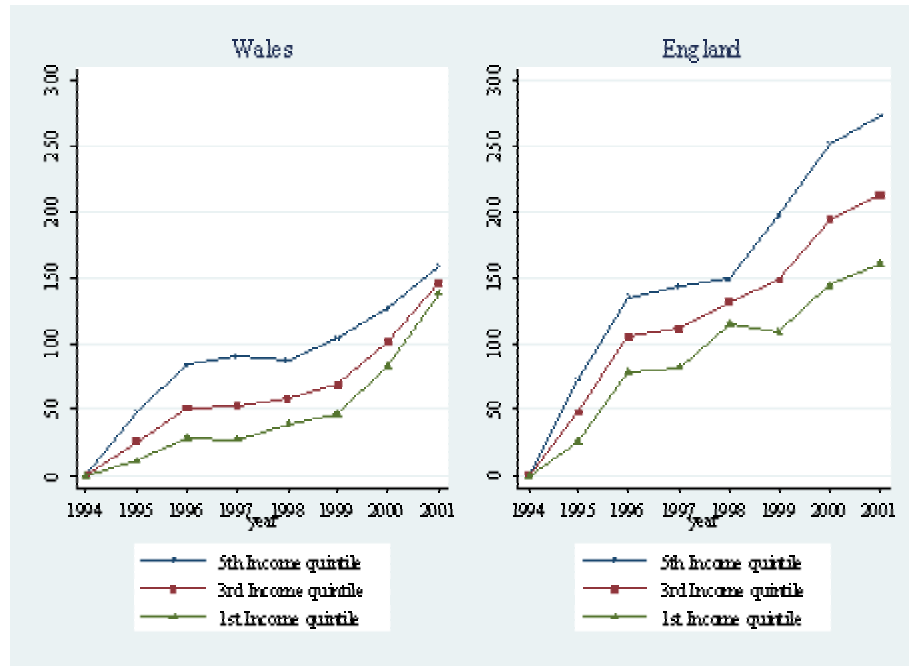
Source: Based on fitted values from Fixed effects estimates in Table 4. Regression gives predicted value for natural logarithm of number of full time students enrolled in HE for each postcode. The figure above shows an index of predicted student numbers enrolled in HE for postcodes in the 5th, 3rd and 1st quintiles, where the value of the index takes the value of zero in 1994.

Figure 7: Predicted HE participation ratio for sub-degree full time students by country and year



Source: Based on fitted values from Fixed effects estimates in Table 6. Regression gives predicted value for natural logarithm of number of full time students enrolled in HE for each postcode. The figure above shows an index of predicted student numbers enrolled in HE for postcodes in the 5th, 3rd and 1st quintiles, where the value of the index takes the value of zero in 1994.

Figure 8: Predicted HE participation ratio for sub-degree part-time students by country and year



Source: Based on fitted values from Fixed effects estimates in Table 7. Regression gives predicted value for natural logarithm of number of full time students enrolled in HE for each postcode. The figure above shows an index of predicted student numbers enrolled in HE for postcodes in the 5th, 3rd and 1st quintiles, where the value of the index takes the value of zero in 1994.

Table 1: Total students (Degree, Ph students and Subdegree students)

