# Minimum Wage and Staying-on Rates in Education for Teenagers

*Research report for the Low Pay Commission*

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# Executive Summary

This report assesses the impact of the introduction of the NMW for 16-17 year olds on the decisions made by young people at age 16 to stay-on in full time education (FTED) or enter the labour market.

The first part investigates whether there is evidence of any changes in education participation rates following the introduction of the NMW for 16-17 years old in October 2004. Using the Local Authorities as local labour markets, the strategy is to compare the evolution of ”staying on” rates in low and high wage LAs that are differently affected by the introduction of NMW. In low wage regions, a large proportion of employees are affected by the introduction of a minimum wage, whereas in high wage regions a far lower proportion is affected.

We found no evidence of reduced participation amongst youths in low wage LAs compared to high wage LAs. We also found no evidence that the large (10%) increase in the NMW that happened in 2006 had any impact either. The decision to “stay on” for 16 years olds does not seem to be affected by the higher wages induced by the introduction of NMW for 16-17 year olds in 2004.

In the second part of the report, we use detailed micro-data to investigate the determinants of young people’s education choices at age 16. We find that the decision about whether to stay on in full-time education is not driven by the local wage available to the 16-17 year olds. Rather the decision is a function of mainly academic ability, social class and other personal/family characteristics. Low ability and low socio-economic group pupils may be more sensitive to changes in local wages. We also found evidence that other characteristics of the local labour market seem to matter to young people when they decide whether to stay on in full-time education. A higher youth unemployment rate at the regional level significantly reduces the probability of being in employment (with respect to being in FTED), especially for males.

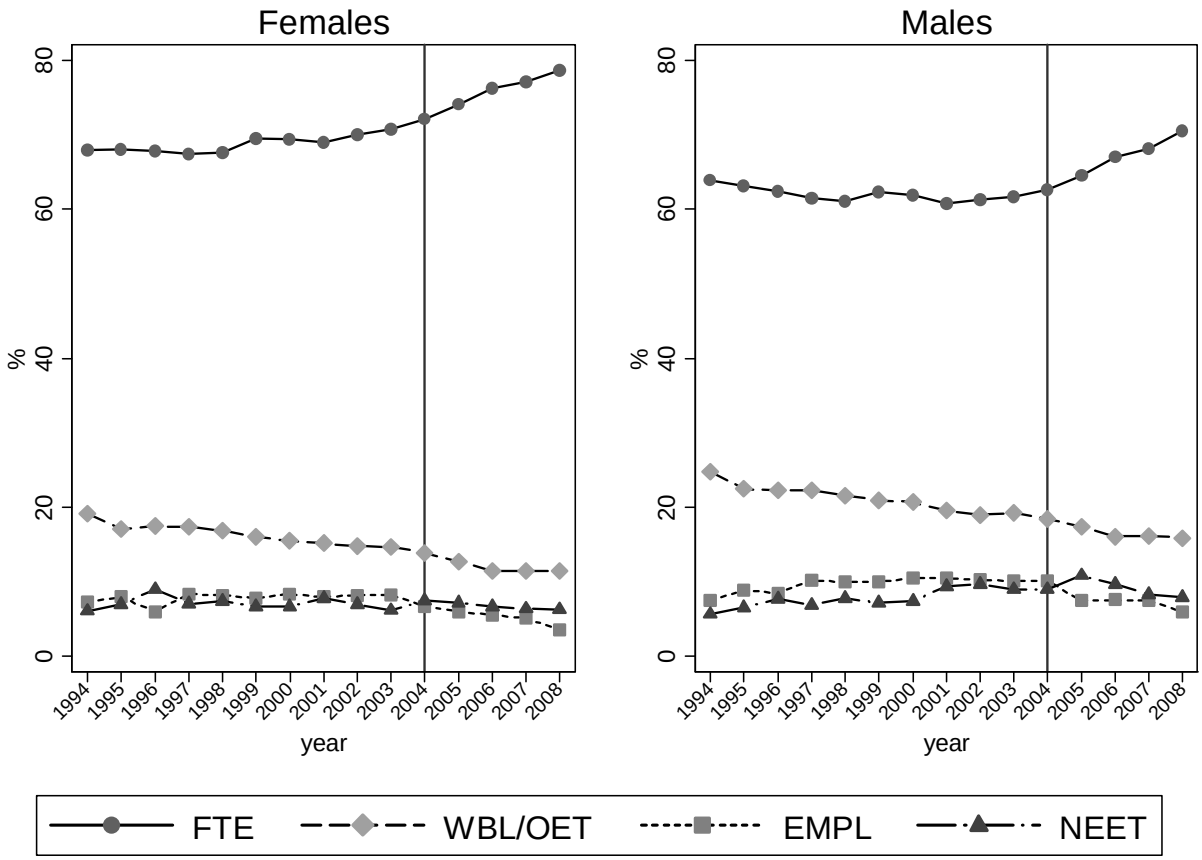
# Introduction

On the 1st of October 2004 a National Minimum Wage (NMW) for young people aged 16-17 was introduced in the UK[5]. This was a response to documented evidence of widespread practice of low paid jobs without any training content (Low Pay Commission, 2004). This policy intervention was aimed at reducing potential exploitation of young people and bringing the UK into line with all the other major countries where a National Minimum Wage (NMW) was already in place for the protection of 16–17 year olds. The decision to introduce a NMW for 16-17 year olds was based on LPC funded research reports suggesting that the introduction of a minimum wage for young people was likely to have negligible effect on participation in education and training (Dickerson and Jones, 2004; Frayne and Goodman, 2004). However, thus far this decision has not been evaluated, in terms of assessing the effect of introducing the NMW for the 16-17 age group on the likelihood of entering the labour market immediately after completion of compulsory education. This is the focus of this report.

As can be seen in Figure 1, the proportion of both males and females remaining in full time education has been increasing over time. In the aggregate data presented in Figure 1, it is obvious that there was no dramatic change in the staying on rate for either males or females, following the introduction of the NMW for 16-17 year olds in 2004. However, given that there was already an upward trend in the staying on rate prior to the introduction of the NMW for 16-17 year olds, we need to use careful econometric techniques to determine whether the increase in the full time staying on rate post 2004 was lower (or higher) than it otherwise would have been in the absence of the NMW.

[5] See Table A in the appendix showing the NMW rates for different age groups across time.

**Figure 1: Participation rate in Education, Training and Employment - 1994-2008**




**Source**: Authors' elaborations from *DCSF Research & Statistics Gateway*, available at: http://www.dcsf.gov.uk/rsgateway/DB/SFR/s000849/index.shtml
**Notes**: FTED= Full Time Education; WBL/OET= Work Based Learning and Other Education and Training; EMPL= In employment (and not in any education or training); NEET=Not in any education, employment or training (NEET)

Before we commence with our empirical analysis we start by considering what theory may indicate what will be the likely impact of the NMW for 16-17 year olds. Theoretical discussion of the impact of the age 16-17 NMW in October 2004 also has to consider the impact of the simultaneous introduction of the Education Maintenance Allowance, (EMA thereafter) in September 2004. The EMA scheme provided a means tested allowance[6] for 16-19 year olds who remained in full time education and was found to have a positive impact on full time education participation post 16 (Dearden et al., 2005 and 2009). The introduction of the EMA may lead teenagers to value more highly education as this would lead to increased non-wage income and therefore an increased reservation wage. Equally the introduction of the NMW for 16-

[6] A maximum allowance of up to £30 per week during term time is paid to young people with households' income below £21,000 per year (in 2009).

17 year olds may draw teenagers into the labour market as the wages that have to be offered to these young people might exceed their reservation wage. We could therefore expect a decreased labour supply and shift towards higher staying on rates or the reverse, depending on the net value of EMA versus the increased wages from the NMW.

On the demand side, if the age 16-17 NMW wage is set relatively high, firms may decrease their demand for 16-17 years old, replacing them with older individuals. This would potentially lead to higher "staying on" rates, given the lower pool of jobs available.

The net effect of these supply and demand side changes on "staying on" rates is indeterminate. It will depend on the respective elasticities of the demand and supply of labour, on the level at which the minimum wage is set and on the degree of substitutability between young and older workers (see Manacorda et al., 2006). If we consider the presence of unemployment these effects are also less clear. If teenagers quit education to search for higher paid jobs at the minimum wage level, while at the same time firms substitute 16-17 years olds for older workers, we would then expect a rise in unemployment together with decreased "staying on" rates.

Another important model depicting the labour market for teenagers is the monopsony model discussed by Manning (2003). This happens when firms can exploit some market power over workers. This market power arises when there are frictions in the labour market that make it time-consuming and costly for workers to change jobs. Assuming this model is operating, a higher wage induced by the establishment of an NMW would lead to higher levels of employment, possibly leading to decreased "staying on" rates. The main reason is that when firms have market power, the introduction of a NMW can be absorbed by the firms (as long as the minimum wage remains below the marginal productivity of workers). In that case, increased wages due to a minimum wage leads to increased supply of labour, ie more young people are ready to supply their labour and enter the labour force (see Manning, 2003). It is possible that a greater number of young people will be tempted to leave full-time education in order to take a job. This will apply particularly to those with a higher preference for the present and who value more highly immediate financial reward (ie.

who find it more difficult to wait until the end of a subsequent training period to obtain their first work income). This will also apply to teenagers for which the cost of further schooling is greater, in terms of the amount of intellectual effort needed and also in terms of direct (financial) and indirect (ie. forgone earnings) costs induced by the extra years of education taken.

With these theoretical considerations in mind, we assess the impact of the introduction of the NMW for 16-17 year olds on the decisions made by young people at age 16 in two ways.

We first use a difference-in differences approach where we evaluate whether the NMW has had any adverse effect on participation in education. As the NMW was rolled out in all areas of the UK simultaneously, we look at whether education participation rates changed over the period just *before* 2004 and *after* 2004 in areas where we believe that the introduction of NMW could have had a high impact through significantly increased wages (i.e. low wage areas). We then compare this to the change in participation rates in areas where we believe the introduction of NMW should have had a low impact on wages (i.e. high wage areas). To do this, the analysis uses aggregated data at a local authority level. We discuss how we determine in which areas the NMW is likely to have most impact in Part I of the report and then proceed to the evaluation.

In Part II of the report we then analyse at a micro level the determinants of young people's decisions to stay in education or enter the labour market at the end of compulsory education. Our particular focus for this analysis is to understand the key drivers of education participation. We consider the impact of local wages, and hence the likely impact of the age 16-17 NMW, in affecting young people's decisions to remain in full time education. We also consider the role of other factors, such as prior educational achievement, gender, socio-economic background etc. This analysis therefore contributes to our understanding of *why* the age 16-17 NMW has or has not had an impact on the post 16 education participation rate.

# 1. Evaluation of the impact of the introduction of a NMW for 16-17 year olds on "staying on" rates

## 1.1 Introduction

Since the seminal work by Card (1992a), the literature has generally investigated the employment effects from introducing the minimum wage by comparing employment rates of groups of workers likely to be affected by the minimum wage with other groups unlikely to be affected. Dolado et al. (1995) have called this approach the differential impact method. A common application is to compare the employment rates of individuals with wages just below the threshold used for the minimum wage with the employment rates of individuals situated further up the wage distribution (Stewart, 2004). Another approach is to use a geographical differential approach, comparing regions affected by a minimum wage (either through a newly introduced minimum wage or an increase in the minimum level) with similar bordering regions unaffected by the policy (Card, 1992a). When the minimum wage is introduced nationally, it is possible to rely on the unequal distribution of wage across regions. The strategy there is to rely on a minimum wage that is much more binding in poorer regions as compared to richer ones. In low wage regions, a large proportion of employees are affected by the introduction of a minimum wage, whereas in rich regions a far lower proportion are affected. This strategy has been used amongst others by Card 1992a, who noted that: "This [regional] variation provides a simple natural experiment for measuring the effect of a legislated wage floor with a treatment effect that varies across states [..]" p. 22. The approach has been used by Card, (1992a) for the US, Dolado et al. (1995) for Spain and France. In the UK, Stewart (2002) used it to investigate the impact of the introduction of the national minimum wage in 1999.

As has been discussed, the focus of this report is on the impact of the age 16-17 NMW on teenage enrolment in post-compulsory education. There is an early literature dating back to the 1980s on the potential reduction in enrolment in education induced

by the minimum wage (Ehrenberg and Marcus, 1980 and 1982). More recently, renewed efforts have been devoted to this question. This literature has led to mixed conclusions. Chaplin et al. (2003) and Campolieti et al. (2003) (both in the US) found no effect of the minimum wage on teenage enrolment in education, while Neumark and Wascher, (2003) in the US and Pacheco and Cruikshank (2003) in New Zealand found evidence of significant negative effects on "staying on" rates.

In the UK context, the question was addressed in preparation for the introduction of the 2004 NMW for 16 and 17 year olds. Dickerson et al., (2004) and Frayne and Goodman, (2004) investigated the issue in work commissioned by the LPC for the 2004 Annual Report. The first paper looked at the individual's decision to choose to enter the labour market. The second attempted to simulate a priori employment and education effects of the NMW for 16-17 year olds introduced in 2004. Using data sets collected for the evaluation of the Education Maintenance Allowance (EMA) pilot in 2001 and 2002, they argued that the introduction of the national minimum wage may lead to a significant decrease in labour demand if perfect competition is assumed to prevail. Under the assumption that the labour market for teenagers is characterised by a monopsony, they suggested that the effect of the minimum wage may lead to increased employment and reduced participation in education.

In this part of our report, we evaluate whether the effect of the NMW in October 2004 has had any impact on participation in full-time education by young people at the age of 16. The first section explains how we define our local labour markets, and how we identify areas where the NMW for 16-17 year olds is likely to have high and low impact. In section 2, we investigate whether the NMW for 16-17 year olds has led to any increase in wages at the bottom of the distribution in our high and low impact areas. If no effect is observed on wages, then it is very unlikely that young people would modify their behaviour towards schooling. In section 3, we explain how we compute our main variable of interest, which is the "staying on" rate at the LA level. Finally, section 4 presents the results of our empirical investigations.

## 1.2 Definition of High and Low wage LAs

Data on wages comes from the *Annual Survey of Hours and Earnings* (ASHE). ASHE is a dataset collected by the ONS with information about the levels, distribution and make-up of earnings and hours worked for employees. The sample size is about 160,000 employees in every year, a one per cent sample of employees in all industries and occupations. Information on wages is obtained directly from employers, which makes it likely that wage data are very accurate (Dustmann, Frattini and Preston, 2007). The ASHE provides very detailed geographical information, down to parliamentary constituency and, as mentioned above, in our analysis we use the local authority level information (LA) and then aggregate up to the nine Government Office Regions.

We decided to allocate each LA into the group of either high or low wage LAs[7] by using their position in a ranking of youth wages. Specifically, for each LA we use the hourly wage situated at the 25th percentile of its age 16-21 wage distribution. LAs are ordered from the lowest 25th to the highest 25th percentile.

Then we select the LAs at the bottom of this ranking. We chose all LAs that account for 10% of the sample of 16-21. We attribute them to the low wage LA group (where we expect a high impact from the NMW for 16-17 year olds). Similarly, we selected the LAs at the top of the wage ranking that again account for 10% of the 16-21 sample and allocate them to the group of high wage LAs (where we expect a low impact from the NMW for 16-17 year olds).

The reason for selecting wages of 16 to 21 year olds, rather than just wages of 16 and 17 year olds is that focusing on the latter would produce extremely small sample sizes due to the very low number of 16-17 year olds in the wage data when the sample is divided into the 115 LAs. In some LAs, the number of 16-17 year olds was fewer than 30. It was not possible to base a reliable selection process on such small numbers. With such small sample sizes, the presence of outliers may have substantially biased

[7] High wage LAs are where the NMW for 16-17 year olds is likely to have low impact. Low wage LAs are where it is likely to have high impact.

our selection of high and low wage LAs and would have lead to essentially random allocation into the high and low wage groupings.

The decision to retain the 25th percentile as the criterion for the selection into the high and low wage groups of LAs is because the sample sizes for those aged 16 to 21 and in work is still low in some LAs. Using a measure that is not too close to the bottom of the distributions is safer, avoiding over reliance on wages earned by only a few individuals. We undertook various robustness checks of this criterion. For example, we experimented with the proportion of 16-21 year olds earning less than £3.00 and with using the 10th and 20th percentiles as cut off criteria. We found that some LAs would be classified as low wage LAs simply on the basis of wages from fewer than 10 individuals. We therefore retained the $25^{th}$ percentile as our preferred cut off.

