An Analysis of the Determinants and Scarring Effects of Economic Inactivity and Unemployment in the UK

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This thesis is submitted in partial fulfilment of the requirements for the degree of *Doctor of Philosophy*

February 2017

Abstract

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Doctor of Philosophy (PhD)
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This thesis aims to analyse the determinants and scarring effects phenomenon of economic inactivity and unemployment – NEET (Not in Education, Employment or Training) – in the UK. We are particularly interested in examining the impacts of different business cycle periods and investigate the presence of true state dependence or the 'scarring effect.' Utilizing the British Household Panel Survey (BHPS) Waves 1-18 and the Understanding Society (US) survey Waves 1-5, we analyse both static and dynamic models of NEET. Our results from the static models reveal that young people are more likely to be unemployed than adults. However, for most of these youths, their probability of being inactive is lower. Meanwhile, the adult age groups, particularly the oldest age group (50-64), face both the risk of being unemployed and of being inactive. The recession periods do have a larger effect on youths than for adults, particularly for the older youths aged 20-24. Meanwhile, during recessions, teenagers (16-19 year olds) are also more likely to be in education. The dynamic probability estimates using the Markov models and the discrete-time duration analysis, which control for unobserved heterogeneity, provide evidence of true state dependence. Specifically, we find that individuals who were unemployed in the last year's interview, are about 17 percentage points more likely to be unemployed at the current interview relative to those who were previously employed. While the corresponding persistence in inactivity state accounts for about 43 percentage points. The duration dependence result reveals that individuals who have been in a particular state for some time are more likely to occupy that state in the future, hence less likely to exit the state. Moreover, in the case of labour market transitions from unemployment and inactivity, we find that occurrence dependence is not scarring, but it is the lagged-duration dependence that is scarring. This suggests that having a one-time long spell of previous unemployment (or inactivity) in the past is worse than having multiple short spells of being in-and-out of the unemployment (or inactivity) state. Therefore, our policy recommendations are directed towards assisting both youths and adults from the risk of being NEET as early as possible in their careers, as well as promoting a flexible labour market system which is balanced with employment security.

JEL-Classification: C33, C41, J31, J64
Keywords: NEET, Youth unemployment, Business cycle, State dependence, Multinomial Logit, Markovian, Duration Analysis, Unobserved heterogeneity

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Acknowledgements

Alhamdulillah, all praise belongs to Allah SWT, without His endless blessing I would not have had the strength to complete my PhD. I am more than grateful for what I have been given until this moment.

I would like to express my deepest gratitude to my supervisors, Prof. Steve Bradley and Prof. Robert Crouchley, for their rigorous guidance, invaluable advice and support. Without their share of knowledge, patience, and constructive comments, I would not have been able to finish this PhD journey. Thank you for always supporting me during the lowest point in my PhD journey, and for all your patience in dealing with my struggles. I just could not thank you both enough and I wish I could have been a better student. Thank you Prof. Bradley for your meticulous corrections and feedback since my first draft, I am still very sorry that you had a hard time reading my drafts, yet always willing to spare your time to revise my drafts. Thank you Prof. Crouchley for your invaluable inputs and your share of knowledge to improve my technical skills which I believe will be my biggest strength as a researcher in the future.

I would like to especially express my gratitude to the Economic and Social Research Council (ESRC) NWDTC and Lancaster University Department of Economics for the financial support and the once in a lifetime opportunity to pursue my PhD degree; to my previous sponsor, the FCO Chevening scholarship, for giving me the chance to continue my study in the UK. I would like to also extend my gratitude to my external and internal thesis examiners, Dr. Harminder Battu and Prof. Colin Green respectively, for their insightful and constructive comments during my viva, which help me in improving the quality of my thesis and my future papers.

I would like to thank the academic and administrative staff members of the Department of Economics for their help and support in making my studies much easier to complete. My gratitude also goes to my fellow PhD students, especially to Maaida, Ayesha, Shane, Alisa, Xuguang, Rob, Xichen, and in particular to my best buddy and my role model throughout this journey, Miaoqing Yang; thank you for always encouraging me during my lowest mood and keeping me calm whenever I was overly panicking.

I would like to thank all of my friends whom I met during this journey: my Indonesian Society family (especially to Jeslyn, Lely, Zefannya, Teteh Vina, Mbak Eny, and Mbak Ara), and the Cultural Society and Taekwondo Society who had made my years at Lancaster became more colourful and enjoyable. Also, massive thanks go to my friends in Indonesia: Nastar sisters and Rahmitha for their support (may our friendship last forever); Priyesta for helping me with the miscellaneous stuffs. Lastly, to my other half my little brother, M. Qareza Qualdi, who is not so little anymore, for all the joy and tears we had. This journey has finally come to an end for me brother, thank you for always being my biggest supporter in life, and good luck for your PhD journey!

Finally, I dedicate this thesis to myself, for finally finishing it. After gritting my teeth and clenching my fists along with tears, pain and laughter in completing this journey, battling with depression and anxiety, I just want to thank myself for not giving up. Thanks for always reminding yourself that doing your best doesn't always mean being the best. This journey has taken so much more than I gained, but hopefully it will be paid off and everything will become a good memory one day.

Author's Declaration

I, Qisha Quarina declare that this thesis titled, "An Analysis of the Determinants and Scarring Effects of Economic Inactivity and Unemployment in the UK" and the work presented in it are my own. I confirm that:

1. This thesis has not been submitted for the award of a higher degree elsewhere.

2. This work was done wholly in the candidature for a research degree at Lancaster University.

3. Chapter 4 was presented at the NWDTC PhD Conference in Economics, 19^{th} – 20^{th} May 2016.

4. Where I have quoted from the work of others, the source is always given. With the exception of such quotations, this thesis is entirely my own work.

5. Where the work of other authors is refereed to, it is properly referenced.

6. I have acknowledged all main sources of help.

7. I grant permission to the institutional repository with respect to online access to my work.

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February 2017

CHAPTER 1

Introduction

Youth unemployment has become a particular concern in many countries, partly because of the fear of scarring effects that may lead these young people to experience unemployment later in their lives (Gregg, 2001; Mroz and Savage, 2006; Scarpetta et al., 2010; Bell and Blanchflower, 2011a; McQuaid et al., 2015). An early study by Freeman and Wise (1982), however, finds that this fear of 'scarring effects' from early unemployment tends to be exaggerated, although they do find that early unemployment has a significant adverse impact on later wage rates. Other studies also show that the consequences of youth unemployment can go beyond economic matters, where youth unemployment is found to induce crimes, drug use, mental disorders and youth suicide (Hammer, 1992; Fougère et al., 2009; Power et al., 2015).

The issue of youth unemployment becomes even more daunting during economic downturns. Freeman et al. (1982) state that one of the most important determinants of youth employment is the strength of the economy as a whole. In this case, when the aggregate level of economic activity and the level of adult employment is high, youth employment is also high, and vice versa (Freeman et al., 1982, pp. 3). Many studies have shown that young people are usually more vulnerable and hit harder by the recessions relative to their adult counterparts (O'Higgins, 2010; Choudhry et al., 2012; Bruno et al., 2014). Several reasons such as lower qualifications, lack of experience and weaker work contracts among young workers than among older workers are argued to explain the differential effects of recessions on youth and adult unemployment (Bruno et al., 2014). Moreover, O'Higgins (2010) argues that the main issue is not only that young people are more vulnerable to the effects of recessions, but also that these adverse effects of recessions are likely to be more long-lasting for young people than they are for adults.

Despite the fact that adult unemployment rates are generally lower and less sensitive to the business cycle than youth unemployment rates, any period of economic slowdown is also expected to lead to a deterioration of the labour market situation of the adult age groups, particularly for disadvantaged groups, such as the low-educated and older workers. Gregg and Wadsworth (2011, pp. 40-41), for example, argue that employers will be reluctant to lose more experienced workers who have firm-specific skills; thus, the costs of recessions tend to fall on low wage workers including, not only young people, but also the less educated workers and minorities. In addition, similar to young people, older individuals are also at risk of experiencing the scarring effects of unemployment or persistence in non-employment. In this regard, those who have more spells of prior unemployment or a longer duration of non-employment are found to be more likely to be non-employed in the future (see Arulampalam et al., 2000; Frijters et al., 2009; Niedergesäss, 2012; Lesner, 2015).

The analysis of scarring effects, or labour market persistence, is particularly important for policy design. The existence of labour market persistence or scarring suggests that short-term labour market policies would also have an impact in the long-run (Arulampalam et al., 2000). This further implies that any policy to reduce unemployment, for example, should be implemented as early as possible during a spell of unemployment to prevent long-term unemployment. In the context of the youth labour market, Doiron and Gørgens (2008) state that if labour market persistence is found to be significant, policy interventions should aim at preventing unfavourable labour market outcomes from occurring early in a person's career.

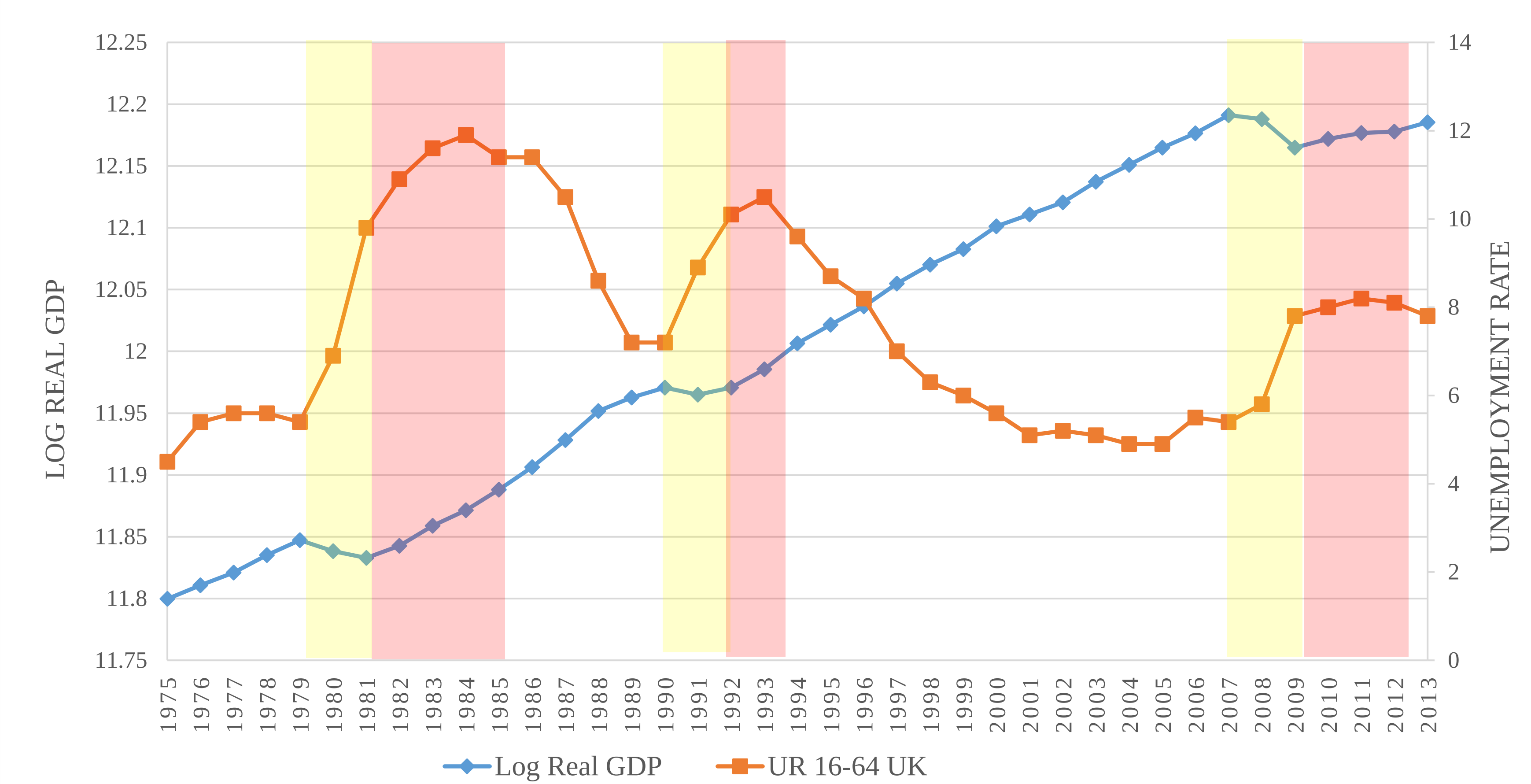
This thesis will first discuss several episodes of recession in the United Kingdom and present descriptive analyses of the trends in the unemployment rate during these recession periods for the all-age unemployment rate and for the youth unemployment rate. Moreover, our analysis focuses on the concept of NEET (Not in Education, Employment or Training). Our main interest is first to investigate the characteristics associated with the probability of being in NEET and Non-NEET states at a given point in time, particularly in analysing the impacts of recessions on the probability of being in NEET states for different age groups and regions in the UK. In addition, we are also interested in examining the impact of previous labour market states and the length of time spent in a given state before an individual makes a transition into another state. This analysis is essential to shed more light on the 'scarring effects' phenomenon, which is essential for the purpose of policy interventions.

1.1 An Overview of UK Recession Periods

Figure 1 plots the yearly UK real GDP (in logarithm) and the aggregate unemployment rate for the working age group 16-64 years. As shown in this Figure, there have been several periods of major economic downturn or recessions in the UK, indicated by a fall in the real GDP level – i.e. the early 1980s and 1990s recessions, as well as the recent global financial crisis in 2008/2009 (the so called Great Recession). From this figure, we can observe that not only a fall in real GDP has an immediate impact on the labour market, but the labour market is slower to adjust to its pre-recession rate than the level of real GDP. In this case, the unemployment rate continues to rise even after the level of real GDP has recovered from its lowest level. This section discusses in more detail about each specific recession period, as highlighted by different coloured bars in Figure 1. The yellow bars indicate periods of a fall in output or real GDP and an increase in the unemployment rate, whereas red bars represent the increase in unemployment rate after the level of output has risen back.

The recession in the early 1980s started to occur in the first quarter of 1980, in which the quarter-on-quarter growth of output fell around 0.9 percent from its previous level in the last quarter of 1979 (Office for National Statistics, 2014a). Prior to 1980, the UK economy had been growing at a lower rate during the 1970s compared to other European countries (Kersting, 2008). In addition, during the 1970s, many industries were considered inefficient and trade unions were powerful. When the Conservative Party led by Margaret Thatcher came to power in May 1979, inflation reached double digits and there had been a Winter of Discontent with many public sector workers staging strikes. Patrick Minford (1983) in Kersting (2008, pp. 188) claims that two distortions in the labour market, which are the operation of the unemployment benefit system and the power of the unions to raise wages relative to non-union wages, were the factors to be blamed for the poor performance of the UK economy in the late 1970s.

Figure 1 Yearly Log Gross Domestic Product (in £million) and Unemployment Rate (UR) 16-64, 1975-2013



Source: Office for National Statistics, 2013 (for GDP at market prices in £million, base year = 2013) and 2014b (for UR).
Note: yellow bar indicates periods of an output fall and increase in the unemployment rate, whereas red bar represents the increase in unemployment rate after the level of output has risen back.

In order to control for inflation, the ruling Conservative Party increased the interest rates and taxes, cut government spending, and implemented new trade union laws in an attempt to weaken the power of unions. One of the consequences of these reforms was that the real GDP contracted further over the next five consecutive quarters, from the first quarter of 1980 up to the first quarter of 1981, resulting in a total output loss of around 4.6 percent during these periods. Nevertheless, these reforms did help the UK economy to recover; that is, inflation managed to fall to a single digit by Spring 1983, the power of unions weakened, and wage growth rose to 3.8 percent by 1983.

The costs of the reforms also fell hard on the labour market. The deep fall in real GDP, and rapid appreciation of the pound, had caused many manufacturing firms that relied on exports to go bankrupt, resulting in a sharp increase in unemployment, reaching 3 million by January 1982. Despite the economic recovery that followed, which started to take effect in 1982, the unemployment rate continued to increase and only reached its peak in 1984 at 11.9 percent, corresponding to more than 3.2 million unemployed people (Office for National Statistics, 2014b). This trend can be seen from Figure 1 which is highlighted by the first red coloured bar. Moreover, by the end of 1989, both the unemployment level and rate did not return to their pre-recession position at any point until the beginning of the next recession in the early 1990s (ONS, 2009).

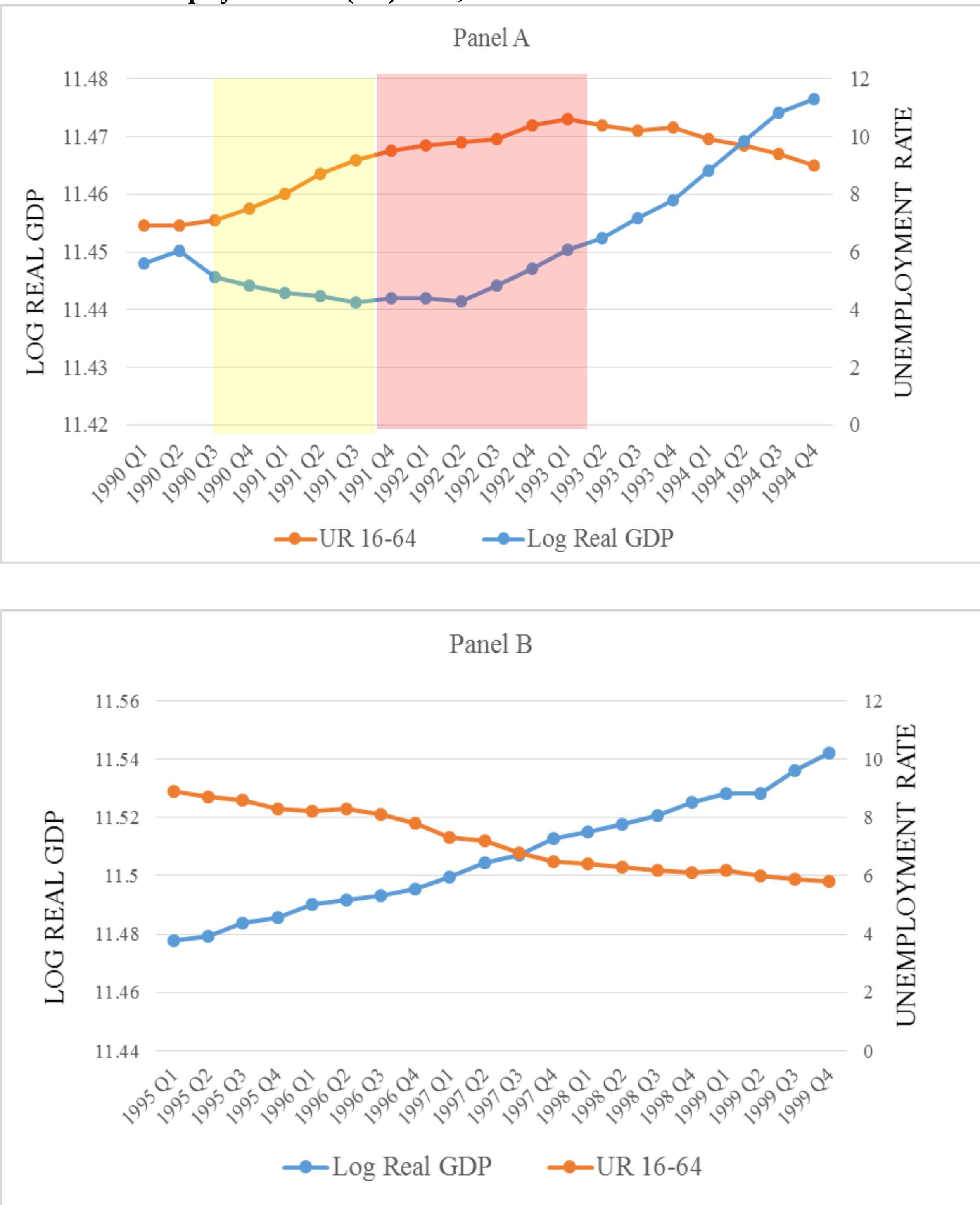
Furthermore, the early 1980s period was also marked by a rapid decline in employment in manufacturing sector and a growth in the service sector where job turnover is relatively higher (Stafford and Duffy, 2009). As documented in Plunkert (1990), the 1980's experienced the shifting of employment from the goods-producing sector (e.g. construction, manufacture, and mining) to the service-producing sector (e.g. finance, insurance, and trade). Throughout the early 1980s recession, the goods-producing industries had lost around more than 4 million jobs (Plunkert, 1990, pp. 4). The service sector, on the other hand, survived the recessionary years and even continued to add jobs. Until the first quarter of 1983, the goods-producing sector continued to lose jobs before recovering thereafter and finally outpaced the service-sector in rate of growth only in 1984.

The survey dataset that will be utilized in this thesis, however, only starts in 1991. Although retrospective information regarding labour market status can be obtained, most of the time-varying variables which are needed for empirical estimation (e.g. marital status, health status, household type, and number of children) are only available from the year 1991 onwards. For this reason, our entire analyses in this study will focus merely on those recession periods which occur in the early 1990s and after. In order to see more precise illustrations of the exact timing of when recession and recovery periods started to take place for those recessions that occured in the 1990s and after, Figure 2 and Figure 3 depict the fluctuations of UK real GDP and aggregate unemployment rates since 1990 on a quarterly basis disaggregated into four non-overlapping sub-periods. These graphs are an extended version of Figure 1.

Following the recovery from its previous recession in the early 1980s, the UK economy was growing strongly by the mid-1980s, with low inflation and a decreasing unemployment rate. During the mid to late 1980s, strong economic growth had induced a property boom under Nigel Lawson's legacy, also known as the Lawson Boom, which then led to an increase in the levels of inflation. In order to control for rising inflation, interest rates were increased and the UK finally joined the European Exchange Rate Mechanism. However, inflationary pressures caused by the German reunification prevented interest rates from being cut (Jenkins, 2010, pp. 29) and the UK economy started to fall into another recession in the third quarter of 1990 (highlighted with the yellow bar in Panel A of Figure 2), where the quarter-on-quarter output growth shrank 1.1 percentage points from its previous quarter. This early 1990s recession was similar to that of the early 1980s recession as it lasted for over a year, in which the negative growth of GDP lasted until the third quarter of 1991. The total contractions of GDP for these five quarters accounted for a 2.4 percent loss of output, lower than the output loss of the earlier recession in the 1980s.

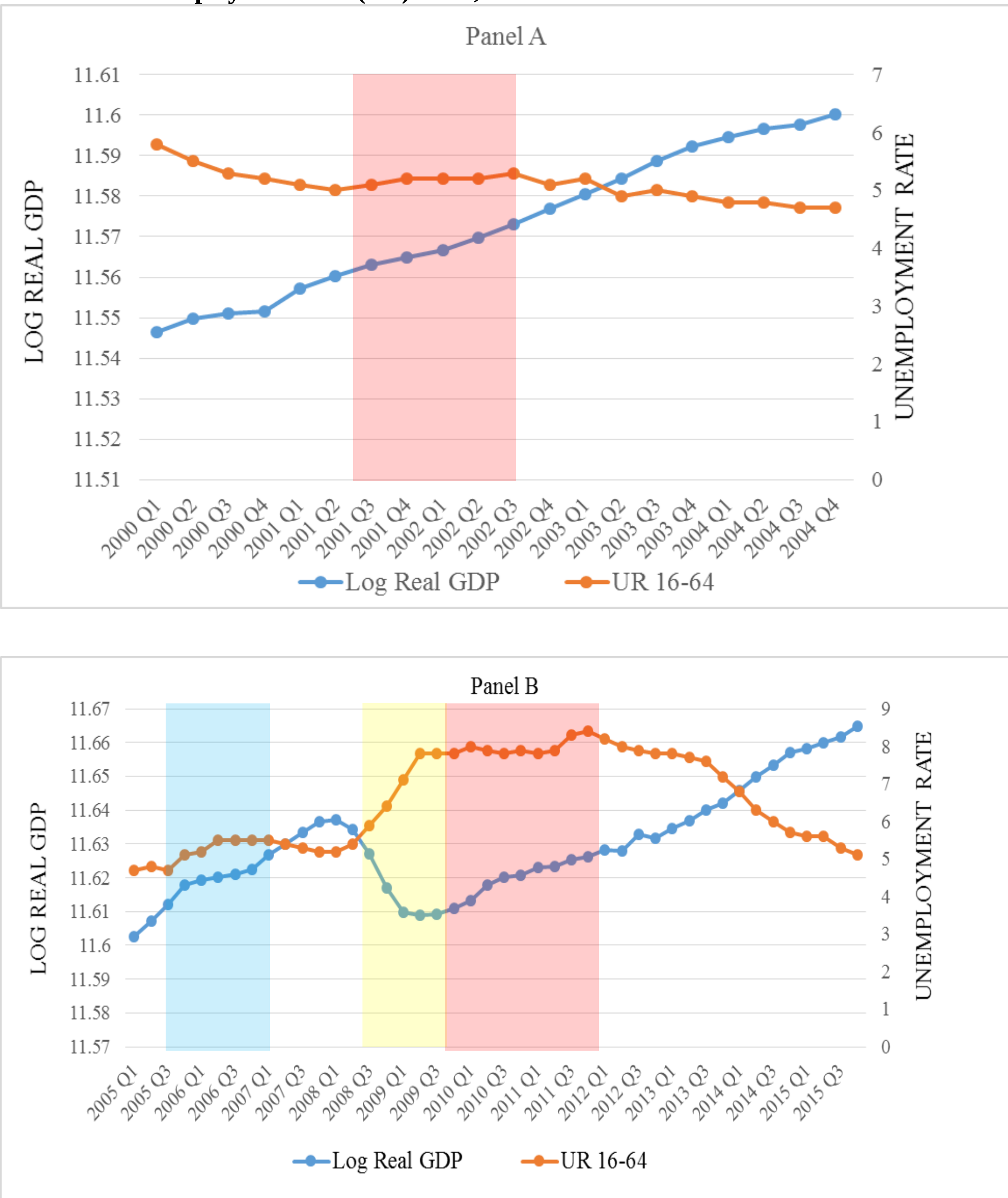
Furthermore, the increase in interest rates had a severe impact on the UK housing market, which then led to a significant fall in prices, and thus a decline in company earnings. As a result, there was a significant increase in the unemployment rate, reaching its peak in the first quarter of 1993 at 10.6 percent, which corresponds to 2.9 million unemployed people (Office for National Statistics, 2014b). Similar to the previous recession in the early 1980s, the peak in unemployment rate for this recession also took place about two years after the end of the recession.

Figure 2 **Quarterly Log Gross Domestic Product (in £million) and Unemployment Rate (UR) 16-64, 1990-1999**



Source: Office for National Statistics, 2016 (for quarterly GDP at market prices in £million, base year = 2013), 2015b (for UR).
Note: yellow bar indicates periods of output fall and increase in the unemployment rate, whereas red bar represents the increase in unemployment rate after the level of output has risen back.

Figure 3 Quarterly Log Gross Domestic Product (in £million) and Unemployment Rate (UR) 16-64, 2000-2013



Source: Office for National Statistics, 2016 (for quarterly GDP at market prices in £million, base year = 2013), 2015b (for UR).
Note: yellow bar indicates periods of output fall and increase in the unemployment rate, whereas red bar represents the increase in unemployment rate after the level of output has risen back.

Looking further at the impact of recession on employment and jobs across industry, Jenkins (2010) shows that the manufacturing sector still had the largest fall in the number of jobs (reaching nearly 500,000 jobs) during the 1990s recession. On the other hand, some service industries exhibited an increase in the number of jobs during this recession. Jobs in health and social work sectors, for example, rose by 3.3 percent (about 85,000 jobs) in the 1990s recession. This paper further shows that the industries that reported an increase in jobs during the early 1980s and 1990s recessions are mostly those based in the public sector.

As previously mentioned, the unemployment rate during the early 1980s and 1990s recessions kept rising even after the level of output had risen from its lowest point. It can be seen from the graph in Panel A of Figure 2 that the gap between output level and the unemployment rate started to widen in early 1990. However, while the level of output began to recover in the third quarter of 1992, the unemployment rate remained at a high level. The unemployment rate only started to recover to its pre-recession level in the second quarter of 1993, which was about three years after the start of the 1990s recession.

Figure 1 further shows that the unemployment rate after the 1980s recession did not return to its pre-recession position before the start of the 1990s recession, and it took around 8 years for the unemployment rate to fully recover after the 1990s recession. According to a report by the Office for National Statistics in 2009 (ONS, 2009), this finding indicates that the economy did not provide enough employment opportunities to account for the growth in the labour supply and people who became unemployed as a result of the recession.

The UK economy during the 'US dot.com' recession in the early 2000s was relatively stable with a low and declining unemployment rates (Tumino, 2015). Although the impact of the early 2000s recession on the UK economy and labour market was fairly small, discussion about this recession is also of interest. The early 2000s recession took place in the US for several reasons, one of which was the burst of the dot.com bubble which further adversely affected the U.S. stock markets. Other reasons include a series of corporate accounting scandals and the 9/11 attack, which resulted in a drastic fall in consumer confidence and demand for tourism. The early 2000s recession affected most Western countries, although some countries such as the

UK managed to avoid sliding into deep recession. Moreover, this recession did not last very long, and only took place between the years 2000 and 2001.[1]

Figure 1 shows that the patterns of yearly GDP levels and unemployment rates are relatively stable during the mid-1990s until around the mid-2000s, depicted by decreasing unemployment rates and increasing GDP levels, and thus show no signs of recession. Looking in more detail at the trends on quarterly data from Panel A of Figure 3 (highlighted by the red bar), the unemployment rate figure does show a slight increase between the third quarter of 2001 until the third quarter of 2002, albeit the quarterly output levels during this period keep on increasing and show no sign of economic downturn.

A far deeper recession, which is commonly called the Great Recession or the Global Financial Crisis, hit the UK in the late 2000s as a result of the subprime-mortgage crisis in the U.S. followed by a significant fall in demand across the world, which was partly caused by the hiatus in lending (credit crunch) (Jenkins, 2010). This recession is considered as the worst recession to have hit the OECD countries since the 1930s (OECD, 2011). Starting in the second quarter of 2008, the Great Recession lasted until the third quarter of 2009.[2] During this period, the cumulative output loss reached 7.2 percent peak to trough (Office for National Statistics, 2014a). Moreover, unlike the previous recessions in the 1980s and 1990s, the recovery of output levels to its pre-recession peak in this latest recession were relatively weak.[3]

The fall in business and consumer confidence, which led to a sharp decrease in household consumer expenditures and businesses’ investment plans, combined with restricted access to credit, all contributed to falling demand for labour and increasing unemployment (UKCES, 2014). The aggregate unemployment rate increased by 0.4 percentage point from 5.4 percent in 2007 to 5.8 percent in 2008, and went up again by 2 percentage points to 7.8 percent in 2009. The economy slowly recovered in 2010, yet the unemployment rate kept worsening to 8 percent in 2010 reaching its peak at

[1] Meanwhile, Dixon et.al (2011) analyses the dot.com recession for the U.S. labour market as in the period between January 2001 and June 2003.
[2] However, business confidence began to decline in 2007, prior to the start of economic contraction (ONS, 2009).
[3] In the previous recessions in 1980s and 1990s, it took around three years for the levels of output to return to its pre-recession peak levels. While in the Great Recession, it took about 5 years (in 2013) for output to return to its pre-recession peak level.

8.4 percent in the last quarter of 2011 before starting to decrease thereafter (Office for National Statistics, 2014a and 2014b). This evidence once again supports earlier trends from previous recession periods, where the impacts of recession on the labour market may have lasted beyond the end of the recession period itself.

Despite the severity of this latest recession in terms of the fall in output, the unemployment rate did not seem to be worse than that of previous recessions and was found to recover much more rapidly than the output level. In other words, the loss of jobs was smaller than the fall in output. In the 1980s recession, on the other hand, the percentage fall in employment was generally in line with the percentage fall in GDP, while during the 1990s recession the fall in employment rate was larger than the fall in output. Moreover, the highest rate of unemployment in 2011 as mentioned above, is also lower than the peak during the 1980s and 1990s recessions.