	OLS		Fixed Effects	
	Wales	England	Wales	England
Ln (Income)	1.832 (10.16)***	1.199 (33.88)***	-	-
Interaction Ln (Income)*year 1995	-0.023 (0.09)	0.098 (1.96)*	-0.043 (0.50)	0.108 (5.61)***
Interaction Ln (Income)*year 1996	0.049 (0.20)	0.147 (2.95)***	0.024 (0.27)	0.167 (8.69)***
Interaction Ln (Income)*year 1997	0.123 (0.49)	0.118 (2.37)**	0.097 (1.13)	0.163 (8.46)***
Interaction Ln (Income)*year 1998	0.173 (0.69)	0.061 (1.24)	0.148 (1.71)*	0.102 (5.32)***
Interaction Ln (Income)*year 1999	0.160 (0.63)	0.129 (2.59)***	0.134 (1.56)	0.173 (9.03)***
Interaction Ln (Income)*year 2000	0.095 (0.38)	0.085 (1.71)*	0.069 (0.80)	0.134 (6.96)***
Interaction Ln (Income)*year 2001	-0.044 (0.17)	0.043 (0.87)	-0.070 (0.81)	0.094 (4.89)***
Population aged 18-24 from Census (in thousands)	1.269 (46.09)***	0.907 (136.99)***	-	-
Year dummies	✓	✓	✓	✓
Constant	-2.153 (4.05)***	-0.268 (2.46)**	3.781 (389.48)***	3.894 (1102.63)***
Observations	3935	54313	3935	54313
Number of postcodes			493	6889
R-squared	0.45	0.37	0.54	0.44

Table 2: Degree students

	OLS		Fixed Effects	
	Wales	England	Wales	England
Ln (Income)	2.134 (11.73)***	1.307 (35.15)***	-	-
Interaction Ln (Income)*year 1995	-0.170 (0.67)	0.044 (0.84)	-0.189 (2.03)**	0.064 (3.32)***
Interaction Ln (Income)*year 1996	-0.082 (0.32)	0.099 (1.89)*	-0.123 (1.32)	0.116 (6.08)***
Interaction Ln (Income)*year 1997	-0.022 (0.09)	0.073 (1.40)	-0.063 (0.68)	0.119 (6.24)***
Interaction Ln (Income)*year 1998	-0.036 (0.14)	0.053 (1.02)	-0.079 (0.85)	0.098 (5.12)***
Interaction Ln (Income)*year 1999	-0.000 (0.00)	0.094 (1.80)*	-0.041 (0.44)	0.159 (8.31)***
Interaction Ln (Income)*year 2000	-0.118 (0.46)	0.048 (0.92)	-0.112 (1.20)	0.119 (6.26)***
Interaction Ln (Income)*year 2001	-0.061 (0.24)	0.041 (0.80)	-0.102 (1.10)	0.097 (5.07)***
Population aged 18-24 from Census (in thousands)	1.141 (41.06)***	0.831 (120.48)***	-	-
Year dummies	✓	✓	✓	✓
Constant	-3.561 (6.65)***	-0.958 (8.38)***	3.199 (305.23)***	3.483 (995.84)***
Observations	3930	54115	3930	54115
Number of postcodes			493	6889
R-squared	0.43	0.33	0.55	0.41

Table 3: Full time students

	OLS		Fixed Effects	
	Wales	England	Wales	England
Ln (Income)	1.846 (10.31)***	1.259 (34.60)***	-	-
Interaction Ln (Income)*year 1995	-0.050 (0.20)	0.018 (0.36)	-0.089 (1.02)	0.056 (2.89)***
Interaction Ln (Income)*year 1996	0.018 (0.07)	0.091 (1.78)*	-0.021 (0.24)	0.141 (7.32)***
Interaction Ln (Income)*year 1997	0.129 (0.51)	0.060 (1.18)	0.085 (0.97)	0.128 (6.66)***
Interaction Ln (Income)*year 1998	0.161 (0.64)	0.042 (0.83)	0.117 (1.34)	0.108 (5.66)***
Interaction Ln (Income)*year 1999	0.221 (0.88)	0.094 (1.84)*	0.177 (2.02)**	0.158 (8.23)***
Interaction Ln (Income)*year 2000	0.177 (0.71)	0.060 (1.17)	0.133 (1.52)	0.121 (6.32)***
Interaction Ln (Income)*year 2001	0.102 (0.41)	0.015 (0.30)	0.058 (0.67)	0.093 (4.87)***
Population aged 18-24 from Census (in thousands)	1.180 (43.18)***	0.859 (126.92)***	-	-
Year dummies	✓	✓	✓	✓
Constant	-2.432 (4.61)***	-0.688 (6.15)***	3.500 (355.04)***	3.625 (1030.64)***
Observations	3932	54178	3932	54178
Number of postcodes			493	6888
R-squared	0.43	0.34	0.49	0.39