It was also essential to use criteria that took into account the spread of the wage distribution in each LA. Indeed, some LAs may not be classified as low wage using their mean hourly wage, but have a very unequal wage distribution and therefore have a high proportion of low paid individuals. We need to create our low and high wage LA groups using the likelihood that a relatively large proportion of low paid young people below 18 are likely to be affected by the NMW and we think that using the 25th percentile of the LA wage distributions is the relevant metric for this purpose.

The idea of selecting only the LAs at the bottom of the wage distribution comes from the assumption that if any effect is detected from the introduction of the age 16-17 minimum wage, it is more likely to happen in an LA with a relatively large proportion of 16-17 year olds who earn a very low wage. This is a conservative approach: we are focusing on LAs where the probability of rejecting the assumption of no effect is the highest. If we do find evidence of decreases in education “staying on” rates in these low wage areas, then we would need to check further up the wage distribution.

We also focused on LAs at the top of the wage distribution as a control group on the basis of the assumption that very few 16-17 year olds will be affected by the wage increase in these high wage LAs. This control group is essentially the LAs that are the most unlikely to be affected by the introduction of the age 16-17 NMW. This is the

essence of the differential approach as identified by Dolado et al. (1995) and used amongst others by Stewart, (2002) and Lemos, (2009).

Another approach is to use a ranking of LAs in the wage distribution before the introduction of the NMW for adults in April 1999. The main assumption would be that given the NMW for adults has tended to equalise the wage distribution in the different regions of the UK (as seen in Dolton et al., 2008), we would need a measure of the wage distribution before this process took place. This way of proceeding would address the possibility that the LAs selected using the 25th percentile of the wage distribution in 2003 are actually LAs where pay has not increased much since the introduction of the NMW and therefore are not the LAs with the highest prevalence of (very) low pay. We will therefore use this second approach as well to allocate the LAs into the high and low wage groups, as shown in Section 1.5.3 (in our robustness checks).

### 1.2.1. Low and High wage LA grouping

We provide in the Appendix (Table A1 and A2) the list of LAs included in the low and high wage groups. We also provide more detailed descriptive statistics on each LA allocated to the two groups.

We first note that more LAs are selected in to the low wage group. This comes from the fact that LAs with low wages tend to have a smaller population than high wage LAs. We therefore need more LAs in the low wage group to allocate 10% of all 16-21 year olds into the low wage group of LAs. We also note that the mean wage computed on all workers in the LA is not perfectly correlated with the 25th percentile of the age 16-21 wage distribution. This confirms that we should use a measure situated at the bottom of the wage distribution for young people likely to be affected by the introduction of the NMW in October 2004. Similarly, the median wage for age 16-21 is not perfectly correlated with the 25th percentile, underlining again the importance of focusing on wages at the bottom of the LA wage distribution.

We also note that using percentiles below the 25th could become problematic. Indeed, some LAs have really small numbers of 16 to 21 year olds. Using the 10th decile for example, would imply using wages of less than 5 individuals for Rutland, East Riding of Yorkshire, North Lincolnshire and Redcar and Cleveland. This is unlikely to provide reliable estimates of the true extent of low paid age 16-17 workers in these LAs.

One question that is relevant to the empirical analysis is whether the LAs included in our low wage areas were already included in the Education Maintenance Allowance (EMA) pilot scheme introduced in 1999 and 2000 (see full list of LAs in Table A3 in the Appendix). In these areas we might expect patterns of staying on rates to have already changed as a result of the early introduction of EMA. We have identified in bold LAs included in the EMA pilot. We note that only two were included in the EMA pilot (Lancashire and Northumberland). By the time that the NMW for 16-17 year olds was introduced in 2004 all areas had EMA.

The high wage group is made up of only 10 LAs. This comes from the fact that the inner London LAs are pooled together and account for a very high proportion of 16-21 year olds in the top 25$^{th}$ percentile of the wage distribution. The main reason behind the grouping of London LAs is due to a problem of small sample size again. Indeed some London LAs in our data had very low numbers of pupils in our school census data and we could not compute reliable "staying on" rates for those LAs.

## 1.3 Wage changes for young people in low and high wage LAs

In this report, we take the view that any potential effect of the introduction of the October 2004 age 16-17 NMW on young people's decision to enter the labour market rather than "stay on" in education and training must have been through increased wages on offer in the local labour market. In this section, we test whether indeed wages have increased in low wage areas and whether the wage increases have been higher in low wage areas compared to high wage areas. If there is not clear evidence of a wage impact from the NMW, then the likelihood that young people may change their decisions following the introduction of the NMW is very low.

The essence of our difference in differences approach is that changes in wages will have been greatest in our low wage LAs. So there is the need to first test whether wages have indeed increased more rapidly in the low wage LAs, using area level estimations. We then investigate more closely the magnitude of the potential wage changes for individuals in the low and high wage LAs.

In Table 1-1 we provide results from regressions where the dependent variable is log wages (ln w) at the 5th, 10th, 25th, and 50th percentiles, while the right-hand side variables are dummy variables (1/0) for being in the low wage group of LAs (low), dummy for post treatment year (year), and the interactions between the two. The model estimated is the following:

$$\ln w_{it} = \alpha + \beta \cdot low + \gamma \cdot year + \lambda \cdot (low \times year) + \varepsilon_{it} \qquad (1)$$

where *i* stands for low/high wage LAs, and t is time. Only the estimated coefficient for the interacted term $\hat{\lambda}$ is presented in the table. Without any additional variables, this coefficient is the same figure as that obtained by computing the difference between the differences in high and low wage LAs.

We, for example, observe that wages at the 25th percentile have increased in low wage LAs by 40% more than in high wage LAs between 2003 and 2004 and this coefficient is highly statistically significant. We also observe greater increases in low wage LAs that are lower in the wage distribution i.e. that are located at the 5th and 10th percentiles. We do not emphasise these results due to the problem of sample sizes underlined in the previous section but they are consistent with the view that wages have increased to a greater extent in LAs that we have identified as low wage and where the impact of the age 16-17 year old NMW is likely to be greatest.

**Table 1-1: Difference in differences estimates of the minimum wage impact in high and low-wage LAs (area-level differences-in-differences)**

| Dependent variable | Diff-in-diff estimates | Std.err. | Adj. $R^2$ |
|---|---|---|---|
| 5th percentile | | | |
| Low and high wage LAs between 2003 and 2004 | .654** | (.308) | .180 |
| Low and high wage LAs between 2003 and 2005 | .157 | (.217) | .485 |
| 10th percentile | | | |
| Low and high wage LAs between 2003 and 2004 | .448*** | (.151) | .404 |
| Low and high wage LAs between 2003 and 2005 | .166 | (.136) | .692 |
| 25th percentile | | | |
| Low and high wage LAs between 2003 and 2004 | .402*** | (.95) | .682 |
| Low and high wage LAs between 2003 and 2005 | .376*** | (.127) | .741 |
| 50th percentile | | | |
| Low and high wage LAs between 2003 and 2004 | .302** | (.132) | .529 |
| Low and high wage LAs between 2003 and 2005 | .343** | (.136) | .605 |

Notes: Each row is a different regressions, the sample size is made of 17 low wage LAs and 8 high wage LAs (each one observed at two time points).

Whilst the main result from this table is that wages increased by a greater proportion in low wage LAs relative to high wage LAs after 2004, another interesting result is that wages have also increased differentially across these groups of LAs further up the wage distribution. The last row of the Table appears to indicate that there were greater wage increases in the low wage LAs than in the higher wage LAs up to the median of the wage distribution. But these differentials in wage increases are not as great compared to those further down the wage distribution.

One important question is to determine whether the magnitude of the increased wages in low wage LAs is sufficient to potentially influence the decision of teenagers to remain in compulsory education or not. In particular we know that the Education Maintenance Allowance (EMA) introduced in September 2004 consisted of a means tested payment of up to £30 a week for young people living in poorer households (the maximum payment is made to incomes below £21,000). If the wage increases due to the introduction of the age 16-17 NMW were only a small fraction of the EMA payment, we might not expect any impact on the decision of teenagers to leave full-time education and enter the labour market. To address this issue we need to determine what happened to individual wages in our data. For this purpose, we pool all individuals in the low wage LAs and compute simple descriptive statistics before and after October 2004.

**Table 1-2: Weekly wage changes at the bottom of the distribution after October 2004 (in pounds)**

| | Percentiles | | | |
|---|---|---|---|---|
| | 5th | 10th | 25th | 50th |
| **Low wage LAs** | | | | |
| Weekly wage increases over: | | | | |
| 2004-05 | 16.84 | 14.73 | 14.70 | 13.33 |
| 2004-06 | 21.54 | 21.18 | 24.97 | 23.03 |
| **High wage LAs** | | | | |
| Weekly wage increases over: | | | | |
| 2004-05 | 3.62 | 4.27 | 3.43 | 3.57 |
| 2004-06 | 17.62 | 16.06 | 12.25 | 13.10 |

Notes: Figures computed assuming 35 weekly working hours. Computations based on numbers in Table A4.

We provide in the Appendix (Table A4), the wages distributions over the three year period 2004-2006 together with the sample sizes in low and high wage LAs. In Table 1-2, we provide descriptive statistics on how much weekly earnings improved (in pounds) after the introduction of the age 16-17 NMW in October 2004. Based on data provided in Table A4 and assuming a 35 working hour week, we show the increase in pounds at different percentiles of the wage distribution, focussing on the lower half of the distribution.

The table further indicates that individual wages have increased much faster in low wage LAs compared to high wage LAs over the 2004-2006 period. All figures show much larger wage increases in low wage LAs. But more importantly for our purpose are the magnitudes of the weekly wage increases. They are always larger in low wage LAs. The increased income for young people earning low wages accounts for at least 50% of the EMA payment one year after the introduction of NMW, and 60% of the EMA payment in 2006. This clearly shows that the wage increases in low wage LAs have been substantial and of sufficient magnitude to potentially influence young people's decision to enter the labour market.

If young people work more than 35 hours, the magnitude of the wage increases would increase proportionally. Also, as the EMA is paid only during term time, this leaves around 15 weeks per year without payment. The effective income per week through EMA is actually much lower than 30 pounds per week, probably around £20, which suggests that the magnitude of the wage gains shown in Table 2 for low wage LAs is likely to be sufficient to potentially influence young people's decisions.

Our conclusion from this analysis is that hourly pay has increased in low wage LAs and quite substantially. The 2004 NMW for 16-17 year olds has led to relatively large wage increases for the affected population, and of a magnitude sufficiently large to have potentially led to changes in the participation of young people in education.

We now proceed with our analysis to detect whether these relatively large gains in wages in low wage LAs has had any negative impact on education "staying on" rates.

## 1.4 Obtaining reliable "staying on" rates

Staying-on or post-16 education participation rates are calculated as the proportion of pupils participating in full time education as a fraction of the maintained school population of school-leaving age. We illustrate this procedure in relation to the computation of the participation rate for the academic year 2003/04 (the year just before the introduction of the October 2004 NMW for 16-17 year olds). The denominator for this variable is made up of all pupils who reached the end of compulsory school in June 2003 in each LA. This is calculated from the 2003 Pupil Level Annual School Census (PLASC) by counting in each LA the total number of young people enrolled in maintained schools in year 11 (the last year of compulsory school) who reached their 16 birthday during the period spanning September 1st 2002-August 31st 2003[8].

The numerator of the "staying on" rate is given by the total number of pupils of the cohort whose final compulsory academic year is 2002/2003 (those born between September 1st 1986-August 31st 1987) and who are enrolled in full time education in the spring 2004. This figure is derived from two sources:

- The number of pupils participating in the school sector post 16 is taken from PLASC 2004. These are all pupils who decided to stay in secondary school and enter the 6th Form in order to complete their schooling.

[8] The school leaving age in UK is given by end of the academic year (June generally) in which pupils reach their 16th birthday (see: UK Education Act, 1996)

- Additionally students may enrol in further education colleges. These are taken from the ILR (Individualised Learner Record). In particular, we select only full-time learners (those enrolled for at least 12 guided learning hours per week) who appear in the data file for the academic year 2003/4.

This procedure is then replicated for the other academic years needed in our empirical analysis (2004/05, 2005/06, 2006/07). We present the average rates in the low and high wage areas in Table 1-3. We observe that participation in full-time education is lower in low wage LAs. We also note that the rates have been increasing steadily during the period. We now turn to an investigation of whether we can detect any impact of the October 2004 NMW introduction on those rates.

**Table 1-3: Staying-on" rates in Low and High wage LAs over the period 2003-2007**

| | Academic year | | | |
|---|---|---|---|---|
| | 2003/04 | 2004/05 | 2005/06 | 2006/07 |
| **Low wage LAs (N=17)** | | | | |
| Mean | .727 | .744 | .757 | .784 |
| St.-err. | (.011) | (.011) | (.011) | (.008) |
| **High wage LAs (N=10)** | | | | |
| Mean | .767 | .783 | .803 | .820 |
| St.-err. | (.019) | (.018) | (.016) | (.019) |

## 1.5 Evaluating the impact of the NMW on education "staying on" rates

Difference in differences regressions are estimated using an equation similar to (1) with the left hand-side variable replaced by the education "staying on" rate in each LA. There are a number of key assumptions underlying this difference in difference approach. The first one is the presence of a common trend before the introduction of the age 16-17 NMW in October 2004. The second one is that no other policies were introduced that differently affected the high and low wage LAs, at least in terms of the key variables of interest. A third key assumption is that the introduction of the age 16-17 NMW has minimal effect on education staying rates in the control group of LAs.

To the extent that this last assumption does not hold, we will tend to underestimate any impact from the introduction of the age 16-17 NMW.

We first present simple difference in differences estimates in detail, showing each component of the usual formula.

**Table 1-4: Difference in differences, using "staying on" rates for the academic year after the introduction (2004/05) with the year before the introduction (2003/04)**

| | Mean | Std. Err. | Number of LAs |
|---|---|---|---|
| **"Staying on" rates in low wage LAs** | | | |
| Staying on rates 04/05 | 0.744 | 0.010 | 17 |
| Staying on rates 03/04 | 0.727 | 0.011 | 17 |
| Difference | 0.017 | | |
| **Staying on rates in high wage LAs** | | | |
| Staying on rates 04/05 | 0.783 | 0.016 | 10 |
| Staying on rates 03/04 | 0.766 | 0.018 | 10 |
| Difference | 0.016 | | |
| Difference in Differences | 0.001 | .008 | |

In the first panel of the table, we show the "staying on" rates in low wage LAs, while the bottom shows the rates for high wage LAs. The first striking feature to take from the table is the stark difference in “staying on” rates between high and low wage LAs. For example, the difference for 2004/05 amounts to four percentage points. This is more than two standard-deviations. We also observe that the rates have been increasing in both area-types over the period 2004/5 and 2005/6. In fact the increase is very comparable in high and low wage LAs (at 1.6-1.7 percentage points). The difference in differences is consequently very low, nearing zero and is not significantly different from zero. This is an early indication that over this period and within the LAs in our two groups, the introduction of the age 16-17 NMW appears to have had negligible impact on participation rates in post-compulsory education.

The question arises now whether comparing the academic year 2003/4 with 2004/5 is an optimal comparison to evaluate the impact of the age 16-17 NMW introduced in October 2004. It may well have been that the introduction of the NMW in 2004 may

not have been known to all 16 years olds who were most susceptible to be affected by the potential increased wage. Also the introduction of the NMW was announced mid-March 2004, at a time when decisions to stay on in education or drop out of school may have already been made by most 16 year olds.

We have therefore reproduced Table 1-4 but comparing 2003/4 with 2005/6, two years after the introduction of the NMW (see Table 1-5). So decisions to drop out by pupils in Year 11 could have been made at the beginning of their school year, one year after the introduction of the 16-17 rates. This is a robustness check of the initial finding of a negligible impact of the NMW impact on post-compulsory participation.