Gregg et al. (2011, pp. 18) argues that there are three factors that can explain this trend, i.e. macroeconomic policy, labour hoarding, and nominal wage adjustment. The first explanation of the UK's relatively better employment performance during the Great Recession is because the macroeconomic policy during this recession was generally very supportive. Unlike the 1980s and 1990s recessions, which resulted from the contraction in monetary policy to control higher inflation, the macroeconomic policy in the Great Recession was more expansive, with a loosening of both fiscal and monetary policy in order to stimulate demand (Coulter, 2016, pp. 198). The second explanation for the UK's employment performance during the Great Recession is that firms consciously retain their valuable labour at the expense of much lower productivity and real wages in order to absorb the fall in demand for labour. Unlike the 1990s, where firms' profits were much worse prior to the recession as a result of high interest rates to control for inflation, firms' profits were much higher prior to the Great Recession in the late 2000s, resulting in less pressure for firms to cut jobs in order to cope with the recession.

Furthermore, as in other recessions, there has been a significant growth of part-time jobs and self-employment. Gregg et al. (2011, pp. 13) argue that during a recession, the total hours of work falls faster than employment as overtime working is cut, some workers are placed on short-time working, and people move into part-time work when they struggle to find full-time jobs. According to Coulter (2016), Sweden and the UK are the only OECD countries that have experienced a smaller rise in unemployment relative to the fall in GDP without a deliberate government policy to subsidize short-term working.[4] In contrast with previous recessions, since output fell much faster than employment and hours worked, productivity also fell sharply during the latest Great Recession. A fall in productivity will then put upward pressure on firm costs and reduce demand unless offset by an adjustment of wages (Gregg et al., 2011, pp. 16). This explains the third reason of the UK's employment performance during the Great Recession, i.e. the willingness of workers to accept lower nominal wage growth in exchange for preservation of jobs at the cost of lower productivity.[5]

In regard to sectoral changes in employment, Coulter (2016, pp. 208) shows that since the start of the recession there has been a shift from public to private sector employment, and that it has been the low-paying public sector jobs that have been cut as indicated by the increase in the overall public sector pay bill. Moreover, similar to the 1980s and 1990s recessions, the manufacturing sector has been hit the hardest by the Great Recession with about 10 percent of employment lost in this recession. On the other hand, some services sectors such as health, education, and social work activities have experienced a growth in employment by 4 percent; meanwhile, other services sectors such as finance, retail and transport experienced a fall in employment by about 4 percent (Gregg et al., 2011, pp. 16).

From the above discussion, we could summarize that contractions in output were far deeper and recovered much slower in the recent Great Recession than in the previous 1980s and 1990s recessions. The impacts of the Great Recession on the labour market, however, are not found to be worse than the previous recessions, although in each of these recessions the unemployment rate only started to recover to its pre-recession position several years after the end of the recession period itself. With regard to the cause of recession, the early 1980s and 1990s recessions both predominantly resulted from the contraction in monetary policy to control for higher inflation (Jenkins, 2010). In contrast, the inflation levels during the Great Recession were relatively low, and this recession was mainly caused by restricted access to credit

[4] This is in contrast to the 1980s recession when the UK's government subsidized short-term working in many major manufacturing plants.
[5] Although the nominal wage growth was lower, but the real growth was sustained since there was a cut in interest rates.

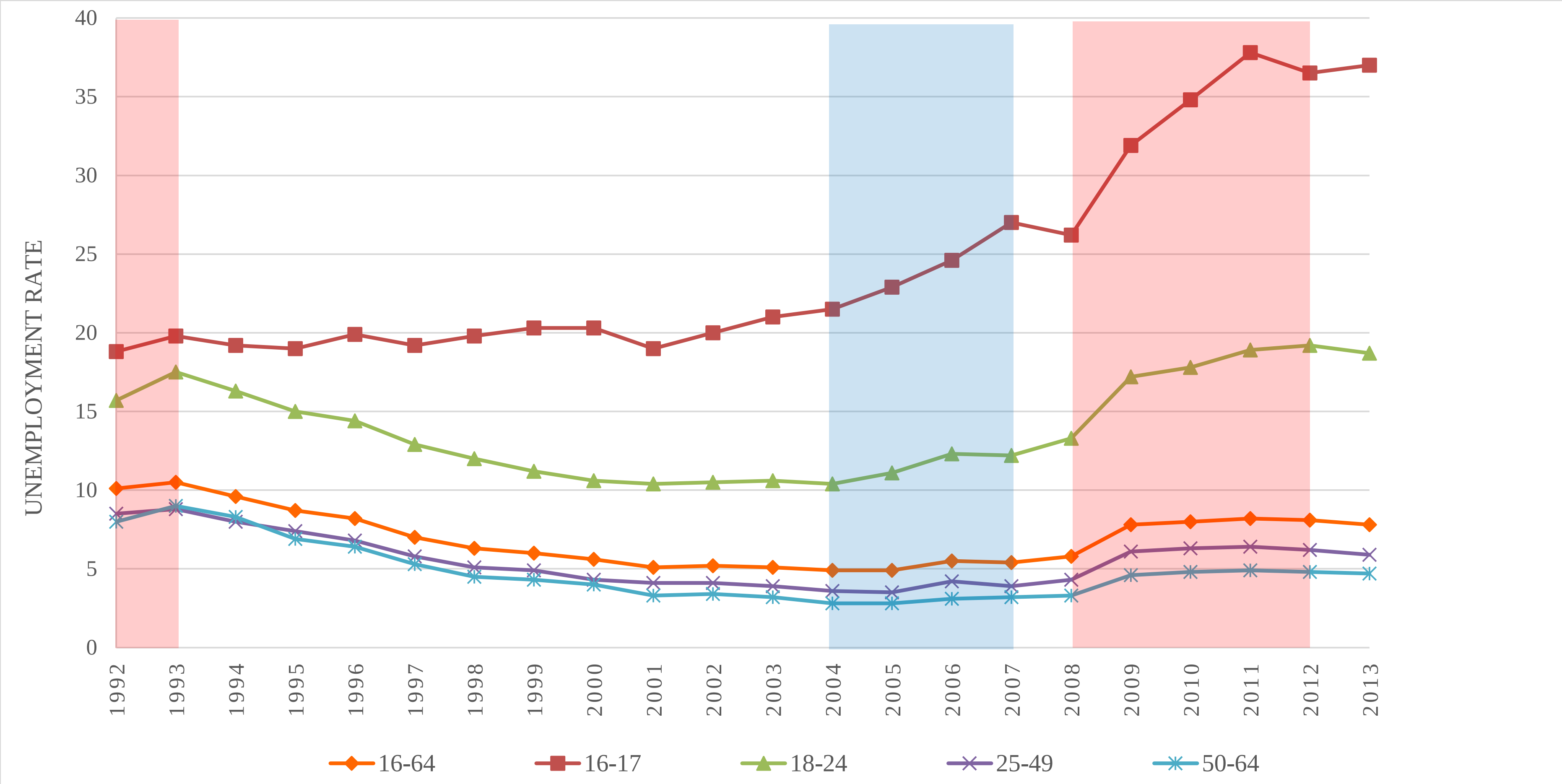
and the fall in business and household confidence, both leading to sharp cutbacks in spending and investment.

Panel B of Figure 3 shows further striking evidence in which the unemployment rate seems to increase around the mid-2000s, i.e. around the last quarter of 2005 until the first quarter of 2007 (highlighted by the blue bar), prior to the start of the Great Recession in 2008. As can be seen from Panel B of Figure 3, the gap between output level and the unemployment rate was becoming closer during this period. This gap started to widen again in early 2007 as the unemployment rate began to drop again before it then started to increase when the impacts of the Great Recession began to take place. One possible explanation for this trend is due to increasing participation rates in higher education, especially for the young people, prior to the Great Recession as suggested by Jenkins and Taylor (2012). The next sections will discuss in more detail about this uncommon trend of the unemployment rate in the mid-2000s by looking at the differences in unemployment rates by age group and the trends in higher education participation rates.

1.2 The UK Unemployment Trends by Age Group

As in other affected OECD countries, the issue of youth unemployment in the UK has received considerable attention from policy makers particularly during the recent Great Recession in 2008/2009. Figure 4 depicts the unemployment rates for different age groups from 1992 – 2013. In general, unemployment rates for the two oldest age groups (age group 25-49 and 50-64) tend to follow the general pattern of the aggregate unemployment rate of the working age population group (16-64). On the other hand, unemployment rates for teenagers (16-17) and older youths (18-24) have always been higher than that for the older age groups. The gap between youth and adult unemployment rates widen in every economic downturn, particularly during the Great Recession. Moreover, the unemployment rate for teenagers (16-17) is more volatile compared to the unemployment rates for other older age groups, that is, it does not always decrease when the economy is in good condition, and it tends to have steeper increase during recession.

Figure 4 Yearly Unemployment Rates by Age Group, 1992-2013



Source: Office for National Statistics, 2014b. (*Note*: the complete dataset of the unemployment rates by age group from this source are only available from 1992)

During the early 1990s recession, the unemployment rate for teenagers (16-17) rose from 18.8 percent in 1992 to its peak of 19.8 percent in 1993, which is two years after the recession had ended. Similarly, in the same period, the unemployment rate for older youths (18-24) also increased by about 1.8 percentage points from 15.7 percent to 17.5 percent. Despite having a lower unemployment rate in general, the unemployment rates for older age groups also worsened during this period. From 1992 to 1993, the unemployment rate for adults aged 50-64 rose from 8 to 9 percent, whereas the unemployment rate for those in the prime-age group (25-49) increased moderately by only 0.3 percentage point, from 8.5 percent in 1992 to 8.8 percent in 1993.

After 1993, except for teenagers, the unemployment rates for all other age groups tended to continuously decrease. Gregg et al. (2011, pp. 41) also identifies this phenomenon, where they state that after the 1990s recession, young people in the age group 16-17 did not seem to have experienced the same fall in unemployment as the older groups, due to increasing numbers of non-employed teenagers staying in education. The unemployment rate of the prime-age group, those aged 25-49, fell significantly after the 1990s recession, from nearly 9 percent in 1993 to only 3.5 percent in 2005. Similarly, the unemployment rate for the oldest age group had a significant fall from 9 percent in 1993 to only around 2.8 percent in 2005. For older youths (aged 18-24), their unemployment rate dropped from around 17.5 percent in 1993 to about 10.4 percent in 2004.

Another interesting fact from Figure 4 is that the youth labour market had worsened several years prior to the start of the Great Recession, particularly during the period between 2004 and 2007. As shown by the blue area in Figure 4, teenage unemployment rate started to rise from 21.5 percent in 2004 to 27 percent in 2007, before then dropped for a while to around 26 percent in 2008 and beginning to rise again in 2009 as a result of the recession. Similarly, unemployment for those aged 18 – 24 began to rise from 10.4 percent in 2004 until it reached its peak of around 19.2 percent in 2012. Gregg et al. (2011, pp. 53) argue that these trends were partly because of changes in the Employment Service which targeted more vigorously at the other ‘at risk’ groups.

Moreover, Gregg et al. (2011) also shows that other factors, such as immigration, the minimum wage and increasing demand for high-skilled workers do not seem to explain the rise in youth unemployment in the mid-2000s. Meanwhile, Jenkins et al. (2012) argue that the reason behind the increase in non-employment rates in the mid-2000s is partly due to increasing participation in post-compulsory education, while the latter increase in the late 2000s reflects the impacts of the Great Recession.

As for the Great Recession is concerned, different age group tended to react differently during this period. From Figure 4 it can be seen that young people tend to be hit harder in the last recession compared to the other age groups. The youth unemployment rate for those aged 16-24 has steeper increase compared to the increase in unemployment rates for the older age groups. From 2008 to 2009, the unemployment rate for teenagers (16-17) rose quite substantially by almost 6 percentage points from 26.2 percent to 31.9 percent, which is much higher than its peak during the 1990s recession. Nevertheless, it only reached its peak in 2011 at 37.8 percent. Similarly, the unemployment rate for older youths (18-24) had a sharp increase from 13.3 percent in 2008 to 17.2 percent in 2009; it then maintained a steady increase every year until its peak in 2012 with 19.2 percent, a level which is also higher than the peak during the 1990s recession. On the other hand, the increase for adult unemployment rates (25-64) seems to be relatively more moderate, and has lower peaks than its 1990s level. The highest point during this last recession was only around 6.4 percent and 4.9 percent in 2011 for those aged 25-49 and 50-64, respectively.

1.2.1 Participation rates in UK higher education (HE)

To shed more light on the unemployment trends in the mid-2000s until the Great Recession, especially in the case of the young people, this section will add some evidence regarding participation rates in higher education (HE) during these periods. As mentioned before, Jenkins et al. (2012, pp. 24) suggests that the increase in non-employment rates in the mid-2000s reflects increasing participation in post-compulsory education. Clark (2011) finds that the youth labour market situation in the UK has large impacts on enrolment in post-compulsory education, where it tends to increase during economic downturns.

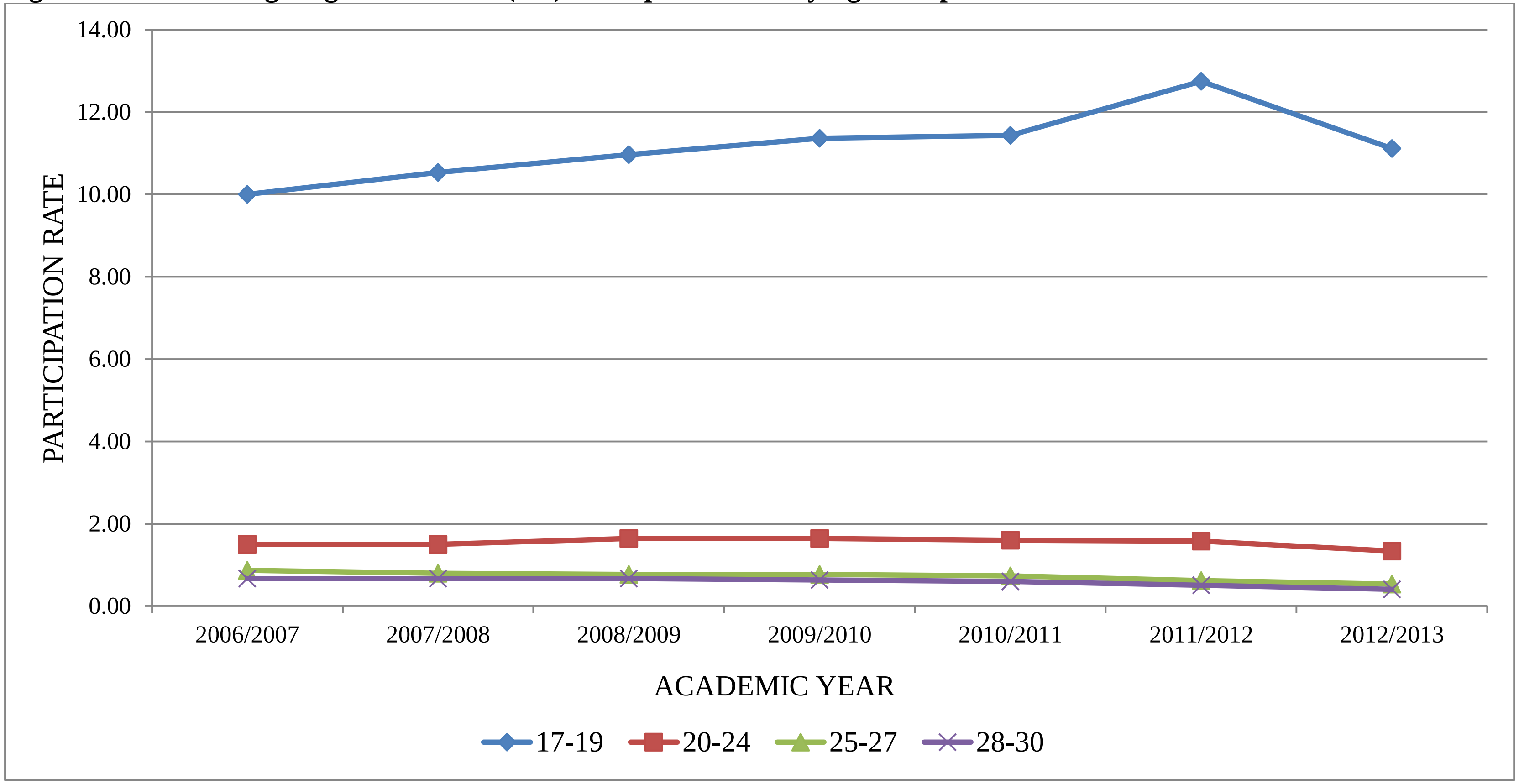
Using data from several OECD countries, Douglass (2010) also shows that the demand for higher education generally goes up during economic downturns. Moreover, Barakat et al. (2010) argue that the impact of recession, in their study referring to the Great Recession, on demand of education, at least in the European context, only apply to demand for post-compulsory education, particularly tertiary education. This section gives a brief description of the demand side for education, particularly for higher education (HE) in the UK, by different age groups. Figure 5 illustrates the participation rate in HE in the UK (averaged out) by age group.[6]

Figure 5 shows that the highest participation rate is for teenagers aged 17-19, in particular the 18 year olds, whereas the participation rates for the adult age groups account for less than one percent for each age category. One interesting pattern from Figure 5 is a sharp increase in the participation rate for the teenage age group during the period 2010-2012. Barakat et al. (2010) finds supporting evidence based on reports published by the central Universities and Colleges Admissions Service (UCAS) in which applications to universities for the academic year 2010-2011 increased by over twenty percent compared to the previous year. This pattern may be caused by the impacts of the Great Recession in the late 2000s. Moreover, much of this increase is attributable to 'mature' student applicants, i.e. those above the age of 25, whose share grew by over sixty percent in one year (Barakat et al., 2010, pp. 7).

It is argued that young people are more likely to choose to go back to further education during economic downturns in order to enhance their human capital and thus their employability in the future, rather than competing in a tight labour market situation (Barakat et al., 2010; Clark, 2011). This may imply that further education is an alternative best option for the young people to cope with recession rather than being unemployed due to rivalry with their adult counterparts in the labour market, or simply giving up looking for a job and dropping out. Using the UK's regional panel data from 1975 to 2005, Clark (2011) finds a strong positive relationship between youth labour market and enrolment in post-compulsory education, where a weakening youth labour market tends to cause enrolment to increase.[7]

[6] The participation rate by age is calculated by diving the number of initial entrants in each age category by the number of population for that age category.
[7] Meanwhile, household income variable is found to have a weak and statistically significant effect on enrolment.

Figure 5 The Average Higher Education (HE) Participation Rates by Age Group



Source: Office for National Statistics, 2015c. (*Note*: the information on participation rates by different age groups prior to the academic year 2006/2007 are not available from this source)

In a cross-country review, for both developed and developing countries during different periods of recession, Ferreira and Schady (2009) and Marcus and Gavrilovic (2010) show that in poorer countries, the effects of recession are usually pro-cyclical, that is, education enrolment rates tend to fall and dropout rates tend to increase during a recession. This is because the opportunity costs of schooling becomes higher and the need for adolescents and young people to contribute economically to their households becomes greater. On the other hand, for higher income countries, such as the US, education enrolments at secondary and tertiary levels usually increase during recession. For these countries, declining labour market opportunities during recessions causes the opportunity costs of schooling become lower and thus young people would instead seek to invest in their future employability. However, this effect is not applicable for those poorer young people, as the evidence shows that they are much less likely to stay in education during recession.

1.3 NEET versus Unemployment

Much of the discussion in the current literature regarding youths emphasizes the significance of the NEET (Not in Education, Employment or Training) rate as opposed to unemployment rate. This is because the youth unemployment rate could be misleading if many of these young people are giving up looking for jobs altogether and becoming economically inactive. Freeman et al. (1982, pp. 6) state that "… many spells of teenage unemployment end not when a job is found, but when the young person drops out of the labour force."

In general, the unemployment rate in the UK is formally measured by the Labour Force Survey (LFS), following the International Labour Organisation's (ILO) definition of unemployment. More specifically, unemployed people are defined as those without a job who have been actively seeking for work in the past 4 weeks and are available to start work in the next 2 weeks including those who are out of work but have found a job and are waiting to start it in the next 2 weeks (ONS, 2014b and 2015b). The unemployment rates are calculated as the number of unemployed people divided by the economically active population, which include those in employment and those who are unemployed.

Therefore, for a given level of unemployment, increasing numbers of young people going into full-time education or training would reduce the size of the economically active population and increase the unemployment rate. In addition, some youths who are classified as unemployed might also be full-time students. Freeman et al. (1982, pp. 5) argue that unemployment amongst young person in school represents less loss to society than that of an adult seeking full-time employment. Similarly, increasing numbers of youths who are out of the labour force would again increase the youth unemployment rate due to the decrease in the denominator.

For the above reasons, an alternative indicator to the youth unemployment rate is the proportion of those young people who are not in education, employment or training (NEET). In this regard, the NEET rate is calculated by dividing the total number of people in a certain age group who are not in education, employment or training by the total number of people in that corresponding age group. Thus, the denominator for the NEET rate is the number of people in a particular age group, instead of only the number of economically active population.[8] Moreover, by its definition, the youth unemployment rate may include those who are still in education but currently looking for or ready to work, whereas the NEET rate excludes all those people who are still in employment, education or training.

In the UK, the term NEET was formally introduced in the late 1990s, following changes in the UK unemployment benefit regime, which removed young people under the age of 18 (more specifically those aged 16-18 years old) from the unemployment statistics and thus left them without access to unemployment benefits (Maguire, 2015). At the political level, this term was introduced in 1999 with the publication of the government's *Bridging the gap* report (Eurofound, 2012). This term is now widely used across the European and other OECD countries. Most European countries defined NEET as young people aged between 15 and 24 years who were not in employment, education or training, and used national data from the Labour Force Survey (LFS) to

[8] For example, the NEET rate for age group 16-17 is calculated by the total number of young people aged 16-17 who are NEET (Not in Education, Employment or Training) divided by the total population of people aged 16-17.

measure the phenomenon (Eurofound, 2012, pp. 20). Meanwhile, at the international level, different countries use different definitions to define those who are NEET.[9]

The term NEET has been widely used by policy makers, particularly in the UK and other European countries, to search for effective interventions in tackling the problems of joblessness and other forms of human capital accumulation, such as education, amongst young people. Being NEET is sometimes associated with the risk of social exclusion, which if it persists will create scarring effects when these young people reach adulthood. Labelling young people as NEET, however, is not without its critics. One of the critiques using the 'NEET' label for interventions with young people according to Yates and Payne (2006) is that the label 'NEET' only classifies young people by what they are *not*, i.e. not in education, employment or training, neglecting the fact that this group consists of a heterogeneous mix of young people with different backgrounds, risks and issues. The authors give an example where some of these young people might be consciously making the decision of not being in EET, for example young parents who prefer to concentrate on child care rather than going to education or training, and for them being NEET is not really a big issue. Thus, simply labelling these young people as NEET and targeting them as such can be misleading, as well as diverting attention away from the other real, and sometimes more important, difficulties that they actual face.[10]

Similar argument is also stated in Furlong (2006). Furlong (2006) argues that one disadvantage of the use of the term NEET is the lack of an agreed definition particularly to make international comparison. Moreover, it is also argued that the sub-groups contained within the NEET category have very different experiences, characteristics and needs. In this case, the NEET classification combines those young people who have little control over their situation with those exercising choices (Furlong, 2006, pp. 554).

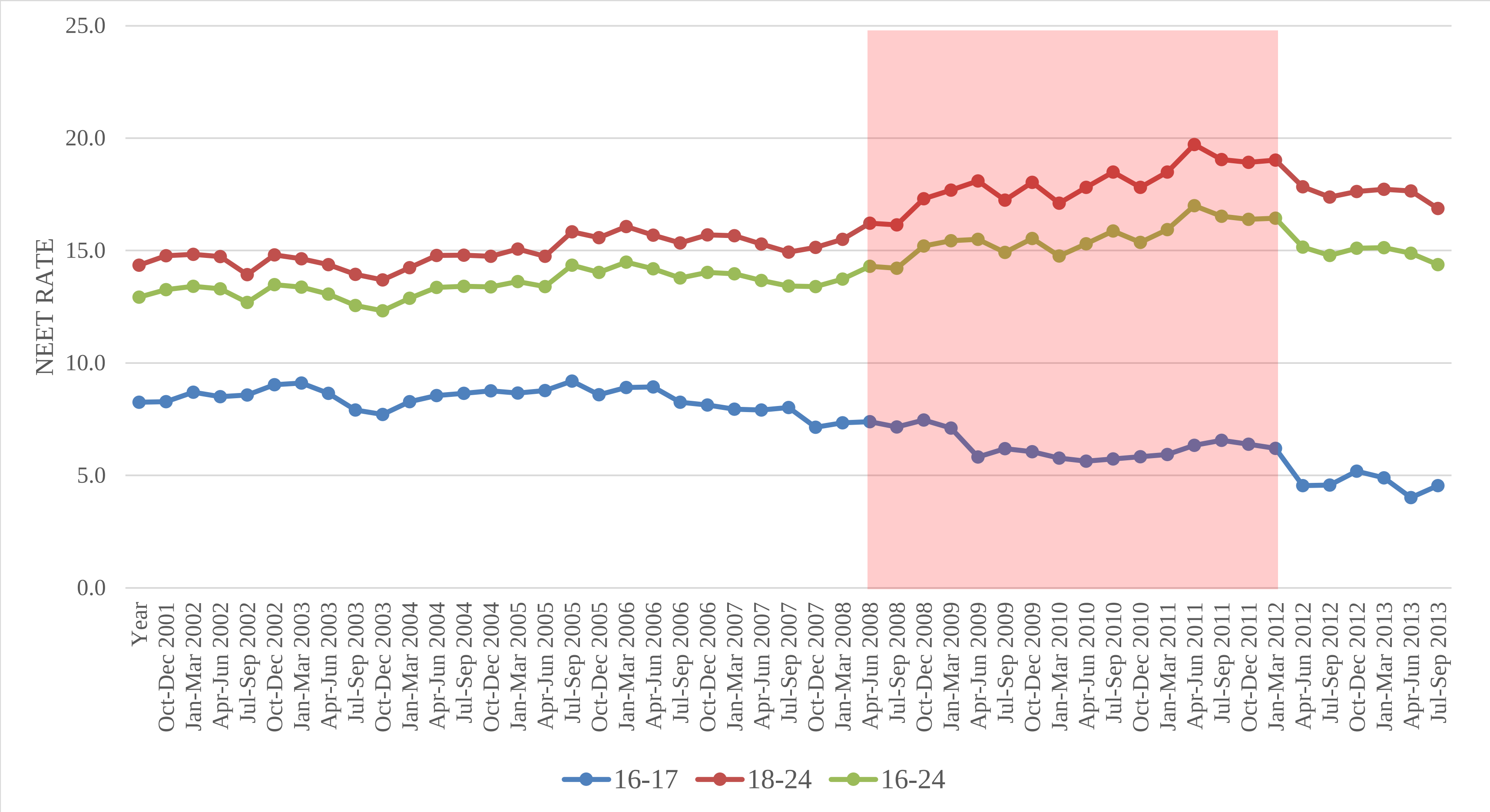
[9] For example in Japan, the NEET group is defined as 'people aged 15–34 years old who are not in the labour force, not attending school and not housekeeping'; while in Korea, NEET refers to 'people aged 15–34 years who have left school, are not preparing to enter a company, do not have a job, do not have family responsibilities (or children) and are not married' (Eurofound, 2012, pp. 20).
[10] Nevertheless, discussions in Yates and Payne (2006) paper are based on evidence from the Connexions Impact Study which employs a purposive sampling, and mostly qualitative, method. Thus, the authors clearly state that the findings cannot be seen as representative of the general population of young people, nor can we make generalisation of these findings.

Figure 6 depicts the quarterly NEET rates for young people in the UK from the last quarter of 2001 until the last quarter of 2013. Unlike the previous analysis of unemployment rates (from Figure 4), the NEET rates for those aged 18-24 have always been higher than the rates for teenagers aged 16-17. One explanation could be that these teenagers are more likely to be actively engaged in full-time education or training, while those older youths aged 18 years and above are more likely to have finished their compulsory education, and thus have a higher tendency to compete in the labour market. The NEET rates for older youths also tend to be more volatile during recession. From 2008 until 2012, the NEET rates for teenagers are quite flat, if not decreasing at some points. In contrast, NEET rates for older youths are more volatile and most of the times showing an increase from the previous quarter.

Despite its popularity, the term NEET has only been applied to discussions regarding young people. Although it is understandable that young people are more exposed to the risk of being outside the labour market, yet their adult counterparts might face similar risks of social exclusion due to being pushed out of the labour market. None of the existing literature, to the best of our knowledge, has applied the concept of NEET to investigate employment opportunities for adults, i.e. those aged 25 and above, and compared this with that for youths. For this reason, little is known about whether these adults are at risk of being in NEET more than the youths or vice versa.

We are aware that adults are less likely to attend full-time education or government training, particularly due to the nature and subject targeting of these programmes. Being NEET, however, also involves those who are inactive for various reasons, thus the risk of being outside the labour market due to inactivity should also apply to those adults. Therefore, this thesis will try to apply the concept of NEET not only for the young group of people, but also for the older group of people.

Figure 6 Quarterly NEET Rates by Age Group, 2001-2013



Source: Office for National Statistics, 2014c.

Utilizing two nationally representative datasets from the British Household Panel Survey (BHPS) and the Understanding Society (US) survey, the main objective of this thesis is to present an analysis of the determinants and effects of business cycle as well as previous labour market histories on the probability of NEET in the UK. In order to conduct our analysis, this thesis will be divided into several empirical chapters. The first empirical chapter examines the impacts of recessions and other factors on the probability of being in NEET and Non-NEET states at a given point in time for different age groups and regions in the UK. The second empirical chapter discusses the dynamic transition probabilities estimations, utilizing the Markov models. The third empirical chapter estimates the labour market dynamics, taking into account other forms of state dependence (i.e. duration, lagged-duration, and occurrence dependence), using discrete-time duration models. Finally, the conclusion along with policy recommendation will be presented in the last chapter.

1.4 Contribution of Study

Growing concern regarding the number of young people who are NEET in the UK as opposed to youths who are unemployed is the focus of this research. This thesis tries to make several contributions to the existing literature by extending the use of the NEET concept for different age groups, both youth and adult age groups, using a larger dataset of the 18 waves of the British Household Panel Survey (BHPS) and the first five waves of the Understanding Society survey.

In previous studies, discussion of the labour market for young people is mostly conducted separately from those for adults. Moreover, as also mentioned previously, the use of the NEET concept is mostly applied to young people, and none of the existing literature, to the best of our knowledge, has applied this concept to older age groups. In this regard, most previous studies disaggregated the labour market status into three major standard categories: employment, unemployment, and inactivity. In this study, we try to include another type of labour market category, that of being in education (or training) into our analyses.

Furthermore, in our labour market transition estimations, not only do we estimate the transition out of the education (or training) state (commonly known as the school-to-work transition), but we also analyse the reverse transition probabilities from other labour market states into the education (or training) state. We are aware that the number of individuals from the adult age group who are in the education state is much lower compared to those from the youth age group. However, unlike the labour market state of being retired that only applies to older individuals, we still find sufficient observations for the adult age group in education (or training) who make transitions in and out of this state.