Table 4: Part time students

	OLS		Fixed Effects	
	Wales	England	Wales	England
Ln (Income)	1.488 (7.44)***	1.145 (31.86)***	-	-
Interaction Ln (Income)*year 1995	0.166 (0.59)	0.166 (3.30)***	0.162 (1.28)	0.176 (7.39)***
Interaction Ln (Income)*year 1996	0.315 (1.13)	0.115 (2.28)**	0.238 (1.88)*	0.151 (6.31)***
Interaction Ln (Income)*year 1997	0.514 (1.84)*	0.133 (2.64)***	0.440 (3.49)***	0.177 (7.42)***
Interaction Ln (Income)*year 1998	0.346 (1.24)	0.001 (0.02)	0.330 (2.62)***	0.025 (1.04)
Interaction Ln (Income)*year 1999	0.481 (1.74)*	0.094 (1.89)*	0.334 (2.66)***	0.136 (5.73)***
Interaction Ln (Income)*year 2000	0.126 (0.45)	0.019 (0.38)	0.061 (0.48)	0.077 (3.24)***
Interaction Ln (Income)*year 2001	0.075 (0.27)	-0.004 (0.08)	-0.045 (0.36)	0.038 (1.60)
Population aged 18-24 from Census (in thousands)	1.429 (47.61)***	0.968 (147.33)***	-	-
Year dummies	✓	✓	✓	✓
Constant	-2.595 (4.40)***	-1.613 (14.59)***	2.397 (170.09)***	2.417 (558.70)***
Observations	3875	53726	3875	53726
Number of postcodes			493	6885
R-squared	0.45	0.40	0.47	0.46

Table 5: Degree Full and Part time students

	Full time				Part time			
	OLS		Fixed Effects		OLS		Fixed Effects	
	Wales	England	Wales	England	Wales	England	Wales	England
Ln (Income)	2.155 (11.79)***	1.370 (36.60)***	-	-	1.128 (5.01)***	0.470 (11.09)***	-	-
Interaction Ln (Income)*year 1995	-0.175 (0.68)	0.024 (0.45)	-0.195 (2.03)**	0.048 (2.50)**	0.099 (0.32)	-0.057 (0.96)	0.101 (0.43)	0.004 (0.10)
Interaction Ln (Income)*year 1996	-0.100 (0.39)	0.073 (1.39)	-0.136 (1.42)	0.104 (5.40)***	0.028 (0.09)	-0.095 (1.60)	0.026 (0.11)	-0.051 (1.39)
Interaction Ln (Income)*year 1997	-0.039 (0.15)	0.043 (0.82)	-0.080 (0.83)	0.098 (5.10)***	0.206 (0.68)	-0.024 (0.41)	0.247 (1.05)	0.043 (1.19)
Interaction Ln (Income)*year 1998	-0.041 (0.16)	0.066 (1.26)	-0.084 (0.88)	0.108 (5.63)***	0.441 (1.46)	-0.040 (0.68)	0.372 (1.59)	-0.026 (0.74)
Interaction Ln (Income)*year 1999	0.026 (0.10)	0.102 (1.95)*	-0.015 (0.15)	0.166 (8.64)***	0.503 (1.69)*	-0.052 (0.89)	0.468 (2.02)**	-0.023 (0.64)
Interaction Ln (Income)*year 2000	-0.089 (0.34)	0.076 (1.45)	-0.082 (0.85)	0.144 (7.49)***	0.071 (0.24)	-0.099 (1.72)*	0.028 (0.12)	-0.103 (2.89)***
Interaction Ln (Income)*year 2001	-0.001 (0.00)	0.054 (1.03)	-0.042 (0.43)	0.121 (6.29)***	-0.283 (0.95)	-0.126 (2.19)**	-0.360 (1.56)	-0.136 (3.83)***
Population aged 18-24 from Census (in thousands)	1.127 (40.34)***	0.815 (117.39)***	-	-	0.742 (23.48)***	0.724 (98.29)***	-	-
Year dummies	✓	✓	✓	✓	✓	✓	✓	✓
Constant	-3.681 (6.84)***	-1.240 (10.78)***	3.137 (290.23)***	3.384 (960.55)***	-2.947 (4.42)***	-0.637 (4.87)***	0.684 (24.74)***	1.191 (182.96)***
Observations	3929	54057	3929	54057	3313	49121	3313	49121
Number of postcodes			493	6887			483	6815
R-squared	0.43	0.33	0.53	0.40	0.25	0.19	0.20	0.16