**Table 1-5: Difference in differences comparing "staying on" rates two year after the introduction of the NMW (2005/06) with those in the period before (2003/04)**

| | Mean | Std. Err. | Number of LAs |
|---|---|---|---|
| **"Staying on" rates in low wage LAs** | | | |
| Staying on rates 03/04 | .757 | .011 | 17 |
| Staying on rates 05/06 | .726 | .011 | 17 |
| Difference | .031 | .015 | |
| **"Staying on" rates in high wage LAs** | | | |
| Staying on rates 03/04 | .803 | .017 | 10 |
| Staying on rates 05/06 | .767 | .019 | 10 |
| Difference | .037 | .026 | |
| Difference in Differences | -.006 | .010 | |

The increases in education “staying on” rates in high and low wage LAs are again remarkably similar at around 3 percentage points. The difference in differences is not statistically significantly different from zero. In fact the increased “staying on” rates is slightly higher in high wage LAs at 3.7 percentage points than in low wage LAs (3.1), but the difference is not statistically significant. This higher increase over a two year period for high wage LAs comes from higher increased “staying on” rates in the second period (2.1 versus 1.4 for low wage LAs). But again, this greater increase is not significant.

### 1.5.1. Conflicting effect of the introduction of the EMA

One way of testing whether our method of looking for any evidence of a negative impact from the age 16-17 NMW on education "staying on" rates is a sensible one is by focusing on a later period. The idea is that there may be some unobserved factors that determine the differences in changes in "staying on" rates between high and low wage LAs and these factors are unrelated to the introduction of the NMW in October 2004. An obvious candidate for this, is the national roll-out of the EMA in September 2004.

To address this potential problem, we focus on changes in "staying on" rates over the academic year 2004/5 and 2005/6. The main idea here is that the EMA will have a greater effect on "staying on" rates in low wage LAs compared to high wage LAs. The EMA is capped at households earning below £30,000 per year. The proportion of poor households is potentially higher in low wage LAs compared to high wage LAs. Also, there is evidence that the effect of the EMA was not fully absorbed in the first year after its introduction. The take-up rate of EMA has increased significantly from 2004 to 2005 and over the subsequent years (see Learning and Skills Council, 2008). This combined with the fact that the NMW for 16-17 years old remained unaltered in October 2005 at £3 per hour provides a useful means of testing whether "staying on" rates *in the LAs selected for this report* have been affected by the conflicting effect of the EMA.

We provide in Table 1-6 the results for the period 2004/5 and 2005/6: we only report the net differences which is the last row of the previous tables.

**Table 1-6: Difference in Differences for the period with no change in minimum wage rate (2004/5 and 2005/6)**

| Staying on rates (PLASC-ILR) | | |
|---|---|---|
| | Difference-in-differences estimate | Standard-errors |
| No change in Minimum wage for 16-17 over the period, 2005/06 vs 2004/05 | | |
| High/low wage LAs | -.006 | .010 |

The coefficient for the difference in differences is negative and very small. It is not significantly different from zero. This indicates that there is little evidence that LAs included in our low and high wage groups were affected differently by the concurrent introduction of the EMA.

### 1.5.2. The "staying on" rates and large increase of the NMW

Another fortunate feature of our period of analysis is that in October 2006, the NMW for 16-17 years olds was increased quite substantially by 10% (ie. it went up from £3.00 per hour to £3.30 per hour). This is a proportionately large increase, and upgrading of similar magnitude has been used in the past to evaluate potential detrimental employment effects from the minimum wage (see Dickens and Draca, 2005). Another advantage of this period is that the EMA remained in force largely unmodified. In fact as the EMA payment did not change over this period it was reducing in real value. So we should expect less of a conflicting effect of the EMA over this period either.

**Table 1-7: Difference in Differences for the period with a large change in minimum wage rate (2005/6 and 2006/7)**

| Staying on rates (PLASC-ILR) | | |
|---|---|---|
| | Difference-in-differences estimate | Standard-errors |
| Large change in Minimum wage for 16-17 over the period, 2006/07 vs 2005/06 | | |
| High/low wage LAs in 2004 | -.006 | .010 |

The difference in difference estimate is negative. It is, however, again not significantly different from zero. This is further support for a story whereby teenagers were not affected by the more attractive wage offer in the local labour markets in our two groups of LAs. More generally, this combined with previous evidence provides quite a strong endorsement for the view that, at the levels at which the minimum wage for 16 and 17 years old was introduced, the NMW for 16-17 year olds did not have any detrimental effect on teenage enrolment in schools in the UK.

### 1.5.3. Robustness checks

We can undertake an important robustness check of our results, by looking at the robustness of our findings if we use slightly different groupings for our high and low-wage LAs. The idea behind the strategy to detect any negative effects on "staying on" rates is to focus on those LAs where it is highly likely that young people have been affected by the introduction of the age 16-17 NMW. The comparison is made with LAs where we are most unlikely to find any effects on participation in education from the introduction of the age 16-17 NMW (ie. the high wage LAs).

We know that the introduction of the NMW for adults and the development rate (18-21) introduced in April 1999, have had a levelling effect on the wage distribution in the regions of the UK (Dolton et al., 2008). Could this levelling effect have had any impact on our selection of low pay LAs? Remembering that we have used data collected in Spring 2003 for the identification of high and low-wage LAs, we re-allocated LAs on the basis of data available before April 1999.

We selected all data collected for the ASHE in Spring 1997 and 1998. The original aim was to have a large enough sample size to be able to rank LAs according to the proportion of young 16 and 17 year olds with a wage below £3.00. But again this approach could not be implemented due to the very small numbers found in some LAs. We have, therefore, again used the 25th percentile as a measure in order to rank the LAs.

We provide in Appendix tables A5 and A6 the list of those LAs allocated to the high and low wage groups using this pre 1999 data, with relevant descriptive statistics. We first note that 8 out of 17 LAs in the low wage group were in the EMA pilot. This comes from the fact that the LAs selected to be included in the EMA were the ones where deprivation and poverty was the most widespread at the end of the 1990s. It is not surprising therefore to find a higher number of LAs included in the EMA pilot in our low wage groups than when we used our initial criteria using a ranking of LAs derived from data for 2003.

We produce in Table 7, similar results to those presented above based on 2003 data. The first two rows of results of Table 7 show no significant impact from the age 16-17 NMW on education "staying on" rates using as the post period, either the academic year 2004/5 or 2005/6. Both coefficients are very close to zero and not statistically significant.

**Table 1-8: Same investigations as on Table 1-4, Table 1-5, Table 1-6 and Table 1-7, but with a different criteria for the grouping into High and Low-wage areas**

| Dependent variable: "staying on" rates in LAs | | |
|---|---|---|
| | Difference-in-differences estimate | Standard-errors |
| Introduction of the minimum wage for 16-17<br>2004/05 vs 2003/04: | | |
| High/low wage LAs in 1997/8 | .002 | (.008) |
| Any change over a 2 year period following introduction of the Minimum wage for 16-17 (2005/06 vs 2003/04 | | |
| High/low wage LAs in 1997/8 | -.008 | (.009) |
| No change in Minimum wage for 16-17 over the period, 2005/06 vs 2004/05 | | |
| High/low wage LAs in 1997/8 | -.010 | (.008) |
| Large change in Minimum wage for 16-17 over the period, 2006/07 vs 2005/06 | | |
| High/low wage LAs in 1997/8 | .025 | (.015) |

Notes: standard-errors corrected for clustering at the LA level

Once again we find no evidence of a significant impact from the introduction of the age 16-17 NMW on education "staying on" rates even when using a different period

and using alternative groupings of LAs for our low and high-wage groups. We find that the large upgrade in the minimum wage introduced in October 2006, did not lead to any significant decrease in "staying on" rates in low wage LAs in comparison to high wage ones.

We also looked at one potential related question, which is whether this lack of change in education participation rates may be confounded by changes in youth unemployment in different LAs. It is, indeed, possible that young people who left full-time education with the intention of taking a job (given the higher wage on offer), are now unsuccessful due to the impact of the NMW. Whilst we do not look specifically at employment effects in this report, we ran similar regressions as before but controlling for unemployment that can evolve differently in low and high wage regions. We used unemployment rates at the LA level[9] for 16-19 year olds as there are no available figures for 16-17 year olds only. We present in Table 1-8 those regressions.

[9] The data are taken from the Annual Population Survey (APS) downloaded through NOMIS.

**Table 1-8: Difference in differences estimates controlling for unemployment at the LA level**

| Dependent variable: "staying on" rates in LAs | | |
|---|---|---|
| | Difference-in-differences estimate | Standard-errors |
| Introduction of the minimum wage for 16-17<br>2004/05 vs 2003/04: | | |
| High/low wage LAs in 2004 | -0.004 | (0.009) |
| High/low wage LAs in 1997/8 | 0.003 | (0.008) |
| Any change over a 2 year period following introduction of the Minimum wage for 16-17 (2005/06 vs 2003/04 | | |
| High/low wage LAs in 2004 | -0.012 | (0.015) |
| High/low wage LAs in 1997/8 | -0.008 | (0.010) |
| No change in Minimum wage for 16-17 over the period, 2005/06 vs 2004/05 | | |
| High/low wage LAs in 2004 | -0.007 | (0.010) |
| High/low wage LAs in 1997/8 | -0.010 | (0.010) |
| Large change in Minimum wage for 16-17 over the period, 2006/07 vs 2005/06 | | |
| High/low wage LAs in 2004 | 0.015 | (0.012) |
| High/low wage LAs in 1997/8 | 0.024 | (0.014) |

Notes: standard-errors corrected for clustering at the LA level

None of the results obtained so far altered significantly when we introduce the unemployment rates at the LA level in our regressions. The coefficient for the interacted term is never significantly different from zero.

## 1.6 Conclusions

Overall, this part of the report provides evidence that the age 16-17 minimum wage introduced in October 2004 did not lead to any significant decrease in "staying on" rates across different LAs. In contrast to recent literature showing such negative effects in the US and NZ, it appears no such negative effect can be detected in the UK.

This result is particularly striking given the rather large effect of the NMW on wages at the bottom of the distribution in local labour markets where low wages for 16 and 17 year olds are widespread.

Given that we find no aggregate effect from the introduction of the NMW for 16-17 year olds, we now turn to our individual level analysis in order to understand better the potential drivers of young people's decisions about leaving full time education.

# 2. The determinants of pupils' education and labour market choices at age 16

## 2.1 Introduction

In Part I of this report we found, using difference in difference analysis, that the introduction of the age 16-17 year old NMW did not have any significant impact on the education "staying on" rate across different LAs. The aim of this second part is to understand in greater detail why this might be so. We do this by analysing the determinants of young people's demand for education. In particular we investigate the role of local wages (and of other labour market conditions) on individual choices at 16.

This part of the report draws heavily on the work of Dickerson and Jones (2004), and hence we provide a summary of that paper to provide context to our analysis. Dickerson and Jones (2004) presented a detailed empirical analysis based on the Youth Cohort Study (YCS) data and developed a formal model of the decision made by young people when choosing between education and employment at age 16. In their empirical analysis, they examined the importance of decisions made at the end of compulsory schooling at age 16 for subsequent labour market activity. They found that the decision made at age 16 - either to remain in full time education or to enter the labour market - is strongly persistent, meaning that individuals are very likely to be in the same labour market state two years later. In particular, most of those who remain in full time education at age 16 are still in education two years later, especially if an 'academic' programme of further education is undertaken and almost 90% of those entering the labour market at age 16 are still in the labour market two years later. In the second part of the empirical analysis, the authors investigated the determinants of individuals' decisions at age 16, using a multinomial logit model. The outcomes considered included full time education, employment, government supported training (GST) and unemployment. Their results revealed that it is GCSE performance which is the dominant influence on the decision to remain in education

or to leave education. Finally Dickerson and Jones (2004) developed a model which suggested that while the effects of a minimum wage can be large under certain assumptions, under the distribution of ability which accords most closely with that observed in the YCS data (highly unequal distribution of GCSE attainment), the marginal impact on participation in full time education resulting from the introduction of a minimum wage is very small. In particular, they predicted that a minimum wage introduced at between £2.50 and £4.00 will have negligible effects on education participation. It was introduced at £3.00 and hour and is still below £4.00 and hour.

In this part of the report we estimate a model of pupils' decisions to remain in full time education or pursue other alternative options, using a similar approach to Dickerson and Jones (2004) but with new and more recent data from the Longitudinal Study of Young People in England. We also use a model of choices at age 16, namely a multinomial model since it is inappropriate to model the decision to stay on in education as a simple binary choice (see Andrews and Bradley, 1997). Our analysis extends the Dickerson and Jones (2004) paper by including measures of local youth wages in the estimation equation. This allows us to directly identify the impact of local wages on individual decisions, by exploiting the variation in the levels of hourly earnings available to young people across different local areas. Therefore this research contributes to the existing literature by focusing specifically on the impact of local labour market wages on pupils' education and employment decisions, whereas previous work (reviewed below in section 2.3) focused primarily on the impact of the unemployment rate on young people's decisions.

## 2.2 Theoretical framework and related literature

Building on the theoretical ideas discussed briefly in the introduction to this report, we now explore the theory of education participation more closely. The analysis of individuals' decisions on participation in post compulsory schooling can be framed in the theoretical framework of the human capital investment model. According to this model - first proposed by Becker (1964) and Ben-Porath (1967) and successively extended (see for example Card and Lemieux, 2001) - the schooling investment is undertaken if the expected benefits from further education exceed the costs.

The expected returns mainly consist of higher wages and/or lower risk of unemployment. The costs of staying-on include direct costs (schooling related expenses, such as college fees, costs of books and material, etc.), non monetary costs (such as net effort, dislike for studying, etc.) and more importantly indirect cost of foregone earnings.

In this context, labour market conditions can affect both the costs and the benefits related to the schooling decision.

Theoretically, the unemployment rate has ambiguous effects on the individual demand for education. On the one hand, current high youth unemployment rates may discourage early school leaving, by reducing the expected gain from job search and by reducing the opportunity cost of schooling. On the other hand, high adult unemployment may increase the probability of expected future unemployment rates, which reduce the returns to education and can therefore decrease the probability of staying on at school after the compulsory leaving age (see Micklewright, Pearson and Smith, 1990 and Petrongolo and San Segundo, 2002).

The role of wages has been less investigated in the literature. Similarly to unemployment rate, the level of local wages may impact on the decision between education and employment in different ways. Higher wages for skilled occupations imply higher returns to education and thus increase the expected benefits of additional years of schooling. By contrast, higher wages for young people who leave school just after the leaving age increase the opportunity costs of schooling and may therefore act as an incentive to enter the labour market earlier. However, according to the model developed by Dickerson and Jones (2004), this effect is supposed to be very small in a context of a very unequal distribution of attainment, as relatively few individuals would be affected at the margin by changes in the expected wages[10].

[10] Their idea is that for all pupils with high ability, the value of remaining in Full-time Education (given their high probability of success in further education) is still greater than any potential increase in their wages while they are 16 and 17 years old.

Although the focus of this report is on the labour supply decisions of 16-17 year olds, and in particular modelling the individual's decision to participate in post-compulsory schooling, to fully understand the overall impact of the 16-17 year old minimum wage introduction in the UK labour market requires consideration of the employer labour demand response too; a response which will depend on the employer's labour market power. As Frayne and Goodman (2004) discuss, whether the labour market is competitive or monopsonistic will determine if the (effective) minimum wage introduction will reduce or increase employment. As will the degree of labour substitutability between workers of different ages, 16-17, youth (18-21) and adult (see also Brown, 1999 and cited references therein).

Frayne and Goodman (2004) present estimates of the elasticity of labour demand for 16-17 year olds suggesting a 3.6 per cent reduction in employment hours for this group in response to a 1 per cent increase in the wage in a competitive market. This response is considerable in magnitude and underscores the issues of substitutability between workers when looking at the younger end of the youth labour market, "because the principal response to a minimum wage is likely substitution away from lower-skilled minimum wage workers toward higher skilled, higher-wage workers" (Neumark and Wascher, 2006, p.15). Within this context this is likely to be a substitution towards slightly older (18-21) and more productive workers, or possibly even to slightly younger (15 year old) workers uncovered by the NMW legislation (Frayne and Goodman, 2004).

Consideration of this labour demand response is important as any possible "pulling effect", out of education that a minimum wage introduction or upgrading might have on the 16-17 year old school pupil needs to be tempered by the possible, and likely, employer labour demand response of substituting or switching away from the 16-17 year olds towards alternative groups of workers.