Another contribution of this thesis is to include estimations for different business cycle phases, both recession and non-recession periods, as illustrated in Figure 1. We include the business cycle indicator into our estimations in the form of time dummy variables. In addition, the trends in both GDP levels and unemployment rates, depicted in Figure 1, are used as our benchmark to generate these dummy variables. Disaggregating the business cycle into several non-overlapping periods allows us to investigate the various impacts of different business cycle periods on the labour market. More specifically, we would be able to observe whether all recession periods have similar adverse impacts on the labour market and whether all non-recession periods have an equal positive effect on the labour market. Since different recessions are different in length and depth, we expect that the effect of each recession period on the labour market will be different. Similarly, different non-recession periods might have different effects on the labour market. In this case, we expect that the non-recession period which follows immediately after a recession will still have an adverse impact on the labour market.

CHAPTER 2

The Determinants of NEET

As in most European countries, the issue of youth unemployment in the UK has received great concern from policymakers particularly during the recent Great Recession in 2008/2009. In the context of youth unemployment, policymakers in the European countries are increasingly using the concept of NEET – Not in Education, Employment or Training – to adequately capture the situation of young people, since many of these young people are students and thus they are regarded as being out of the labour force when the traditional unemployment indicator is used. At the EU level, NEETs are considered to be one of the most problematic groups in the context of youth unemployment (Eurofound, 2012). Moreover, in terms of policy perspective, the main challenges for policymakers are to provide pathways for the young people back into education and training as well as enabling contact for these young people with the labour market.

The usage of the concept of NEET, however, both in the context of policy making and in the existing literature, only applied to young people, and thus this concept is rarely to be found in the discussions of adult age groups. One of the contributions of our study is to apply the concept of NEET not only to the group of young people but also for those in the older age groups. By definition, the classification of NEET in the UK includes those (young people) who are unemployed (‘active’ NEET) and those looking after children or relatives at home, temporarily sick or long-term disabled (‘inactive’ NEET), as well as those putting their efforts into developing artistic or musical talents, or simply taking a break from work or education (Furlong, 2006, pp. 554). Thus, the concept of NEET involves the situation of being unemployed and economically inactive, which could also be applied in the case of adult labour market status.

Furthermore, with respect to the policy context, the concept of NEET has been used by policymakers to measure the disengagement of young people from the labour market and from society in general (Eurofound, 2012; Maguire, 2015). By the same token, this concept could be applied as a measurement of disengagement for adults who are economically inactive and unemployed. It has been well documented in several studies (see, for example, Haardt, 2005 and Cappellari et al., 2005) that one of the policy concerns in the case of adult labour market, particularly for older individuals, is to re-engage those who are out of the labour force back into employment. Hence, applying the same concept of NEET for adults would enable us to tackle the issue of social exclusion in the case of adults who are currently being disengaged from the labour market due to economic inactivity as well as for those who are in unemployment.

As mentioned in the previous chapter, we are aware of the fact that adults are less likely than youths to attend full-time education or government training. Moreover, the previous chapter has also presented some evidence that young people seemed to take 'shelter' in education during the recent Great Recession, as indicated by the increasing participation rates in Higher Education (see Barakat et al., 2010 and Jenkins et al., 2012). In this study, we will try to examine whether similar patterns also exist in the case of adult age groups; that is, whether the adult age groups are also more likely to be in education during bad economic conditions. The results from this analysis might be of interest for policy purposes, since it would enable us to see whether policy to provide pathways for individuals to return to education or training would only be applicable in the case of youths or it would also be effective for the older individuals.

For the above reasons the main objective of this chapter is to analyse the characteristics of individuals in a given labour market state at a given point in time. In other words, we try to estimate the state probabilities associated with being NEET and to see 'who is in what state.' Our main focus in this chapter is to analyse the determinants of being in NEET and Non-NEET states, particularly regarding the impacts of recession on different age groups as well as for different regional areas in the UK. For the later analysis, we disaggregated regions in the UK between the northern and southern regions.[21]

In regard to the effect of recession on different age groups, numerous studies have suggested that the employment of youths is highly vulnerable to the overall

[21] The northern regions consist of North East, North West, Yorkshire and Humber, Wales, Scotland, Northern Ireland and Channel Island; while the southern regions are East Midlands, West Midlands, East, London, South East, and South West.

conditions of the economy. Scarpetta and Manfredi (2010) using the OECD data find that youth unemployment is indeed more sensitive to the business cycle than adult unemployment. Utilizing data from more than 70 countries spanning the period of 1980 – 2005, Choudhry et al. (2012) also shows evidence that the impact from recession is higher for the youth than for adult unemployment rate. Moreover, growing number of studies have concentrated their discussions on those young people who are NEET as opposed to unemployed. Nevertheless, as previously discussed, discussions regarding the importance of NEET on older age groups are rare to be found.

Looking at the trends in unemployment for different regions in the UK during various business cycle periods, Figure 7 provides the pictures of the real per capita Gross Value Added (GVA) and unemployment rates for those regions in the northern and southern parts of the UK.[22] For comparison, the level of real GVA and unemployment rate at the national level are also included. It is clear from Figure 7 that output for regions in the southern part of the UK is far higher than output for regions in the northern part. One reason could be that regions in the southern part of the UK, such as London, are endowed with better infrastructure and might have more industry that tends to be high end, such that the value added from these regions are higher compared to regions in the northern part of the UK. Moreover, it is also evident from the Figure that recessions hit both northern and southern regions in the UK, indicated by a fall in the real GVA level, except for the period during the dot.com recession in the early 2000s which had little severe impacts on the UK economy. Later in our analysis, we find that the impacts of recession by region are different depending on the cause of the recession and the difference in industrial structure between the northern and southern region of the UK.

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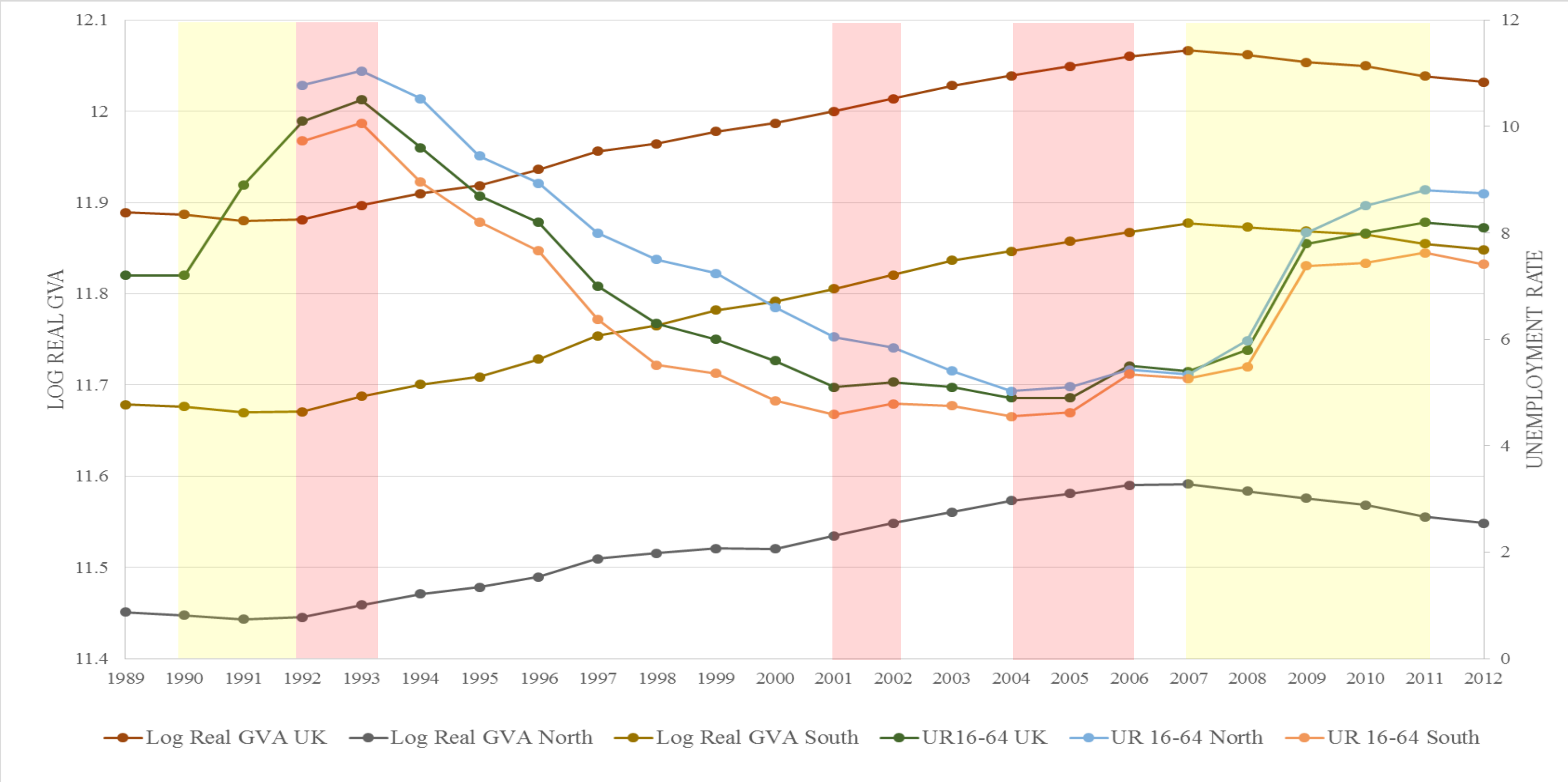
[22] The regional income data from the Office for National Statistics (ONS) are only available in the form of Gross Value Added (GVA). The ONS did recently release the historical Regional GDP data from 1968-1996 upon user request. However, the ONS warns that these data may not be suitable for all analytical purposes, partly because they were compiled as GDP rather than GVA estimates (see ONS, 2016b). The latest ONS Regional GVA estimates are in basic prices which include taxes on the production process (such as business rates and any vehicle excise duty paid by businesses) but exclude taxes (less subsidies) on products. By contrast, the GDP is measured in market prices. The difference between the two is called the basic price adjustment (BPA), and reflects the impact of taxes and subsidies on market prices (Chamberlin, 2010). In general, the relationship between GDP and GVA can be written as follows: GDP at market prices = GVA at basic prices + taxes on products - subsidies on products. Moreover, GVA at factor cost + (Production taxes less Production subsidies) = GVA at basic prices. Additionally, the real Regional GVA estimates are obtained by dividing the nominal Regional GVA by the Regional Retail Price Index (RPI) for each corresponding year, with the base year of 2005.

Figure 7 **Yearly UK and Regional Log Per Capita Gross Value Added (in £) and Unemployment Rate (UR) 16-64, 1989-2012**



Source: Office for National Statistic s, 2014d (for per capita GVA) and 2014e (for UR).

Note: yellow bar indicates periods of a fall in GVA and increase in the unemployment rate, whereas red bar represents the increase in unemployment rate after the level of GVA has risen back.

Figure 7 also shows that the unemployment rates by region generally follow the unemployment rate trends at the national level. Similar to the figure of real GVA by region, the unemployment rate for the northern regions is also higher than the unemployment rate of the southern regions in all periods. Moreover, the unemployment rate for the northern regions almost always higher than the national unemployment rate. This may support the notion that regions in the southern part of the UK could have more job opportunities available as compared to those regions in the northern part. In addition, almost every period of recession is accompanied by an increase in the unemployment rate. One exception is during the early 2000s recession, where the increase in the unemployment rate only apparent in the case of southern regions, whereas the unemployment rate for the northern regions tended to decrease.

For the purpose of this study, we make use of the UK British Household Panel Survey (BHPS) dataset for waves 1-18, and joined them with its successor study of the Understanding Society (US) data for waves 1-5. Our sample consists of individuals aged 16-65 in each wave who have not yet retired. We estimate multinomial logit models to account for multiple labour market states based on the self-reported current labour market status (or economic activity) of respondents in each survey. In addition, not only do we estimate the three standard labour market states, i.e. employment, unemployment, and inactivity (out of the labour force), but we also include the economic activities of being in education or training as alternatives. Classifying the labour market statuses into these categories enables us to distinguish between individuals who are NEET (those who are not in education, employment or training) with those who are Non-NEET or EET (those in education, employment or training).

Lastly, there are at least two reasons why the analysis in this chapter might be important to support analyses in the next chapters. First, our analysis in this chapter provides a picture of the characteristics of individuals who are in a particular labour market state. Secondly, our results from this chapter can be used as a benchmark to analyse the dynamic nature of transitions between different labour market states (transition probabilities) which will be the main purpose of the next chapters.

2.1 Research Questions

In this chapter, we focus on individual labour market states at a given point in time, and our research questions are:

1) What are the characteristics of those who are in NEET as opposed to those in Non-NEET states?
2) Does the probability of being in NEET vary by age group? And do young people have a higher chance to be in NEET compared to their adult counterparts?
3) Do different business cycle periods, particularly recessions, have different impacts on the probability of being NEET and does this vary by age group and region? In this case, we are interested in whether young people suffer more from the economic downturns when compared to their adult counterparts? In other words, are young people more likely to be in NEET, either being in unemployment or inactivity, during recessions?
4) Also, does living in the southern part of the UK bring more advantages during the recession periods than living in the northern part of the UK (including Wales) in terms of a person's labour market status?

Many previous studies have suggested that young people are more vulnerable to any economic shocks, thus we expect that young people would be more likely to be in NEET states during recessions, and that these adverse impacts of recession would be greater for these young groups compared to older age groups. We would also expect a higher chances for youths to be in education or training state during recession. Dolado et al. (2013) using the European Labour Force Survey data shows descriptive evidence of increasing percentages of NEET young people in Spain who returned to the education system or training programmes during recession, even though the process takes place at a low pace.

In addition, it is also expected that those regions in the northern part of the UK (including Wales) will be affected more by the economic downturns than those regions in the southern part, partly due to lower level of regional income, which may also indicate lower level of infrastructure and productivity, that would make it harder for these regions to escape from recession.

2.2 Literature Review

This section discusses the literature which has investigated those characteristics that influence individual labour market status. These characteristics, among other factors, include individual personal characteristics (such as age, gender, education, ethnicity, etc.) and characteristics at the household level (e.g. the presence of children or spouse, type of housing, etc.). Other macro-level variables, such as the rate of growth of GDP or the unemployment rate, are usually also included into the analysis as proxies for the labour market or shocks to the economy. In most cases, it is found that the labour market status of young people is more vulnerable to any kind of economic shocks as compared to that of the adult labour market (Bell and Blanchflower, 2010b, 2011a, 2011b; Marcus and Gavrilovic, 2010). Hence, young people are more likely to experience multiple spells of being in-and-out of the NEET state.

In the case of the youth labour market studies, the discussions have been mostly centred on issues relating to the transition from school to the labour market, also known as the school-to-work transition, as well as the determinants of youth unemployment (Freeman and Wise, 1982; Dolton et al., 1994; Marks and Fleming, 1998; Lassibille et al., 2001; Ryan, 2001; Andrews et al., 2002; Bradley and Nguyen, 2004; Andrews and Bradley, 1997; Caroleo and Pastore, 2007; Quintini et al., 2007; Choudhry et al., 2012; Bell and Blanchflower, 2011a, 2011b; Lucchino et al., 2012). Most of these studies have moved from a cross-sectional analysis into a more advanced longitudinal investigation.

In much of the previous literature, it is argued that the main reason for unemployment among youths is that these young people have lower levels of human capital and therefore lower productivity compared to their adult counterparts (Caroleo and Pastore, 2007; Bell and Blanchflower, 2011a, 2011b; Gregg and Wadsworth, 2011; Choudhry et al., 2012; Jenkins and Taylor, 2012). Caroleo et al. (2007) further argue that despite the increasing educational attainment, young people still lack two components of human capital, i.e. generic and job-specific work experience, which they refer to as the “youth experience gap” problem. For this reason, young people would move in and out of employment in search of the best job-worker match. As a consequence, employers prefer adult workers to youth workers. This implies that the employment probability for adults is higher than that for youths.

Bell et al. (2011b, pp. 242) state several reasons why youth unemployment rate may be higher than that of adult. The first reason comes from the internal labour market side, which relates to the lack of general and firm-specific skills owned by the young workers compared to those owned by the adult workers. Secondly, in the external labour market, young workers may be less efficient in job searching activities compared to adults since they are likely to have fewer networking opportunities and less experience in finding a job. Lastly, on the supply side, they argue that youths are less likely to have significant financial commitments than their elders, which may then restrict the job search activities of these young people.

Lower levels of human capital and a lack of work experience are no doubt significant aspects of youth unemployment. However, there are other factors that play a significant role in influencing youth unemployment. A study by D'lppolito (2011) compares the labour market outcomes in Denmark and Italy, where the author argues that labour market regulations, the strength of the economy, and the proportion of young people in the population are among significant determinants of youth unemployment. One of the main findings in this study is that the growth in real GDP significantly reduces the youth unemployment rate in both Danish and Italian youth labour markets.

Other studies show that personal characteristics such as age, gender, ethnicity, and education also significantly influence the likelihood of unemployment among youths. Harris (1996), using the Australian Longitudinal Survey (1985-1988), finds that personal characteristics such as age, education, and financial commitments have a positive impact on the employment probability. The probability of employment increases with age and the financial commitment of buying a house exerts a significant positive effect on employment prospects, particularly for males. The author further finds that females are less likely to supply their labour if they have children. Other factors such as, place of residence, marital status, and household type are also found to be important determinants of unemployment duration and incidence of unemployment. In this study, however, there is little evidence of a racial group disadvantage, although it is found that people with disabilities are disadvantaged in the workplace. Harris (1996, pp. 127) suggests that a policy directed towards education will have direct implications for reducing unemployment levels as well as the length of unemployment spells.

A study by Marks et al. (1998), again for Australian youths, aims to analyse the factors influencing youth unemployment by utilizing panel data from four cohorts of Australian young people born in the years between 1961 and 1975. They find that age is an important variable with respect to the incidence of unemployment, where older young people are less likely to be unemployed than their younger counterparts. They also find that after controlling for school achievement, the school qualifications such as degrees, apprenticeships and TAFE certificates become less significant. Based on this result, the authors argue that increasing post-school participation would initially reduce unemployment, but for those with poor skills in literacy and numeracy this reduction in unemployment would not be sustainable in the long-run. In terms of gender, they find that the unemployment incidence for men is not significantly different to women. Yet, after taking into account labour market experience, the result shows that men are more likely to become unemployed than women. Parental background (i.e. parental occupation) also influences the probability of unemployment but the effect from this variable become smaller once school factors and qualifications are taken into consideration.

As discussed previously, in the case of youth labour market, the concern is mostly on the number of young people who are in NEET and not in NEET. Bynner and Parsons (2002) analyse the impacts of earlier educational achievement and circumstances of young people (over the ages 16-18) on the probability of entering into and exiting from NEET status in their later lives (outcomes at the age of 21). They use longitudinal data from the 1979 British Birth Cohort Study (BCS70). They find that capital in the home, represented by a lack of parental interest in a child's education (for girls at age 10) and parent's not reading to child (for boys at age 5) play a significant role in predicting NEET. Moreover, for boys, living in the inner-city also has a significant role in predicting NEET, whereas for girls family poverty also matters. These variables remain significant even after taking into account the highest educational attainment achieved at the age of 16. Another study concerning NEET is conducted by Pemberton (2008) in the case of young people in Greater Merseyside, UK. The author highlights the importance of intergenerational factors and youth disaffection as the main predictors of NEET status.

The impact of economic recession on youth unemployment has also been discussed in much literature (see Demidova and Signorelli, 2010; Marcus and

Gavrilovic, 2010; Scarpetta et al., 2010; Choudhry et al., 2012; Kelly et al., 2013). Kelly et al. (2013), for example, looks at the transition in the labour market for Irish youths, taking into account the impact of the last Great Recession in 2009. Utilizing the longitudinal household survey dataset, they analyse the impacts of socioeconomic and demographic characteristics on the probability of young people transitioning from unemployment status to employment in 2006 and 2011, representing the period before the recession and the recovery period after the recession, respectively. This study finds that the rate of transition to employment for unemployed youths fell dramatically between 2006 and 2011. Moreover, they argue that this fall is not due to changes in the composition or the characteristics of the unemployed group but to changes in the external environment, where education and nationality factors have become more important for finding a job in Ireland (Kelly et al., 2013, pp. 16).

Bell et al. (2011a), using the 2009 Eurobarometer studies, examines the individual characteristics associated with having lost a job during the recession. They find that males, people aged 15 – 24, and immigrants are those who are more likely to have lost their jobs during recession. Another cross-country study by Choudhry et al. (2012) using a large sample of more than 70 countries (including the OECD and developing countries) for the period 1980-2005 finds that financial crises significantly increase the youth unemployment rate and the impacts from crises on the youth unemployment rate are higher than their impacts on the overall unemployment rate.[23] They further investigate the persistence of these effects and find that the adverse effects of crises on the youth unemployment rate are high in the second and third year after the financial crisis and disappear after five years of the financial crisis.

Another study by Dietrich (2013), utilizing the European Union Labour Force Survey from 2001 to 2010, finds that the youth unemployment rate responds directly to the business cycle, as measured by the GDP growth and lagged GDP growth. In this case, a decrease in GDP leads to a significant increase in the youth unemployment rate within countries. Moreover, this study also investigates the effects of macro variables on the youth unemployment ratio (YPUER), defined as the unemployed share of the total youth (15-24) population, and NEET ratio. Again, it is found that YPUER is

[23] The authors define crises as the sum of systemic banking crises and non-systemic banking crises. This variable takes the value of 1 if there is a crisis in a country and 0 otherwise.

significantly influenced by GDP growth and other labour market variables. In contrary, the impact of macro variables on the NEET ratio is less significant. It is argued that this finding is consistent with the assumption that NEET consists of more heterogeneous groups of people, including those opting for sabbaticals, voluntary leisure time, or taking over family care (Dietrich, 2013, pp. 314).

A more recent study by Bell and Blanchflower (2015) for Greece reveals that it is the 25-29 year olds who were hit hardest by the latest 2008 recession in that they failed to make a successful transition from school-to-work. Hence, they emphasize the importance of considering those within this age group when analysing youth unemployment since the proportion of this group who are NEETs, at least in Greece during the 2008 recession, is very high and their unemployment even outnumbers those aged 15-19.

In the case of the UK labour market, Jenkins and Taylor (2012) utilize the 18 waves of BHPS data and the first wave of Understanding Society survey for individuals aged between 15-69 years old to analyse the relationship between non-employment rates and age. The probit regression models are used, where the probability of being non-employed is estimated separately for each survey year and gender, controlling for other variables such as education, housing tenure, government region, health and marital status, household type, access to car, and presence of children. Although not specifically focusing on young people, this study finds strong evidence that young people, both men and women, have been hit particularly hard by the Great Recession, especially for those with no qualifications. This study also finds that the impacts of the recent Great Recession are stronger than that of the early 1990s recession. Moreover, the authors show that the non-employment trends for those aged 15-22 years old began to rise in the mid-2000s (prior to the Great Recession period), which is much earlier than for other age groups, and continued to increase until the end of 2009. They argue that the increase in non-employment rates prior to the Great Recession is due to increasing participation in post-compulsory education while the latter increase in the late 2000s reflects the impacts of the recent recession.

Other studies which examine the labour market for the older age groups are conducted, among others, by Bruce et al. (2000) and Cappellari et al. (2005). Bruce et al. (2000) analyses the labour market transitions between wage employment, self-employment, and retirement for older workers in the United States by concentrating on the determinants of self-employment among older workers. They argue that self-employment is an important labour market activity for older workers. Their findings suggest that the effects from credit market imperfections seem to be more apparent than the impacts from employer-provided health insurance as determinants of self-employment transitions.

A study by Cappellari et al. (2005) estimates the static probabilities of being in labour market states at a given point in time, in the case of older men and women aged 50 to the State Pension Age in the UK. Utilizing the UK Labour Force Survey (LFS) 1993-1994, they first find that both men and women become more likely to be inactive and less likely to be employed as they get older. They argue that for these older workers, as they get older they will be more likely to retire and, thus, drop out of the labour force. Having better qualifications is associated with a lower probability of being employed and also becoming inactive. This result is explained by the decision on early retirement. In this case, better qualified individuals are more likely to be able to afford early retirement while individuals with lower qualifications need to remain active in the labour market.

Furthermore, Cappellari et al. (2005) also finds significant household characteristics as determinants of the probability of being in a labour market state at a given point in time. They find that the presence of dependent children and a partner who is also employed increases the probability of being employed and lowers the probability of being inactive. Regarding this finding, the authors argue that family responsibilities and the employment of one’s partner would encourage employment for the other. Another possible explanation suggested by the authors is that this is due to assortative mating. Specifically, couples are formed from those with similar characteristics, which in this case is their attitude towards employment. In terms of the household tenure, those who were paying off a mortgage were less likely to be inactive and were more likely to be employed than those who owned their own house, suggesting the need to stay employed for those who still need financial resources to repay their mortgage. In addition, this study also finds evidence of regional effects, in particular for men. In this case, living in the north of the UK (including Wales) is associated with a higher probability of being inactive and a lower probability of being employed, as compared to living in central London, while the reverse is true for those living in the south.

Overall, previous studies have found that personal characteristics, such as age and education, and household characteristics (e.g. the presence of children or spouse) are among the most statistically significant factors that influence the probability of unemployment, particularly for young people. In most of these studies, however, the analysis of the state of the labour market for young people is discussed separately from those of older age groups. Moreover, previous studies regarding the impact of recessions have shown that young people have been hit particularly hard by the economic downturns compared to their adult counterparts, although only a few studies have examined the impact of other periods, such as before or after a recession. Our study will try to fill this gap in the literature by not only investigating the determinants of NEET for both youths and adults, but we will also include estimations for different business cycle periods in our models.

2.3 Data and Method

2.3.1 Sample and variables

The data used for analysis in this chapter consists of the British Household Panel Survey (BHPS) Waves 1-18 combined with the Understanding Society (US) survey Waves 1-5.[24] Our sample is restricted to individuals, both males and females, aged 16-65 in each wave who have not yet retired. These individuals are further classified into five age groups: 1) teenagers 16-19; 2) older youths 20-24; 3) younger prime-age 25-35; 4) mature prime-age 36-49; and 5) the oldest age group aged 50-65. We consider the first two cohort groups as youths while the latter three are considered adults.[25] We omit those individuals aged above 65 years old in order to avoid a large number of sample who report having a labour market status of retired.

[24] Detailed explanation regarding the dataset and all variables used in this thesis can be found in Appendix A.

[25] The official definition of young people used by the Office for National Statistics in the UK in defining youth unemployment is those unemployed people between aged 16 to 24.

For the time being, we allow individuals to be re-added into the analysis even after they miss one or more interview waves (interview-gaps), as long as the current labour market status date is consistent and does not overlap with the labour market status date in the previous available wave. In addition, we also allow for new respondents, who have just turned 16 years old or are new members of the household, into our estimation sample. In other words, individuals will only be missing and dropped from the sample if they: (1) are retired[26]; (2) have missing relevant variable information needed for estimation; or (3) leave the survey or stop being interviewed permanently. Our final sample is therefore an unbalanced panel, pooled cross-section with complete information on the respondents' labour market status as well as their personal and household characteristics.

The dependent variable is constructed from the individual respondent dataset, the survey question regarding individual's self-reported current labour force or economic activity status at the time of interview in each wave. There are ten categories of current economic activity or labour market status from the BHPS, which are: self-employed, in-paid employment (either part-time or full-time), unemployed, retired, on maternity leave, family care, full-time student, long-term sick or disabled, on a government training scheme, and others. In the Understanding Society survey, two more categories are added, which are: unpaid worker in family business (added since the first wave) and working in an apprenticeship (added since the third wave). We omit the category of retired, since by definition only older workers at retirement age are part of this category.

In the final dataset, the dependent variable consists of four mutually exclusive labour market states, i.e. employment, education, unemployment, and inactivity, where the former two states are part of the Non-NEET status and the latter two states are part of the NEET status. The employment state consists of individuals who are self-employed, in-paid employment, on maternity leave, working as unpaid family workers, and working in an apprenticeship.[27] Moreover, the education state consists

[26] This includes individuals who have taken early retirement. Thus, individuals aged 65 or below who are already retired, will also be dropped from our sample.
[27] Females who are on maternity leave are included as being employed, since they are still engaged in employment, but only taking a temporary time-off for child care. Similarly, individuals who work as unpaid family workers are considered as being employed, since even though they receive no formal salary or wage, but they are actively engage in family business instead of being unemployed or inactive.

of individuals who are in full-time education or government training. Following Sissons and Jones (2012), the remaining individuals are categorized as NEET, either being in unemployment or inactivity, where the inactivity state consists of those who are economically inactive due to family care, long-term sick or disabled, and those doing something else (others).[28] Classifying NEET into two different categories allows us to distinguish between two concepts of being unemployed and being inactive. A study by Ordine (1992) on labour market transitions shows that being unemployed and being out of the labour force states represent two behaviourally distinct states, particularly for the young people; thus, it is relevant to disaggregate these two labour market states.[29]

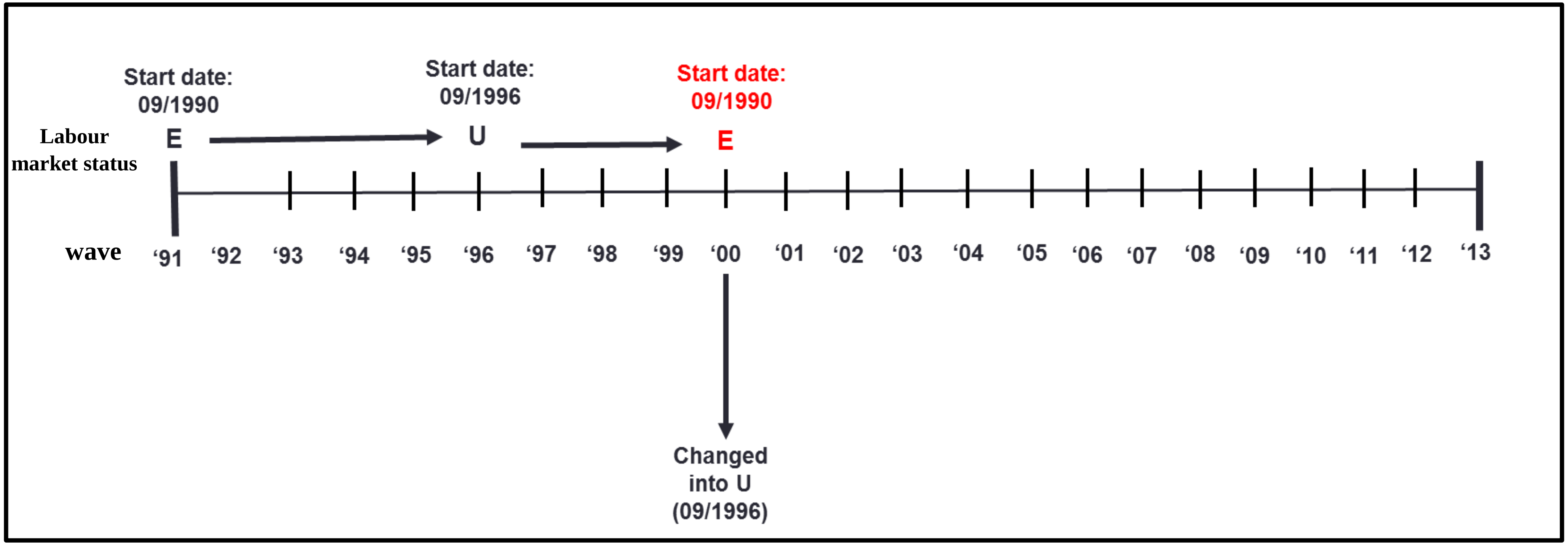
In our estimations, observed characteristics from each wave are regressed against individual's labour market status at the time of interview in each corresponding wave, regardless of when the labour market status started. One problem that we found in the BHPS data is the inconsistency of current labour market status date or calendar time between waves. In order to address this problem, we take additional information regarding the start or end date of both current and retrospective labour market status in each wave. By collecting these information from all waves, we are able to sort individual's labour market histories in a correct order, and ensure that the begin date of current labour market status at the time of interview does not overlap between waves. This problem is more obvious in the BHPS than in the US survey, yet the total number of cases are found to be very small.