Table 6: Sub-degree Full time students

	OLS		Fixed Effects	
	Wales	England	Wales	England
Ln (Income)	0.386 (1.91)*	0.214 (5.57)***	-	-
Interaction Ln (Income)*year 1995	0.159 (0.56)	0.057 (1.06)	0.141 (0.77)	0.114 (3.34)***
Interaction Ln (Income)*year 1996	0.420 (1.49)	0.051 (0.95)	0.321 (1.76)*	0.109 (3.18)***
Interaction Ln (Income)*year 1997	0.577 (2.04)**	-0.050 (0.94)	0.429 (2.35)**	0.010 (0.30)
Interaction Ln (Income)*year 1998	0.619 (2.18)**	-0.167 (3.15)***	0.629 (3.44)***	-0.149 (4.40)***
Interaction Ln (Income)*year 1999	0.291 (1.03)	-0.190 (3.57)***	0.285 (1.56)	-0.176 (5.20)***
Interaction Ln (Income)*year 2000	0.279 (1.00)	-0.237 (4.49)***	0.163 (0.90)	-0.230 (6.84)***
Interaction Ln (Income)*year 2001	0.268 (0.96)	-0.299 (5.66)***	0.080 (0.44)	-0.294 (8.74)***
Population aged 18-24 from Census (in thousands)	0.938 (30.62)***	0.683 (99.67)***	-	-
Year dummies	✓	✓	✓	✓
Constant	0.255 (0.43)	0.459 (3.89)***	1.792 (87.32)***	1.485 (244.69)***
Observations	3749	51103	3749	51103
Number of postcodes			492	6836
R-squared	0.22	0.18	0.08	0.10

Table 7: Sub-degree Part time students

	OLS		Fixed Effects	
	Wales	England	Wales	England
Ln (Income)	0.535 (2.32)**	0.391 (9.09)***	-	-
Interaction Ln (Income)*year 1995	0.482 (1.50)	0.375 (6.35)***	0.638 (3.24)***	0.459 (12.16)***
Interaction Ln (Income)*year 1996	0.704 (2.19)**	0.294 (4.99)***	0.821 (4.16)***	0.385 (10.24)***
Interaction Ln (Income)*year 1997	0.849 (2.65)***	0.304 (5.18)***	0.915 (4.66)***	0.409 (10.91)***
Interaction Ln (Income)*year 1998	0.566 (1.77)*	0.151 (2.60)***	0.692 (3.51)***	0.213 (5.76)***
Interaction Ln (Income)*year 1999	0.638 (1.99)**	0.424 (7.29)***	0.750 (3.82)***	0.499 (13.44)***
Interaction Ln (Income)*year 2000	0.431 (1.35)	0.426 (7.37)***	0.474 (2.42)**	0.517 (13.96)***
Interaction Ln (Income)*year 2001	0.135 (0.42)	0.424 (7.35)***	0.204 (1.04)	0.502 (13.58)***
Population aged 18-24 from Census (in thousands)	1.256 (36.43)***	0.773 (105.08)***	-	-
Year dummies	✓	✓	✓	✓
Constant	-0.503 (0.74)	-0.386 (2.91)***	1.631 (73.83)***	1.204 (175.88)***
Observations	3748	50932	3748	50932
Number of postcodes			489	6864
R-squared	0.32	0.28	0.26	0.34