In this report we are however, primarily focused on the supply side and we turn to the existing evidence on this issue now.

### 2.2.1. Previous empirical evidence

The empirical literature that has investigated the factors affecting the individual demand for education has mainly focused on the role of personal characteristics and family background.

These studies generally make use of rich individual-level micro dataset and find that academic achievement and parental social class have a major impact. For example, Micklewright (1989) using data from the National Child Development Study (NCDS) find that in England and Wales family background, as measured by parental education, class and number of siblings has a substantial impact on the probability of staying in education after the end of compulsory school. He also finds that about two-thirds of this effect remains even after controlling for pupils' ability and type of school. Rice (1999) using information from the England and Wales Youth Cohort Studies (YCS) finds important effects for school type, ethnicity and parental education, but she shows that by far the largest effects come from exam achievement and parental socio-economic group. Dickerson and Jones (2004) use the same dataset and find that while differences by gender and family background are significant, the largest single influence on the decision to remain in full time education at age 16 is GCSE attainment. Andrews and Bradley (1997) model a richer menu of school-leaver choices, using a multinomial logistic framework to examine the determinants of six possible first destination states[11]. Again their results reveal that exam achievement is the key driver and the higher the level of achievement the more likely the school leaver is to stay on to pursue academic qualifications, and the less likely they are to choose all the other options. They also found school-level factors to be important, in particular school size and school-level exam achievement.

Other studies confirm the importance of academic achievement and family background for other countries (see for example Petrongolo and San Segundo, 2002 for Spain; Kane, 1994 for the United States; and Kodde and Ritzen, 1988 for the Netherlands).

[11] They distinguish between: staying on and study for academic qualification; staying on and study for vocational qualification; leaving to employment associated with on the job training; leaving to employment associated with general skills training; leaving for GTS; and unemployed.

The literature that focused on the role of labour market conditions on the individual demand for education is scarcer and the results are mixed. These studies are based on two different empirical methodologies, one using time series data and the other using cross sectional individual-level micro data.

For the UK, Pissarides (1981) analysed time series data for 1955-78 and finds that the most important variables affecting enrolment rates in full-time education are real household income and relative earnings of qualified workers. On unemployment, his results show that youth unemployment is not significantly related to enrolment rates. On the contrary, registered adult unemployment seems to enhance male enrolment rates, while it does not significantly affect female ones. The positive effect of registered unemployment indicates that "the staying-on rate has a cyclical component, being higher than otherwise when unemployment is high […]. The reason for this cyclical component is the higher risk of unemployment suffered by adult workers who left school early; youths anticipate this risk, and at the trough of a cycle, when the risk is higher, more of them are willing to stay on at school" (Pissarides, 1981, p. 354). Whitfield and Wilson (1991) re-estimated Pissarides' model over a longer period (1955-85) and find a significant impact of unemployment. In particular, they identify the overall unemployment rate, the returns to a postsecondary degree, the social class structure and the scale of youth training provision as the main determinants of the rate of participation in further education.

McVicar and Rice (2001) also use time series data to assess the impact of local labour market conditions on the staying on rate and further extend the period considered to include years between 1988 and 1994 when the participation rate grew significantly. Their results show that the rapid increase in the rate of participation was largely driven by improvements in the level of attainment at GCSE, coupled with the expansion of higher education sector. They also find that the sharp rise in the unemployment rate in the early 1990s significantly contributed to the growth in participation. Clark (2009) adopts a somewhat different approach to analyse this issue. He uses a 30 year panel (1975-2005) of regional data to exploit the variation in staying-on rates and unemployment over time and between regions. His main finding

is that local youth unemployment has a positive, significant and large[12] effect on participation rates.

Overall, it seems that the studies based on time series generally find a significant role of local unemployment on education participation. However, the evidence from studies of individual behaviour using micro-data is less clear.

Micklewright, Pearson and Smith (1990) fail to find any significant impact from local unemployment rates on staying on. They use data on Great Britain from the Family Expenditure Survey (FES) for the period 1978-84 during which unemployment rose sharply and show that the impact of unemployment[13] seems to be very sensitive to the model specification. The authors thus conclude that they were unable to find evidence of unemployment significantly affecting the proportion of 16 years old leaving full time education.

A different conclusion is reached by Rice (1999). She uses information from the YCS, coupled with labour market data, and estimates a logit model of choice on whether to remain in full-time education or to seek employment after the end of compulsory schooling. She is able to control for a large set of variables describing personal characteristics and family background and her results show that labour market conditions play an influential role in participation in education. In particular, she shows that short-run movements in the demand for labour, as reflected in changes in local unemployment rates, do affect the decision to invest in further education, but the effects are not uniform, in the sense that they mainly influence young males with weaker academic qualifications.

The only research that studied the role of youth wages is Frayne and Goodman (2004) who look specifically at the effect of introducing a NMW for 16 and 17 year olds on the demand for education. They use data from the evaluation of the Education Maintenance Allowance (EMA) which contain a longitudinal sample of approximately 19,000 young people in both the EMA pilot areas and specially

[12] The author states that the magnitude of the effect found is at least twice as large as those previously estimated in the literature (see Clark, 2009, p.17).
[13] They use a measure of total unemployment rate in the quarter and in the region of interview, without distinguishing between youth and adult unemployment.

selected control areas. They estimate a structural model of work and schooling decisions amongst 16 to 17 year olds, in which the decision to take up a job and the decision to remain in school depend upon the potential wage, and a set of other characteristics (such as gender, previous educational attainment, parental characteristics and other financial incentives, such as EMA entitlement if in school). In particular, they use a two stage model where they first predict two sets of wages for all individuals: their potential wage at school and their potential wage in the labour market. Then they use these wage predictions as explanatory variables in the model of labour market and schooling decisions. Their estimates show a low elasticity of labour supply to wages. They calculate that introducing a NMW in October 2004 at £3 or £3.50 per hour would make little difference to the number of young people wanting to work, either by leaving school and joining the labour market, or by combining school and part-time work.

## 2.3: Empirical strategy

We model the demand for education at 16 using two econometric models. We first treat the staying on decision as a binary choice where the individuals decide whether to stay in full time education or not. We then adopt a multinomial model to consider a wider set of choices available after leaving school.

The decision to stay in full time education (FTED) will depend on the optimal value of S (the number of years of post compulsory school), according to the following simple rule:

$$Y = \begin{Bmatrix} 0 \ if \ S^* = 0 \\ 1 \ if \ S^* > 0 \end{Bmatrix} \qquad (1)$$

Given the theoretical model we discussed in the previous section, the optimal number of S, and therefore the probability of staying in FTED after the end of compulsory school, will depend on a set of individual characteristics ($X$) and on local labour market conditions ($Z$). In particular - drawing on Rice (1999) - the probability of staying on in FTED for individual $i$ in the local area $j$ can be written as follows:

$$\Pr(Y_{ij} = 1) \equiv \Pr\left( f(X_{ij}, Z_j, \varepsilon_{ij}) > 0 \right) \qquad (2)$$

Adopting a linear approximation for the function *f*(.) and assuming a logistic cumulative distribution function of the random error, we obtain the following logit model of binary choice:

$$\Pr(Y_{ij} = 1) = \frac{\exp(X_{ij}^{'}\alpha + Z_j^{'}\beta)}{1 + \exp(X_{ij}^{'}\alpha + Z_j^{'}\beta)} \qquad (3)$$

Estimates of the parameters α and β are obtained through maximum likelihood estimation.

In the next section we discuss and describe in detail the variables included in the model. Here, we just emphasize that we directly include in the model a measure of youth wages at the local area level, which is a novelty in the literature that has mainly focused on the role of unemployment rate (that is also in our model). In fact, the ultimate aim of the analysis is to understand whether local wages affect individual's decision on staying-on in FTED. In our approach, the identification of the wage effect comes from the variation in the level of wages in different local areas (Card, 1992, for the US, Dolado et al., 1995, for France and Spain, and Stewart, 2002, for the UK). The idea is that local areas reflect different local labour markets where individuals are exposed to different macroeconomic conditions (different youth wages, returns to education, unemployment rates, etc.). Therefore for our identification strategy, it is crucial to establish what is the best definition of *local labour market.* We use alternatively Local Authorities (LAs) and Government Office Regions (GOR). Each measure has its advantages and disadvantages. LAs are preferred because they allow more variation to identify the wage effect. They are smaller spatial units than regions but arguably sufficiently large to constitute a labour market. This is especially the case for pupils aged 16-17, since teenagers are typically less mobile and constrained to the geographical location of their home as they are unlikely to be able to afford to move out of the parental home and many are likely to work in low-skill industries

with high turnover costs (Frayne and Goodman, 2004). The disadvantage of using LAs is that measure of wages and unemployment are less precise (see discussion in the next section). Regions allow us to use a more reliable measure of wages and unemployment rates and, being larger, reduce the problem of possible mobility between areas. However, when we use regions we have only 9 points of variation to identify wage effects.

The second step of the analysis is to consider a wider set of possible destinations after age 16, without restricting the choice to a binary one. In particular, we will model the probability of undertaking the schooling decision *k* using a multinomial logit (MNL) where ***k***=1,..5 are the different choices available:

- *Going to a school or college full time (FTED)*
- *In full-time or part-time paid work (EMPL)*
- *Apprenticeship (APPR)*
- *Unemployed (UNEMP)*
- *Other – out of the labour force (OTH)*

The multinomial logit specifies that:

$$P_k = P(y = k) = \frac{\exp(\beta' X)}{\sum_{h=1}^{K} \exp(\beta_h' X)}, k = 1..K$$

To ensure model identification, $\beta_j$ is set to zero for one of the categories and the coefficients are then interpreted with respect to that category. In our case, we set *FTED* as the base category.

This specification implies that the probability of undertaking the schooling decision k versus the probability of undertaking the generic decision *h* does not depend on alternative choices. This assumption underlying the MNL model is called Independence of Irrelevant Alternatives (IIA) and it essentially requires that an

individual evaluation of an alternative relative to another alternative should not change if a third (irrelevant) alternative is added or dropped to the analysis[14].

## 2.4: Data and model specification

Our analysis is based on data from the *Longitudinal Study of Young People in England* (LSYPE). The LSYPE is a survey of about 15,000 young people in England who were aged 13 and 14 in 2003/2004 and then followed over time on an annual basis. The survey covers the secondary school period until year 11 (that marks the end of compulsory schooling) and the last available wave (wave 4) refers to the academic year 2006/07, when the young person has already made the decision on whether to stay in full time education or to start working.

The LSYPE is a very rich source of information on pupils' personal characteristics, attitudes, experiences, behaviours, expectation and aspirations as well as on family background, household composition and parents' characteristics and aspirations. It therefore constitutes an ideal dataset to study the key factors affecting young people's decisions on activities after the years of compulsory education.

LSYPE data have been matched to other datasets. First, we matched observations in LSYPE with the *National Pupil Database* (NPD) that provides information on pupils' records in standard national tests (Key stage tests), to the *Pupil Level Annual School Census* (PLASC) that contains a number of pupil-level background characteristics and to the *LEA and School Information Service* (LEASIS) that contains school level characteristics.

Data on local labour market conditions have been drawn from different sources and matched to LSYPE using the unique LEA and regional identifiers. Data on wages comes from the *Annual Survey of Hours and Earnings* (ASHE).

[14] This assumption is forced in the MNL model because MNL has errors which are independent and identically distributed. The IIA assumption is a rather strong one and it might not be appropriate to describe our model. An extension of this research will be to try to model individuals' decisions using other models that do not assume IIA and allow error correlations.

Data on unemployment rates at the LA and region level have been downloaded from the *Annual Population Survey* (APS) through the NOMIS website. Information on house prices at LA and region levels are taken from the Communities and Local Government monthly house price index, which is a weighted average of prices for a standard mix of dwellings[15]. The data used for this is a survey known as the *Regulated Mortgage Survey (RMS).*

As mentioned in section 3, we include in the model different variables that are likely to affect the decision on staying-on at age 16. First, we include variables reflecting personal characteristics and family background. In particular, we use a number of pupil level characteristics taken form PLASC, such as gender, ethnicity (whether non-white British), an indicator of Special Educational Needs (SEN) and English as an Additional Language (EAL). The literature has emphasized the importance of school attainment as a key determinant of choices at age 16 (see for example Dickerson and Jones, 2004; Rice, 1999). The idea is that ability affects the returns to education, and the likelihood of success in further education. We use the NPD/PLASC dataset to create two measures of academic achievement at Key Stage[16] 4 (GCSE[17]), which is the national exam taken at age 16 before leaving compulsory school. The first measure is a synthetic continuous score averaging scores in different subjects. In particular, we use a capped average point score[18] that takes into account the pupil's eight highest grades. This score has been standardised so that the variable has mean 0 and standard deviation 1 within the LSYPE total sample in wave 3. The second measure of school attainment is a dummy indicating whether the pupil achieved at least 5 GCSE with grades A*-C to see whether there are discontinuities at this threshold. This is an important threshold in the education system, affecting the likelihood of being accepted in certain types of post compulsory schooling, and can

[15] More information can be found at http://www.communities.gov.uk/housing/housingresearch/housingstatistics/housingstatisticsby/housingmarket/overviewhousingmarketstats/ , we are grateful to Corrado Giulietti for making the data available to us.

[16] The Key Stage tests are national achievement tests performed by all children in state schools. The tests are anonymised and marked by external graders.

[17] General Certificate of Secondary Education

[18] According to the new scoring system introduced between 2002–03 and 2003–04, 58 points were awarded for an A*, 52 for an A, 46 for a B, 40 for a C, 34 for a D, 28 for a E, 22 for F, and 16 for a G. Marks are allocated for standard GCSEs, but also for all qualifications approved for use pre-16, such as entry-level qualifications, vocational qualifications, and AS levels taken early.

therefore influence the actual possibility of enrolling in specific types of post 16 provision.

In terms of family background, parental income is likely to affect pupils' decision, since parental income is the primary source of finance when credit markets are imperfect (Kodde and Ritzen, 1985) and parents with different incomes may be differently willing or able to subsidise costs during post compulsory education. Unfortunately LSYPE data do not provide a clean measure of parental income. Therefore we use pupil's eligibility for Free School Meals (FSM) to proxy family poverty status[19] and a number of dummies describing parental occupation[20] as an indicator of parental income. Parental education may also be a key factor affecting the schooling decisions of youths, since this affects children's preferences for education and may moreover proxy permanent family income better than actual income (see Petrongolo and San Segundo, 2002). We measure parental education using two dummies indicating whether the father and mother have a degree.

The LSYPE dataset also includes a vast array of detailed questions relating to the attitudes, values and behaviour of both parents and pupils, several of which are likely to affect the post compulsory schooling decision. Among these, we insert a variable describing pupils' attitudes toward school in year 11 (last year of compulsory school), and a variable capturing parents' expectations. The first one is obtained from LSYPE interviews in 2006 and it sums the answers that the young person has given to 12 attitudinal questions relating to how they feel about school[21]. The variable ranges from 0 – 48 by assigning values to the variables (using a Likert scale) according to whether they were positive or negative statements[22]. The higher the score, the more positive is the young person's attitude to school. Parental expectations are measured

[19] See Hobbs and Vignoles (2007) for a discussion on the use of FSM as a proxy for poverty status.
[20] These dummies turn out to be insignificant once we include all the other variables in the model and hence we omit them in the results tables.
[21] The specific items: are 1) I am happy when I am at school ; 2) School is a waste of time for me; 3)School work is worth doing; 4) Most of the time I don't want to go to school; 5) People think my school is a good school; 6) On the whole I like being at school; 7) I work as hard as I can in school; 8) In a lesson, I often count the minutes till it ends; 9) I am bored in lessons; 10) The work I do in lessons is a waste of time; 11) The work I do in lessons is interesting to me; 12) I get good marks for my work. For each of these items pupils have to say whether they a) strongly agree; b) agree; c) disagree; or d) strongly disagree.
[22] For further details see the LSYPE user guide, available at http://www.data-archive.ac.uk/doc/5545/mrdoc/pdf/5545wave_three_documentation.pdf

by a dummy variable indicating whether the parent expected the pupil to stay on in FTED when the pupil was in year 9. Including these attitudinal variables is intended to account for what would otherwise be unobserved pupil heterogeneity that might be correlated with staying on.