Figure 8 illustrates a common case of inconsistency that is found in our data. This Figure illustrates a hypothetical individual who had been in employment since September 1990, when he was first interviewed in 1991. This person was in employment from wave 1 until wave 5, and became unemployed in September 1996 (wave 6) and after. Information on labour market status in wave 10, however, overlaps with that in the previous wave. For such case, we will adjust the information in wave 10 as being unemployed, continuing the information from the previous wave.

[28] Since there is no clear explanation of what type of economic activities classified in the category of 'others' (in the BHPS) or 'doing something else' (in the US survey), we assume that this category involves activities other than being in employment, education, and unemployment, and thus we classify this category into the inactivity state.

[29] In this case, the author finds that the probability for young people to find a job is relatively higher when they were unemployed than if they were in inactivity.

Figure 8 An Example of Correcting for Inconsistency in Labour Market Status Information in the BHPS



With respect to our main variable of interest, the business cycle, we will utilize year dummy variables to divide the business cycle situation into several non-overlapping sub-periods, as depicted in Figure 1. We view those periods with increasing level of GDP and decreasing unemployment rate as the non-recession periods, whereas years during which the level of GDP is decreasing and unemployment rate is increasing are considered as the recession periods. In addition, although the GDP level and unemployment rate were relatively stable during the early 2000s, the period between 2001-2002 will also be considered as recession to capture the impact of the dot.com recession. Similarly, the period in mid-2000s prior to the Great Recession, in which there had been a slight increase of the aggregate unemployment rate, will also be defined as recession.

Our final year dummy variables, based on the BHPS and US survey waves, to indicate different business cycle periods consist of eight non-overlapping sub-periods, as follows:

1) BHPS Waves 1-3 (1991-1993) represent the first recession in the early 1990s;
2) BHPS Waves 4-7 (1994-1997) are the first non-recession period;
3) BHPS Waves 8-10 (1998-2000) are the second non-recession period;
4) BHPS Waves 11-12 (2001-2002) indicate the early 2000s recession;
5) BHPS Waves 13-14 (2003-2004) are the third non-recession period;
6) BHPS Waves 15-16 (2005-2006) represent the recession period in the mid-2000s prior to the Great Recession;
7) BHPS Waves 17-18 and US survey Waves 1-2 (2007-2010) represent the Great Recession period; and
8) US survey Waves 3-5 (2011-2013) indicate the recovery period following the Great Recession.

The last category allows us to examine whether there is any long-lasting impacts after the Great Recession (post-recession impacts). Moreover, the second non-recession period in 1998-2000 (BHPS Waves 8-10) is used as the base category. In addition, the other explanatory variables that will be used in the analysis are age group, gender, ethnicity, highest educational level or qualification, marital status, health status, number of children, household type, house tenure, and region of residence.

2.3.1.1 Descriptive statistics

The size of our final sample, based on person specific identification number (pid or pidp) and after dropping those samples with missing values in relevant variables, consists of 72,646 individuals, of which 38,690 are females and 33,956 are males. However, since we allow every individual to appear more than once in our sample, our total pooled cross sections sample with complete values in all relevant variables is 341,674 observations, with 185,861 females and 155,813 males. Table 1 reports the descriptive statistics by gender.[30] A distribution of our sample across different types of labour market states by age group and gender can also be seen from Figure 9 and Figure 10 for male and female sample, respectively.

Table 1 indicates that most of our sample are engaged in the economic activity of being employed. As expected, the older the age group, the lesser proportion of these individuals who are engaged in education or training activities, where a majority of those who self-report as being in education or training are young people, particularly teenagers aged 16-19 years old. For the employment category, the distribution for the male sample shows that the majority of those who are employed come from the younger prime-age group (25-35 years old) and mature prime-age group (36-49 years old), with around 26 and 37 percent, respectively. Similarly, for female sample, most of those who are employed are of the prime-age groups with about 26 percent for the younger prime-age group and nearly 39 percent for the mature prime-age group.

Furthermore, in the case of unemployment labour market status, for both the male and female sample, the percentage of older youths, aged 20-24, who are unemployed is higher than that of teenagers, aged 16-19, but the highest number of unemployed people come from individuals in the mature prime-age category, aged 36-49. As for the inactivity category, for the male sample, the majority of those who are inactive come from the oldest age-group, aged 50-65 years old, with about 53 percent, whereas for the female sample the inactivity category consists mostly of those mature prime-age females aged 36-49 years old with around 35 percent.

[30] The descriptive statistics by age group and gender can be found in Appendix B, Table B.1 and B.2.

Table 1 Descriptive Statistics of the Multinomial Logit Sample (Proportions)

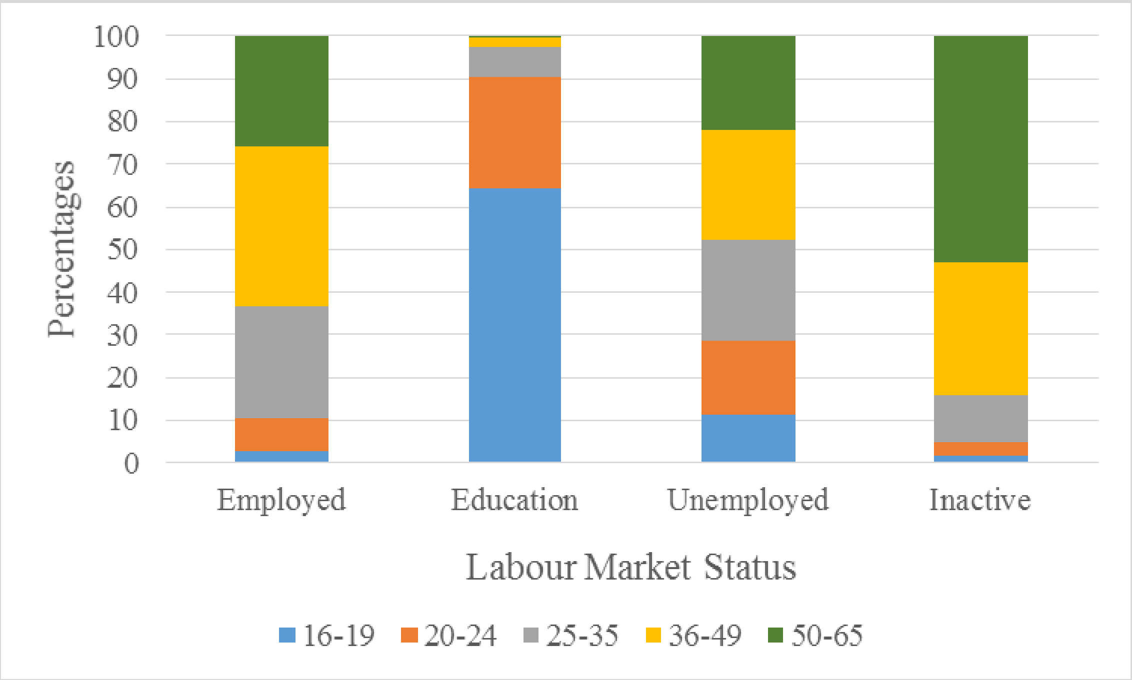
Variables	Male	Female
Employed (base)	0.777	0.672
Education	0.080	0.080
Unemployed	0.077	0.047
Inactive	0.067	0.202
36-49 (base)	0.333	0.346
16-19	0.083	0.078
20-24	0.097	0.095
25-35	0.233	0.248
50-65	0.254	0.233
White (base)	0.891	0.887
Black	0.029	0.037
Asian	0.067	0.063
Others	0.013	0.014
No education (base)	0.121	0.131
Higher/1stdegree	0.244	0.253
A level	0.188	0.168
GCSE/O level	0.215	0.241
CSE level	0.031	0.026
Prof qualif/Others	0.200	0.181
Never/not married (base)	0.403	0.354
Married	0.530	0.528
Ever married	0.067	0.118
Health Excellent/Good (base)	0.788	0.766
Health Fair	0.152	0.160
Health Poor	0.061	0.074
No children	0.670	0.590
1-3 children	0.317	0.394
4+ children	0.013	0.016
Single no child (base)	0.114	0.077
Single with childd	0.039	0.115
Couple no child	0.222	0.208
Couple with child	0.435	0.407
2+ Adults	0.181	0.185
Others	0.009	0.008
Owned outright (base)	0.171	0.166
Owned mortgage	0.541	0.521
Local auth. rented	0.107	0.127
Housing assoc. rented	0.049	0.060
Employer rented & other	0.013	0.010
Rented unfurnished	0.062	0.069
Rented furnished	0.057	0.047

Table 1 (continued)

Variables	Male	Female
London (base)	0.104	0.106
North East	0.041	0.039
North West	0.090	0.091
Yorkshire & Humber	0.075	0.074
East Midlands	0.073	0.068
West Midlands	0.073	0.073
East	0.076	0.073
South East	0.110	0.111
South West	0.072	0.070
Wales	0.096	0.096
Scotland	0.120	0.120
NI & Channel Island	0.071	0.080
Non-recession 1998-2000 (base)	0.093	0.088
Recession 1991-1993	0.068	0.063
Non-recession 1994-1997	0.090	0.083
Recession 2001-2002	0.076	0.074
Non-recession 2003-2004	0.067	0.065
Recession 2005-2006	0.064	0.062
Recession 2007-2010	0.275	0.283
Non-recession 2011-2013	0.267	0.282
Total observations	155,813	185,861

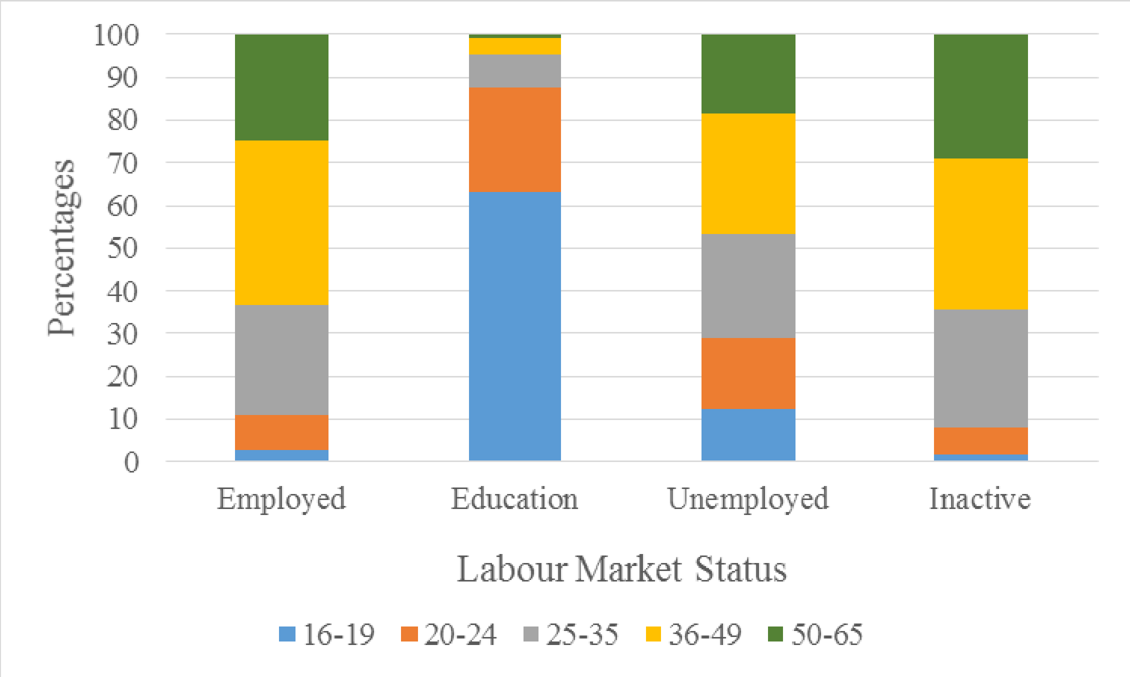
Source: BHPS Waves 1 – 18 and US survey Waves 1 – 5.

Figure 9 Labour Market Status Distribution for Male Sample by Age Group



Source: BHPS Waves 1-18 and US survey Waves 1-5.

Figure 10 Labour Market Status Distribution for Female Sample by Age Group



Source: BHPS Waves 1-18 and US survey Waves 1-5.

In addition, there is quite a significant number of females from the younger prime-age group, aged 25-35, who are self-reported as being inactive as compared to their male counterparts. In this case, out of the total inactive females, nearly 28 percent of them are in the younger prime-age group (25-35 years old), whereas only about 11 percent out of the inactive males are from this age group. This raw data result may indicate that females tend to be inactive (out of the labour force) at a younger age than their male counterparts. One possible explanation might be because females are more likely to switch their focus on their family when they get married and have a family, while their male counterparts have the role as the breadwinners and thus would still actively engage in the labour force during their prime-age.

In regard to personal characteristics, the age structure of our sample by gender is shown in Table 2. The majority of our sample, for both male and female, are in the mature prime-age group, which is also the base category for the dummy age group variable. In general, there is a tendency for our sample size to increase by age, but it gets smaller again for the oldest age group. Moreover, our sample is dominated by Whites, which is unsurprising. The proportion of those who are Asians is larger than those who are Blacks, as also shown in Table 1. Looking at the educational level, the overall picture from Table B.1 and Table B.2 in Appendix B shows that older age groups tend to have a higher level of education. This may be due to the fact that most of the young people in our sample are still engage in education, thus they have not yet completed their highest education level.

Table 2 Age Group Distribution of the Sample by Gender (Percentages)

Age group	Male	Female
16-19	8.33	7.76
20-24	9.65	9.47
25-35	23.32	24.81
36-49	33.28	34.62
50-65	25.42	23.33
Total observations	155,813 (100)	185,861 (100)

Source: BHPS Waves 1 – 18 and US survey Waves 1 – 5.

The percentage of marital status by gender and age group is summarized in Table 3. It is obvious from this table that the majority of adults in our sample are married; in contrast, nearly all of the teenagers and older youths in the sample are not or have never been married.[31] Table 3 also reports the regional distribution of our sample by both gender and age group. In this case, the majority of our sample, especially in the case of male sample, reside in the southern regions of the UK. Only in the case of teenage females (aged 16-19) and females in the mature prime-age group (aged 36-49) that we find higher percentages for those who live in the northern than southern regions of the UK. As for the health condition variable, Table 3 shows that our sample is predominantly in a good or excellent health condition. Moreover, the descriptive statistics results by age group in Table B.1 and Table B.2 of Appendix B also indicate that the older the age of individuals, the higher the proportions of those having worse health condition. In addition, more than 90 percent of our sample have children of three or less, and only very few of them have more than seven children.[32] This is unsurprising, particularly in the case of the young people.

[31] Due to small number of observations, for the two age groups of young people (16-19 and 20-24 age groups), the marital status variable was only classified into two categories, not married and married/ever married; whereas, for the older age groups, the marital status variable was disaggregated into three categories: not married, married, and ever married.
[32] The number of owned children variable in our models is a continuous variable.

Table 3 Marital, Health, and Regional Status of the Sample by Gender and Age Group (Percentages)

	Male					Female				
Age group	16-19	20-24	25-35	36-49	50-65	16-19	20-24	25-35	36-49	50-65
Marital status										
Never/not married (base)	99.75	94.71	52.48	22.37	12.52	99.27	88.78	43.75	18.65	8.59
Married	0.25	5.29	44.89	69.40	74.32	0.73	11.22	50.78	66.38	69.30
Evermarried	-	-	2.63	8.23	13.16	-	-	5.47	14.98	22.11
Health status										
Good (base)	86.50	83.64	82.84	79.06	70.30	83.80	80.56	80.41	76.05	69.30
Fair	11.31	13.10	13.22	14.84	19.39	12.64	14.61	13.94	16.04	19.74
Poor	2.19	3.25	3.94	6.10	10.31	3.56	4.83	5.65	7.91	10.97
*Region status**										
North region	49.26	48.53	49.33	49.21	49.48	50.24	48.68	49.71	50.32	49.99
South region	50.74	51.47	50.67	50.79	50.52	49.76	51.32	50.29	49.68	50.01
Total obs.	12,975 (100)	15,041 (100)	36,336 (100)	51,855 (100)	39,606 (100)	14,426 (100)	17,610 (100)	46,109 (100)	64,348 (100)	43,368 (100)

Source: BHPS Waves 1 – 18 and US survey Waves 1 – 5.

With respect to the household characteristics, it appears that most of our sample live in the type of household that consists of couples with children, followed by the type of househould consisting of couples without children. Moreover, young people aged 16-24 tend to live in household types that consist of at least two adults or that consist of a couple with children. This is not uncommon, since these young people may still live with their parents and not yet live independently from their family. On the other hand, a majority of the sample from the oldest age group, 50-65 years old, live in household type which consists of couples without children. This may indicate that many of our oldest sampled individuals live separately from their children, and thus they may only live together with their spouses.

In regard to household tenure, most individuals in our sample (accounting for more than 50 percent of our sample) own their houses with a mortgage, and many others are home owners (owned outright). This is true for both males and females as well as for different age groups. As for the region of residence, around one-fifth of our sample lives in London and the South East. Moreover, there appears to be quite a significant number of individuals who live in Scotland, which accounts for about 12 percent of our sample. One explanation is due to the extension of samples for Scotland and Wales since BHPS Wave 9 in 1999 (see Taylor, 2010).[33] Moreover, we find no significant difference for all of these findings between males and females across different age groups.

2.3.2 The econometric model

Several previous studies regarding the probability of being in a given labour market state at a certain point in time (state probabilities) have utilised the binary outcome of the probit model (for example, Cappellari et al. (2005) in the case of British older workers, Akhtar and Shahnaz (2005) in the case of youth unemployment in Pakistan, and Bell and Blanchflower (2015) regarding youth unemployment in Greece). This chapter utilizes the multinomial logit model to allow for independent variables to vary across more than two possible discrete alternative outcomes. These outcomes are based upon individual's current labour market status in a given year, i.e. at the interview date in each survey wave. As discussed previously, the current labour market status information of individuals is disaggregated into four mutually exclusive categories: employment, education, unemployment, and inactivity. The first two outcomes are considered as Non-NEET, while the latter two are NEET. However, inactivity due to retirement will be omitted from our analysis, since it applies only to adults at their retirement age.

In modelling the probability of being in NEET and Non-NEET, let us define an individual labour market state as $j = 0,\ldots,3$, where $j = 0$ if the current labour market status is 'employment', $j = 1$ if the individual is in education (including government training programmes), $j = 2$ for the current labour market status of unemployment, and $j = 3$ for those who are in inactivity. Moreover, individual i, where $i = 1, \ldots, n$, represents the i-th individual in the sample who is observed in survey wave t ($t = 1, \ldots, 23$) and is characterised by a latent probability of being in a particular labour market state j which is a function of a vector of covariates (X) and unknown coefficients to be estimated α, such that

[33] More specifically, Scotland and Wales boost samples were included since BHPS Wave 9, while a new sample for Northern Ireland was included in BHPS Wave 11.

$$P_{ijt} = \Pr [y_{it} = j] = F_{jt} (X_{it}, \alpha) \tag{2.1}$$

where y_{it} is the random variable describing the labour market state of individual *i* at wave *t*; *X* represents a vector of covariates or independent variables that consist of personal and household characteristics. The functional form for F_{jt} should be such that probabilities lie between 0 and 1 and sum over *j* to one (Cameron and Trivedi, 2005 pp. 496).

The probability, *p*, of the *i*-th individual being in state *j* at time *t* is thus can be written as

$$p_{ijt} = \Pr [y_{it} = j] = \frac{\exp(\alpha_j X_{ijt})}{\sum_{k=0}^{3} \exp(\alpha_k X_{ikt})} \tag{2.2}$$

where subscript *j* or *k* denotes the alternatives, in this case the individual's labour market state, which takes the value of 0 for employment, 1 for education (or training), 2 for unemployment, and 3 for inactivity. Since the probabilities must sum to one, a normalization of parameters is needed. In here, the labour market state of employment ($j = 0$) is set as the base category group, such that the coefficients for this labour market state are normalized to zero ($\alpha_0 = 0$). The independent variables (*X*) include age, gender, educational background, ethnicity, marital status, health condition, housing type, housing tenure, number of owned children, region of residence, and different business cycle periods.

At this stage, we will for now neglect the dynamic nature of the labour market transitions between each wave and focus only on the probability of being served in a labour market state at a given point in time. Moreover, in this chapter we still have not taken into account the start and end dates of the labour market status, except for data checking purposes as discussed in previous section; hence, the length duration of each labour market state is ignored.[34] As a consequence, not only do we allow for the same individual to appear more than once in our sample, but a person's current economic activity or labour market status in wave *t* could also be the same as his or her status in the previous wave(s). When fitting the multinomial logit regression model, we use the relevant cross-sectional weight for each year. In addition, to control for repeated

[34] The time duration estimation will be examined in the last empirical chapter using the survival analysis model.

observations of the same person over time, the standard errors are estimated using the adjusted robust standard errors for clustering of individuals based on the individual's unique identification (*pid*) number.

In order to answer our research questions, our estimations will first be conducted for males and females separately, in order to compare the impacts of independent variables between gender, then by each age group and region, in order to observe whether there are any significant age related and regional differences of the impacts of recessions on the individual's NEET probability. In the estimations by gender and age group, the regional variable is treated as a dummy variable with 12 categories. Meanwhile, estimations by region will be conducted for the northern versus the southern regions of the UK with gender and age variables now included as a dummy variable.

2.3.2.1 Results interpretation: marginal effects

All results from our multinomial logit models will be presented in marginal effects (evaluated at the covariates' mean values). In the multinomial logit model, marginal effects allow us to calculate the effect on the j-th probability of changing by one unit a regressor or independent variable that takes the same value across all alternatives (Cameron and Trivedi, 2005, pp. 502). Cappelari et al. (2005) explains that marginal effects measure the change (relative to a reference case) in the probability of being in a given state resulting from having a certain characteristic. For example, if we would like to know "what is the effect on the probability of being unemployed if the number of own children increases by one child?", then according to Cameron and Trivedi (2005), in order to answer this question, from Equation (2.2) we can find

$$\frac{\partial \mathrm{p}_{ijt}}{\partial X_{it}} = \mathrm{p}_{ijt}\,(\alpha_{jt} - \overline{\alpha_{it}}) \tag{2.3}$$

where $\overline{\alpha_{\iota t}} = \sum_k p_{ikt}\ \alpha_k$ is a probability weighted average of the α_k. By estimating the marginal effects, we can also obtain the values for the dependent variable's base category. Thus, we will be able to directly interpret the impact of a certain regressor on the probability of being in a particular state, which in our case is either being employed, in education (or training), unemployed, or being inactive.

2.3.2.2 Likelihood Ratio Test

Utilizing the multinomial logit model as opposed to a binary logit allows us to distinguish the impacts of independent variables on different states of NEET and Non-NEET, i.e. either being employed or in education for Non-NEET and either being unemployed or inactive for NEET. Cramer and Ridder (1991) provides a solution to test whether a subset of states in a multinomial logit model can actually be treated as a single state or whether each state shows significant differences on their own. They argue that the introduction of a new outcome within state j, for example, will lead to an extended model with (J + 1) states, where j_1 and j_2 are the two new states being substituted for j. They find that if the new distinction is arbitrary and irrelevant, the new model is again a multinomial logit, in which j_1 and j_2 have the same regressor coefficients as those of their parent state, except that their intercepts differ. Therefore, they suggest that to test for the pooling states is to test for the equality of their logit regressor coefficients, apart from the intercept (Cramer and Ridder, 1991, pp. 269). In order to do this, we only need to apply the likelihood ratio test.

Following the work by (Cramer and Ridder, 1991, pp. 269-270), if we have a multinomial logit model with (J + 1) outcomes or states and define the two states, which are candidates for pooling, as j_1 and j_2, then the null hypothesis is that they all have the same regressor coefficients other than the intercept. That is,

$$\alpha_{j1} = \alpha_{j2} = \alpha_j \tag{2.4}$$

and the test statistics to test for this hypothesis is

$$\text{LR} = 2\,\{\log \hat{L} - \log \hat{L}_R\} \tag{2.5}$$

where log $\hat{L}$ is the maximum log-likelihood of the original model and log $\hat{L}_R$ is the maximum log-likelihood if our estimations are constrained to satisfy (2.4). Log $\hat{L}$ is usually readily available once we run the estimation of the original model with (J+1) states, whereas the value of log $\hat{L}_R$ requires further estimation. This estimation is derived from the unconstrained estimation of the pooled model with only J states. The restricted maximum log-likelihood is estimated by

$$\log \hat{L}_R = n_{j1} \log n_{j1} + n_{j2} \log n_{j2} + \ldots + \textstyle\sum_k n_{jk} \log n_{jk} - n_j \log n_j + \log \hat{L}_p \qquad (2.6)$$

where $\log \hat{L}_p$ is the unconstrained maximum log-likelihood of the pooled model with only J states and n indicates the number of sample observations in each state such that $n_{j1} + n_{j2} + \ldots + n_{jk} = n_j$. In order to make a decision whether to reject or not reject the null hypothesis, the likelihood ratio (LR) test follows the chi-square distribution with degrees of freedom equal to the number of restrictions implied by the null hypothesis given in (2.4).

2.4 Empirical Results

In this section, empirical results from multinomial logit estimations are analysed. The full results consisting of all independent variables can be seen in Appendix B. All results are reported in terms of marginal effects evaluated at the mean values of other covariates. The estimated standard errors are clustered within the individual level such that the estimations are robust to the presence of repeated observations on the same person over time.

2.4.1 Likelihood ratio test

Before analysing the empirical results from the multinomial logit models, we will first perform the likelihood ratio test to examine whether our classification of dependent variables into four categories is relevant or not. In other words, we would like to test whether it is better to put the unemployment and inactivity categories as two separate states or to pool these two categories into one single category of NEET. Similarly, we will also test whether the employment and education categories are better as two separate states or as one single category of Non-NEET. In the end, we will be able to draw a conclusion regarding the validity of our labour market status classification. We perform this test for the entire sample model by gender and for models which are disaggregated by both gender and age group.

The first test is to examine whether we should pool together the NEET state or separate this category into two states of unemployment and inactivity. In this analysis, the base category of dependent variable is the Non-NEET status. In order to calculate the test statistics, we need to have the number of sample in each of the labour market state and the log-likelihood values of the models. Table 4 provides the distribution of sample for each labour market state by gender and age group, while the relevant maximum log-likelihood values from both unrestricted and restricted multinomial logit models to calculate the test statistics for this case are provided in Table 5.

In one example, the case of the male sample for all age groups, we can obtain the restricted maximum log-likelihood using Equation (2.6) as follows:

$$\log \hat{L}_R = n_{j1} \log n_{j1} + n_{j2} \log n_{j2} - n_j \log n_j + \log \hat{L}_p$$

$$= 11955\ln(11955) + 10356\ln(10356) - (22311\ln(22311)) + (-47207.057)$$

$$= -62614.515$$

Thus, the likelihood ratio test statistics is given by

$$LR = 2\{-58006.024 + 62614.515\} = 9216.984$$

Since we have 46 coefficients for the two restricted and unrestricted multinomial logit models, this test statistic will follow the chi-squared distribution with 46 degrees of freedom. The test statistic is quite significant, indicated by a very small p-value, thus with the null hypothesis of

$$H_0: \alpha_{Unemployed} = \alpha_{Inactive} = \alpha_{NEET}$$

we can reject this null hypothesis and conclude that the NEET labour market state should not be combined together.

Table 4 Sample Size by Labour Market Status, Gender, and Age Group

Labour market state	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
	16-19		20-24		25-35		36-49		50-65		Total	
NEET	1,510	1,637	2,398	3,848	3,943	12,536	6,326	15,654	8,134	12,512	22,311	46,187
Unemployed	1,339	1,054	2,085	1,452	2,806	2,102	3,092	2,447	2,633	1,605	11,955	8,660
Inactive	171	583	313	2,396	1,137	10,434	3,234	13,207	5,501	10,907	10,356	37,527
Non-NEET	11,465	12,789	12,643	13,762	32,393	33,573	45,529	48,694	31,472	30,856	133,502	139,674
Employed	3,475	3,426	9,415	10,172	31,534	32,402	45,266	48,103	31,404	30,768	121,094	124,871
Education	7,990	9,363	3,228	3,590	859	1,171	263	591	68	88	12,408	14,803
Total observations	12,975	14,426	15,041	17,610	36,336	46,109	51,855	64,348	39,606	43,368	155,813	185,861

Table 5 Likelihood Ratio Test for Pooling the NEET category

	Dependent Variable			
	Non-NEET (base), NEET	**Non-NEET (base), Unemployed, Inactive**		
	$\log \hat{L}_p$	$\log \hat{L}$	Test- statistics	df
Male (all age)	-47207.057	-58006.024	9216.98	46
16-19	-4206.2597	-4699.732	79.86	40
20-24	-5766.9912	-6580.6191	230.64	41
25-35	-9572.2449	-11537.768	805.88	42
36-49	-13052.84	-16612.726	1646.74	42
50-65	-13350.36	-17386.63	2170.27	42
Female (all age)	-81369.818	-99500.742	8315.59	46
16-19	-4004.6981	-4809.9865	521.34	40
20-24	-6536.3026	-8364.2677	1444.57	41
25-35	-20098.739	-24656.41	2221.81	42
36-49	-28450.544	-34230.224	2013.07	42
50-65	-20199.114	-24479.202	1026.47	42

Using the same method, we also find significant results for all other models in the case of female sample and those which are disaggregated by age group, as indicated by the very small p-values of the test statistics. These results suggest that for all estimations we should separate the NEET state into two states of unemployment and inactivity, instead of pooling them together.

After analysing the NEET category, the next test is to determine whether the Non-NEET category should be distinguished as two separate states of employment and education or should it be pooled together as one single state. The reference category in this analysis is the NEET labour market status, and the corresponding log-likelihood values are given in Table 6.

Utilizing Equations (2.5) and (2.6) and following the same process as above, the test statistic results for the youngest male and female sample, 16-19 years old, are 1867.96 and 1761.43, respectively. Since each estimation for the youngest age group includes 40 coefficients, the test statistics follow the chi-squared distribution with 40 degrees of freedom. In this case, the null hypothesis is

$$H_0: \alpha_{Employed} = \alpha_{Education} = \alpha_{Non\text{-}NEET}$$

Table 6 Likelihood Ratio Test for Pooling the Non-NEET category

	Dependent Variable			
	NEET (base), Non-NEET	NEET (base), Employed, Education		
	log $\hat{L}_p$	log $\hat{L}$	Test- statistics	df
Male (all age)	-47207.057	-64799.147	47398.34	46
16-19	-4206.2597	-10305.659	1867.96	40
20-24	-5766.9912	-11158.724	3581.61	41
25-35	-9572.2449	-12824.921	1425.88	42
36-49	-13052.84	-14491.759	357.62	42
50-65	-13350.36	-13752	167.25	42
Female (all age)	-81369.818	-103116.1	50936.13	46
16-19	-4004.6981	-10556.252	1761.43	40
20-24	-6536.3026	-12573.233	3723.76	41
25-35	-20098.739	-24633.627	1090.33	42
36-49	-28450.544	-31333.349	623.58	42
50-65	-20199.114	-20722.443	160.41	42

The associated p-value of the test statistic is very small. Therefore, these test statistics are very significant and we can conclude that the Non-NEET labour market state should not be pooled together, and that it is relevant to disaggregate this category into two states of employment and education. The test statistic results are also significant for the rest of the models, thus further supporting our finding that the Non-NEET labour market state should not be combined together.

Having performed the likelihood ratio test, we can conclude that it is relevant to distinguish our dependent variable into four separate labour market states of employment, education, unemployment, and inactivity (with employment as the base category). The former two states represent those people who are in the Non-NEET category whereas the latter two states consist of those who are in the NEET category.

2.4.2 Multinomial logit results

2.4.2.1 Gender and age related differences

In general, our static probability results by gender for the age variable, as shown in Table 7, are in line with those found in previous literature, such as Harris (1996) and Cappellari et al. (2005), where employment probability tends to increase with age and that the older the individual the more likely they become inactive.