We also include a variable measuring the number of hours (if any) worked during the school term. This should control for different tastes and preferences toward working and for possible links with the labour market before completing compulsory schooling.

Our model also contains some variables describing characteristics of the secondary school attended in year 11, the last year of compulsory education. These variables are created using data from LEASIS, EDUBASE and PLASC. In particular, we control for a measure of school disadvantage (the school percentage of students eligible for FSM), for school type (whether the school attended was a sixth form school or not) and for the percentage of pupils staying on in FTED at the school level[23]. This variable seems particularly important, given the possible relevance of peer group in the staying on decision (see for example Thomas and Webber, 2001 and 2009, who argue that the utility associated with post-secondary education is higher when more of the peer group also participate). We created the same variable at the LEA level as well and introduce the two variables (at the school level and at the LEA level) alternatively.

Finally, we include in the equation our variables of interest reflecting local labour market conditions. In particular we are interested in the role of local wages and hence we want a measure of the potential wage young people could command if they decide to enter into the labour market in different local areas. We use ASHE to create measures of average hourly wages paid in different local areas to *young* people. ASHE provides information on wages by age groups and allows identification of disaggregate geographical areas. The age group we are interested in is the 16-17 one.

[23] Using PLASC and ILR (Individualised) we are able to follow the whole population of pupils in state schools after the end of compulsory education and to determine who is staying in FTED (those staying in schools are recorded in PLASC, while those staying in further education colleges are recorded in ILR). Therefore for each school (and LEA) we calculate the proportion of pupils in FTED at age 17 as a fraction of the school (LEA) whole population in school at 16 (last year of compulsory school).

However, when we use local authority as the geographical unit, the number of people aged 16-17 in each LA is low[24] and therefore the average wages would be computed on a very small sample size, which would make the data unreliable. Therefore, when we use LAs as our measure of the local labour market, we proxy wages for 16-17 year olds using wages for people aged 16-21[25]. This dramatically increases our sample size at the cost of some precision. When aggregating the data at the regional level, we have enough sample size to use the more appropriate measure of wages for the 16-17 age group. Average wages are calculated at the LA and region level, considering the area of work and not the area of usual residence.

One potential problem is that average wages at the local area level may just reflect different cost of living and not effectively measure different real wages. Therefore we include price data in the analysis. A retail price index at region and local authority level is not available, and thus we use house prices, that are available at the LA and region level, as a proxy for local level of prices[26].

Wages also reflect different local labour market characteristics, and we control for this as well as the local youth unemployment rate and the proportion of pupils staying on in FTED in each area. The local youth unemployment rate is also an interesting variable to look at in its own right, since most of the literature that has studied the impact of local labour market conditions on the demand for education has focused on unemployment effects, rather than wages.

[24] Out of the 160,000 ASHE sample size, only 1904 people are aged 16 or 17 in 2006. If we divide this number by the about 140 LAs, it is clear that the sample size is too low (in some LAs the number of people aged 16 17 is even below 5).

[25] This seems a rather good proxy since the two measures of wages are highly correlated (the coefficient of correlation is 0.712 at the LA level and 0.904 level)

[26] In order to check whether house prices are a good proxy for the general level of prices, we compared house prices and average prices in each region, relative to national average price (UK=100), available - for 2004 only – at http://www.statistics.gov.uk/articles/economic_trends/ET615Wingfield.pdf
The correlation between the two variables is very high (0.985) and statistically significant. Figure AII.1 in the appendix reports a graph showing the correlation between the two measures of local prices.

## 2.5: Descriptive statistics

Summary statistics of all the variables included in the analysis disaggregated by gender are reported in Table AII.1 in the Appendix.

The next table (Table 2-1) shows the distribution of main activities at age 17, the first year after the end of compulsory school. The table reports such distribution by different pupils' characteristics, first by gender (left panel), then by past school attainment (central panel) and finally by father's education.

**Table 2-1: Distribution of main activity at age 17, by pupils' characteristics (column %)**

| | Males | Females | 5-GCSE A*-C | < 5-GCSE A*-C | Father has a degree | Father with no degree |
|---|---|---|---|---|---|---|
| FTED | 66.17 | 76.19 | 91.25 | 53.61 | 92.94 | 70.16 |
| EMPL | 13.26 | 8.43 | 3.85 | 17.09 | 3.48 | 11.78 |
| APPR | 7.89 | 4.06 | 2.04 | 9.37 | 1.03 | 6.55 |
| UNEMP | 7.51 | 5.18 | 0.88 | 11.08 | 0.91 | 5.87 |
| other | 5.17 | 6.14 | 1.98 | 8.87 | 1.64 | 5.64 |
| Total | 100 | 100 | 100 | 100 | 100 | 100 |

About 66% of females and 76% of males remain in full time education, while about 13% (males) and 8% (female) enter into the labour market. Females are on average more likely to stay-on in FTED than males. However, males are more likely to choose to start an apprenticeship after the end of compulsory schooling (almost 8% of males, against 4% of females). A similar proportion of males and females is not working nor studying (around 12.5% for males and 11.3% for females). Among this NEET group, a larger proportion of males are unemployed (7.5%) and a lower percentage is out of the labour force (5%). For females, it is the opposite: about 5% are unemployed and 6% are out of the labour market.

These figures are fairly consistent with the national official statistics published annually by the DCSF and reported in Table 2-2 for 2007, confirming the representativeness of our sample. The categories available are not exactly the same, and the percentages of pupils in full time education and in employment seem to be lower than that in LSYPE (potentially due to differential attrition in the LSYPE

survey). This could be due to the fact that DCSF classifies as Work Based Learning (WBL), Employer Funded Training (EFT) or Other education and training (OET) some of the pupils that we classify as working or in FTED. However, the differences between males and females are similar in the national data to those in LSYPE.

**Table 2-2: Participation of 17 year old in education and training, England, 2007. Column %**

| | Males | Females |
|---|---|---|
| Full-time education | *61.6* | *71.0* |
| In employment | *9.5* | *7.9* |
| WBL[1]; EFT[2]; OET[3] | *18.8* | *13.2* |
| Not in any education, employment or training (NEET) | *10.4* | *8.1* |

**Source**: DCSF; statistics available at: http://www.dcsf.gov.uk/rsgateway/DB/SFR/s000849/index.shtml
**Notes**: [1]: Work-Based Learning; [2]: Employer Funded Training; [3]: Other Education and Training: it includes part-time education not funded by employers or through WBL; also full- or part-time education in independent FE and HE institutions.

The last two panels in Table 2-1 show that the percentage in FTED education increases dramatically if we focus only on pupils with high academic attainment who achieved 5 or more GCSE with grades A-C* (91.2% stay in FTED) and on pupils whose father has obtained a degree (93% in FTED). This clearly highlights descriptively how important are pupils' achievement and family background are in affecting staying-on decisions at age 16.

However, the focus of this research is on the role played by local labour market conditions in individual decisions. As explained above, our identification strategy relies on variations in the levels of wages (and unemployment rates) at the local area level. The next two figures depict the level of hourly wages (Figure 2) and unemployment rates (Figure 3) by region and show that there is indeed variation in local labour market conditions across different areas.

Figure 2: Hourly wages by regions

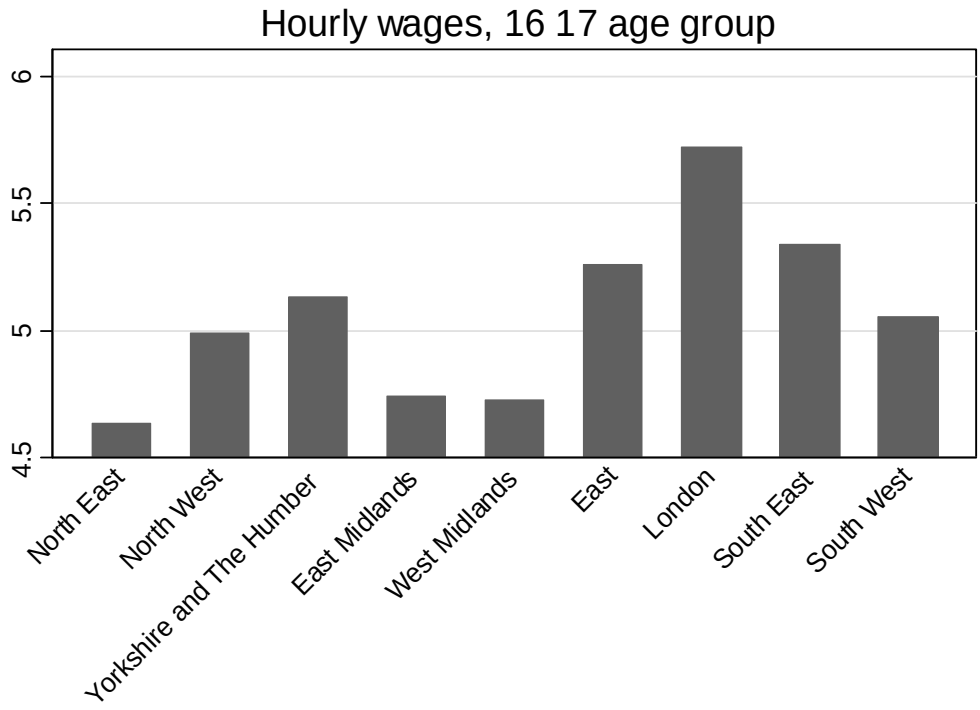
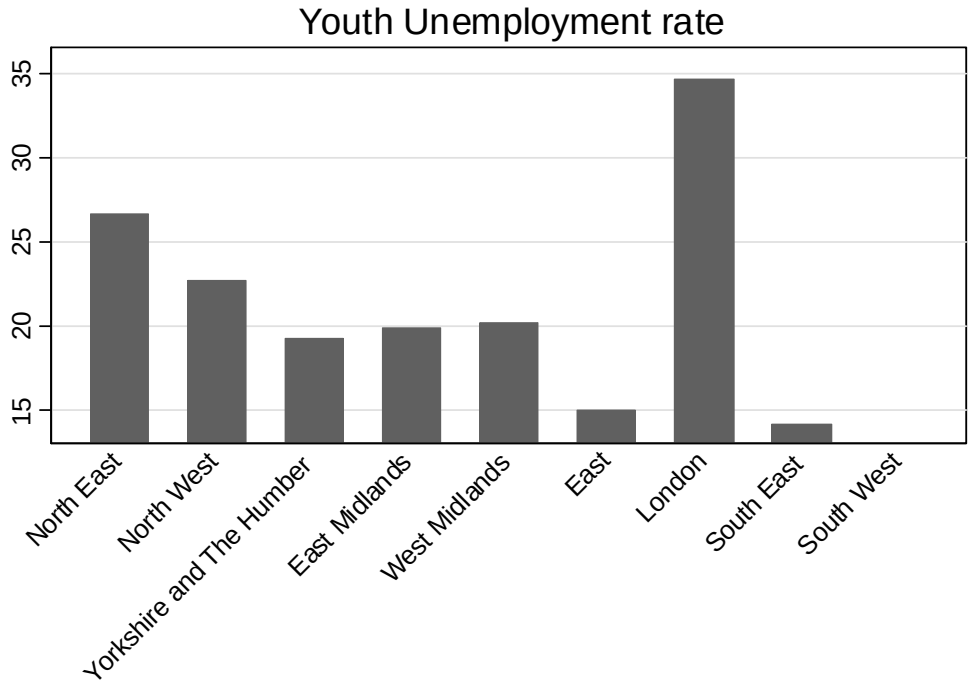



Figure 3: Youth unemployment rate by regions



## 2.6: Results

This section presents and discusses the estimates and results. The first paragraph focuses on the results from the Logit model, where we treat the individual decision as a binary choice. We then present the results of the Multinomial Logit Model, where we consider a wider set of individual choices at age 16.

### 2.6.1: Participation in Full time Education: Estimates of a logit model

The following tables present estimates from the logit model of the staying-on decision. We estimate separate equations for males and females, since we expect the estimates to differ across genders. The tables report the marginal effects (i.e. the partial derivative of the predicted probability with respect to a given independent variable), calculated at the sample mean of the regressors.

Table 2-3 and Table 2-4 show the results of the model where we use LAs to define local labour markets, for females and males respectively. The tables are organised as follows: in column 1 we include variables describing pupils' characteristics and family background; in column 2 we add school-level characteristics; in column 3 we add LEA-level variables, including the wage level and unemployment rate. In column 4 we also control for the level of prices; finally in the last column (col. 5) we add a set of regional dummies to control for any regional effects not captured by the local labour market variables.

**Table 2-3: Logit estimates (marginal effects) - Females - Local labour market: LAs**

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| FSM | -0.009 | 0.007 | 0.009 | 0.004 | 0.004 |
| | (0.025) | (0.025) | (0.026) | (0.026) | (0.026) |
| SEN | 0.022 | 0.030 | 0.029 | 0.031 | 0.030 |
| | (0.020) | (0.021) | (0.022) | (0.022) | (0.023) |
| Non white British | 0.060*** | 0.060*** | 0.067*** | 0.065*** | 0.067*** |
| | (0.019) | (0.019) | (0.022) | (0.022) | (0.021) |
| EAL | 0.048** | 0.056** | 0.034 | 0.035 | 0.034 |
| | (0.024) | (0.023) | (0.031) | (0.030) | (0.030) |
| KS4 (std scores) | 0.057*** | 0.065*** | 0.060*** | 0.059*** | 0.058*** |
| | (0.010) | (0.012) | (0.013) | (0.013) | (0.013) |
| 5 GCSE A*-C | 0.143*** | 0.129*** | 0.136*** | 0.139*** | 0.142*** |
| | (0.020) | (0.021) | (0.023) | (0.023) | (0.023) |
| Father has a degree | 0.070*** | 0.067*** | 0.067*** | 0.067*** | 0.066*** |
| | (0.017) | (0.017) | (0.017) | (0.017) | (0.017) |
| Mother has a degree | 0.086*** | 0.073*** | 0.082*** | 0.078*** | 0.078*** |
| | (0.018) | (0.020) | (0.020) | (0.021) | (0.021) |
| School attitude scale | 0.006*** | 0.005*** | 0.006*** | 0.006*** | 0.006*** |
| | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) |
| No hours worked | -0.005*** | -0.005*** | -0.005*** | -0.005*** | -0.005*** |
| | (0.001) | (0.001) | (0.002) | (0.002) | (0.002) |
| Parents want yp to stay in FTED | 0.080*** | 0.073*** | 0.079*** | 0.080*** | 0.074*** |
| | (0.022) | (0.022) | (0.024) | (0.024) | (0.023) |
| Sixth form school | | -0.006 | | | |
| | | (0.013) | | | |
| School % of FMS | | -0.001* | | | |
| | | (0.001) | | | |
| School % staying in FTED | | 0.001* | | | |
| | | (0.001) | | | |
| LA % staying in FTED | | | 0.002 | 0.003 | 0.004* |
| | | | (0.001) | (0.002) | (0.002) |
| Unemployment rate (16-19) | | | -0.000 | -0.000 | -0.000 |
| | | | (0.001) | (0.001) | (0.001) |
| Log (hourly wages, 16-21) | | | -0.077 | -0.029 | -0.011 |
| | | | (0.117) | (0.138) | (0.146) |
| House prices | | | | -0.000 | -0.000 |
| | | | | (0.000) | (0.000) |
| *Region dummies* | *no* | *no* | *no* | *no* | *yes* |
| Observations | 3493 | 3466 | 3259 | 3234 | 3229 |

***Notes**: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1*

*Standard errors are clustered by school in col.2 and clustered by LEA in col. 3 ,4, and 5*

(*) dy/dx is for discrete change of dummy variable from 0 to 1

**Table 2-4: Logit estimates (marginal effects) - Males - Local labour market: LAs**

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| FSM | -0.006 | -0.015 | 0.003 | 0.004 | -0.001 |
| | (0.040) | (0.043) | (0.040) | (0.040) | (0.000) |
| SEN | -0.011 | 0.004 | -0.023 | -0.021 | -0.021 |
| | (0.030) | (0.032) | (0.036) | (0.036) | (0.036) |
| Non white British | 0.087*** | 0.064* | 0.076** | 0.076** | 0.083** |
| | (0.031) | (0.033) | (0.035) | (0.035) | (0.035) |
| EAL | 0.127*** | 0.127*** | 0.112*** | 0.113*** | 0.113*** |
| | (0.032) | (0.032) | (0.036) | (0.035) | (0.034) |
| KS4 (std scores) | 0.071*** | 0.090*** | 0.074*** | 0.073*** | 0.073*** |
| | (0.015) | (0.016) | (0.019) | (0.019) | (0.019) |
| 5 GCSE A*-C | 0.186*** | 0.167*** | 0.171*** | 0.175*** | 0.178*** |
| | (0.023) | (0.025) | (0.025) | (0.025) | (0.025) |
| Father has a degree | 0.116*** | 0.101*** | 0.115*** | 0.117*** | 0.116*** |
| | (0.026) | (0.027) | (0.027) | (0.027) | (0.027) |
| Mother has a degree | 0.059* | 0.053* | 0.074*** | 0.077*** | 0.077*** |
| | (0.030) | (0.032) | (0.026) | (0.026) | (0.027) |
| School attitude scale | 0.010*** | 0.009*** | 0.010*** | 0.010*** | 0.010*** |
| | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) |
| No hours worked | -0.007*** | -0.006*** | -0.008*** | -0.007*** | -0.007*** |
| | (0.002) | (0.002) | (0.002) | (0.003) | (0.003) |
| Parents want yp to stay in FTED | 0.166*** | 0.162*** | 0.175*** | 0.175*** | 0.172*** |
| | (0.024) | (0.025) | (0.026) | (0.026) | (0.026) |
| Sixth form school | | 0.017 | | | |
| | | (0.021) | | | |
| School % of FMS | | 0.003** | | | |
| | | (0.001) | | | |
| School % staying in FTED | | 0.004*** | | | |
| | | (0.001) | | | |
| LA % staying in FTED | | | 0.007*** | 0.007** | 0.008*** |
| | | | (0.002) | (0.003) | (0.002) |
| LA unemployment rate (16-19) | | | 0.002* | 0.002* | 0.002 |
| | | | (0.001) | (0.001) | (0.002) |
| LA Log (hourly wages, 16-21) | | | -0.059 | -0.068 | 0.143 |
| | | | (0.178) | (0.192) | (0.200) |
| House prices | | | | 0.000 | 0.000 |
| | | | | (0.000) | (0.000) |
| *Region dummies* | *no* | *no* | *no* | *no* | *yes* |
| Observations | 3617 | 3571 | 3351 | 3332 | 3330 |

***Notes**: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1*
*Standard errors are clustered by school in col.2 and clustered by LEA in col. 3 ,4, and 5*

Our estimates confirm the importance of personal characteristics and family background on the staying-on decision for both males and females. In particular, consistent with the literature, the two measures of prior school attainment are always positive and significant across all the specifications and seem to be slightly more important for males. Family social background – as measured by parents' education –

is also significant, suggesting that having parents with a degree significantly increases the probability of staying on in FTED. The education level of the father seems to be more important for males than females, while mothers' education seems to be equally important for males and females. Not surprisingly, pupils' attitude toward school and parents' expectations are positively related to the staying-on decision. The number of hours worked during year 11 has a significant coefficient and negative sign, meaning that the more the pupils have worked during school term time the less likely they are to stay on after 16. In terms of other personal characteristics, it seems that, once we control for family background and past achievement, non white British are more likely to stay in FTED, and this variable is especially significant for females. This result is in line with previous evidence (Burgess et al, 2009) of higher education achievement and catch up by many ethnic minority groups (once you control for free school meal (FSM) and other socio-economic backgrounds). Surprisingly, receiving FSM or having special education needs (SEN) do not really affect the probability of continuing studying after the end of compulsory school.

Some school variables also play a significant role in the decision at age 16. In particular, the school percentage of pupils receiving free school meal (FSM) and the school percentage of pupils staying on in FTED have a respectively negative and positive impact on pupils' staying-on decision, as predicted. It is important to underline here that we do not give any causal interpretation to these results, as these variables are likely to be endogenous and what we are really capturing is pupils sorting into schools according to characteristics that also affect their staying on decision at age 16.

Focusing on the last three columns of the two tables, we can note that interestingly our results show that wages and the other labour market conditions do not have any significant impact on the schooling decision.

In the next table (Table 2-5) we change the definition of local labour market, using regions instead of LAs and investigate whether the results change. In the table we just report the full specification with and without controlling for prices for males (col. 2 and 3) and females (col. 1 and 2). It seems that local wages are again not significant for neither males nor females. However, we find evidence of a positive impact of

youth unemployment for males. A high unemployment rate seems to push people into education, possibly reducing the expected gain from job search. This latter result is consistent with findings in Rice (1999) and Clark (2009) for the UK and in Petrongolo and San Segundo (2002) for Spain.

**Table 2-5: Logit estimates (marginal effects) - Males and Female – Local labour market: regions**

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | ***Females*** | | ***Males*** | |
| FSM | -0.006 | -0.006 | 0.002 | 0.002 |
| | (0.034) | (0.035) | (0.043) | (0.043) |
| SEN | 0.021 | 0.022 | -0.015 | -0.014 |
| | (0.019) | (0.019) | (0.024) | (0.023) |
| Non white British | 0.058*** | 0.059*** | 0.066* | 0.069** |
| | (0.017) | (0.017) | (0.035) | (0.035) |
| EAL | 0.049** | 0.049** | 0.130*** | 0.128*** |
| | (0.023) | (0.023) | (0.031) | (0.031) |
| KS4 (std scores) | 0.057*** | 0.058*** | 0.073*** | 0.074*** |
| | (0.016) | (0.016) | (0.015) | (0.015) |
| 5 GCSE A*-C | 0.143*** | 0.142*** | 0.178*** | 0.176*** |
| | (0.026) | (0.027) | (0.019) | (0.018) |
| Father has a degree | 0.068*** | 0.069*** | 0.106*** | 0.106*** |
| | (0.015) | (0.015) | (0.026) | (0.027) |
| Mother has a degree | 0.083*** | 0.083*** | 0.055*** | 0.056*** |
| | (0.012) | (0.012) | (0.017) | (0.017) |
| School attitude scale | 0.006*** | 0.006*** | 0.010*** | 0.010*** |
| | (0.001) | (0.001) | (0.001) | (0.001) |
| No hours worked | -0.005*** | -0.005*** | -0.007*** | -0.007*** |
| | (0.002) | (0.002) | (0.002) | (0.002) |
| Parents want yp to stay in FTED | 0.078*** | 0.079*** | 0.167*** | 0.166*** |
| | (0.022) | (0.023) | (0.019) | (0.019) |
| LA % staying in FTED | 0.002 | 0.003 | 0.009*** | 0.011*** |
| | (0.001) | (0.002) | (0.002) | (0.003) |
| Regional unemployment rate (16-19) | -0.000 | 0.000 | 0.002* | 0.003** |
| | (0.001) | (0.001) | (0.001) | (0.001) |
| Regional log (hourly wages, 16-17) | -0.037 | 0.106 | -0.194 | 0.119 |
| | (0.114) | (0.128) | (0.156) | (0.269) |
| House prices | | -0.000 | | -0.000 |
| | | (0.000) | | (0.000) |
| Observations | 3480 | 3480 | 3607 | 3607 |

***Notes**: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1*
*Standard errors are clustered by regions*

### *2.6.1.1: Predicted probabilities*

Our analysis has suggested that rather than labour market characteristics, what matters for the staying on decision are personal characteristics and in particular individual ability, as captured by past academic achievement. However, marginal effects calculated at the average values of all variables may hide significant heterogeneity in the impact of prior achievement on the probability of remaining in full time education. To investigate this, we calculate the predicted probability of being in FTED for high and low ability pupils (measured by having or not at least 5 GCSEs with grades A*-C and by being respectively in the top and bottom deciles of the GCSE score distribution) and coming from a low socio-economic background (defined as both father and mother not having a degree and by being eligible for free school meals). All other variables are set at their median values.

The first row of Table 2-6 shows that the probability of remaining in full time education for low socio-economic individuals varies by prior achievement (loosely described as ability in the table and text). For low ability males, the staying on rate is about 58% and it is 90% for high ability boys. For females the predicted probabilities of being in FTED are about 66% for low ability girls and 95 % for high ability girls.

**Table 2-6: Predicted probabilities of staying in FTED for pupils from low socio-economic background and different ability**

| | **Males** | | **Females** | |
|---|---|---|---|---|
| | ***Low ability*** | ***High ability*** | ***Low ability*** | ***High ability*** |
| Predicted probability of being in FTED | 0.584 | 0.905 | 0.659 | 0.953 |
| *Change in predicted probability caused by* | | | | |
| Move from lowest to highest wage LA | -0.043 | -0.0152 | -0.0280 | -0.006 |
| 10% increase in average LA wage | -0.009 | -0.0033 | -0.0056 | -0.0012 |

**Notes**: High and Low ability defined as having or not at least 5 GCSE with grades A*-C and by being respectively in the top and bottom deciles of the GCSE scores distribution. Probabilities calculated for pupils eligible for FSM and with both parents without a degree. All the other variables are set at the median.

In the second part of Table 2-6 we investigate how such probabilities are affected by changes in local wages. We calculated these changes in probabilities only using LAs

as the local labour market, as this is our preferred specification and it is where we found a negative, although insignificant relationship, between wages and the staying-on decision.

Looking at the model for males, moving from the LA with the lowest average hourly wages to the LA with the highest average wages would decrease the probability of being in FTED by 1.5 percentage points for high ability pupils, while it would decrease it by about 4.3 percentage points for low ability pupils. Similarly a 10% increase in average LA wage would lead to a reduction of 0.33 and 0.9 percentage points in the probability of being in FTED for high and low ability pupils respectively. For females the reduction in the probability of being in FTED following an increase in wages seems to be smaller (see the right panel in the table).

What is interesting to note here is that the reduction in the predicted probability of being in FTED due to changes in wages is considerably larger for low ability pupils with poor GCSE results, than for people with good past school attainment. This suggests that the potential impact of wages is not homogeneous across the population, but depends on pupils' characteristics.

To further investigate the relationship between local wages and the staying-on decision, we plot predicted probabilities of staying in FTED against log wages at the LA (Figure 4) and regional level (Figure 5).

As before, we calculate these probabilities for an individual from a low socio-economic background and by their ability level (defined as above). While the logit estimates have shown that wages do not significantly affect individual decisions, if we focus on pupils from low socio-economic background only, we can see a clear negative relationship between wages and the probability of staying in FTED. This is especially visible for low ability individuals and for males. The patterns in Figure 4 and Figure 5 are similar, suggesting that it does not make a significant difference if we look at regions or LAs as local labour markets in this instance. It is important to underline however that even if there seems to be a negative relationship between local wages and the propensity to stay in FTED, the magnitude of the wage effect is small and often not statistically different from zero.

**Figure 4: Predicted probabilities of staying on and LA wages, by pupils' ability**

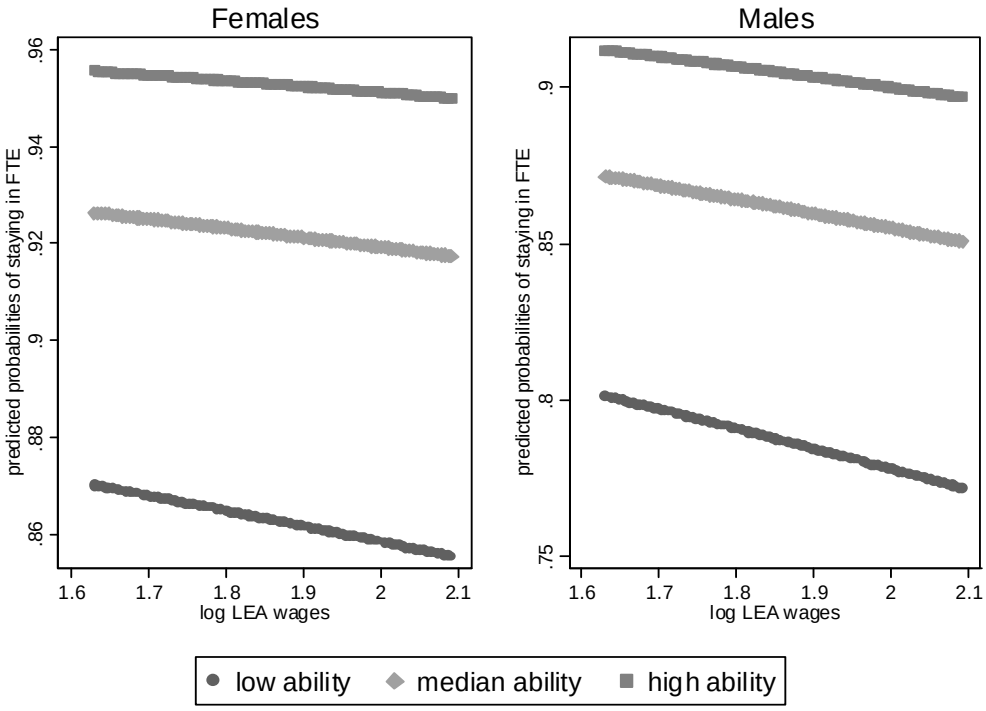
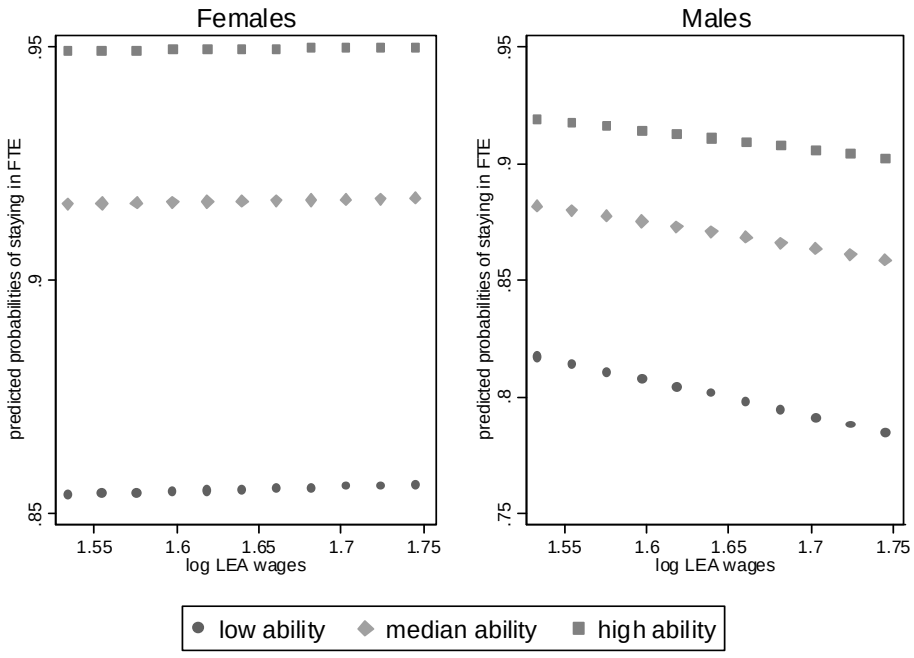



**Figure 5: Predicted probabilities of staying on and regional wages, by pupils' ability**



### 2.6.2: Different choices at 16: Estimates from the multinomial logit model

This section presents the Multinomial Logit model (MNL) estimates. The base category chosen to identify the model is FTED, and therefore all the coefficients have to be interpreted with respect to being in full time education. In order to make the interpretation of the coefficients easier, as in Dickerson and Jones (2004) we transform the coefficients into *relative risk ratios* (RRR), which yield the proportionate change in the relative risk of choosing alternative *k* rather than the base category for a one unit change in any particular X. This can be written as:

$$RRR_k = \frac{P_k}{P_1} = \frac{P(y=k|(x+1))}{P(y=1|X)} = \exp(\beta_k), k = 2..K$$

The following tables show MNL estimates for males and females using LAs (Table 2-7) and regions (Table 2-8) as our definition of the local labour market. In each column, we report the RRR of being in that particular activity (in employment, in apprenticeship, unemployed, or other) relative to the base category (being in full time education).