Table 7 Multinomial Logit Estimates of Age Group and Business Cycle by Gender

Variables	Employed	Education	Unemployed	Inactive
	Dependent Variable			
	Male			
36-49 (base)				
16-19	– 0.420***	0.400***	0.038***	– 0.018***
	(0.016)	(0.017)	(0.005)	(0.002)
20-24	– 0.097***	0.075***	0.039***	– 0.017***
	(0.006)	(0.005)	(0.004)	(0.002)
25-35	0.0003	0.008***	0.004*	– 0.013***
	(0.003)	(0.001)	(0.002)	(0.001)
50-65	– 0.035***	– 0.003***	0.012***	0.025***
	(0.004)	(0.001)	(0.003)	(0.002)
Non-recession 1998-2000 (base)				
Recession 1991-1993	– 0.051***	0.001	0.047***	0.004**
	(0.005)	(0.001)	(0.004)	(0.001)
Non-recession 1994-1997	– 0.032***	0.002***	0.022***	0.007***
	(0.004)	(0.001)	(0.003)	(0.001)
Recession 2001-2002	– 0.008***	– 0.0002	0.003	0.006***
	(0.003)	(0.001)	(0.002)	(0.001)
Non-recession 2003-2004	– 0.003	0.0006	– 0.002	0.005***
	(0.003)	(0.001)	(0.003)	(0.001)
Recession 2005-2006	– 0.004	0.001	– 0.002	0.005***
	(0.003)	(0.001)	(0.003)	(0.001)
Recession 2007-2010	– 0.047***	0.004***	0.032***	0.011***
	(0.003)	(0.001)	(0.003)	(0.001)
Non-recession 2011-2013	– 0.044***	0.004***	0.029***	0.011***
	(0.003)	(0.001)	(0.003)	(0.002)
	Female			
36-49 (base)				
16-19	– 0.396***	0.417***	0.039***	– 0.060***
	(0.012)	(0.014)	(0.004)	(0.006)
20-24	– 0.131***	0.080***	0.026***	0.025***
	(0.008)	(0.004)	(0.003)	(0.006)
25-35	– 0.029***	0.011***	0.006***	0.013***
	(0.005)	(0.001)	(0.002)	(0.004)
50-65	– 0.091***	– 0.007***	– 0.005***	0.103***
	(0.006)	(0.001)	(0.002)	(0.006)
Non-recession 1998-2000 (base)				
Recession 1991-1993	– 0.050***	– 0.002**	0.009***	0.044***
	(0.007)	(0.001)	(0.002)	(0.006)
Non-recession 1994-1997	– 0.036***	0.001	0.004**	0.031***
	(0.005)	(0.001)	(0.002)	(0.005)
Recession 2001-2002	– 0.018***	– 0.001	0.002	0.017***
	(0.004)	(0.001)	(0.002)	(0.004)
Non-recession 2003-2004	– 0.017***	– 0.001	0.002	0.016***
	(0.005)	(0.001)	(0.002)	(0.004)
Recession 2005-2006	– 0.022***	– 0.0004	0.003	0.020***
	(0.006)	(0.001)	(0.002)	(0.005)
Recession 2007-2010	– 0.060***	0.002**	0.022***	0.036***
	(0.005)	(0.001)	(0.002)	(0.005)
Non-recession 2011-2013	– 0.060***	0.003***	0.025***	0.033***
	(0.006)	(0.001)	(0.002)	(0.005)

Note: 1) results are in marginal effects at mean values; 2) robust standard errors in parentheses, 3) *** p<0.01, ** p<0.05, * p<0.1; 3) we also control for other covariates, which are: ethnicity, educational attainment, marital status, health status, number of children, household type, house tenure, and region of residence.

Moreover, it is also evident that individuals in mature prime-age group, aged 36-49 (the base category), for both males and female, have a higher probability of being employed compared to the other age groups. One exception, however, is for males in the prime-age group, 25-35 years old, where their employment probability seems to be not significantly different from their counterparts in the mature prime-age group.

Teenagers, 16-19 years old, have the lowest probability of being employed relative to the base group, i.e. teenage males and females respectively are about 42 and 40 percentage points less likely to be employed. Since we include the sample of teenagers who still engage in education, these results may indicate that most teenagers in our sample are still in education rather than being actively involved in the labour market. Findings for the probability of being in full-time education or training seems to support this notion where in this case, teenage males and females are significantly more likely to engage in full-time education or training, by around 40 and 42 percentage points respectively, compared to the mature prime-age adults. In addition, compared to the base group, teenagers are also significantly more likely to be unemployed, by nearly 4 percentage points for both males and females, but less likely to be inactive, by nearly 2 percentage points for males and 6 percentage points for females. This implies that when teenagers are in NEET states, they tend to stay actively looking for jobs (unemployed) rather than dropping out of the labour force and becoming inactive.

As for older youths, aged 20-24, they also have significantly lower probability of being employed and a higher probability of being in education compared to the base age group, although with lower magnitudes than those found for teenagers. In this case, older youth males and females are only about 10 and 13 percentage points less likely to be employed respectively, while for both males and females their probabilities of being in education are only about 8 percentage points higher than the base age group. The unemployment probabilities for older youths, however, are similar to those observed in the case of teenagers, i.e. older youths are more likely to be unemployed by nearly 4 percentage points for males and 3 percentage points for females. This may suggest that while older youths mostly no longer engage in education, their chances in job searching are similar to that of teenagers, yet their probability of employment is still much higher than that of teenagers. Interestingly, while older youth males are significantly less likely to be inactive, by approximately 2 percentage points, older youth females have a higher probability of being in inactivity by nearly 3 percentage points. This implies that when older youths are in NEET states, they are not only exposed to the risk of being unemployed, but also, at least in the case of females, of giving up altogether from the labour force and becoming inactive.

As suggested by previous studies, lower levels of human capital, lack of work experience, and mismatch between the skills that young people have to offer and those required by employers are argued to be the reasons why these young people fail to compete with their adult counterparts in finding a job in the labour market (see, among others, Caroleo and Pastore, 2007; Bell and Blanchflower, 2011a and 2011b; Gregg and Wadsworth, 2011). Another possible explanation is due to lack of formal and informal networking possessed by young people which may also determine the employment and unemployment probabilities of these young people relative to their adult counterparts. Macmillan (2010), for example, relates the networking channel in the context of intergenerational worklessness between parent and their children. In this regard, the author argues that one of the channels through which worklessness could be causally transmitted from one generation to the next is through ‘social capital’ or informal social networks; yet, this study does not specifically identify through which of the channels that the causality of intergenerational worklessness might occur.[35]

Other studies, which discuss the importance of social capital and networking, have tried to measure social capital using information regarding access to social networks. One study by Fidrmuc and Gërxhani (2005) in the case of European countries measures social capital by civic participation and access to social networks. This study empirically shows that being unemployed translates into more limited access to both informal and formal networks, while being employed has the opposite effect. A recent paper by Mowbray et al. (2016) tries to examine the relationship between employment status and the use of social networking sites amongst 16-21 year olds using data from the Innovation Panel Wave 6 of the UK Understanding Society study, which was conducted in 2012. This study finds a strong association between being a member of social networking sites and being in paid employment amongst 16-21 year olds in the UK. The authors argue that young people are increasing their

[35] Other channels that are mentioned in this study are through changing tastes and attitudes of parents, and through the associated stress and depression from spells out of work.

likelihood of encountering new information online which is conducive to the generation of employment opportunities.[36] Note, however, that analysis regarding networking and employment opportunities is beyond the scope of our study.

Findings for the prime-age group, 25-35 years old, show similar patterns to results for the older youths, except in the case of the employment probability of males in this age group which is found to be insignificantly different relative to the base age group. Relative to the mature prime-age group, the probability of being in education and being unemployed for the prime-age group is significantly higher, although with only small percentages of less than one percentage point in most cases. Moreover, the probability of being inactive is significantly lower for males but higher for females, which is consistent with the findings obtained in the case of older youths. These results seem to reveal the presence of gender differences for individuals in this age group. In this case, prime-age males tend to possess better labour market outcomes compared to their female counterparts in the same age group. On the other hand, prime-age females aged 25-35 are relatively less likely to find employment and at the same time are more exposed to the risk of being in NEET states, both by being in unemployment and inactivity, compared to their male counterparts.

Consistent with previous findings in Cappellari et al. (2005) for individuals nearing the pension age, i.e. those aged 50 years and above, our results also reveal that individuals in the oldest (50-65) age group are significantly more likely to be inactive and less likely to be in employment, relative to the base age group. Moreover, for both males and females, only individuals in the oldest age group have a lower probability of being in full time education or training as compared to the base age group.

Analysing particularly the probability of being in inactivity, the results for males indicate that only males in the oldest age group are significantly more likely to be inactive, by about 2.5 percentage points, relative to the base age group. In the case of females, while teenage females have a lower probability of being inactive, females in other older age groups are significantly more likely to be inactive. Specifically, the highest probability of being inactive is for females in the oldest age group with about 10 percentage points.

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[36] Whilst the topic regarding networking as a strategy during job search has also been addressed in several job search literature (see, for example, Hoye et al., 2009).

Another gender difference appears in the case of unemployment probability for the 50-65 age group, where relative to the base age group males in this age group are more likely to be unemployed while the reverse is true for females. Although females in this age group are less likely to be unemployed, the positive result from the inactivity probability undoes the negative result from the unemployment probability. Thus, this implies that the negative probability of unemployment for females in the oldest age group could be caused by their decisions to drop out from the labour force and become inactive as they are reaching the pension age. On the other hand, in the case of males, they may still actively engage in the labour force during their old age even though their chance of being employed is now lower, probably because their productivity levels are now lower than when they were younger.

2.4.2.2 The impact of business cycle

With regard to business cycle periods, we can observe from Table 7 that relative to the non-recession period in 1998-2000, the overall results for all other periods show positive and statistically significant marginal effects in the probability of being in inactivity and negative marginal effects in employment probability when the results are statistically significant. Meanwhile, results with respect to the unemployment probability and probability of being in education (or training) are, in most cases, not statistically significant. Moreover, in most periods, results for males are similar to those found for females, implying that gender-related differences regarding the impacts of business cycle periods on the labour market probability at a given point in time are less apparent in our findings.

For both males and females, the early 1990s recession period between 1991 and 1993 is associated with significantly lower probabilities of employment, by about 5 percentage points, and a higher probability of being in NEET states – unemployment and inactivity. In addition, for females, their probability of being in education (or training) is also significantly lower during this period. In terms of the unemployment probability, males appear to be hit harder by this recession than females since they are nearly 5 percentage points, as compared to only less than one percentage point for females, more likely to be unemployed during this period relative to the base period in 1998-2000. One possible explanation is due to differences between the distribution of female and male workers across different industries (as suggested for example by Albanesi and Sahin, 2013). In this regard, male workers are generally hired in goods-producing industries, like construction and manufacturing, which were substantially affected by the early 1990s recession (see Jenkins, 2010). Meanwhile, female workers are mostly employed in the service-providing and government sectors. In addition, we also observe similar patterns in the non-recession period between 1994 and 1997. This finding supports the presence of a persistence of adverse impacts from the early 1990s recession until around four years after the end of the recession period.

Despite its trivial impact on the UK economy, we still find evidence of adverse impacts on the labour market due to the dot.com recession in early 2000s. During this period, employment probabilities for both males and females are significantly lower and the probabilities of inactivity are statistically significant and positive even though the marginal effects account for only less than one percentage point for males and only less than 2 percentage points for females in both cases. In contrast, the unemployment and education probabilities are insignificant during this period for both males and females.

Relative to the base period, the periods in the mid-2000s tend to be relatively stable for males, despite having a significantly higher probability of being inactive during this period, yet the magnitudes are very small. In contrast, females are still experiencing statistically significant lower probabilities of employment and a higher probability of inactivity during the mid-2000s. This finding again suggests that in any business cycle period, females are more likely to be in inactivity state than their male counterparts.

In line with our expectations, the latest Great Recession in the late 2000s shows significant adverse impacts on labour market outcomes for both males and females. During this period, the employment probabilities are significantly lower while the probability of being in NEET (both unemployment and inactivity) states are significantly higher. For males, their employment probability decreased by nearly 5 percentage points while their unemployment probability increased by about 3 percentage points. Meanwhile, during the same period, females experienced a decrease in their employment probability by about 6 percentage points and an increase in their unemployment probability by about 2 percentage points. In addition, we also find supporting evidence of higher participation in education during the Great Recession for both males and females, which is consistent with the notion argued in previous studies that enrolments in higher education tend to increase during economic downturns (see Barakat et al., 2010; Marcus and Gavrilovic, 2010; Clark, 2011). These patterns are still found in post-recession periods between 2011 and 2013.

Unlike previous recession in the early 1990s, females suffered a higher reduction in their employment probability during the Great Recession. This is in line with previous study by Perivier (2014) which shows that during the Great Recession, female job losses were more sensitive to the downturn. One explanation is because the Great Recession has more impacts on sectors in which females are over-represented, i.e. the service-based industries such as the financial sector. Meanwhile, Razzu and Singleton (2016) using an analysis of labour market flows in the UK shows that the greater rise in male unemployment during the Great Recession can be explained by a more cyclical response of flows between employment and unemployment for men than that for women.[37]

As for the probability of being inactive, our results in Table 7 tend to suggest that regardless of the business cycle period, females have a higher probability of being inactive than their male counterparts, although the probability of being inactive for females also seems to be higher during recessions. Similar finding is found in Razzu and Singleton (2016), in which it is shown that for both men and women the inactivity rate is generally not sensitive to the state of the economy. We argue that the higher probability of inactivity for females might be related to the traditional roles for females to take care of their family, while males as the breadwinners will be more likely to be engaged with the labour market.

In order to get more insights regarding the impacts of different business cycle periods on different age groups, we further distinguish our estimations by both gender and age group. Results for these estimations are summarized in Table 8.

[37] Recall that we will examine the dynamic transitions between labour market states in the following empirical chapters.

Table 8 Multinomial Logit Estimates of Business Cycle by Age Group and Gender

Age group and Business cycles	Employed		Education		Unemployed		Inactive	
	Male	Female	Male	Female	Male	Female	Male	Female
Age group: 16-19								
Non-recession 1998-2000 (base)								
Recession 1991-1993	– 0.030	0.039	0.005	– 0.067**	0.028**	0.026**	– 0.002	0.002
	(0.029)	(0.029)	(0.029)	(0.029)	(0.013)	(0.010)	(0.002)	(0.005)
Non-recession 1994-1997	– 0.058**	– 0.038	0.073***	0.026	– 0.012	0.007	– 0.003**	0.004
	(0.026)	(0.024)	(0.026)	(0.024)	(0.010)	(0.007)	(0.002)	(0.004)
Recession 2001-2002	– 0.033	0.0002	0.033	– 0.016	– 0.0003	0.013	0.0003	0.003
	(0.026)	(0.024)	(0.026)	(0.025)	(0.010)	(0.008)	(0.002)	(0.005)
Non-recession 2003-2004	– 0.074***	0.015	0.094***	– 0.016	– 0.021**	0.004	0.001	– 0.003
	(0.028)	(0.027)	(0.028)	(0.028)	(0.010)	(0.008)	(0.002)	(0.004)
Recession 2005-2006	– 0.074***	– 0.031	0.079***	0.008	– 0.005	0.022**	0.0002	– 0.0003
	(0.029)	(0.026)	(0.029)	(0.028)	(0.012)	(0.009)	(0.002)	(0.004)
Recession 2007-2010	– 0.291***	– 0.164***	0.252***	0.124***	0.032***	0.038***	0.007***	0.002
	(0.023)	(0.021)	(0.023)	(0.022)	(0.010)	(0.007)	(0.002)	(0.004)
Non-recession 2011-2013	– 0.342***	– 0.220***	0.318***	0.186***	0.017*	0.032***	0.006**	0.002
	(0.022)	(0.020)	(0.022)	(0.021)	(0.010)	(0.008)	(0.003)	(0.004)
Age Group: 20-24								
Non-recession 1998-2000 (base)								
Recession 1991-1993	– 0.070***	– 0.049**	– 0.015	– 0.017	0.086***	0.047***	– 0.002	0.019**
	(0.022)	(0.022)	(0.017)	(0.016)	(0.016)	(0.014)	(0.003)	(0.009)
Non-recession 1994-1997	– 0.041**	– 0.049***	0.0004	0.020	0.042***	0.022**	– 0.001	0.007
	(0.018)	(0.019)	(0.015)	(0.014)	(0.013)	(0.011)	(0.003)	(0.008)
Recession 2001-2002	0.016	– 0.016	– 0.031**	0.003	0.011	0.006	0.003	0.007
	(0.018)	(0.018)	(0.015)	(0.014)	(0.011)	(0.011)	(0.003)	(0.007)
Non-recession 2003-2004	0.007	– 0.012	– 0.029*	– 0.003	0.015	0.012	0.007*	0.003
	(0.021)	(0.020)	(0.017)	(0.015)	(0.013)	(0.011)	(0.004)	(0.009)
Recession 2005-2006	– 0.045**	– 0.010	0.031	0.012	0.010	– 0.002	0.004	– 0.0003
	(0.022)	(0.021)	(0.020)	(0.016)	(0.013)	(0.011)	(0.004)	(0.009)
Recession 2007-2010	– 0.068***	– 0.064***	– 0.003	0.008	0.062***	0.036***	0.009***	0.020***
	(0.018)	(0.017)	(0.014)	(0.013)	(0.011)	(0.009)	(0.003)	(0.008)
Non-recession 2011-2013	– 0.058***	– 0.074***	– 0.022	– 0.015	0.069***	0.060***	0.012***	0.029***
	(0.019)	(0.018)	(0.015)	(0.013)	(0.013)	(0.011)	(0.004)	(0.009)

Table 8 (Continued)

Age group and Business cycles	Employed		Education		Unemployed		Inactive	
	Male	Female	Male	Female	Male	Female	Male	Female
Age group: 25-35								
Non-recession 1998-2000 (base)								
Recession 1991-1993	– 0.054***	– 0.052***	0.008**	– 0.008*	0.045***	0.006	0.001	0.054***
	(0.008)	(0.013)	(0.004)	(0.004)	(0.007)	(0.004)	(0.002)	(0.012)
Non-recession 1994-1997	– 0.029***	– 0.031***	0.009***	– 0.005	0.017***	0.002	0.002*	0.034***
	(0.006)	(0.010)	(0.003)	(0.004)	(0.005)	(0.003)	(0.001)	(0.009)
Recession 2001-2002	– 0.007	– 0.017*	– 0.001	– 0.004	0.005	0.008**	0.004***	0.014*
	(0.005)	(0.010)	(0.002)	(0.004)	(0.004)	(0.004)	(0.001)	(0.008)
Non-recession 2003-2004	– 0.002	– 0.017	– 0.0001	– 0.007*	0.001	0.003	0.001	0.022**
	(0.005)	(0.011)	(0.003)	(0.004)	(0.004)	(0.004)	(0.001)	(0.010)
Recession 2005-2006	0.001	– 0.016	– 0.001	– 0.003	– 0.003	0.001	0.003*	0.018*
	(0.005)	(0.012)	(0.003)	(0.004)	(0.004)	(0.004)	(0.002)	(0.011)
Recession 2007-2010	– 0.037***	– 0.040***	0.002	– 0.004	0.028***	0.023***	0.008***	0.021**
	(0.005)	(0.010)	(0.002)	(0.003)	(0.004)	(0.003)	(0.002)	(0.009)
Non-recession 2011-2013	– 0.029***	– 0.034***	– 0.002	– 0.007**	0.022***	0.025***	0.008***	0.017*
	(0.006)	(0.011)	(0.002)	(0.003)	(0.004)	(0.004)	(0.002)	(0.009)
Age Group: 36-49								
Non-recession 1998-2000 (base)								
Recession 1991-1993	– 0.030***	– 0.027**	0.0003	0.004	0.028***	0.001	0.003	0.022**
	(0.007)	(0.012)	(0.002)	(0.003)	(0.005)	(0.003)	(0.002)	(0.011)
Non-recession 1994-1997	– 0.020***	– 0.028***	– 0.0006	0.004	0.015***	– 0.001	0.006***	0.025***
	(0.005)	(0.009)	(0.002)	(0.003)	(0.004)	(0.003)	(0.002)	(0.008)
Recession 2001-2002	– 0.002	– 0.006	– 0.001	– 0.002	– 0.001	– 0.005**	0.005***	0.012*
	(0.004)	(0.008)	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.007)
Non-recession 2003-2004	– 0.001	– 0.002	– 0.00004	– 0.003*	– 0.006*	– 0.002	0.007***	0.008
	(0.004)	(0.009)	(0.002)	(0.002)	(0.003)	(0.003)	(0.002)	(0.008)
Recession 2005-2006	0.0004	– 0.014	– 0.002	– 0.003	– 0.003	– 0.001	0.005***	0.018**
	(0.005)	(0.010)	(0.002)	(0.002)	(0.003)	(0.003)	(0.002)	(0.009)
Recession 2007-2010	– 0.027***	– 0.049***	– 0.003*	– 0.003	0.018***	0.013***	0.012***	0.039***
	(0.004)	(0.009)	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.009)
Non-recession 2011-2013	– 0.023***	– 0.032***	– 0.005***	– 0.005***	0.014***	0.011***	0.013***	0.026***
	(0.005)	(0.010)	(0.002)	(0.002)	(0.003)	(0.003)	(0.002)	(0.009)

Table 8 (Continued)

Age group and Business cycles	Employed		Education		Unemployed		Inactive	
	Male	**Female**	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**
Age group: 50-65								
Non-recession 1998-2000 (base)								
Recession 1991-1993	– 0.065***	– 0.100***	– 0.00006	0.0002	0.047***	0.008	0.017**	0.091***
	(0.013)	(0.018)	(0.001)	(0.0004)	(0.009)	(0.005)	(0.008)	(0.017)
Non-recession 1994-1997	– 0.069***	– 0.061***	0.001	0.0004	0.035***	0.009*	0.034***	0.052***
	(0.010)	(0.013)	(0.001)	(0.0005)	(0.007)	(0.005)	(0.007)	(0.012)
Recession 2001-2002	– 0.011	– 0.036***	– 0.001*	– 0.0002	0.002	0.003	0.010**	0.034***
	(0.007)	(0.010)	(0.001)	(0.0002)	(0.005)	(0.004)	(0.005)	(0.010)
Non-recession 2003-2004	– 0.002	– 0.040***	– 0.001	– 0.0001	– 0.002	0.005	0.004	0.035***
	(0.008)	(0.012)	(0.001)	(0.0003)	(0.006)	(0.004)	(0.005)	(0.011)
Recession 2005-2006	0.003	– 0.035***	– 0.001*	– 0.0002	– 0.008	0.003	0.007	0.032***
	(0.009)	(0.013)	(0.001)	(0.0002)	(0.006)	(0.004)	(0.006)	(0.012)
Recession 2007-2010	– 0.036***	– 0.034***	– 0.001	0.0003	0.024***	0.015***	0.013***	0.018*
	(0.008)	(0.012)	(0.001)	(0.0003)	(0.006)	(0.003)	(0.005)	(0.012)
Non-recession 2011-2013	– 0.033***	– 0.041***	– 0.001	0.0002	0.022***	0.018***	0.012**	0.022*
	(0.009)	(0.013)	(0.001)	(0.0002)	(0.006)	(0.004)	(0.006)	(0.013)

Note: 1) results are in marginal effects at mean values; 2) robust standard errors in parentheses, 3) *** p<0.01, ** p<0.05, * p<0.1; 3) we also control for other covariates, which are: ethnicity, educational attainment, marital status, health status, number of children, household type, house tenure, and region of residence.

Estimation results by both age group and gender broadly supporting those results that are found in estimations by gender. In the early 1990s recession, we find that older youths (20-24) and the oldest age group (50-65) are those who suffered the most in terms of job loss due to this recession. During this period, the employment probability for older youths decreased by about 7 and 5 percentage points for male and female, respectively. Meanwhile, the employment probability for the oldest age group also experienced a decrease by 6.5 percentage points for males and about 10 percentage points for females. As for the probability of unemployment, the results for older youths show an increase in probability by nearly 9 and 5 percentage points for male and female, respectively. The corresponding marginal effects for the oldest age group is about 4.7 percentage points for males, while the result for females is insignificant. Similarly for teenagers, whose employment probabilities during this recession are insignificant, their probability of being unemployed also increased by nearly 3 percentage points in the case of both males and females.

Our findings in the case of youths coincide with the findings in previous literature such as by Choudhry et al. 2012, which suggested that youth unemployment is highly affected by financial crisis. As explained previously, young people may have a lack of human capital and lower productivities compared to their adult counterparts. Another argument states that during a crisis, young workers were often amongst the first to lose their jobs as their temporary contracts were not renewed, and these young people now facing higher competition with job-seekers who have more employment experience in a market with fewer jobs on offer (Eurofound, 2012). As for the oldest age group, their skills may be depleted, thus their productivity might no longer be as good as when they were younger. Additionally, individuals aged 50 years and above are reaching their pension age. These reasons might encourage employers to retain younger workers who are still in their prime-age rather than older workers who are soon to retire. As a result, older workers are being disadvantaged in the labour market, especially during recessions.

Furthermore, the unemployment probabilities during the early 1990s recession are also found to be higher for all other age groups. The unemployment probability of the prime-age group, 25-35 years old, for example, increased by around 4.5 percentage points for males and nearly one percentage point for females during this recession. Moreover, there seems also an increase in the probability of being inactive during this period, particularly for females and those in the older age groups, whereas the inactivity probabilities for teenagers are insignificant. Specifically, during this recession, the probability of being inactive for the oldest age group increased by about 2 and 9 percentage points for male and female, respectively.

Similar to aggregate results for all age groups discussed previously, the triple adverse impacts of the early 1990s recession (i.e. lower employment probabilities, higher probabilities of unemployment and inactivity) still appear in the post-recession period between 1994 and 1997. During this post-recession period, even the employment probability of teenage males is found to be lower by about 6 percentage points. Another interesting finding during the 1990s recession and its post-recession period is that prime-age males, aged 25-35, show a significant higher tendency to enrol in further education (or training), although by only less than one percentage point. Meanwhile, youth's probability of being in education (or training) is rather insignificant during the 1990s recession period, and even shows a lower probability in the case of teenage females.[38] Moreover, during the 1994-1997 period, only the education probabilities for teenage males and males aged 25-35 years old that are found to be significantly higher.

After disaggregating our estimations by age group, the adverse impacts of the dot.com recession in the early 2000s are less obvious. The employment probabilities are only significantly lower for females aged 25-35 years old, by about 2 percentage points, and females in the oldest age group, by around 3 percentage points. Meanwhile, the unemployment probabilities are only significantly higher for prime-age females aged 25-35. The unemployment probabilities for females aged 36-49 years old are even significantly lower. It is only the probability of being in inactivity that tends to be higher during this period, especially for the adult age groups.

Supporting previous findings by gender, labour market outcomes for adult males during the non-recession period in the mid-2000s are relatively stable, except in some cases for the mature prime-age males (aged 36-49) where their probabilities of being inactive increased by only a small percentage point. On the other hand, adult females

[38] As a comparison, Clark (2011) shows that about 15 percent of the 22 percentage point increase in boy's enrolment rates in the UK is caused by increased unemployment associated with the early 1990s recession. For girls, out of the 25 percentage point increase in enrolment rates, only less than 10 percent is explained by unemployment due to the early 1990s recession.

tend to still suffer from higher probabilities of being in inactivity. In addition, in the case of the oldest females aged 50 years and above, their employment probabilities are also found to be significantly lower during this period.

In the case of youth labour market probabilities during the mid-2000s, our results show that teenage males are significantly more likely to be in education (or training), by about 9.4 percentage points, but less likely to be in both employment and unemployment, with the corresponding magnitudes of 7.4 percentage points for employment and 2.1 percentage points for unemployment. In contrast, during the 2003-2004 period, the employment and unemployment probabilities of older youth males are insignificant while their probability of being in education is significantly negative. Even though the probability of being in education for older youth males tends to be lower, this negative effect is less than the positive effects obtained from teenage males. This finding is consistent with previous literature by Jenkins et al. (2012) that finds higher non-employment rates for young people during the mid-2000s, in which the authors argue that this result is caused by increasing participation in post-compulsory education. In addition, similar to the results found for the prime-age males (aged 36-49), older youth males also experienced an increase in their probabilities of being inactive by only less than one percentage point.

Meanwhile, the labour market probabilities for female youths during the mid-2000s period is mostly insignificant. It is only during the 2005-2006 period that teenage females show a higher probability of being unemployed. Similarly for male youths, their labour market outcomes tended to deteriorate during the 2005-2006 period, indicated by a significant lower employment probability by about 7.4 and 4.5 percentage points for teenagers and older youths, respectively. This finding is in line with descriptive results shown in a previous study by Gregg et al. (2011), in which youth labour market is proven to have worsened between 2004 and 2007, prior to the Great Recession.

Unlike during the early 1990s recession, teenagers have been affected particularly hard by the latest Great Recession in the late 2000s. During this latest recession, teenage employment probabilities fell by about 29 percentage points for males and 16 percentage points for females.[39] In addition, their probabilities of being in NEET states were also significantly higher; in this case, their unemployment probabilities increased by more than 3 percentage points while their probabilities of being inactive also rose by less than one percentage point. Similar patterns are also found in the case of older youths. Nevertheless, while the probabilities of being in education (or training) for teenagers were significantly higher (by about 25 percentage points for males and 12 percentage points for females) during the Great Recession, the results of the education probabilities for older youths were insignificant.[40] This implies that while teenagers tend to cope with the Great Recession by returning to further education, older youths seem to be discriminated further in the labour market during this period and did not take harbour in education.

The adverse impacts of the Great Recession are also clearly apparent for the adult age groups, although the impacts on young people are still far worse than that experienced by these adults. For the adult age groups, not only do they have higher chances to be in the NEET labour market states, both unemployment and inactivity, but they also experience a lower probability of being in the Non-NEET states, employment and education. In the case of mature prime-age group (36-49 year olds), for instance, their unemployment probability during this recession increased by more than 1 percentage points, while their probability of being inactive increased by around 1.2 percentage points for males and nearly 4 percentage points for females.

Even after the recession period ended in 2010, the adverse impacts of the Great Recession on the labour market still continue to appear during the post-Great Recession-period of 2011-2013. This result and the previous result from the early 1990s recession tend to support our raw data trends, shown in Figure 1, in which the impacts of any recession on the labour market persist for a few years even after the economy begins to recover to its pre-recession level.

[39] This is in line with a previous study by Jenkins and Taylor (2012), where it is empirically shown that the non-employment rates of young people have been hit particularly hard by the recent Great Recession and were higher during the Great Recession than during the early-1990s recession. More specifically, it is found that in 2009, young men were 32 percentage points more likely to be non-employed than their counterparts aged 30–49.

[40] This is similar to that stated in Barakat et al. (2010), where applications to universities for the academic year 2010-2011 are reported by the Universities and Colleges Admissions Service (UCAS) to have increased by over twenty percent compared to the previous year.

2.4.2.3 Regional differences

Another focus of this chapter is to analyse regional differences on the probability of being in NEET and Non-NEET states at a given point in time, in particular during recession periods. Table 9 presents the results of regional effects by gender, while the estimations that are disaggregated by gender and age group can be found in Appendix B. From Table 9, several gender differences are evident in terms of the regional variable.

In the case of males, compared to living in the London area, living in the northern regions (including Wales) significantly decreases their employment probabilities and increases their chance of being unemployed and inactive. One possible explanation might be because regions outside London offer less job opportunities which are suitable for male workers. However, the probability of being in education is mostly insignificant for all regions. On the other hand, we find mixed results in the case of females. In general, living outside London significantly decreases their probabilities of being unemployed and being in education. The latter finding might be caused by the availability of a better educational infrastructure in London. The lower probability of unemployment for females who live outside London could be caused by the availability of more (part-time) job opportunities which are available for females in regions outside London, and may also be due to lower competitions from their male counterparts, who are found to have lower employment probabilities in these regions as discussed previously.