The results confirm the importance of school attainment and parents' education. Looking at Table 2-7 it seems that for higher ability females who obtained 5 or more GCSEs at grades A*-C the relative risk of being in employment rather than in FTED is about 38%, while the relative probabilities of being in apprenticeship, unemployed or out of the labour force are respectively 20%, 14% and 45%. Results for males are very similar in terms of magnitude and significance.

Similarly low relative risks are reported for employment, apprenticeship, unemployment and other activities for those who have parents with a degree. Boys having a father (mother) with a degree are 55% (64%), 33% (51%) and 33% (not significant) less likely to be respectively in employment, apprenticeship, and unemployment rather than in FTED. Similarly, for females, the relative risk of being

in employment over FTED is 38% if the mother has got a degree, while mother's education does not significantly affect the relative risk of being in apprenticeship or unemployed. Regarding labour market conditions, our results suggest that, while local wages do not seem to have any impact on the probability of taking different choices at sixteen, the local youth unemployment rate does. This holds true both at the LA level and at the region level. A higher local youth unemployment rate significantly decreases the probability of being in employment rather than in FTED, although the magnitude of the effect is small as the coefficient is close to 1. This relationship also only holds for males. It seems that youth unemployment in the LA pushes males out of the labour market and into education, consistent with theoretical predictions that high unemployment rates for young people reduce the opportunity costs of schooling. Regional unemployment seems again to decrease the relative risk of being in employment (and in apprenticeship) over FTED for males. For females the effect is not significant in terms of employment risk but we find some evidence that the regional unemployment rate positively affects the probability of starting an apprenticeship

**Table 2-7: Multinomial Logit estimates (RRR) - Males and Female – Local labour market: LAs**

| | Females | | | | Males | | | |
|---|---|---|---|---|---|---|---|---|
| | ***EMPL*** | ***APPR*** | ***UNEMP*** | ***other*** | ***EMPL*** | ***APPR*** | ***UNEMP*** | ***other*** |
| FSM | 0.703 | 0.968 | 1.306 | 1.080 | 0.689 | 0.905 | 1.633 | 0.955 |
| | (-0.88) | (-0.08) | (0.78) | (0.23) | (-1.11) | (-0.25) | (1.52) | (-0.10) |
| SEN | 0.893 | 0.876 | 0.329** | 0.722 | 1.051 | 1.372 | 1.036 | 1.129 |
| | (-0.35) | (-0.34) | (-2.19) | (-0.81) | (0.21) | (1.32) | (0.12) | (0.34) |
| Non white British | 0.440* | 0.331*** | 0.872 | 0.458* | 0.596 | 0.390*** | 0.776 | 0.814 |
| | (-1.83) | (-2.99) | (-0.27) | (-1.96) | (-1.19) | (-2.95) | (-0.64) | (-0.58) |
| EAL | 0.559 | 0.894 | 0.690 | 0.740 | 0.365* | 1.093 | 0.222*** | 0.587 |
| | (-0.93) | (-0.25) | (-0.69) | (-0.62) | (-1.67) | (0.23) | (-3.06) | (-1.23) |
| KS4 (std scores) | 0.591*** | 0.712 | 0.569*** | 0.477*** | 0.582*** | 1.009 | 0.539*** | 0.593*** |
| | (-4.12) | (-1.56) | (-3.46) | (-3.80) | (-4.57) | (0.07) | (-3.72) | (-2.79) |
| 5 GCSE A*-C | 0.379*** | 0.204*** | 0.142*** | 0.449** | 0.409*** | 0.346*** | 0.218*** | 0.524** |
| | (-3.99) | (-4.63) | (-5.14) | (-2.27) | (-5.03) | (-5.00) | (-4.74) | (-2.02) |
| Father has a degree | 0.558 | 0.475 | 0.249** | 0.497 | 0.551* | 0.328*** | 0.331* | 0.586 |
| | (-1.62) | (-1.40) | (-2.17) | (-1.47) | (-1.94) | (-2.77) | (-1.77) | (-1.21) |
| Mother has a degree | 0.402** | 0.692 | 0.382 | 0.137* | 0.638* | 0.514* | 0.779 | 0.639 |
| | (-1.97) | (-0.66) | (-1.09) | (-1.95) | (-1.78) | (-1.78) | (-0.44) | (-1.04) |
| School attitude scale | 0.952*** | 0.959** | 0.936*** | 0.949*** | 0.948*** | 0.949*** | 0.934*** | 0.944*** |
| | (-3.84) | (-2.45) | (-4.29) | (-4.57) | (-5.88) | (-5.47) | (-6.05) | (-4.13) |
| No hours worked | 1.079*** | 1.034 | 0.959 | 1.045* | 1.073*** | 1.039** | 0.915** | 1.030 |
| | (4.08) | (1.37) | (-1.14) | (1.95) | (4.66) | (1.99) | (-2.47) | (1.21) |
| Parents want yp to stay in FTED | 0.511*** | 0.601* | 0.654 | 0.443*** | 0.380*** | 0.367*** | 0.415*** | 0.680 |
| | (-3.46) | (-1.73) | (-1.40) | (-3.31) | (-5.86) | (-6.08) | (-4.22) | (-1.60) |
| LA % staying in FTED | 1.007 | 0.960 | 0.924** | 0.978 | 0.958** | 0.951** | 0.986 | 0.985 |
| | (0.28) | (-1.11) | (-2.25) | (-0.80) | (-2.18) | (-2.03) | (-0.47) | (-0.53) |
| LA unemployment rate (16-19) | 1.008 | 1.015 | 0.984 | 0.991 | 0.978** | 0.983 | 1.004 | 0.997 |
| | (0.85) | (1.01) | (-1.15) | (-0.70) | (-2.25) | (-1.47) | (0.38) | (-0.26) |
| LA Log (hourly wages, 16-21) | 1.339 | 8.625 | 0.404 | 0.515 | 1.314 | 2.210 | 7.746 | 0.069 |
| | (0.18) | (0.93) | (-0.48) | (-0.36) | (0.19) | (0.51) | (1.14) | (-1.22) |
| House prices | 1.000 | 1.000 | 1.000* | 1.000* | 1.000 | 1.000 | 1.000 | 1.000 |
| | (-0.28) | (-0.69) | (1.92) | (1.94) | (0.78) | (-1.62) | (-0.78) | (0.13) |
| Observations | 3234 | | | | 3332 | | | |
| Log likelihood | -1874.03 | | | | -2510.38 | | | |

**Notes**: t statistic in parenthesis: *** p<0.01, ** p<0.05, * p<0.1. Standard errors are clustered by LA

**Table 2-8: Multinomial Logit estimates (RRR) - Males and Female – Local labour market: regions**

| | Females | | | | Males | | | |
|---|---|---|---|---|---|---|---|---|
| | ***EMPL*** | ***APPR*** | ***UNEMP*** | ***other*** | ***EMPL*** | ***APPR*** | ***UNEMP*** | ***other*** |
| FSM | 0.677 | 1.109 | 1.438 | 1.221 | 0.634 | 1.031 | 1.580 | 1.132 |
| | (-0.73) | (0.41) | (0.90) | (0.46) | (-1.59) | (0.06) | (1.18) | (0.34) |
| SEN | 0.960 | 1.061 | 0.371** | 0.822 | 1.005 | 1.258 | 1.078 | 1.059 |
| | (-0.13) | (0.16) | (-1.98) | (-0.58) | (0.03) | (0.78) | (0.36) | (0.26) |
| Non white British | 0.492* | 0.321*** | 1.134 | 0.372** | 0.638 | 0.515* | 0.889 | 0.633 |
| | (-1.76) | (-4.18) | (0.34) | (-2.08) | (-1.52) | (-1.69) | (-0.49) | (-1.10) |
| EAL | 0.560 | 0.841 | 0.393** | 0.741 | 0.315*** | 0.831 | 0.216*** | 0.542 |
| | (-0.91) | (-0.26) | (-2.07) | (-0.56) | (-4.81) | (-0.38) | (-3.63) | (-1.05) |
| KS4 (std scores) | 0.618*** | 0.781 | 0.532*** | 0.473*** | 0.594*** | 0.954 | 0.554*** | 0.606*** |
| | (-3.17) | (-1.26) | (-3.69) | (-4.31) | (-4.72) | (-0.75) | (-3.34) | (-3.52) |
| 5 GCSE A*-C | 0.370*** | 0.230*** | 0.135*** | 0.434** | 0.415*** | 0.351*** | 0.219*** | 0.471*** |
| | (-4.04) | (-6.48) | (-6.54) | (-2.27) | (-10.15) | (-4.50) | (-4.93) | (-3.56) |
| Father has a degree | 0.504** | 0.414 | 0.390* | 0.511 | 0.653 | 0.319*** | 0.303** | 0.632 |
| | (-2.22) | (-1.58) | (-1.85) | (-0.88) | (-1.17) | (-2.72) | (-2.02) | (-1.32) |
| Mother has a degree | 0.430** | 0.566 | 0.298 | 0.127** | 0.691** | 0.640 | 0.770 | 0.855 |
| | (-2.23) | (-1.08) | (-1.44) | (-2.44) | (-2.21) | (-1.23) | (-0.45) | (-0.50) |
| School attitude scale | 0.952*** | 0.956*** | 0.942*** | 0.952*** | 0.946*** | 0.947*** | 0.932*** | 0.951*** |
| | (-3.41) | (-2.86) | (-3.19) | (-3.78) | (-7.39) | (-9.34) | (-5.65) | (-5.09) |
| No hours worked | 1.078*** | 1.026 | 0.967 | 1.044 | 1.074*** | 1.032 | 0.920** | 1.017 |
| | (3.58) | (0.92) | (-1.07) | (1.55) | (5.08) | (1.37) | (-2.03) | (0.54) |
| Parents want yp to stay in FTED | 0.507*** | 0.554*** | 0.707* | 0.479*** | 0.393*** | 0.357*** | 0.463*** | 0.747 |
| | (-3.10) | (-3.43) | (-1.92) | (-3.40) | (-6.17) | (-8.23) | (-3.88) | (-1.11) |
| LA % staying in FTED | 1.011 | 0.943** | 0.939* | 0.980 | 0.947*** | 0.915*** | 0.945 | 0.954* |
| | (0.33) | (-2.45) | (-1.89) | (-0.84) | (-3.23) | (-3.60) | (-1.45) | (-1.67) |
| LA unemployment rate (16-19) | 0.992 | 1.026*** | 0.978 | 1.004 | 0.984** | 0.984* | 0.981 | 0.986 |
| | (-0.79) | (3.34) | (-1.21) | (0.37) | (-2.40) | (-1.70) | (-1.10) | (-0.85) |
| LA Log (hourly wages, 16-21) | 0.531 | 6.143 | 14.349 | 0.001 | 1.171 | 1.334 | 0.069 | 0.081 |
| | (-0.38) | (0.60) | (0.72) | (-1.63) | (0.09) | (0.13) | (-0.94) | (-0.85) |
| House prices | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000** | 1.000 |
| | (-0.28) | (-0.55) | (0.86) | (1.63) | (1.23) | (-0.24) | (2.24) | (1.49) |
| Observations | 3480 | | | | 3607 | | | |
| Log likelihood | -2070.62 | | | | -2784.53 | | | |

Overall, the MNL results have confirmed the insignificant effect of local wages on the staying on decision of young people. Our previous evidence from the logit model suggested that the impact of local wages will be heterogeneous for different

subgroups of the population. In particular, we might expect that those who are more likely to be affected by fluctuations in local wages are pupils with lower attainment at school and those coming from a low socio-economic background. Bright pupils coming from well educated families will probably stay-on in FTED, regardless of the local labour market situation and therefore only a smaller group of less advantaged individuals might be affected at the margin by changes in wages. To test this hypothesis, we have run regressions including interaction terms between local wages and a) the dummy indicating whether the pupil obtained 5 or more GSCEs with grades A*-C and b) whether the person's mother/or father has a degree. The results were insignificant and are not reported here. This suggests that we were not able to find any significant effect of wages even when focusing on particular subgroups of the population[27]

Overall, the decision about whether to stay on in FTED does not seem to be driven by the local wage available to the 16-17 year old. Rather the decision is a function of academic ability mainly, social class and other personal/family characteristics. This may of course reflect the insensitivity of young people's decisions to short term youth wages or an information failure whereby young people do not have sufficient information on which to base their staying on decisions. It may be easier for young people to recognise and respond to changes in unemployment rather than wages. This is consistent with our finding that the sensitivity of young people to wages was heterogeneous and that low ability and low socio-economic group pupils may be somewhat sensitive to changes in local wages. We also found evidence that other characteristics of the local labour market do seem to matter to young people when they decide whether to stay on in full time education. A higher youth unemployment rate at the regional level significantly reduces the probability of being in employment (with respect to being in FTED), especially for males.

[27] When we run these regressions without including control for local prices we find that wages increase the probability of being in employment for low attainment pupils.

# 3. Concluding Remarks and Policy Discussion

In 2004 the government introduced a minimum wage for 16-17 year olds of £3.00 per hour[28]. This policy change was driven by the desire to prevent exploitation for all workers, including the very young. This is clearly a crucially important policy objective from an equity perspective. However, the introduction of a 16-17 year old minimum wage was also recognized as a policy that might have potentially negative effects. In particular, by increasing the economic value of employment at age 16-17, it is possible that this minimum wage would affect students' education participation decisions. We hypothesized that young people who are considering dropping out of education and training, i.e. those on the margins of this decision, would potentially be tempted into the labour market because the relative value of employment increased following the introduction of the age 16-17 minimum wage. Indeed the same argument might be made about the minimum wage for 18-21 year olds. Given the high long run economic value of education and qualifications in the UK (e.g. Blundell et al., 2000 and 2005; Dearden et al., 2002), we would be very concerned from a policy perspective if young people make the decision to leave education on the basis of the short run gain from the minimum wage, as opposed to taking a longer term view and choosing to invest in more education.

A tendency to take a short term view is obviously a particular problem for some groups of young people with high discount rates. We might be concerned that those with high discount rates are those who we already worry about as having low achievement and poor labour market prospects, namely the least skilled and those from disadvantaged backgrounds. Understanding the impact of the 16-17 year old minimum wage on these particular groups of young people is therefore of particular importance from an equity perspective.

We might also be worried about the impact of the 16-17 year old minimum wage because of what we know about the results from another key education policy that was introduced just prior to the NMW for 16-17 year olds, namely the Education

[28] see Table A (Appendix) for subsequent upgrades.

Maintenance Allowance. This involved paying young people from poorer households to remain in full time education. The EMA has been found to have a quite substantial and positive impact on full time education participation post 16, of the order of a 4.5% point improvement, against an average full time education participation rate of 64.7% at age 16. Hence we know that a payment of up to £30 per week (maximum) does influence pupils people from poorer households to remain in full time education and that this effect is significant. By our approximate calculations, the value of the introduction of the NMW for 16-17 year olds was around 50-60% of the value of the EMA in poorer regions. This implies that potentially at least the minimum wage for 16-17 year olds might influence some young people to go down the employment route by altering the short run economic value of employment versus full time education.

Given the positive impact of EMA on pupils' participation in education, we might assume a priori that the short term costs of different choices at age 16 do influence student behaviour and thus that the introduction of the NMW for 16-17 year olds would affect staying on rates. This is the issue we have explored in this report.

We have taken two different approaches to considering the potential impact of the 16-17 year old minimum wage on the education participation choices of young people. Firstly, we looked at area changes in education participation rates following the introduction of the 16-17 year old minimum wage, with our identification coming from the fact that the minimum wage would have more and less impact in different geographical areas. Secondly, we used micro data to examine in detail the determinants of young people's education choices, including the impact of the minimum wage.

Our main results show that in fact the minimum wage has had no impact on young people's staying on decisions. Our data hints that low ability, low socio-economic group pupils may be somewhat more sensitive to the introduction of the NMW. Certainly though, what matters most to young people appears to be individual factors, such as prior educational achievement and parental socio-economic backgrounds.

Some labour market factors do influence the decision to stay on, and in particular this decision is influenced by the likelihood of the young person being out of work. Thus

the local unemployment rate does affect young people's staying on decision, even though wages appear not to. These findings are in fact consistent with previous evidence that has suggested that the main driver of education participation decisions is prior achievement, rather than the local labour market wage.