With respect to the employment probability for females, the results are rather insignificant, but females who reside in West Midlands, South East, and Scotland have a significantly higher chance of being employed relative to those who live in London, whereas those who live in Northern Ireland and Channel Island are significantly less likely to be employed. One explanation could be that sectors which generally hire more female workers, such as the financial and other service sectors, are more widely available in the region such as the South East. Similarly, there seems to be no regional differences in the probability of being inactive for females; significant results are only found for Scotland and Northern Ireland and Channel Island, where those who live in Scotland have a lower likelihood of being inactive and those who live in the latter two regions have a higher incidence of being inactive.

Table 9 Multinomial Logit Estimates of Regional Effects by Gender

Region of Residence	Dependent Variable			
	Employed	Education	Unemployed	Inactive
	Male			
London (base)				
North East	– 0.039***	– 0.0003	0.018***	0.021***
	(0.009)	(0.001)	(0.007)	(0.005)
North West	– 0.029***	0.0002	0.014***	0.015***
	(0.006)	(0.001)	(0.005)	(0.003)
Yorkshire & Humber	– 0.011*	0.0001	0.006	0.005**
	(0.006)	(0.001)	(0.005)	(0.002)
East Midlands	– 0.009	– 0.002**	0.005	0.006**
	(0.006)	(0.001)	(0.005)	(0.003)
West Midlands	– 0.008	– 0.001	0.006	0.003
	(0.006)	(0.001)	(0.004)	(0.002)
East	0.002	– 0.001	– 0.005	0.004
	(0.006)	(0.001)	(0.004)	(0.003)
South East	0.007	– 0.001	– 0.005	– 0.0005
	(0.005)	(0.001)	(0.004)	(0.002)
South West	0.007	– 0.001	– 0.009**	0.004
	(0.006)	(0.001)	(0.005)	(0.003)
Wales	– 0.024***	– 0.001	0.009*	0.016***
	(0.007)	(0.001)	(0.005)	(0.003)
Scotland	– 0.012**	– 0.0003	0.003	0.009***
	(0.006)	(0.001)	(0.004)	(0.003)
NI & Channel Island	– 0.045***	0.001	0.021***	0.023***
	(0.008)	(0.001)	(0.006)	(0.004)
	Female			
London (base)				
North East	0.007	– 0.001	– 0.007*	0.001
	(0.013)	(0.001)	(0.004)	(0.011)
North West	0.011	– 0.000	– 0.002	– 0.009
	(0.010)	(0.001)	(0.003)	(0.009)
Yorkshire & Humber	– 0.001	– 0.003***	– 0.006**	0.010
	(0.011)	(0.001)	(0.003)	(0.010)
East Midlands	0.014	– 0.002*	– 0.013***	0.001
	(0.011)	(0.001)	(0.003)	(0.010)
West Midlands	0.017*	– 0.001	– 0.003	– 0.014
	(0.010)	(0.001)	(0.003)	(0.009)
East	– 0.001	– 0.003**	– 0.008***	0.011
	(0.011)	(0.001)	(0.003)	(0.010)
South East	0.025***	– 0.002*	– 0.012***	– 0.011
	(0.010)	(0.001)	(0.003)	(0.009)
South West	0.004	– 0.003***	– 0.012***	0.012
	(0.011)	(0.001)	(0.003)	(0.010)
Wales	0.001	– 0.001	– 0.006*	0.005
	(0.011)	(0.001)	(0.003)	(0.010)
Scotland	0.029***	0.001	– 0.006**	– 0.024***
	(0.010)	(0.001)	(0.003)	(0.009)
NI & Channel Island	– 0.020*	– 0.001	– 0.013***	0.034***
	(0.012)	(0.001)	(0.003)	(0.011)

Note: 1) results are in marginal effects at mean values; 2) robust standard errors in parentheses, 3) *** p<0.01, ** p<0.05, * p<0.1; 3) we also control for other covariates, which are: age, ethnicity, educational attainment, marital status, health status, number of children, household type, house tenure, and business cycle.

Disaggregating further by both gender and age group, our results in Appendix B show less gender disparity in the case of young people. In this case, results for teenagers (aged 16-19), both male and female, suggest that residing outside London gives teenagers better employment opportunities compared to living in the London area. At the same time, residing outside London is also associated with a lower chance of being in education. One explanation may be because London has more options in terms of education system, especially those for teenagers, and better public infrastructure compared to other regions outside London. However, competition in the labour market in central London is very fierce, such that teenagers who have a relatively lower level of human capital would be less likely to find employment in this region. In addition, teenagers who live in several regions in the northern part of the UK (e.g. North West, Yorkshire, Wales, and Scotland) as well as those who live in some southern regions, such as in the West Midlands and East Midlands, also have a significantly higher probability of unemployment.

On the other hand, labour market opportunities seem to be better for older youths (aged 20-24) who reside in the London area since living in regions outside London, particularly in the northern regions, is associated with lower employment probabilities and a higher chance of being unemployed. Thus, in contrast with the results found for teenagers, older youths, both males and females, who may have higher levels of human capital than teenagers could obtain better labour market opportunities by residing in the London area. With regard to the probability of being in education, most of the results for older youths are statistically insignificant. Higher probabilities of being in education are found only for older youths males who live in Yorkshire, South East, and Scotland, and for older youths females who reside in North West and Scotland (relative to London). As for the probability of being inactive, the results for both teenagers (aged 16-19) and older youths (aged 20-24) are mostly insignificant.

Results for adult age groups show that for adult males, living in other regions outside London, in particular living in the northern regions, is associated with a lower probability of employment, a higher probability of being unemployed and inactive, and, in some cases for those males in the prime-age groups, a higher probability of being in education. One exception is for mature prime-age males, aged 36-49, who live in the South East who have a higher probability of being employed and a lower probability of being in unemployment relative to London.

As for adult females, the probabilities of employment and unemployment for females in the prime-age groups (aged 25-49) show opposite conclusions from that of adult males. In this case, compared to London, living in other regions increases their chance of being employed and lowers their probability of being unemployed. Again, we argue that the employment prospects for females are better in the regions outside London because of lower competitions from their male counterparts, who are less likely to find employment in these regions. Moreover, females in the younger prime-age group (25-35 year olds) who live outside London are also more likely to be in education and less likely to be inactive. Meanwhile, the results for probabilities of being in education and inactivity for mature prime-age females (36-49 year olds) are mostly insignificant. In the case of females in the oldest age group (50-65 year olds), living outside London, particularly in the northern regions, is associated with lower probabilities of being employed, unemployed, and in education. Whereas, those who live in northern regions such as Yorkshire, Wales, and Northern Ireland have a higher chance of being inactive.

With respect to the impacts of recessions for different regions of the UK (northern versus southern region), Table 10 reports the impacts of business cycle periods when estimations are disaggregated by region of residence (north and south), in which gender and age group are now treated as dummy variables. Results in Table 10 generally show limited evidence of 'north-south divide' in terms of labour market probabilities. One possible explanation is due to regional migration as stated in Andrews et al. (2011), where it is explained that workers will be attracted to high wage regions (such as the South and East) which will then increase the supply of labour and put downward pressure on wages. Therefore, labour migration could provide a mechanism through which the relocation of rational workers, who are seeking for the highest possible expected earnings, might bid away differences in labour market outcomes (Andrews et al., 2011, pp. 127).

In relation to regional unemployment, McCormick (1997) shows that in the 1991 Census data, the tendency for net migration moving from the high unemployment regions (Northern, North West, Yorkshire, Wales, Scotland) to the low unemployment regions (South and East) is found to be eliminated, and thus the 'north-south divide' is negligible. Moreover, it is further stated that this Census evidence suggests that migration has contributed to reducing trend unemployment differentials between north and south (McCormick, 1997, pp. 583). Andrews et al. (2011) also provides supporting empirical evidence using the BHPS data (1991-2007), where it is found that regional real wages and tightness do not have a significant influence on individual migration decision. They argue that this finding implies that there is no strong evidence to support the notion that the net flows of migration move from ‘poorer’ regions to ‘better’ regions.

Table 10 Multinomial Logit Estimates of Business Cycle by Region

Variables	Dependent Variable			
	Employed	**Education**	**Unemployed**	**Inactive**
		North		
Non-recession 1998-2000 (base)				
Recession 1991-1993	– 0.042***	– 0.001	0.017***	0.026***
	(0.006)	(0.001)	(0.003)	(0.005)
Non-recession 1994-1997	– 0.039***	0.002*	0.009***	0.028***
	(0.005)	(0.001)	(0.003)	(0.004)
Recession 2001-2002	– 0.021***	– 0.001	0.003	0.019***
	(0.003)	(0.001)	(0.002)	(0.003)
Non-recession 2003-2004	– 0.011***	– 0.0004	– 0.003	0.014***
	(0.004)	(0.001)	(0.002)	(0.003)
Recession 2005-2006	– 0.011***	– 0.0005	– 0.005**	0.016***
	(0.004)	(0.001)	(0.002)	(0.003)
Recession 2007-2010	– 0.047***	0.002***	0.020***	0.025***
	(0.004)	(0.001)	(0.002)	(0.003)
Non-recession 2011-2013	– 0.054***	0.003***	0.022***	0.028***
	(0.005)	(0.001)	(0.003)	(0.004)
		South		
Non-recession 1998-2000 (base)				
Recession 1991-1993	– 0.055***	0.0001	0.036***	0.019***
	(0.005)	(0.001)	(0.003)	(0.003)
Non-recession 1994-1997	– 0.034***	0.003***	0.017***	0.014***
	(0.003)	(0.001)	(0.002)	(0.002)
Recession 2001-2002	– 0.006*	– 0.0001	– 0.002	0.008***
	(0.003)	(0.001)	(0.002)	(0.003)
Non-recession 2003-2004	– 0.016***	– 0.0001	0.003	0.013***
	(0.004)	(0.001)	(0.003)	(0.003)
Recession 2005-2006	– 0.023***	0.002*	0.008***	0.014***
	(0.005)	(0.001)	(0.003)	(0.004)
Recession 2007-2010	– 0.069***	0.004***	0.033***	0.033***
	(0.004)	(0.001)	(0.002)	(0.003)
Non-recession 2011-2013	– 0.063***	0.004***	0.029***	0.029***
	(0.004)	(0.001)	(0.002)	(0.003)

Note: 1) results are in marginal effects at mean values; 2) robust standard errors in parentheses, 3) *** p<0.01, ** p<0.05, * p<0.1; 3) we also control for other covariates, which are: age, gender, ethnicity, educational attainment, marital status, health status, number of children, household type, and house tenure.

Looking more specifically at each period, Table 10 indicates that during the early 1990s recession, there had been a decrease in the employment probability and an increase in the probability of being NEET (unemployed and inactive) for both regions in the northern and southern part of the UK. Relative to the base period, the fall in employment probability during the 1990s recession was slightly higher in the southern regions (i.e. by about 5.5 percentage points) than that in the northern regions (i.e. around 4.2 percentage points). Similarly, during the same period, those living in the southern regions suffered a higher probability of unemployment by more than twice of those who reside in the northern regions of the UK; that is, the unemployment probability increased by nearly 4 percentage points for the southern region and by only less than 2 percentage points for the northern region. It is only the probability of being inactive which is found to be larger for the northern region than the southern region, i.e. by nearly 3 percentage points for the northern region as compared to 2 percentage points for the southern region.

Recall from our discussions in Chapter 1 that following the recovery from the early 1980s recession, the UK economy experienced a strong growth in the mid-1980s which leads to a property boom. Taylor and Bradley (1994) shows that the increase in households borrowing, in terms of housing equity, due to financial liberalization in the 1980's was more pronounced in the south leading to large owner-occupied sector and high house prices. As a result, the housing and consumption boom in the late 1980s was also largest in the south. The unanticipated increase in interest rates to control for the increase in inflation due to housing boom increased mortgage repayments, and reduced disposable income (McCormick, 1997, pp. 583). Consequently, house prices and consumption declined more in the south. This could explain our previous finding where we found that the adverse impact of the early 1990s recession seems to hit the UK's southern regions harder than the northern regions.

As for the early 2000s recession, we again find that the impact of the early 2000s recession is relatively negligible than the impact from the previous recession in the 1990s and the later recession in the late 2000s. During this recession, the employment probability decreased by about 2 percentage points for the north and by less than one percentage point for the south. Moreover, the probability of being inactive also increased by only a small amount of nearly 2 percentage points for the north and one percentage point for the south.

Meanwhile, the impacts of the latest Great Recession appear to be more pronounced for the southern regions than those for the northern regions. During this recession, the south experienced a lower probability of employment and higher probability of being NEET (both unemployment and inactivity). The probability of being employed for those who reside in the southern regions decreased by nearly 7 percentage points, while the decrease in employment probabilities for those who live in the northern regions only account for less than 5 percentage points. In addition, the probability of being NEET (both unemployed and inactive) for those who reside in the south increased by more than 3 percentage points, while for those who live in the north the corresponding magnitude is only about 2 percentage points. One explanation is because sectors which were hit hardest by the Great Recession (such as financial sectors) are over-represented in the south (Vaitilingam, 2010).

2.4.2.4 Other covariates

Overall results for ethnicity in the case of males suggest that when compared to Whites, other ethnicities tend to have a lower probability of being in employment and a higher probability of being in either education, unemployment, or inactivity. Analysing further by different age groups, we further find similar results except in the case of teenagers. That is, we find opposing results where Black and Asian teenagers, relative to their White counterparts, have a lower probability of being unemployed and inactive.[41] In addition, we also find that Asian older youths are significantly less likely to be inactive.

In the case of females, and relative to their White counterparts, those from other ethnic groups in general have higher probabilities of being in education, unemployment, and inactivity, and a lower probability of employment. One exception is for Black females who have significantly lower probability of being inactive relative to their White counterparts. Moreover, we also find that teenage Black females are

[41] A study by Li and Heath (2008) shows that Black African men in the UK were very educationally qualified and were little different from the White British men in gaining access to the paid employment. However, these men were also more likely to be unemployed and inactive. Meanwhile, Chinese men were more likely to engage in small-scale self-employment, thus avoiding the risks of unemployment.

significantly less likely to be unemployed when compared to teenage White females.[42] Results by age group for females further show that the significant and positive employment probabilities for Black females are only found for those Black females aged 36 years and above, while the employment probabilities for Black females from those younger age groups are significantly lower than the employment probabilities of their White female counterparts.

Furthermore, relative to those without education, a higher educational background is found to be associated with a higher probability of being in employment and a lower probability of being unemployed or inactive, implying that education plays a significant role in protecting individuals from being in NEET states. This result is consistent even after disaggregating estimations by gender and age group. As for the probability of being in education (or training), the results show that compared to those with no education, having higher education does lead to a higher probability of being in further education except for, in some cases, those with CSE level qualifications, where their probability of being in education is lower.

Gender disparities seem to be present in the case of marital status results. Compared to those who are not married, being married or ever married for males increases their probability of being employed and decreases their likelihood of being in other labour market states. This finding is still robust even after estimations are disaggregated by age group. Meanwhile, for females, compared to those who are not married, females who are married or ever married not only have a higher probability of being employed but are also significantly more likely to be inactive. Females in the oldest age group, 50-65 years old, who are married also show a lesser tendency of being employed. Both results from males and females seem to imply that having a spouse or family increases the need to stay in employment as they bear heavier financial burdens for the family. At the same time, however, these results also suggest the division of gender roles in the family. That is, while females, particularly older

[42] This finding contradicts with previous literature on ethnic disadvantage in the UK (see, for example, Fieldhouse and Gould, 1998 and Blackaby et al., 2005). However, our finding may also suggest that teenage Black females are mostly in education and less attached to the labour market (both by less likely to be employed and unemployed) than their White counterparts, which could be a way to avoid discrimination in the labour market and to build their human capital to advance their position in the labour market (see Bradley and Lenton, 2007).

females, tend to be more responsible for family care once they get married, males have the responsibilities of being the breadwinners in the family.

With regard to health condition, relative to having an excellent or good health condition, being not healthy or being of a somewhat fair health condition significantly lowers the probability of being in employment and education and significantly increases the probability of being in NEET states. These results are robust for both genders in all age groups. Thus, having a good health condition is important for someone to be in the Non-NEET status, either being employed or in education. Moreover, the impacts of health condition tend to be more important in the case of older age groups. As suggested by Cappellari et al. (2005), the older the individual the more likely their health condition will deteriorate, and hence the higher the chance that they end up being in NEET states, particularly to end up dropping out of the labour force and becoming inactive.

Having more children appears to increase the employment probability for youth males and decreases their probability of being in education. Additionally, the probability of being unemployed and inactive for youth males are also significantly higher with the increase in the number of children. Similarly, having more children for young females increases their probability of employment and being in NEET states, while their probability of being in education is lower. On the other hand, for adult males and females, having more children is associated with lower probabilities of being employed, although their probabilities of unemployment and inactivity are still significantly higher. Moreover, in some cases we also find that for adult males and females, the probability of being in education is significantly higher with the presence of children.

Therefore, contrary to the findings for marital status, we find no gender disparity due to the presence of children. In other words, our findings tend to suggest that childcare responsibilities are shared equally between males and females in the household. For young people in particular, having children would be an obstacle for them to enrol in further education, and increases their responsibilities to actively engage in the labour market although at the same time also increasing their chance to drop out of the labour force to care for their children. Meanwhile, results for adults tend to indicate that they are more likely to focus on childcare once they have more children since their employment probabilities are lower while their probabilitities of inactivity are significantly higher in most cases.

The type of household also exerts some effects.[43] Relative to living alone without children, living in a household as couple (with or without children) significantly increases the male probability of being employed and decreases their probability of being unemployed or inactive. In the case of females, compared to the base category of living alone without children, those females living in any other type of household with children have a lower probability of being employed and a higher incidence of being inactive. In contrast, females who live in a household type consisting of a couple without children have a higher likelihood of being employed and lower chance of being unemployed. This finding supports the view that it is females who hold the responsibility for childcare in the household. As for the probability of being in education, the results for both males and females in general show that the probability of being in education is lower for those who live in a household type consisting of a couple without children and for the others category. Meanwhile, living in the other types of households increases their probability of being in education.

Furthermore, the impacts of household tenure are similar for both males and females. Relative to those who own their housings outright, individuals who pay mortgages for their housings or rent their houses from employers are significantly more likely to be employed and less likely to be unemployed or inactive. The opposite is true for individuals who live in other kinds of household tenure. This is consistent with the notion that the need for financial resources to pay for mortgages or rental fees might encourage individuals to be in employment, or at the very least to stay actively engaged in the labour force.

[43] We note that some of the following findings contradict with the results on the number of children. This may be because we estimate these two effects separately. Further investigation may be needed by taking into account other factors, such as using interactions between these two variables, the role of spouse in the household, as well as the role of child's age. However, since they are not the main focus of this thesis, thus further examination of these variables is beyond the scope of our study

2.5 Summary

This chapter provides an initial investigation of the labour market behaviours of those individuals aged 16-65 years old in the UK by analysing the characteristics of individuals who occupy a certain labour market state at a given point in time. Particular focus in this chapter is on examining the impacts of different business cycle periods, especially the recession periods, on different age groups, gender, and region (northern versus southern regions). Analyses in this chapter provide a starting point for further examinations using more complex modelling to estimate the dynamic nature of the labour market (transition probabilities) as well as the effects of different forms of state dependence.

The results from our empirical analysis in this chapter reveal that the issue of being NEET (Not in Education, Employment or Training) is not only important for the case of young people, but it is also a significant problem for their adult counterparts, in particular for females and those aged 50 years and above. We find that young people have a higher probability of being unemployed relative to their adult counterparts by about 3 to nearly 4 percentage points. However, their probability of being inactive is lower by nearly 2 percentage points for males and about 6 percentage points for teenage females, whereas older youth females (20-24 year olds) have a higher probability of being inactive by about 2.5 percentage points. Moreover, for these young people, and particularly for teenagers, they still have a higher chance of going into further education, which is likely to be a better alternative to completely dropping out of the labour force.

Meanwhile, most individuals in the adult age groups face the risk of being both unemployed and economically inactive. Specifically, adults aged 50 years and above have a higher probability of being inactive by about 2.5 and 10 percentage points for males and females, respectively. Moreover, compared to the mature prime-age adults (35-49 year olds), the younger prime-age adults (25-35 year olds) also have a higher probability of being unemployed by less than one percentage point. Additionally, prime-age females aged 25-35 also face a higher risk of being economically inactive by more than one percentage point, while the reverse effect is found for males.

With respect to the business cycle periods, we find no gender disparity in our results, but we do find that the impacts of recession are different for each age group. In this case, we find supporting evidence that recessions adversely affect the youth labour market harder than the labour market for adults. During the early 1990s recession, the older youths (aged 20-24) and the oldest age group (aged 50-65) were affected the most by the recession. During this period, the employment probability for older youths decreased by about 7 and 5 percentage points for male and female, respectively. Meanwhile, the employment probability for the oldest age group also experienced a decrease by 6.5 percentage points for males and about 10 percentage points for females. As for the probability of unemployment, the results for older youths show an increase in probability by nearly 9 and 5 percentage points for male and female, respectively. The corresponding marginal effects for the oldest age group is about 4.7 percentage points for males, while the result for females is insignificant. In addition, the probability of being inactive for the oldest age group also increased by approximately 2 and 9 percentage points for male and female, respectively.

Meanwhile, during the Great Recession in the late 2000s, both teenagers (16-19 year olds) and older youths (20-24 year olds) experienced the hardest impacts of the recession. During this latest recession, teenage employment probabilities fell by about 29 percentage points for males and 16 percentage points for females, while employment probabilities for older youths fell more moderately by less than 7 percentage points for both males and females. In addition, youths' probabilities of being in NEET states were also significantly higher during this period. In this case, unemployment probabilities for teenagers increased by more than 3 percentage points, while their probabilities of being inactive also rose by less than one percentage point. As for older youths, their probabilities of being unemployed increased by more than 6 percentage points for males and by nearly 4 percentage points for females; meanwhile, their probabilities of being in inactivity rose by nearly one percentage point in the case of males and by about 2 percentage points for females. Moreover, we also find evidence that teenagers (16-19 year olds) took harbour in education during the Great Recession, as their probabilities to be in education are found to be higher during this period (by about 25 percentage points for males and 12 percentage points for females).

Supporting our raw data results presented in Figure 1 of the previous chapter, we also empirically find that the adverse impacts of the early 1990s recession and the

Great Recession persist until the following non-recession periods in 1994-1997 and 2011-2013, respectively. On the other hand, after disaggregating our estimations by both gender and age group, the adverse impacts of the dot.com recession in the early 2000s are less obvious.

Results for regional differences reveal that compared to the London area, the regions outside London are a good place for teenagers to find employment, yet they are not a good place to go for education. In contrast, older youths (aged 20-24) who reside in regions outside London, particularly in the northern regions, have lower employment probabilities and a higher chance of being unemployed. In regard to the probability of being in education, most of the results for older youths are insignificant. In addition, youths (teenagers and older youths) who live in several regions in the northern part of the UK (e.g. North West, Yorkshire, Wales, and Scotland) as well as teenagers who live in some southern regions, such as in the West Midlands and East Midlands, also have significantly higher probabilities of unemployment. As for the probability of being inactive, the results for both teenagers (aged 16-19) and older youths (aged 20-24) are mostly insignificant.

Furthermore, in the case of adult males, compared to living in the London area, residing in other regions, particularly in the northern regions, is associated with a lower probability of employment as well as a higher probability of being unemployed and inactive. As for adult females, the probabilities of employment and unemployment for females in the prime-age groups (aged 25-49) show opposite conclusions from that of adult males. This implies that living in the London area offers higher employment opportunities for adult males, but not for adult females. As for the oldest females (50-65 year olds), living outside London, particularly in the northern regions, is associated with lower probabilities of being employed, unemployed, and in education, and a higher chance of being inactive.

With respect to the impacts of recessions for different regions of the UK, we find limited evidence of ‘north-south divide’ in terms of labour market probabilities. One possible explanation is due to regional migration, where labour migration could provide a mechanism through which the relocation of rational workers, who are seeking for the highest possible expected earnings, eliminates differences in labour market outcomes (McCormick, 1997; Andrews et al., 2011). Looking more specifically at each period, our results suggest that the adverse impacts of the two major recessions in the early 1990s and late 2000s were more pronounced for the south than the north. In this case, the fall in employment probabilities and the increase in unemployment probabilities during the two recessions were higher in the south than that in the north. The supporting arguments for these findings are because housing boom during the 1990s recession was sharpest for the south, while sectors which were hit hardest by the Great Recession (such as financial sectors) are over-represented in the south.

CHAPTER 3

The Dynamics of NEET

Our analyses so far have only focused on the effects associated with the probability of being in a given labour market state at a given point in time, also referred to as 'state probabilities' (Cappellari et al., 2005). This chapter broadens our approach from the analysis of state probabilities to the analysis of factors that influence transitions between labour market states, otherwise known as transition probabilities. Moreover, we also try to incorporate the issue of state dependence, in particular Markovian dependence, into our analysis by estimating the first-order Markovian models. In this case, transitions between labour market states can be analysed by relating the labour market occupied at a given point in time with the labour market state occupied up to a certain point in the past.

The concept of Markovian dependence, along with other types of state dependence, was first suggested by Heckman and Borjas (1980). More formally, in the case of Markovian dependence Heckman et al. (1980, pp. 247) explains that in a short time interval, the probability that, say, an employed individual will be unemployed in the future is different from the probability that an unemployed individual will remain unemployed. We restrict our attention in this chapter to analyse Markovian dependence since other forms of state dependence require more complicated data management and more detailed information regarding the length duration of each labour market spell as well as the histories of previous labour market states, which are occupied prior to the current labour market status.[67] Analyses of these other types of state dependence will be conducted in the next empirical chapter.

In the simple Markov model, transitions between labour market states are assumed to depend only on the origin state and a set of exogenous variables but not on the history of the process (Steiner and Kwiatkowski, 1995, pp. 10). This assumption is rather restrictive, yet the Markov models can still be used as our starting point in

[67] The other forms of state dependence are occurrence dependence, lagged-duration dependence, and duration dependence (Heckman and Borjas, 1980).

assessing the importance of state dependence, which is essential for understanding the labour market dynamics and for policy design, particularly in the long-run.

One challenge of taking into account the impacts of previous labour market states into our analysis is distinguishing the impact that comes from state dependence (also called ‘true state dependence’ or ‘genuine state dependence’ or the ‘scarring effect’) with those that are caused by differences in individual characteristics, and particularly unobserved heterogeneity among individuals. In regard to this issue, there may exist some unobserved personal characteristic across individuals, such as ability or motivation, which determines an individual labour market status in each year, and these effects may be correlated over time. Individuals with a lower ability or weaker motivation to work, for instance, will be more likely to be unemployed over time. Thus, observing that these individuals experience unemployment from time to time would simply reflect the difference across individual characteristics, both observed and unobserved, where otherwise they would have an equal chance of being unemployed. In other words, any evidence showing that previous unemployment spells are highly correlated with an individual’s current unemployment status might be caused solely by their unchanging ability or motivation over the years, which is unobserved by researchers. As a consequence, failure to control for unobserved heterogeneity will make the relationship between the past and current labour market status spurious (Heckman et al., 1980; Tumino, 2015).

On the other hand, in the case of homogeneous individuals, for example when different individuals have similar abilities or motivational traits in the labour market, then any persistence in the labour market is due to causal impacts between the previous labour market experience and the current labour market status, which is known as ‘true state dependence’ or the ‘scarring effect.’ In this regard, individuals who are currently unemployed, for instance, would behave differently in the future as compared to other identical individuals who are currently not experiencing unemployment.

Previous studies in this field have addressed the importance of identifying true state dependence in analysing labour market transitions. In terms of labour market policies, the existence of state dependence may determine whether government labour market interventions in the short-run would also have long-run impacts in the future. Arulampalam et al. (2000, pp. 25) in the context of unemployment dependence argue that if there is no state dependence in unemployment incidence, then any short-run unemployment reduction policies will have no effect in the long-run equilibrium of the aggregate unemployment rate. Conversely, if true state dependence in unemployment incidence exists, then policies to reduce the unemployment rate in the short-run will also have an impact in the long-run in reducing the natural rate of unemployment. If this is the case, then labour market interventions should focus on preventing early unemployment incidences, such as through education or training. Therefore, it is important to examine whether labour market persistence is caused by genuine state dependence, or instead whether it is due to individual heterogeneity in characteristics.

In this chapter, we try to extend previous work by Arulampalam et al. (2000) and Tumino (2015) to explore the persistence in labour market states using the BHPS and the US dataset. In this case, we utilise similar econometric modelling of the random effects dynamic probit models to estimate the first-order Markov models. Arulampalam et al. (2000) finds strong evidence of state dependence in unemployment in the case of British men aged 16 and above. This study shows that persistence in unemployment probability due to past unemployment incidences in the previous year accounts for less than 25 percent for young men and around 40 percent for adult men. Meanwhile, Tumino (2015), which examines the persistence in unemployment in the case of British men during different business cycle periods, finds a negative relationship between the scarring effect of unemployment and the business cycle; that is, the impact of past unemployment experience on the probability of current unemployment incidence is larger during worse labour market conditions than when the labour markets are in favourable conditions.

Nevertheless, unlike our benchmark studies by Arulampalam et al. (2000) and Tumino (2015), we will use larger datasets of the entire waves of the BHPS data and the first five waves of the US survey in order to account for different business cycle (and labour market) conditions. Moreover, this study contributes to the previous literature by investigating persistence in several different labour market states, not only persistence in the unemployment state. Thus, for each model, the (first-order) lagged dependent variables, which capture the effects of labour market dynamics and state dependence, are constructed as dummy variables for being employed, in education, unemployed, or inactive in the previous wave (with employment is set as the base category). In terms of sample selection, we are allowing for new respondents to be added into our estimated sample by controlling for the initial condition problem using solutions suggested by Wooldridge (2005 and 2009).

There are several explanations for why state dependence or persistence in the labour market may exist. In the case of unemployment persistence, Pissarides (1992) and Mroz and Savage (2006) suggest that the depreciation in human capital when being unemployed plays an important role for state dependence. Another reason could be due to the discouragement and habituation effect (Clark et al., 2001). In this regard, individuals who have been out of employment or out of the labour force for some time may become used to the situation, and if this becomes the norm for an individual then there will be less of an incentive to change one’s labour market status. For potential employers, individual labour market histories might be used as a proxy for worker motivation and productivity (Vishwanath, 1989; Lockwood, 1991) where individuals with longer out of employment durations demonstrate ‘negative signalling’ in the hiring process and are ‘stigmatized’ as being less motivated or having lower productivities. As a consequence, individuals with longer past unemployment durations will have a lower probability of being hired (Blanchard and Diamond, 1994; Biewen and Steffes, 2010).

On the other hand, persistence in employment may exist because past employment experiences could be a positive signal for an individual’s higher motivation or higher productivity to work (Niedergesass, 2012). In addition, past employment spells may broaden individual’s networking channels, which can be helpful to find new job opportunities (Ioannides and Loury, 2004). In contrast, previous employment experiences can also contribute to longer unemployment or out of employment durations if human capital gains from past employment episodes are firm-specific and thus not relevant for new employers (Ljungqvist and Sargent, 1998). Moreover, new potential employers would be reluctant to pay for these workers who have too high of a reservation wage; hence, this increases the workers’ unemployment spells or job search durations.