Our findings have important policy implications. Firstly, we are about to enter a high youth unemployment period as the longer run impact of the current recession hits the youth labour market. Obviously in this situation policy-makers do not want to do anything to draw more young people into the labour market and thereby potentially increase youth unemployment further. The evidence here is reassuring in that respect. Young people appear to be more responsive to changes in the local unemployment rate than they are to changes in the local wage. Hence with rising youth unemployment in the middle of a recession, raising further the 16-17 year olds NMW rate would probably not have a detrimental effect on "staying on" rates in education as the youth unemployment rate would act as a natural buffer against any "pull" effect (however small) out of education from raising the 16-17 year NMW.

Another major education policy change is also likely to impact on the youth labour market, namely the raising of the education and training participation age to 18 by 2015. The objective of this legislation is to formally engage young people with education and training for longer and hopefully cause them to become more skilled and qualified as a result. This change in legislation has been compared to previous changes that increased the compulsory school leaving age to the current age of 16. However, previous changes were unambiguously introduced to require young people to remain in full time education up to the age of 16. The proposed changes for 2015 in fact require young people to remain in education and/or training and it is somewhat more ambiguous as to what this will mean in practice. Certainly it does not preclude young people from entering the labour market on a part time basis. For the education system, attempting to prepare for this change in legislation is problematic, as it is not clear how young people's behaviour will be affected. Our evidence suggests that if we have a period of high and rising youth unemployment leading up to the change in legislation, this is likely to cause young people to remain in full time education whatever happens on the minimum wage front. We are likely to have increased demand for full time education and training if we have high youth unemployment and

the consequence of the legislative change will be that students will have a right to access such education and training, regardless of their prior achievement. Thus very low achieving pupils may well seek to enrol in FE colleges or remain in school to a greater extent than in the past. Of course how the minimum wage interacts with the requirements of the education system and the legislative requirement to remain in education or training until 18 needs to be determined. If young people now stay on in education until age 18 as the norm, clearly it will be the older minimum wage levels that are likely to be most relevant for their decision making.

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# Appendix (Introduction)

**Table A: National Minimum Wage Rates: April 1999 onwards**

| | | **Adult employees (22+)** | | **Youth employees (18-21)** | **16-17 year olds** |
|---|---|---|---|---|---|
| NMW introduction | 1st April 1999 | £3.60 | 1st April 1999 | £3.00 | |
| NMW upratings | | | | | |
| 1st uprating | Oct 2000 | £3.70 | 1st June 2000 | £3.20 | |
| 2nd uprating | Oct 2001 | £4.10 | | £3.50 | |
| 3rd uprating | Oct 2002 | £4.20 | | £3.60 | |
| 4th uprating | Oct 2003 | £4.50 | | £3.80 | |
| 5th uprating | Oct 2004 | £4.85 | | £4.10 | Introduction: £3.00 |
| 6th uprating | Oct 2005 | £5.05 | | £4.25 | £3.00 |
| 7th uprating | Oct 2006 | £5.35 | | £4.45 | £3.30 |
| 8th uprating | Oct 2007 | £5.52 | | £4.60 | £3.40 |
| 9th uprating | Oct 2008 | £5.73 | | £4.77 | £3.53 |
| 10th uprating | Oct 2009 | £5.80 | | £4.83 | £3.57 |

# Appendix (Part I)

Table A1: Low wage LAs, using ASHE 2003, and ranked from lowest 25th percentile

Low wage LAs

| | Total number of 16-21 | Percentiles: | | | Mean wage in LA (for 16-21 years old) | Mean wage in LA for all active |
|---|---|---|---|---|---|---|
| | | 10th | 25th | 50th | | |
| Rutland | 4 | 3.73 | 3.89 | 4.84 | 5.75 | 9.95 |
| East Riding of Yorkshire | 31 | 3.50 | 3.99 | 4.85 | 6.00 | 9.62 |
| Warwickshire | 86 | 3.23 | 4.00 | 4.75 | 5.42 | 10.59 |
| North Lincolnshire | 24 | 3.62 | 4.08 | 4.75 | 4.83 | 10.11 |
| Blackpool | 34 | 3.82 | 4.14 | 4.63 | 4.85 | 9.05 |
| Herefordshire | 28 | 3.91 | 4.15 | 5.05 | 5.03 | 8.97 |
| Stockton-on-Tees | 36 | 3.61 | 4.16 | 5.30 | 5.18 | 9.20 |
| **Lancashire** | 211 | 3.50 | 4.17 | 4.93 | 5.28 | 9.83 |
| Devon | 119 | 3.69 | 4.20 | 4.81 | 5.05 | 9.39 |
| Durham | 68 | 3.80 | 4.20 | 5.00 | 5.62 | 9.57 |
| Dorset | 85 | 3.70 | 4.21 | 4.81 | 5.03 | 9.48 |
| Medway | 40 | 3.86 | 4.22 | 5.18 | 5.73 | 9.90 |
| Plymouth | 52 | 3.81 | 4.25 | 4.79 | 5.29 | 10.08 |
| Redcar and Cleveland | 24 | 3.39 | 4.25 | 4.86 | 5.32 | 10.15 |
| Derbyshire | 113 | 3.64 | 4.27 | 4.80 | 5.18 | 9.26 |
| Windsor & Maidenhead | 32 | 2.94 | 4.27 | 5.58 | 5.79 | 13.54 |
| **Northumberland** | 37 | 3.80 | 4.29 | 4.85 | 5.88 | 9.72 |
| **Total** | 1024 | | | | | |

Notes: These are all LAs with the lowest 25th percentile and accounting for 10% of the whole workforce of 16-21 years old.

Table A2: High wage LAs, using ASHE 2003

High wage LAs

| | Total number of 16-21 | Percentiles: | | | Mean wage in LA (for 16-21 years old) | Mean wage in LA for all active |
|---|---|---|---|---|---|---|
| | | 10th | 25th | 50th | | |
| Bracknell Forest | 22 | 4.33 | 4.77 | 5.87 | 6.18 | 14.12 |
| Reading | 47 | 4.24 | 4.82 | 5.65 | 5.83 | 12.42 |
| Isle of Wight | 21 | 4.39 | 4.82 | 5.50 | 5.48 | 9.26 |
| Buckinghamshire | 75 | 4.22 | 4.83 | 5.45 | 6.05 | 12.17 |
| North East Lincolnshire | 37 | 3.80 | 4.84 | 5.35 | 6.05 | 8.96 |
| Surrey | 210 | 4.27 | 4.88 | 5.70 | 6.42 | 13.09 |
| Halton | 31 | 4.18 | 4.94 | 5.49 | 6.00 | 10.37 |
| Milton Keynes | 60 | 4.39 | 4.97 | 6.00 | 6.63 | 12.05 |
| Thurrock | 32 | 4.65 | 5.15 | 5.68 | 5.88 | 9.69 |
| Inner London | 432 | 4.51 | 5.25 | 6.61 | 7.25 | 16.17 |
| **Total** | 967 | | | | | |

Notes: These are all LAs with the highest 25th percentile and accounting for 10% of the whole workforce of 16-21 years old.

Table A3: List of LAs included in the Education Maintenance Allowance (EMA) pilots:

**15 LAs in September 1999:**

Middlesbrough, Walsall, Southampton, Cornwall, Leeds, Inner London (Lambeth, Southwark, Lewisham, Greenwich), Oldham, City of Nottingham, Bolton, Doncaster, Stoke-on-Trent, and Gateshead

**41 LAs in September 2000:**

Barnsley, Birmingham, Bradford, Coventry, Halton, Inner London (Camden, Ealing, Hammersmith and Fulham, Hackney, Haringey, Islington, Tower Hamlets, Wandsworth), Hartlepool, Kingston upon Hull, Knowsley, East Lancashire, Leicester, North East Lincolnshire, Liverpool, Luton, Manchester, North Tyneside, Northumberland, Outer London (Barking and Dagenham, Brent, Newham, Waltham Forest), Salford, Sandwell, Sheffield, South Tyneside, St. Helens, Suffolk, Sunderland, Tameside, Wakefield, Wigan, Wirral, Wolverhampton, Worcestershire.

Table A4. Wage percentiles in low and high wage LAs, for the period, 2004-2006, (ASHE)

| Year | Percentiles | | | | | | |
|---|---|---|---|---|---|---|---|
| | 5th | 10th | 25th | 50th | 75th | 90th | 95th |
| 2004 | 3.08 | 3.64 | 4.20 | 4.87 | 5.81 | 7.11 | 8.62 |
| 2005 | 3.56 | 4.07 | 4.62 | 5.25 | 6.22 | 7.59 | 9.16 |
| 2006 | 3.69 | 4.25 | 4.91 | 5.53 | 6.47 | 7.84 | 8.95 |
| 2004 | 4.00 | 4.39 | 5.00 | 5.94 | 7.51 | 9.47 | 11.43 |
| 2005 | 4.10 | 4.51 | 5.10 | 6.04 | 7.51 | 9.21 | 10.49 |
| 2006 | 4.50 | 4.85 | 5.35 | 6.32 | 7.82 | 9.46 | 10.87 |

Notes: The samples size are for low wage LAs: 2004 (1024), 2005 (1110), and 2006 (1105), for high wage LAs: 2004 (967), 2005 (1056) and 2006 (975).

Table A5: Low wage LAs, using 25th percentile in ASHE 1997, 1998

Low wage LAs

| | Total number of 16-21 | Percentiles: | | | Mean wage in LA (for 16-21 years old) | Mean wage in LA for all active |
|---|---|---|---|---|---|---|
| | | 10th | 25th | 50th | | |
| Torbay | 15 | 1.89 | 2.45 | 3.78 | 3.67 | 7.02 |
| **Knowsley** | 28 | 2.32 | 2.69 | 3.41 | 4.03 | 8.24 |
| Trafford | 63 | 2.13 | 2.88 | 3.69 | 3.91 | 8.78 |
| Redcar and Cleveland | 26 | 2.27 | 2.90 | 3.84 | 3.76 | 8.05 |
| East Riding of Yorkshire | 81 | 2.39 | 2.91 | 3.68 | 4.15 | 7.50 |
| **North Tyneside** | 44 | 2.57 | 2.99 | 3.51 | 4.14 | 7.57 |
| **Doncaster** | 80 | 2.04 | 3.00 | 3.73 | 4.05 | 7.10 |
| Durham | 115 | 2.26 | 3.01 | 3.92 | 4.08 | 7.55 |
| North Yorkshire | 124 | 2.39 | 3.04 | 3.89 | 3.91 | 7.36 |
| **Wigan** | 59 | 2.49 | 3.05 | 3.74 | 4.08 | 7.82 |
| Plymouth | 74 | 2.47 | 3.05 | 3.62 | 3.93 | 7.49 |
| Cumbria | 161 | 2.48 | 3.09 | 3.82 | 4.11 | 7.42 |
| **Wolverhampton** | 53 | 2.38 | 3.13 | 3.60 | 3.55 | 7.73 |
| Stockport | 87 | 2.51 | 3.13 | 3.84 | 4.11 | 8.19 |
| **Stoke-on-Trent** | 88 | 2.58 | 3.14 | 3.82 | 4.02 | 7.04 |
| **Bolton** | 67 | 2.42 | 3.14 | 3.63 | 4.05 | 7.81 |
| **Lincolnshire** | 159 | 2.57 | 3.14 | 3.75 | 4.14 | 7.08 |
| **Total** | 1324 | 2.38 | 2.98 | 3.72 | 3.98 | 7.63 |

Table A6: Low wage LAs, using 25th percentile in ASHE 1997, 1998

High wage LAs

| | Total number of 16-21 | Percentiles: | | | Mean wage in LA (for 16-21 years old) | Mean wage in LA for all active |
|---|---|---|---|---|---|---|
| | | 10th | 25th | 50th | | |
| Surrey | 325 | 3.04 | 3.80 | 4.66 | 4.84 | 9.78 |
| Peterborough | 69 | 3.00 | 3.81 | 4.33 | 4.91 | 8.13 |
| West Berkshire | 44 | 2.19 | 3.89 | 4.73 | 5.00 | 9.33 |
| Cambridgeshire | 175 | 3.00 | 3.90 | 4.50 | 4.88 | 8.72 |
| Reading | 81 | 3.16 | 4.20 | 5.31 | 5.41 | 9.54 |
| Inner London | 845 | 3.44 | 4.31 | 5.39 | 5.97 | 12.02 |
| **Total** | 1539 | 2.97 | 3.98 | 4.81 | 5.16 | 9.66 |

# Appendix (Part II)

**Table AII.1: Descriptive statistics**

| | Males | | | | | Females | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Obs* | *Mean* | *Std. Dev.* | *Min* | *Max* | *Obs* | *Mean* | *Std. Dev.* | *Min* | *Max* |
| Stay in FTED | 3332 | 0.752 | 0.432 | 0 | 1 | 3234 | 0.836 | 0.370 | 0 | 1 |
| In employment | 3332 | 0.102 | 0.302 | 0 | 1 | 3234 | 0.061 | 0.239 | 0 | 1 |
| In apprenticeship | 3332 | 0.065 | 0.246 | 0 | 1 | 3234 | 0.031 | 0.173 | 0 | 1 |
| Unemployed | 3332 | 0.046 | 0.209 | 0 | 1 | 3234 | 0.033 | 0.180 | 0 | 1 |
| Other | 3332 | 0.036 | 0.186 | 0 | 1 | 3234 | 0.039 | 0.193 | 0 | 1 |
| FSM | 3332 | 0.089 | 0.285 | 0 | 1 | 3234 | 0.098 | 0.297 | 0 | 1 |
| SEN | 3332 | 0.1 | 0.3 | 0 | 1 | 3234 | 0.066 | 0.249 | 0 | 1 |
| Non white British | 3332 | 0.315 | 0.465 | 0 | 1 | 3234 | 0.329 | 0.470 | 0 | 1 |
| EAL | 3332 | 0.214 | 0.410 | 0 | 1 | 3234 | 0.234 | 0.423 | 0 | 1 |
| KS4 (standardised score) | 3332 | 0.164 | 0.903 | -2.317 | 4.335 | 3234 | 0.354 | 0.859 | -2.317 | 3.282 |
| 5 GCSE A*-C | 3332 | 0.520 | 0.500 | 0 | 1 | 3234 | 0.612 | 0.487 | 0 | 1 |
| Father has a degree | 3332 | 0.149 | 0.356 | 0 | 1 | 3234 | 0.145 | 0.352 | 0 | 1 |
| Mother has a degree | 3332 | 0.120 | 0.325 | 0 | 1 | 3234 | 0.109 | 0.311 | 0 | 1 |
| School attitude scale | 3332 | 33.630 | 7.487 | 1 | 48 | 3234 | 34.078 | 7.503 | 1 | 48 |
| No of hours worked per week | 3332 | 1.637 | 3.608 | 0 | 37 | 3234 | 1.866 | 3.667 | 0 | 34 |
| Parent wants YP to stay in FTED at 16 | 3332 | 0.800 | 0.400 | 0 | 1 | 3234 | 0.883 | 0.321 | 0 | 1 |
| Unemp. rate (16-19) | 3332 | 21.909 | 10.065 | 5.900 | 67.100 | 3234 | 22.119 | 10.421 | 5.900 | 67.100 |
| LEA % staying in FTED | 3332 | 74.409 | 5.019 | 54.960 | 88.326 | 3234 | 74.669 | 5.194 | 54.960 | 88.326 |
| House prices | 3332 | 192457 | 61649 | 98950 | 597276 | 3234 | 197645 | 64025 | 98950 | 597276 |
| Log (hourly wages - 16-21) | 3332 | 1.831 | 0.066 | 1.631 | 2.092 | 3234 | 1.837 | 0.072 | 1.631 | 2.092 |
| Log (hourly wages - 16-17) | 3332 | 1.630 | 0.105 | 1.338 | 1.996 | 3234 | 1.635 | 0.108 | 1.338 | 1.996 |
| whether attended sixth form school | 3303 | 0.612 | 0.487 | 0 | 1 | 3227 | 0.623 | 0.485 | 0 | 1 |
| school % FSM | 3324 | 11.648 | 11.809 | 0.364 | 85.386 | 3226 | 12.183 | 12.057 | 0.000 | 85.386 |
| school % staying in FTED | 3332 | 75.668 | 10.539 | 11.111 | 100.000 | 3234 | 76.166 | 10.323 | 38.298 | 98.901 |

**Figure AII.1: Correlation between RPI and house prices at regional level – 2004**