The aims of this chapter are twofold: analysing the transition probabilities in the labour market using the first-order Markov models, and investigating the evidence of labour market persistence from our sample. For the purpose of this chapter, we make use of the 18 waves of the BHPS data and the first five waves of the Understanding Society dataset. As for the empirical modelling, persistence in the labour market will be analysed by Markov models. Several previous studies in this area have used the dynamic probit models, in which the probability that an individual occupies a given labour market state at a given point in time is set as a function of the previous labour market states occupied up to a certain point in the past (see Arulampalam et al., 2000; Cappellari et al., 2005; Tumino, 2015; Gørgens and Hyslop, 2016). Other studies have extended their analyses and use the multinomial logit models to examine the determinants of labour market transitions, allowing the dependent variable for each labour market state to have more than one possible labour market destination (see, for example, Ordine, 1992; Steiner and Kwiatkowski, 1995; Prowse, 2005; Baussola et al., 2015).

Unlike the duration analysis which will be examined in the next chapter, at this stage the length of time or duration spent in each labour market state is not important and thus will not be considered in our estimation. In addition, with regard to sampling methods, in Markov models we do not need to select individuals at a given state and observe them until they leave that state (or until the end of a sample period). Thus, we can simply consider the entire distribution of a state at a given point in time and estimate how that distribution is influenced by its past realisations (Cappellari et al., 2005). In contrast, the duration models select individuals in a given labour market state and observe them from the start of the spell until they leave that labour market state (the end of that labour market spell) or until the sample period ends.

3.1 Research Questions

In this chapter, the labour market transition probabilities will be explored by the Markov models, in which the probability of occupying a particular labour market state at a given point in time is assumed to be influenced by previous labour market states occupied in the past while controlling for other observed individual personal and household characteristics, unobserved heterogeneity, as well as the initial condition problem. Thus, the empirical research questions that need to be addressed in this chapter are:

1) By how much does the probability of being in a given labour market state at a given point in time depend on the labour market status in the previous period?
2) Is there any evidence of labour market state dependence (or persistence in the labour market) from the previous period?
3) Is there any support for the ‘scarring effect’ in the labour market? In particular, are ‘bad’ labour market states, such as NEET (unemployment and inactivity), scarring?
4) How do the impacts of an individual’s personal and household characteristics change after we control for the unobserved heterogeneity in our models?

In order to answer these empirical questions, we utilize random effects dynamics probit models. The use of the random effects models, as opposed to the standard bivariate probit models, is important in order to control for the unobserved time-invariant individual differences (heterogeneity) in the labour market, and hence to disentangle the impacts that come from the unobserved heterogeneity and those caused by true state dependence (after controlling for other observed characteristics). In addition, we also control for the initial condition problem, adapting the solution by Wooldridge (2005 and 2009).

3.2 Literature Review

Numerous studies in the labour economics literature for European countries, as well as the UK, have shown evidence of the significance of state dependence in analysing labour market transition dynamics. This finding is particularly true for those individuals who are in unfavourable labour market states, such as unemployment. It implies that individuals who have occupied unfavourable labour market states, such as being unemployed or being out of the labour force, in the past will tend to stay in that labour market state in the future, and, hence, are trapped in a vicious cycle of bad labour market outcomes. Most studies in this area have focused on analysing the persistence in unemployment (such as Arulampalam, 2000; Bell and Blanchflower, 2011; and Tumino, 2015) although some other studies have broadened their analyses to include estimations of persistence in other labour market states (such as Cappellari et al., 2005; Benchekroun, 2014; and Baussola et al., 2015).

Studies in the case of the UK labour market by Arulampalam et al. (2000) and Cappellari et al. (2005), for example, utilize low-order Markov models in order to assess the impacts of previous labour market statuses on the probability of individuals being in a given labour market state at a given point in time. Using the first five waves of the British Household Panel Survey (BHPS), Arulampalam et al. (2000) finds strong state dependence effects, with regard to previous unemployment incidences, on the probability of being unemployed in the case of British men aged 16 and above. Their findings further show that the impacts of state dependence on unemployment probability are stronger in the case of mature men, those aged 25 and above in 1991, as compared to those for youths. In this case, persistence in unemployment probability due to past unemployment incidences in the previous year account for only less than 25 percent for young men. Meanwhile, for adult men, around 40 percent of persistence in the unemployment probability is accounted for by state dependence. Another significant finding in this study is that more educated men are less likely to be unemployed relative to those men without any qualifications, while most other explanatory variables are rather insignificant.

Utilizing a similar method as Arulampalam et al. (2000), Cappellari et al. (2005) not only examines the issue of state dependence in the case of the unemployment probability but also estimates labour market persistence for the probability of employment and inactivity. Using a dataset from the UK Labour Force Survey (LFS) 1993-1994 for older men and women aged 50 to the state pension age, they analyze labour market movements from employment, unemployment, and inactivity using first-order Markov models. In general, they find that when moving from analysing static probabilities to transition probabilities, which include an additional variable for the one-year lagged dependent variable of the labour market status, the impacts of personal characteristics in the latter estimation become less significant as compared to the former case. They further argue that it is the past labour market state variable that overpowers other covariates, and thus this shows strong evidence for labour market persistence or state dependence. One of the conclusions given in this study is that the best predictor for labour market transitions is the labour market state itself rather than respondent’s observed characteristics.

Again for the UK labour market, using BHPS data from 1998 – 2008 for British youths aged 18 - 24, McQuaid et al. (2016) investigates the scarring effects from the length of unemployment (measured in number of weeks unemployed) on individual future unemployment prospects as well as their pay and wellbeing in 5 and 10 years later. In this case, the information on the individuals' number of weeks in unemployment in 1998 is used as the main variable of interest to see if there is any scarring occuring in 2003 and 2008. From the Ordinary Least Squares and logistic regression models they find supporting results that previous unemployment spells do contribute to lower pay and a higher probability of future unemployment. On the other hand, there is no statistically significant evidence of scarring effects on individual wellbeing, which is measured by their satisfaction with life.

More recent studies have extended their analyses from using the binary outcome model, commonly the probit model, to using a more extensive model such as the multinomial logit in order to estimate the determinants of labour market flows, allowing for multiple labour market transition destinations for each labour market state origin (see, among others, Ordine, 1992 for the Italian youth labour market; Steiner and Kwiatkowski, 1995 for Poland; Prowse, 2005 for the UK; Benchekroun, 2014 for Morocco; Baussola et al., 2015 for Italy and UK). These studies show that the effects of most explanatory variables (i.e. personal and household characteristics, labour market indicators, and other variables) on labour market transition probabilities vary by state of origin, state of destination, and sometimes by gender.

Utilizing Italian labour market data, Ordine (1992) compares the labour market transition determinants between employment, unemployment, and out of the labour force for Italian youths and prime-age unemployed in the period 1988-1989. This study finds evidence of state dependence and negative duration dependence in unemployment, i.e. the longer the unemployment duration the less likely an individual will move out of unemployment. In addition, prime-age males have a higher chance of moving from unemployment to inactivity (out of the labour force) the longer they have been unemployed. Youths and women tend to remain unemployed regardless of the time spent unemployed. Another crucial finding from this study is the attempt to separate the 'unemployment' state from the 'out of the labour force' state. The author shows that while this separation is negligible in the case of prime-age workers, for young workers it is important to make a clear disaggregation between the origin state of 'unemployment' and 'out of the labour force' because the probability of youths finding a job is higher when the origin state is unemployed compared to when the origin state is out of the labour force.

Bausolla et al. (2015) compares the determinants of labour market transitions between the labour markets in Italy and United Kingdom, with particular focus on the gender unemployment gap problem. Making use of the labour force survey data from both countries for the period 2004-2013, the authors disaggregate their analyses between the pre-recession and recession periods, that is, the pre-recession period 2004-2008/09 and the recession period in 2009-2013. Their results suggest that in both countries, women are less likely to escape from the inactivity state compared to men. In addition, women and young people are the disadvantaged groups in the Italian labour force, especially during the pre-recession period for women. The impacts of the recession hit male employment harder than female employment in Italy, narrowing the gender unemployment gap during this period, whereas in the UK there is no evidence of gender differences during recession. The authors further find that Italian youths have lower employment opportunities and a lower probability of moving out from inactivity, relative to Italian older workers, whereas young people in the UK tend to have lower unemployment rates and a higher labour force participation rate. The authors also show the importance of having higher education for employment opportunities in both countries, although for Italy this positive effect disappears during the recession period.

Another piece of evidence on labour market transition probabilities for the UK labour market is rounded by Prowse (2005) using 12 waves of the BHPS data. This study examines women’s labour market transitions between full-time employment, part-time employment, and non-employment. Findings in this study support the presence of positive state dependence in all three labour market states, in which significant positive true state dependence is found to be larger for full-time employment and non-employment states than for part-time employment. Moreover, results for other covariates indicate that older people are more likely to be in full-time employment than youths, while the presence of children lowers the probability of employment. Moreover, having higher education and vocational qualifications increases the probability of employment, whereas having non-labour income has a small negative impact on employment probability.

With regard to discussions on the business cycle and recession, recent studies by Tumino (2015) and Lehmann et al. (2016) estimate the transition between labour market states during periods of economic recession in the UK and Latvia, respectively. Utilizing data for the Latvian labour market in 2007-2012, Lehmann et al. (2016) investigates the determinants of labour market transitions between six labour market states (permanent employment, temporary employment, professional self-employment, non-professional self-employment, unemployment and inactivity) during the Great Recession.[68] Based on the 3x3 matrix and from multinomial logit model analyses, several conclusions can be drawn from this study: (1) the crisis period between 2008-2009 has the most severe impact on the Latvian labour market, indicated by a sharp increase in labour market flows from employment to unemployment; (2) even after 2008, the outflow rates from unemployment only fall slightly, resulting in an increase of unemployment duration during this crisis period;[69] (3) males, young workers and workers with lower than secondary education have the largest inflow rates into unemployment; and (4) workers who are older, non-Latvian and less skilled are the ones affected the most by the economic crisis.

Tumino (2015) in the case of the British Men sample analyses the persistence in unemployment from the early 1990s to the Great Recession period. This study aims to investigate the relationship between true state dependence and the business cycle using the local unemployment rate as one of the control variables to estimate the persistence of unemployment incidence. The labour market transition estimations are disaggregated into three mutually exclusive sub-periods, which are: (1) the early 1990s period, a period of high but declining unemployment, using the BHPS Waves 1-5; (2) the early 2000s period, which is characterized by low and stable unemployment, using the BHPS Waves 9-13; and (3) the Great Recession period in the late 2000s, using the BHPS Waves 16-20.[70] Findings in this study support the presence of true state dependence in all three sub-periods that are analysed. Moreover, this study also finds

[68] The authors make use of two different datasets, the EU SILC and the Latvian Labour Force Survey. The former dataset is used to estimate labour market transitions between the six categories, while the LFS data can only estimate labour market transitions between three standard labour market states (i.e. employment, unemployment, and inactivity).

[69] Although the unemployment flows somewhat recovered during 2010-2011, i.e. unemployment outflow (inflow) rates are slightly higher (lower), these improvements were not large enough to surpass the increase in unemployment duration and thus increase the long-term unemployment incidence.

[70] Wave 19 and 20 in this study refer to the Understanding Society Wave 2 (2010/2011) and Wave 3 (2011/2012), since after the BHPS Wave 18, respondents of the BHPS were only re-interviewed as part of the US data's respondents from US Wave 2 onwards.

a negative relationship between the scarring effect of unemployment and the business cycle; that is, the impact of past unemployment experience on the probability of current unemployment incidence is larger during worse labour market conditions than when the labour markets are in favourable conditions.[71]

Supporting evidence for the negative relationship between unemployment scarring and business cycle is also found in Michaillat (2012). The author argues that this relationship is caused by job rationing during recessions. In this regard, the author states that even if there is no frictional unemployment, unemployment due to job rationing, i.e. shortage of jobs, is still likely to arise. Moreover, the author shows that during recessions, unemployment due to job rationing quantitatively outweighs frictional unemployment while the reverse is true during good labour market conditions.

Other studies have found mixed results regarding the relationship between true state dependence and the business cycle. Tumino (2015) argues that this relationship is closely related to the nature of the causes of labour market scarring. Labour market persistence due to changes in human capital (i.e. either depreciation in human capital due to unemployment experience, or increases in human capital in the case of employment persistence) is said to be independent from the business cycle condition, since any changes in human capital are assumed unrelated to fluctuations in the economy and labour markets. Another study by Ayllon (2013) shows that persistence in labour market caused by discouragement is more likely to occur during worse labour market conditions when the unemployment rate is high, thus resulting in a negative relationship between scarring effects and business cycles.

On the other hand, a positive relationship between state dependence and the business cycle is found in several studies such as Omori (1997) and Kroft et al. (2013) for the US, Lockwood (1991) for the UK, and Biewen and Steffes (2010) for Germany. These studies analyse scarring in unemployment and find that the negative signalling of unemployment, the so called ‘stigma effect’, are worse during favourable economic conditions (low unemployment rate) than during adverse labour market conditions.

[71] The local labour market conditions are proxied by the claimant proportion, measuring the proportion of claimants of unemployment benefits over the population aged 16-64 at the local authority district level (Tumino, 2015, pp. 10).

One explanation is that it looks more suspicious if a person is unemployed when the overall labour market situation is relatively good compared to when the labour market is in a bad condition (Biewen and Steffes, 2010, pp. 188). As a result, unemployment experiences become less informative for potential employers to proxy unobserved characteristics of job applicants in periods of recession (or when the unemployment rate is high), resulting in weaker scarring effects.

3.2.1 Transitions in and out education

With regard to young people in the UK, once young people completed their compulsory schooling at the age of 16, they are faced with the choices of whether to stay on for further education, enter the labour market and become either employed or unemployed, or to choose a government-funded youth training programme. The previous literature refers to this as the school-to-work transition. This transition from school to the labour market will then determine whether they will be classified as NEET or Non-NEET. Therefore, later in their lives, these young people can either stay in NEET or move into Non-NEET by entering either employment, education or training. Similarly, those who choose to continue to further education or obtain a job after they completed compulsory schooling at the age of 16 may eventually drop out from further education or leave their jobs, and thus move back into NEET. Once these young people enter adulthood and engage in the labour market, they may still face the risk of being NEET. However, none of the discussions regarding adult labour market dynamics in previous studies, to the best of our knowledge, use the term NEET.

This section places particular attention to the dynamics of education transition probabilities. Most existing literature discussing the dynamics of education are limited to analyses regarding young people, particularly in the context of the school-to-work transitions (STWT). Thus, little is known regarding the transition probabilities in and out of the education state, especially in the case of adult age groups. None of the existing literature, to the best of our knowledge, have yet discussed this type of transitions for different age groups other than those in the case of youths.

Nguyen and Taylor (2003) investigate six different possible destinations (i.e. private four-year college, public four-year college, private two-year college, public two-year college, employment and unemployment) for high school graduates in the U.S. Using the multinomial logit framework, they find that educational attainment and family background, particularly parental education, have a strong influence on the post-high school decisions of youths. Among other significant factors, they find that Black and Hispanic students are more likely to enrol in public four-year colleges compared to their White counterparts. Moreover, ethnic minority students are also found to be much less likely to join the labour market after graduating from high school. One explanation suggested by the authors is because ethnic minority students choose to invest in higher education in order to offset potential discrimination in the labour market should they look for a job instead.

A similar study for the UK is rounded by Andrews and Bradley (1997) for school leavers in Lancashire in 1991. Using a six-way multinomial logit regression framework, they model the first destination of young people within six months after finishing their compulsory schooling. They find that the first destination from school is influenced by individual, school, and local labour market variables. Specifically, a young person is more likely to leave school the bigger the school, the lower its academic performance, and the lower his expected lifetime earnings.

With regard to state dependence and scarring effects, several studies investigate these issues for young people, particularly within the context of the school-to-work transition (see Biggeri and Grilli, 2001; Lassibille et al., 2001; Burgess et al., 2003; Audas et al., 2005). One study by Burgess et al. (2003) utilizes the UK Labour Force Survey (LFS) between 1981 and 1997 to examine the impact of unemployment experience during an individual's early career life on future employment prospects. In general, they find that the scarring effect of early unemployment tends to be largest for the least educated, the unskilled, and the most disadvantaged youths.

Another study by Biggeri et al. (2001) investigates the factors that determine the transition from university to work, with respect to the labour market outcomes of their graduates, in the case of the Italian graduates in 1992. They find that the hazard of obtaining the first job is monotonically decreasing in time and that the graduates who have previous working experience are at an advantage in obtaining a job. Among other covariates, they also find that parental background does matter for graduates. Specifically, graduates are more likely to obtain a job if at least one of their parents is working or if at least one of their parents has a secondary school certificate or a degree. Moreover, females and mature graduates (those aged over 30 years by the time they graduate) tend to have a lower chance of getting a job compared to their male and young graduate counterparts respectively.

3.3 Data and Method

3.3.1 Sample and variables

For the purpose of empirical estimations in this chapter, we utilize the British Household Panel Survey (BHPS) Waves 1-18 and the Understanding Society (US) Waves 1-5 dataset. The BHPS Waves 1-18 cover the period from 1991-2008 while the US Waves 1-5 data cover the period from 2009-2013. Moreover, respondents from the BHPS wave 18 can also be observed as part of the US sample from wave 2 onwards.

Similar to the previous chapter, the sample selection is for both males and females aged 16 – 65 years old from each wave who have not retired and are engaged in either employment, education or training, unemployment, and inactivity. Compared to other similar studies on state dependence, our sample is relatively more diverse, since we allow for students who are still enganging in full-time education as well as other individuals who have already dropped out from the labour force (inactive), due to various reasons, to be part of our sample.

Individuals remain in the sample at subsequent waves until they are retired or are not interviewed at a particular wave. The last point is needed since our analysis requires individuals to be observed consecutively in order to allow for a lagged dependent variable to be added into our dynamic probit model estimations. In addition, individuals can also be dropped from the sample if they have any missing relevant variables information which is needed for the estimations of our models. In order to maximize the sample size, respondents who have just turned 16 or are new members of the household are also allowed to be added into the sample. Thus, our final sample is an unbalanced panel, allowing for new respondents to enter the sample, with complete information on the respondents' characteristics until the end of the sample period analysed, or until the respondents are no longer observed in the survey before the sample period ends.

Since we model the labour market transitions from one wave to the next, this implies that individuals who are included in the sample since the first wave of the BHPS up to the fifth wave of the US data can be observed for up to 22 times and contribute to the estimation with total observations of at most 21 times.[72] Similarly, individuals who first entered the survey in 1992, the second wave of the BHPS, can be observed for up to 21 waves with the total number of transitions made between labour market states being at most 20 times and so forth. Moreover, we assume that any transitions that happen within each wave (i.e. there may be multiple transitions which happen within the one year span of each wave) have negligible effects, and we further assume that there is no left censoring (i.e. any labour market experience that occurred before an individual was first observed in the survey is assumed to have no effect on the labour market transitions).[73] With respect to the first assumption, Bhuller et al. (2014, pp. 2) states that if a model follows the Markov property at the monthly level, this property carries through to the annual level when the dynamic process is aggregated over time. Moreover, they also argue that the selection of time interval, or the level of time aggregation, is determined mostly by the availability of suitable micro-level panel data rather than by theoretical considerations.

Furthermore, the works by Arulampalam et al. (2000) and Tumino (2015), which also utilize the BHPS and the US dataset, do not allow for new entrants to be added into their estimated sample due to their strategy of facilitating the estimations for the initial conditions problem. In the former work, the estimated sample is only taken from the first wave of the BHPS while Tumino (2015) takes the sample at the beginning of each sub-period analysed. In this study, we use the same approach as Tumino (2015) in dealing with the initial conditions problem by following the solutions suggested by Wooldridge (2005, 2009, and 2013). However, instead of using a single common date of entry for all respondents, we assign the initial or the first date of entry for each respondent according to the first time the respondent was observed in the survey. Hence, we are allowing for those new individuals who enter the survey

[72] Recall that individuals from the BHPS sample are also part of the US sample only from the second wave onwards.

[73] In regard to the first assumption, Baussola et al. (2015) adapts the methodology proposed by Shimer (2012) to correct for multiple labour market transitions that may occur during the one year time span considered, which may bias labour market flows obtained by surveys conducted over different time frequencies.

after the first wave in 1991. In this case, we assume that there exists no relevant labour market history prior to individuals first entry to the survey.

The above assumption may seem too restrictive, yet our analyses in this chapter provide a starting point to investigate any evidence on the issue of state dependence and the transition probabilities between different labour market states before we conduct a more elaborate analysis of duration dependence in the next chapter. In the next chapter, all labour market transitions within each wave and between waves are considered on a monthly basis. Additionally, any past labour market experiences that occurred before an individual is first observed in the survey will also be taken into consideration as additional explanatory variables.

Similar to the previous chapter, the dependent variables of labour market states refer to the self-reported current labour force or economic activity status at the time of interview. There are four mutually-exclusive dependent variables, i.e. employment, education, unemployment and inactivity. The random effects probit regressions are conducted separately for each labour market state. Our dependent variable classifications could be considered as our contribution to the existing literature since most previous studies of state dependence using the first-order Markov models are limited to estimating the persistence in unemployment. A previous study for the UK by Cappellari et al. (2005), using the Labour Force Survey (LFS) data, has done similar estimations by investigating labour market transition probabilities between three different labour market states (i.e. employment, unemployment, and inactivity), and by also utilizing the first-order Markov models. This study, however, does not take into consideration the initial condition problem and the sample is limited to only the older people of the UK, aged 50 years and above.

The same set of explanatory variables as in the static probabilities are included in our models. Variables of race and gender are time-invariant variables. Other variables such as age, education, marital status, health status, household type and tenure, number of children, and region of residence are updated at each interview date. Moreover, the (first-order) lagged dependent variables are also included in the models to capture the effects of labour market dynamics and state dependence. These variables are constructed as dummy variables for being employed, in education, unemployed, or inactive in the previous wave. The base category is the employment status; thus, the effects of previous labour market state are expressed relative to the individual who was employed in the previous one-year interview wave. Similar to previous empirical chapter, a set of time-interval dummy variables are included in the models to represent different business cycle periods.

3.3.2 The econometric model

For the purpose of this chapter, our analysis of labour market transitions is assumed to follow the Markov process. As previously mentioned, having this assumption also implies that labour market transition rates only depend on the origin state and/or a set of explanatory variables but not on the history of labour market processes (Steiner and Kwiatkowski, 1995). In this regard, Bhuller et al. (2014, pp. 2) argues that the main assumption in dynamic discrete models which follow a Markov process is that, conditional on both observed and unobserved individual characteristics, the first lag of the dependent variable is sufficient for estimating the outcome and that higher-order lags are assumed not to add any predictive power to the model.

3.3.2.1 A random-effects dynamic probit model

The empirical framework to identify the presence of true state dependence in our data follows previous work on a similar topic, utilizing the dynamic random effects probit models (see Arulampalam et al., 2000; Cappellari et al., 2005; Prowse, 2005; Stewart, 2007; and Tumino, 2015) and adapting the solution for the initial condition problem by Wooldridge (2005, 2009, and 2013). Gørgens and Hyslop (2016) refers to this approach as the dynamic binary response (DBR) approach, in which state dependence is modelled in terms of the effects of previous period's labour market state occupancy on the probability of occupying a certain labour market state in the current period. They specify the first-order DBR model for an individual i at time t as follows

$$P\ (y_{it} = 1|H_{it-1} = \mathrm{h}_{it-1}, X_{it} = x_{it}, V_i = v_i) = G(\beta\, x'_{it} + \gamma\ y_{it-1} + \delta v_i) \tag{3.1}$$

where H_{it} denotes the entire history of covariates and outcomes to period t and G is a logistic function. Following Equation (3.1), the propensity of an individual i (where

i = 1, …, n, with n is the total number of sample) observed to be in a given labour market state at the time of interview t (t = 2, …, T_i) is given by

$$P\ (y_{it} = 1 |\ y_{i,t-1}, \ldots, y_{i1}\ , x_i, v_i) = G(\beta\ x_{it} + \gamma\ y_{i,t-1} + \delta v_i) \qquad (3.2)$$

hence,

$$y_{it}^{*}\ =\ \beta\, x_{it} + \gamma\, y_{i,t-1} + \delta v_i + e_{it} \qquad (3.3)$$

where y_{it}^{*} is the observed labour market state occupied by individual i at the time of interview at wave t, and G is the standard normal cumulative distribution function. Equation (3.3) further tells us that the propensity, y_{it}^{*}, of an individual i observed to be in a given labour market state at the time of interview t, is a function of labour market status at the previous one-year lagged interview, y_{it-1}, a vector of observed explanatory variables, x_{it}, an individual specific time-invariant unobserved heterogeneity, v_i, and a random error term e_{it} with $e_{it} \sim$ N(0, σ_e^2). The random error term e_{it} is assumed to be independent of the explanatory variables (x_{it}) for all i and t, and for the lagged dependent variable (y_{it-1}). The individual specific time-invariant unobserved heterogeneity term, v_i, enters additively in the distribution function and captures the variances in the individual's ability or attitudes in the labour market; its distribution is assumed to be random with $v_i \sim$ N(0, σ_v^2), and v_i is assumed to be independent of the random error term e_{it}.

The individual, i, is observed to be in a certain labour market state at the time of interview, t, if her unobserved propensity to be in that labour market state, y_{it}^{*}, crosses a threshold of zero; that is, if $y_{it}^{*} > 0$, or else $y_{it}^{*} = 0$. In other words, the dependent variable y_{it}^{*} is a binary indicator of state occupancy which takes the value of 1 if individual, i, is observed at a certain labour market state at time t, and takes the value of 0 otherwise. Since our sample is an unbalanced panel, the total number of observations for each individual is a maximum T_i – 1. Our main interest is to investigate the presence of state dependence by analysing the value of γ. If there is a positive state dependence in the labour market, then the value of $\gamma > 0$, whereas $\gamma < 0$ indicates a negative state dependence.

Equation (3.3) possesses two crucial assumptions. First, we assume that the labour market transitions are correctly described by a first-order Markov model, in which only the observed and unobserved characteristics as well as the first lag of the dependent variable have an influence on the model while higher-order lags of the dependent variable are assumed to have no impact on the model. Secondly, all observed characteristics (both individual and household characteristics), x_{it}, satisfy the strictly exogenous assumption; in this case, only x_{it} which is important to determine the dependent variable after controlling for the unobserved heterogeneity variable v_i (Bhuller et al., 2014; and Wooldridge, 2005). Meanwhile, the impacts of earlier values of x_i on the dependent variable are ignored. Under these assumptions, the coefficient of the first-lag dependent variable can be interpreted as measuring *structural* state dependence (Bhuller et al., 2014, pp. 8). Any spurious relationship in state dependence caused by unobserved individual's heterogeneity is then captured in the unobservable term v_i.

3.3.2.2 Heterogeneity and the initial condition

One common problem in estimating Equation (3.2) and (3.3) above is the initial conditions problem. This problem arises when the initial observation y_{i1} is not exogenous and correlated with the unobservable heterogeneity term v_i. If this correlation exists, then the estimated parameter of interest γ would be biased upward because the effects of the unobserved heterogeneity would be partly captured by the coefficient of the lag dependent variable γ (Stewart, 2007). According to Arulampalam et al. (2000, pp. 31), in the BHPS data, the initial conditions problem occurs because the start of the survey period in 1991 does not coincide with the start of the stochastic process generating individual labour market experiences. In this case, most of the labour market information in the BHPS is of interrupted spells, where most individuals in the sample have entered or engaged in labour market activities prior to 1991, the start of the BHPS survey. Therefore, an individual who is observed to occupy a given labour market state at his first interview date at time *t* may be there because of his previous labour market histories or due to other observable or unobservable characteristics that affect his probability of occupying the labour market state.

In this study, we follow previous works by Bhuller et al. (2014) and Tumino (2015) by adapting the approach suggested by Wooldridge (2005 and 2009) to handle the initial condition problem. In this approach, the unobserved heterogeneity term v_i

is specified as a function of the labour market status in the initial period y_{i1} and x_i where

$$v_i = a_0 + a_1\, y_{i1} + a_2\, x_i + a_i \qquad \text{with } (a_i \,|\, y_{i1}, x_i) \sim \mathrm{N}(0, \sigma_a^2) \tag{3.4}$$

where x_i consists of nonredundant explanatory variables in all time periods. Thus, with the presence of x_i in Equation (3.4), we cannot identify the coefficients on time-constant covariates in x_{it}, although time-constant covariates can be included in x_i in Equation (3.4). Substituting Equation (3.4) into Equation (3.3) we can get:

$$y_{it}^{*} = \beta\, x_{it} + \gamma\, y_{it-1} + a_0 + a_1\, y_{i1} + a_2\, x_i + a_i + e_{it} \tag{3.5}$$

with $i = 1, \ldots, N$; $t = 2, \ldots, T_i$; and $e_{it} \,|\, (x_i, y_{i,t-1}, \ldots, y_{i1}, ai) \sim \mathrm{N}(0, 1)$. Equation (3.5) follows a probit model and can be estimated using the random effects probit. The residual error term a_i is assumed to be uncorrelated with the initial labour market outcome y_{i1} and x_i as well as with the error term e_{it}. Moreover, this approach allows for correlation between the individual-specific heterogeneity term v_i and the explanatory variables, X_{it}. In common practice, the vector of covariates x_i is replaced by the individual longitudinal averages of all time-varying observable characteristics $\bar{x}_i$ (see for example Arulampalam et al., 2000; Bhuller et al., 2014; and Tumino, 2015).

In our estimation, to account for the initial condition problem, we include additional explanatory variables of y_{i1} and x_i in each time period. In this case, a variable indicating whether the labour market state of the dependent variable (y) was also occupied by someone at his first interview date in the survey (denoted as y_{i1}) and the individual's initial age at the time of his first interview in the survey are included as additional regressors in the models. Moreover, as mentioned earlier, the approach to handle the initial condition problem as in Equation (3.5) allows for correlation between the individual-specific heterogeneity term v_i and the explanatory variables, X_{it}. Thus, we also estimate the models by including additional regressors representing the within-individual average of all time-varying covariates.

Furthermore, since we are allowing for new entrants to be added into our estimated sample, the initial time period $t = 1$ corresponds to the first wave in which the respondents first entered or were interviewed in the survey. Therefore, $t = 2$ corresponds to 1992 for individuals who have taken part in the survey since 1991 but corresponds to 1993 for individuals who have taken part in the survey since 1992 and so forth. In the estimations of these models (hereafter referred to as the full sample estimations), to control for the different entry year of each respondent, we include the additional regressor of year-entry dummies to represent the entry year of each respondent. In addition, we also re-estimate all models to account for only those individuals who have taken part in the survey since 1991, hereafter referred as the 1991 panel sample. In general, our findings show that the main results are still robust in both cases.

We estimate the parameters in Equation (3.5) using the maximum likelihood estimation for the standard random effects probit software. In this study, we estimate all models using the STATA option '*xtprobit.*' In addition, when fitting the random effects probit models we use a robust standard errors calculation to control for multiple observations of the same individual over time as well as the relevant longitudinal weight for each respondent in our sample.

3.4 Descriptive Statistics

After omitting those observations with missing information values and dropping individuals who have been retired, our final unbalanced panel sample consists of 148,874 observations, representing more than 20,800 individuals. Selecting only those observations that started in the first BHPS wave in 1991, the total number of observations is reduced to 80,206 observations, which is made up of 6,848 individuals.

The descriptive statistics for all explanatory variables are given in Table 11 for both the full sample and the panel 1991 sample. In general, the raw data results are similar in both cases. Overall, the majority of respondents in our sample are adults in the prime-age group (primarily those aged 25 – 49 years old), females, and from the white ethnic group. Meanwhile, youths and the non-white ethnic groups only account for less than 10 percent and about 4 percent of our sample, respectively.

Table 11 Descriptive Statistics of the Markov Model Sample (Proportions)

Variables	Full sample	1991 panel sample
Employment	0.780	0.805
Education	0.323	0.017
Unemployment	0.424	0.038
Inactive	0.144	0.140
Employment (*t*-1)	0774	0.804
Education (*t*-1)	0.039	0.020
Unemployment (*t*-1)	0.043	0.038
Inactive (*t*-1)	0.142	0.138
Age 36-49 (base)	0.398	0.422
Age 16-19	0.269	0.010
Age 20-24	0.059	0.044
Age 25-35	0.254	0.228
Age 50-65	0.261	0.296
Female (base)	0.537	0.536
Male	0.463	0.464
White (base)	0.959	0.961
Black	0.011	0.010
Asian	0.022	0.020
Others	0.007	0.009
No education (base)	0.148	0.158
Higher/1stdegree	0.182	0.158
A level	0.146	0.124
GCSE/O level	0.203	0.198
CSE level	0.031	0.038
Prof qualif/Others	0.286	0.323
Never/not married (base)	0.284	0.229
Married	0.613	0.662
Evermarried	0.102	0.109
Health Excellent/Good (base)	0.738	0.729
Health Fair	0.182	0.192
Health Poor	0.080	0.079
No children	0.584	0.597
1-3 children	0.401	0.391
4+ children	0.015	0.012
Single no child (base)	0.088	0.098
Single with chil	0.082	0.080
Couple no child	0.240	0.249
Couple with child	0.504	0.523
2+ Adults	0.074	0.039
Other	0.011	0.011
Owned outright (base)	0.170	0.176
Owned mortgage	0.589	0.614
Local auth. rented	0.115	0.101
Housing assoc. rented	0.039	0.036
Employer rented & other	0.011	0.013
Rented unfurnished	0.045	0.035
Rented furnished	0.031	0.026

Table 11 (continued)

Variables	Full sample	1991 panel sample
London (base)	0.068	0.091
North East	0.041	0.058
North West	0.080	0.109
Yorkshire & Humber	0.068	0.095
East Midlands	0.066	0.090
West Midlands	0.063	0.088
East	0.067	0.095
South East	0.102	0.140
South West	0.066	0.093
Wales	0.123	0.055
Scotland	0.153	0.087
NI & Channel Island	0.101	
Non-recession 1998-2000 (base)	0.146	0.167
Recession 1991-1993	0.085	0.154
Non-recession 1994-1997	0.155	0.260
Recession 2001-2002	0.122	0.097
Non-recession 2003-2004	0.116	0.087
Recession 2005-2006	0.106	0.078
Recession 2007-2010	0.133	0.095
Recovery4 2011-2013	0.137	0.062
Total observations	148,874	80,206

Source: BHPS Waves 1 – 18 and US survey Waves 2 – 5.[74]

Consistent with that reported in Tumino (2015), our sample also predominantly consists of those who are above the CSE education level while around 15 percent are reported to have no education or qualifications. In regard to marital status, the proportion of those who are married is higher than 60 percent of the total sample while only less than 30 percent of them are never or not married. In addition, regarding health status, individuals in our sample are mostly in an excellent or good health condition and only about 8 percent of them are reported to be in a poor health condition.

In regard to household characteristics, the majority of respondents in our sample live in the type of household consisting of couples as well as children, where the average number of children owned by our sample respondents is about 1.04. In addition, a great majority of individuals in our sample own their houses with a

[74] Note again that respondents from the BHPS Wave 18 are revisited as part of the US sample only from the second wave of the US data, in 2010, onwards. Thus, we do not observe Wave 19, which corresponds to the first wave of the US data, in our sample.

mortgage and only around 17 percent of them are home owners. As for the region of residence, more than a half of the respondents in our sample live in the northern regions of the UK including Scotland and Wales. For those regions in the south, most of our respondents in the sample live in the South East region, with the proportions in both types of sample being higher than 10 percent.

The dummy variables representing different business cycle periods also indicate the year dummies for which survey the respondent is observed in our sample. When we allow for new entrants into the sample, a large proportion of our sample is observed between wave 4 and 10, or for the periods between 1994 – 2000. Taking into account only those respondents that we observe since 1991, the sample proportion is in decline throughout the sample period, indicating that the sample may suffer from sample attrition problems or because of those censored samples due to retirement. Finally, in the estimation for the full sample case that include new entrants to the survey, we add an additional regressor of a set of dummy variables representing the year of entry to the survey for each respondent; as expected, more than a half of our sample entered the survey in 1991.

Table 12 and Table 13 report the evidence of persistence in the labour market from the raw data, respectively for the full sample that include the new entrants and for only the panel sample observed since 1991. In general, the results from both Tables are similar and support the presence of persistence in the labour market state for all labour market statuses. The percentage of sample who was in employment at the time of survey (at time *t*) conditional on being in employment in a previous wave (at time *t*–1) is above 94 percent for both types of sample while the percentages from other previous labour market states at time *t*–1 are negligible.

Table 12 Persistence in the Labour Market for the Full Sample (Percentages)

	Status at (t)			
Labour Market Status	Employment	Education	Unemployment	Inactivity
Employment (*t*-1)	94.49	13.11	34.65	12.66
Education (*t*-1)	1.24	79.05	6.82	0.77
Unemployment (*t*-1)	1.99	4.44	42.94	5.83
Inactive (*t*-1)	2.28	3.40	15.59	80.74
Total observations	116,191 (100)	4,820 (100)	6,320 (100)	21,543 (100)

Source: BHPS Waves 1 – 18 and US survey Waves 2 – 5.

Table 13 Persistence in the Labour Market for the 1991 Sample (Percentages)

Labour Market Status	Status at (t)			
	Employment	Education	Unemployment	Inactivity
Employment (*t*-1)	95.16	19.63	39.87	13.50
Education (*t*-1)	0.73	69.51	5.41	0.46
Unemployment (*t*-1)	1.83	5.92	42.10	4.78
Inactive (*t*-1)	2.28	4.94	12.62	81.26
Total observations	64,583 (100)	1,335 (100)	3,050 (100)	11,238 (100)

Source: BHPS Waves 1 – 18 and US survey Waves 2 – 5.

The majority of sample who was in education at time *t* is also more pronounced for those who were previously in education at the previous wave at time *t* – 1. In this case, about 79 percent of those who are observed as being in education at time *t*, were also engaged in education in the previous waves. The corresponding percentage for the 1991 panel sample is also quite high at more than 69 percent. In addition, in the case of full sample, around 13 percent who were previously employed at time *t* – 1 are found to be in education at the time of survey. As for the case of only the 1991 panel sample, the corresponding percentage is even higher reaching above 19 percent out of the total individuals who are observed to be in education.

Results in Table 12 and Table 13 also reveal the presence of persistence in unemployment and in inactivity. In both types of samples, the percentage of the sample who are in unemployment given that they were also unemployed in the previous wave account for more than 40 percent. These raw data estimations are in line with those reported in similar previous studies by Arulampalam et al. (2000) and Tumino (2015). Meanwhile, the persistence in inactivity seems to be more obvious, with more than 80 percent of those observed being inactive at time *t* also being previously in inactivity in the previous wave (*t*–1). Moreover, in both full sample case and the case for only the 1991 panel, the percentage of being unemployed at the time of survey conditional on being employed in the previous wave is also quite substantial, accounting for more than 30 percent of the total unemployed in each case.

Additionally, being previously inactive was also found to affect the probability of being unemployed at the current wave, where for both types of sample the percentages account for more than 10 percent out of the total unemployed individuals in each case. In addition, around 12 percent of the inactive individuals at the time of survey in full sample case were observed to be employed in the previous wave while the corresponding result for the 1991 panel sample was at about 13 percent. One possible explanation for this is because older workers could be more likely to leave employment, such as by taking early retirement, for the purpose of family care or due to sickness, which makes them have to drop out from the labour force altogether.

3.5 Empirical Results

In this section, we present the results of our empirical estimations using random effects probit models. The regressions are performed separately for each labour market state. Moreover, we re-estimate all models only for respondents who have entered the survey since 1991. For comparison, we also estimate all models using the standard binary probit models controlling for all observed characteristics but without taking into account the individual's unobserved heterogeneity and ignoring the solution for initial condition issue. These standard probit models allow us to analyse the relationship between lagged and current labour market states after controlling for the observable characteristics but not unobservables. Thus, results obtained from these models cannot be interpreted as representing the impact of true state dependence. Our main interest, however, is to investigate the existence of true state dependence from our data. Therefore, our interpretations will be based on the results obtained from random effects probit models, which control for both individual time-invariant unobserved heterogeneity and the initial conditions problem.

Table 14 to Table 17 present the outputs of our main variables of interest acquired from the random effects and standard probit models for estimations of the labour market status of employment, education, unemployment, and inactivity. In each table, the reported results in the second and fourth columns refer to findings obtained for all panel sample estimations in which new respondents who entered the survey after 1991 are included in the estimation sample. Meanwhile, results in the third and fifth columns represent the findings found from estimations only for the panel sample for those entering the survey in 1991. All results are reported in terms of average marginal effect values with the robust standard errors given in parentheses. A complete results with a full set of explanatory variables can be found in Appendix C.

Table 14 Transitions from Employment State

Variables	Random-effects probit		probit	
	Full	1991	Full	1991
Labour Market Status (*t*-1)				
Employment (base)				
Education	– 0.396*** (0.010)	– 0.437*** (0.016)	– 0.550*** (0.010)	– 0.558*** (0.016)
Unemployment	– 0.312*** (0.007)	– 0.324*** (0.010)	– 0.486*** (0.008)	– 0.474*** (0.012)
Inactive	– 0.524*** (0.006)	– 0.550*** (0.009)	– 0.726*** (0.005)	– 0.727*** (0.007)
Initial Conditions				
initial labour market state	YES	YES	–	–
initial age	YES	YES	–	–
averages of all time–varying covariates	YES	YES	–	–
Year-entry dummies	YES	–	YES	–
Observation	148,874	80,206	148,874	80,206
Log– likelihood	– 33610.644	– 17476.928	– 34882.096	– 18133.094
lnsig2u	– 0.935 (0.046)	– 1.049 (0.062)	–	–
No. of parameters	80	60	70	50

Note: 1) Results are in marginal effects at mean values; 2) robust standard errors in parentheses; 3) *** p<0.01, ** p<0.05, * p<0.1; 4) we control for other observed characteristics.

Table 15 Transitions from Education State

Variables	Random-effects probit		probit	
	Full	1991	Full	1991
Labour Market Status (*t*-1)				
Employment (base)				
Education	0.196*** (0.011)	0.211*** (0.018)	0.264*** (0.011)	0.265*** (0.018)
Unemployment	0.017*** (0.002)	0.013*** (0.002)	0.018*** (0.002)	0.014*** (0.002)
Inactive	0.006*** (0.001)	0.003** (0.001)	0.005*** (0.001)	0.003** (0.001)
Initial Conditions				
initial labour market state	YES	YES	–	–
initial age	YES	YES	–	–
averages of all time–varying covariates	YES	YES	–	–
Year-entry dummies	YES	–	YES	–
Observation	148,874	80,206	148,874	80,206
Log– likelihood	– 8028.7742	– 3026.5742	– 8248.6194	– 3133.9318
lnsig2u	– 1.545 (0.129)	– 1.670 (0.199)	–	–
No. of parameters	80	60	70	50

Note: 1) Results are in marginal effects at mean values; 2) robust standard errors in parentheses; 3) *** p<0.01, ** p<0.05, * p<0.1; 4) we control for other observed characteristics.

Table 16 Transitions from Unemployment State

Variables	Random-effects probit		probit	
	Full	1991	Full	1991
Labour Market Status (*t*-1)				
Employment (base)				
Education	0.035*** (0.004)	0.050*** (0.008)	0.037*** (0.004)	0.052*** (0.007)
Unemployment	0.174*** (0.007)	0.184*** (0.010)	0.286*** (0.007)	0.284*** (0.011)
Inactive	0.014*** (0.002)	0.004* (0.002)	0.017*** (0.002)	0.007*** (0.002)
Initial Conditions				
initial labour market state	YES	YES	–	–
initial age	YES	YES	–	–
averages of all time–varying covariates	YES	YES	–	–
Year-entry dummies	YES	–	YES	–
Observation	148,874	80,206	148,874	80,206
Log– likelihood	– 19157.993	– 9533.0143	– 19715.615	– 9797.0949
lnsig2u	– 1.193 (0.062)	– 1.477 (0.090)	–	–
No. of parameters	80	60	70	50

Note: 1) Results are in marginal effects at mean values; 2) robust standard errors in parentheses; 3) *** p<0.01, ** p<0.05, * p<0.1; 4) we control for other observed characteristics.

Table 17 Transitions from Inactivity State

Variables	Random-effects probit		probit	
	Full	1991	Full	1991
Labour Market Status (*t*-1)				
Employment (base)				
Education	0.029*** (0.006)	0.027*** (0.008)	0.032*** (0.005)	0.033*** (0.008)
Unemployment	0.137*** (0.005)	0.124*** (0.007)	0.150*** (0.005)	0.139*** (0.007)
Inactive	0.428*** (0.007)	0.458*** (0.009)	0.632*** (0.006)	0.649*** (0.009)
Initial Conditions				
initial labour market state	YES	YES	–	–
initial age	YES	YES	–	–
averages of all time–varying covariates	YES	YES	–	–
Year-entry dummies	YES	–	YES	–
Observation	148,874	80,206	148,874	80,206
Log– likelihood	– 23077.059	– 12023.051	– 24114.181	– 12572.622
lnsig2u	– 0.763 (0.051)	– 0.850 (0.070)	–	–
No. of parameters	80	60	70	50

Note: 1) Results are in marginal effects at mean values; 2) robust standard errors in parentheses; 3) *** p<0.01, ** p<0.05, * p<0.1; 4) we control other observed characteristics.

Generally, results for the 1991 panel sample tend to reproduce the results obtained for full sample case. In terms of the impact of the lagged labour market status on the current labour market status, however, results for the 1991 panel sample mostly show higher marginal effects (but with the same signs) than those found in the full sample estimation. The effects from other covariates are somewhat mixed, even though in most cases the marginal effects for the 1991 panel sample are still somewhat higher than those results in the full sample case.

Comparing the goodness-of-fit between the random effects and standard probit models, we can observe from Table 14 to Table 17 that the log-likelihood values obtained from the random effects probit models are lower in absolute term, i.e. less negative or closer to zero, than those obtained from standard probit models. Performing the likelihood ratio test for each labour market state result, based on estimated log-likelihood values between the random effects probit model and the standard probit model (with degrees of freedom equal to the difference in the number of parameters between the two models), generates significant estimated test statistics (with very small p-values = 0.000), implying that the random effects models, which account for the unobservables and initial condition, fit our data better than the standard probit models that do not control for the unobservables and initial condition.

Furthermore, after controlling for the unobserved heterogeneity in the model, the impacts of all other observable characteristics, in terms of marginal effects, become significantly lower. This suggests that failure to control for the unobserved heterogeneity would bias the relationship between current and past labour market status upwards, and thus this relationship would be spurious. Moreover, this finding also implies that an individual’s time-invariant heterogeneity and past labour market outcome play significant roles in determining her current labour status, such that the effects from other covariates become relatively less important.

3.5.1 Labour market persistence

In this section, we will discuss the empirical results of the impact of the lagged dependent variable, or past labour market status, on the probability of current labour market state. This relationship captures the effects of the dynamics in the labour market. In general, results from all labour market state estimations, presented in Table 14 to Table 17, show supporting evidence of the presence of persistence in the labour market, or true (genuine) state dependence, for all labour market states. In this case, we find that the probability of being in a given labour market state at the time of the current interview is much higher for individuals who occupy that labour market state in the previous (one-year) interview than for other individuals who engage in other labour market states. This finding is consistent with those found in the literature (see Arulampalam et al., 2000; Cappellari et al., 2005; and Tumino, 2015).

The results for the employment status in Table 14 indicate that relative to being employed in the previous wave, occupying the other labour market statuses in year *t*-1 is associated with a lower probability of being employed in year *t*. In other words, individuals who were employed in the previous wave are more likely to be employed in the current wave, other things being equal. Removing the control for the unobservables and initial condition problem inflates the impact of the previous labour market status by almost 20 percentage points, as shown in column (4) and (5) of Table 14. As suggested in previous studies, one explanation for the persistence in employment is because past employment may increase an individual's stock of human capital that would enhance his productivity in the future and thus increase his probability of being re-employed (Prowse, 2005). Another reason is that past employment may broaden an individual's networking channel, which can be helpful in finding new job opportunities for workers (Ioannides and Loury, 2004).

With regard to individuals who were previously in non-employment states, the probability of becoming employed in the current wave is comparatively more likely for those who were unemployed (i.e. the marginal effect signs are the least negative), and this is followed by those who were previously in education. Meanwhile, those who were previously in inactivity are the least likely to make transitions into employment since their marginal effects are the most negative compared to other non-employment states.

Similar results are also found in the probability of being in education (or training) at a given point in time. In this case, students who were in education last year have a higher chance of continuing being in education in the next year by about 20 percentage points, relative to those who were previously employed. On the other hand, being previously engaged in other non-employment labour market states seems to be negligible for the probability of currently being in education (or training), although the signs are still significantly positive relative to someone who was previously employed. This result, however, could arise simply because the education program itself may last for several years before students are allowed to graduate.

Results in Table 16 and Table 17 also show a positive and statistically significant relationship between the lagged and current labour market status of unemployment and inactivity respectively, with the largest transition rate being for someone who occupies the same labour market state in year *t*-1 and year *t*. This result implies that after controlling for both the effects of observed characteristics and unobserved individual heterogeneity, those who were unemployed (or inactive) in the previous wave face higher risks of being unemployed (or inactive) in the current wave than those who were previously engaged in employment or (in comparative terms) in other non-employment labour market states.[75]

Persistence in inactivity, however, is much larger than persistence in unemployment, where persistence in the former state is more than 20 percentage points higher than persistence in the latter state. Specifically, individuals who were unemployed in the previous year's interview are about 17 percentage points more likely to be unemployed at the current interview relative to those who were previously employed. In contrast, individuals who were in inactivity last year are about 43 percentage points more likely to remain inactive at the current wave relative to those who were previously in employment. This finding also supports the notion of scarring effects, particularly for unfavourable or 'bad' labour market outcomes such as unemployment and inactivity. In other words, having a 'bad' labour market outcome in the past is shown to be scarring in the future, since individuals who occupy this labour market state in the past are more likely to be trapped in a vicious cycle of being in that same state in the future.

Furthermore, with respect to inactivity probability, results in Table 17 for both types of sample reveal an interesting fact where past unemployment appears to have

[75] Comparing the coefficient values of our results with those found in Tumino (2015), our results are slightly higher; that is, our findings in terms of coefficients values are about 1.2, while those obtained in Tumino (2015) after controlling for both observed variables and unobserved heterogeneity are between 0.9 to 1.

quite a substantial effect on the current probability of being inactive. Relative to someone who was previously employed, being in unemployment in the previous year's interview increases the probability of making transitions into the inactivity state at the current interview by nearly 14 percentage points for the full sample estimation and 12 percentage points in the case of the 1991 panel sample. This may be related to the discouragement effects of the unemployed, as suggested by Schweitzer and Smith (1974), where the unemployed individuals might give up from the labour force altogether if they keep failing to find a job. This notion, however, could be more relevant once we take into account the length of unemployment duration itself, which will be analysed in the next empirical chapter. Still, this finding suggests that even in the span of one year, the unemployed individuals have a considerable tendency to give up looking for jobs and become inactive.

On the other hand, results in Table 16 for transition into the unemployment state suggest that among individuals who were in non-employment states in the previous year's interview, those who were previously inactive were the ones who were relatively the least likely to make a transition back into the labour force by being unemployed. Even those individuals who were students in the previous year's interview have, in relative terms, higher probabilities of making a transition into the unemployment state by about 4 percentage points. This may suggest that once individuals drop out from the labour force, it is hard to make them actively engage in the labour force again.

Similar to that found in the case of employment probability, results for the probability of transition into other labour market states, from Table 14 to Table 17, also demonstrate that a failure to control for the unobserved time-invariant individual heterogeneity and the initial condition problem is found to make the relationship between the past and current labour market status biased upwards. However, these results, which are obtained from the standard binary probit estimations do not represent the true or genuine impact of the past labour market status on the current labour market status. Consistent with that suggested in previous existing studies, this spurious relationship occurs because the effects of the unobserved heterogeneity are partly captured by the coefficient of the lag dependent variable (Stewart, 2007).

We further try to investigate the effects of state dependence for different age groups; i.e. between young people (aged 16-24) and adults (aged 25 and above). Table 18 and Table 19 summarize the results for full sample and the 1991 panel sample respectively when regressions of the random effects probit models are estimated separately for young people and adults.

Even after disaggregating our sample by age group, we still find significant evidence of persistence in the labour market for both youths and adults. Moreover, persistence in the labour market in most cases is found to be larger in the case of adults than youths, except for persistence in education (or training). This finding is similar to that found in Arulampalam et al. (2000) in the case of persistence in unemployment. One explanation argued in Arulampalam et al. (2000) regarding this finding is because young people are generally more mobile workers than their adult counterparts. Moreover, the authors also state another possible explanation as being the effect of the flexible labour market of the 1990s, with adult workers being unemployed and then struggling to return to employment by taking temporary or short-term jobs. As a result, the state dependence, particularly in unemployment, may be stronger for older than younger workers.

Persistence in unemployment appears to be an important issue faced by both young people and adults since the effect of past unemployment on the current probability of being unemployed is found to be similar for both youths and adults. That is, young people who were unemployed in the previous year's interview are about 17 percentage points more likely to remain unemployed at the current interview relative to their counterparts who were previously employed. The corresponding percentage for adults who were previously unemployed to remain unemployed at the current interview is about 18 percentage points.[76]

[76] Meanwhile for the 1991 panel sample, unemployment probability at time *t* due to previous unemployment at time *t*-1 account for about 19 percentage points in the case of both youths and adults. These results are lower than those found in Arulampalam et al. (2000), in which the persistence in unemployment due to previous unemployment account for about 25 and 40 percent for British young and adult men, respectively.

Table 18 Random Effects Probit Estimates for the Full Sample by Age Group

Variables	Youth				Adult			
	Labour Market Status at Current Interview (*t*)							
	Employment	**Education**	**Unemployment**	**Inactivity**	**Employment**	**Education**	**Unemployment**	**Inactivity**
Labour Market Status (*t*-1)								
Employment (base)								
Education	– 0.401***	0.362***	0.029***	– 0.004	– 0.407***	0.234***	0.067***	0.057***
	(0.014)	(0.014)	(0.007)	(0.005)	(0.015)	(0.015)	(0.008)	(0.009)
Unemployment	– 0.269***	0.049***	0.168***	0.059***	– 0.328***	0.013***	0.180***	0.146***
	(0.017)	(0.012)	(0.015)	(0.008)	(0.008)	(0.002)	(0.007)	(0.006)
Inactive	– 0.434***	0.001	0.030**	0.272***	– 0.522***	0.004***	0.013***	0.437***
	(0.021)	(0.018)	(0.013)	(0.027)	(0.007)	(0.001)	(0.002)	(0.007)
Observation	12,806	12,806	12,806	12,806	136,068	136,068	136,068	136,068
Log-likelihood	– 5216.2465	– 3881.2207	– 3092.8748	– 1542.7385	– 28178.006	– 4028.3743	– 15974.486	– 21393.097
lnsig2u	– 1.519	– 3.381	– 1.478	– 0.961	– 0.893	– 1.551	– 1.260	– 0.770
	(0.204)	(1.141)	(0.255)	(0.300)	(0.050)	(0.167)	(0.069)	(0.053)
No. of parameters	74	74	73	74	79	77	77	78

Note: 1) Results are in marginal effects at mean values; 2) robust standard errors in parentheses; 3) *** p<0.01, ** p<0.05, * p<0.1; 4) we control for other observed characteristics.

Table 19 Random Effects Probit Estimates for the 1991 Panel Sample by Age Group

	Youth[5]				Adult			
	Labour Market Status at Current Interview (*t*)							
Variables	**Employment**	**Education**	**Unemployment**	**Inactivity**	**Employment**	**Education**	**Unemployment**	**Inactivity**
Labour Market Status (*t*-1)								
Employment (base)								
Education	– 0.400*** (0.023)	0.332*** (0.023)	0.056*** (0.015)	0.001 (0.011)	– 0.470*** (0.021)	0.254*** (0.021)	0.074*** (0.012)	0.041*** (0.011)
Unemployment	– 0.271*** (0.028)	0.037** (0.017)	0.187*** (0.026)	0.026** (0.011)	– 0.336*** (0.011)	0.012*** (0.002)	0.189*** (0.010)	0.133*** (0.008)
Inactive	– 0.418*** (0.046)	– 0.010 (0.024)	– 0.013 (0.017)	0.151*** (0.042)	– 0.548*** (0.009)	0.003*** (0.001)	0.005** (0.002)	0.461*** (0.009)
Observation	4,309	4,309	4,309	4,309	75,897	75,897	75,897	75,897
Log-likelihood	– 1665.256	– 1046.061	– 1116.076	– 408.276	– 15704.228	– 1933.0498	– 8390.0097	– 11520.311
lnsig2u	– 1.382 (0.295)	– 14.349 (32.217)	– 1.621 (0.403)	– 0.477 (0.401)	– 0.997 (0.066)	– 1.628 (0.245)	– 1.524 (0.100)	– 0.823 (0.072)
No. of parameters	49	49	49	48	58	57	57	58

Note: 1) Results are in marginal effects at mean values; 2) robust standard errors in parentheses; 3) *** p<0.01, ** p<0.05, * p<0.1; 4) we control for other observed characteristics; 5) in the estimations for youths, observations are only lasted up to the ninth year (BHPS Wave 9), because those who were observed in 1991 at the age of 16 would be 25 years of age by the tenth year (wave 10), thus, they will be included in the group for adults).

On the other hand, unemployed youths in the previous wave have a much lower probability of making a transition into the inactivity state in the current wave in comparison to that found in the case of unemployed adults. In relation to the discouragement effects suggested by Schweitzer and Smith (1974), this finding may suggest that adults are more likely to be discouraged from finding a job compared to young people who may still have the motivation and energy to search for a matching job.

Another interesting fact from Table 18 and Table 19 is regarding the relationship between past inactivity and the current education probability, which becomes insignificant in the case of young people. More specifically, we find that being previously inactive for young people is insignificant for the transition probability into the education state; similarly, young people being students in the previous year's interview does not have any significant effects on the transition probability into the inactivity state. This supports our previous finding where the risk of being inactive for young people tends to be relatively negligible.

Unlike those found for youths, our results show positive and statistically significant relationships between past inactivity and the current probability of education, as well as between past education and current inactivity state in the case of estimations for adults. In this regard, inactive adults are significantly more likely to make transitions into education in the following wave, although its magnitude is only less than 0.5 percentage point. Meanwhile, adults who were observed to be in education at the previous year's interview have a significantly higher probability to be inactive at the current interview by about 6 percentage points in the case of full sample and 4 percentage points for the 1991 panel sample.

3.5.2 Other covariates

Comparing the results obtained from the transition probabilities with those found from the static probabilities of the multinomial logit analyses in the previous chapter reveals that the effects of observable characteristics on the individual's labour market probability becomes much lower once we take into account the effects from previous labour market states. This finding is true for almost all observable independent variables. This implies that the labour market states occupied in the past play a more significant role as determining factors of the current labour market state than any other observable individual characteristics.

Furthermore, controlling for the unobserved heterogeneity and initial condition problem using the random effects probit estimations, we can observe from results in Appendix C that the effects of observable individual characteristics becomes much less relevant in the models. Compared to the standard probit models, the effects of most independent variables in the random effects probit models tend to become much lower in magnitude, and, in some cases, these variables also become insignificant. It is only the effect of the past labour market status variables that appears to remain highly significant.

The most apparent changes are found for the impact of educational background on employment probability. Table C.1 and Table C.2 of Appendix C show that after controlling for the unobservables and the initial condition problem, it is only higher or first degree qualifications that significantly increase an individual’s probability of being employed, relative to someone without an education. Meanwhile having a CSE level of education is now associated with a lower employment probability. Furthermore, the impacts from other types and levels of educational qualifications are now found to be insignificant. Moreover, in the case of inactivity probability, the effect of the education level of CSE level becomes even more insignificant in the inactivity probability model with random effects. Meanwhile, other educational qualifications that remain significant in the probit model with random effects now have a lower magnitude as compared to the standard probit models for inactivity probability.

The impact of several age categories is also found to have changed once we estimate the random effects models. In the probability of being in education, for example, it is now only the teenage age group that have a significant and higher probability of being in education, relative to the base age category, while the results for other age groups become insignificant. Teenagers who used to have a lower probability of being inactive in the standard probit model are now found to have no significant impacts in the random effects probit model of inactivity. A similar case is found for the unemployment probability of the older youths (aged 20-24 years). In contrast, the probability of being inactive for the prime age individuals aged 25-35 years becomes significant (and remain with a positive sign) in the probit model with random effects. Moreover, the results for older youths (aged 20-24 years) that showed a significant and lower probability of being inactive in the standard probit model (relative to the base age category) is observed to have a significant and positive probability of being inactive in the corresponding random effects model.

Furthermore, being married or ever married no longer affects an individual's employment probability once we control for the unobserved heterogeneity and initial condition. Meanwhile, the results from the other random effects probit models still suggest that being married significantly lowers the probability of being in education and unemployment but increases the probability of being inactive, which may be related to the need to focus more on family matters once someone has committed to marriage.

Males are still found to have a significantly higher chance of being employed or being actively engaged in the labour force and looking for jobs compared to females while their likelihood of being in education or becoming inactive are significantly lower compared to females. As for the ethnicity variable, those from the ethnic group of Asian and others have worse employment prospects and a higher unemployment probability relative to their counterparts from the White background. Meanwhile, results for the Black ethnicity group are mostly insignificant, except that they have a significantly higher probability of being in education and a lower probability of being inactive relative to their White counterparts. Moreover, none of the other ethnic groups show significant results in the inactivity probability model. With regard to the probability of being in education, Asian and Other ethnic groups are also found to have a higher chance of being in education relative to individuals from the White group. The latter finding may suggest that individuals from the Non-White ethnic group are more likely to be in education as to avoid discrimination in the labour market by increasing their human capital in order to advance their position in the labour market. This is in line with previous study by Bradley and Lenton (2007).

The effects of health status and number of children remain constant. Having a good health condition is associated with higher opportunities to engage in Non-NEET states such as employment and education whereas having a bad or worse health condition increases an individual's probability of becoming NEET, either unemployed or inactive. Moreover, having more children lowers the probability of both being employed and unemployed. In contrast, having more children corresponds to higher probability of inactivity. This finding may suggest that once someone has become a parent, he or she might have less attachment to the labour market as they have to pay more attention to childcare or other family related issues.

The other household characteristics tend to show lower magnitudes and significance, although the overall findings are still the same. Unlike the results obtained from the static probability models, in the dynamic probability estimations, we do not find significant regional differences in labour market probabilities. Almost none of the results for the regional variable are statistically significant in all labour market state models, which suggests that once we take into account the impact of the previous labour market states into the models and control for any unobserved heterogeneity as well as the initial condition issue, the regional disparity in labour market probabilities ceases to exist.

As for the year dummy variables, which indicate different business cycle periods, we still find similar findings as those found in the previous empirical chapter of the static probability analyses. In this case, periods of recessions, in particular the early 1990s recession and the Great Recession, have significant adverse impacts on the labour market by increasing individual unemployment probability and deteriorating their employment prospects. Even worse, during the Great Recession, the probability of being inactive was also found to be significantly higher. In addition, we also find that the adverse impacts of the Great Recession still persist even after three to four years after the end of the recession periods.

3.6 Summary

In this chapter, we shifted our analysis from static labour market probability estimations to dynamic transition probabilities between labour market states. Our main focus is to investigate the impact of true state dependence using first-order Markov models, controlling for the unobservable individual time-invariant heterogeneity as well as the initial condition problem. We estimate the model for two different types of samples: the first estimation is for all respondents with non-missing relevant information of variables regardless of their initial entry year into the survey, while the second estimation is to re-estimate the same models only for those respondents who entered the survey in 1991.

In general, our results are in line with the findings from previous literature (such as Arulampalam et al., 2000; Cappellari et al., 2005; and Tumino, 2015), where we also find strong evidence of persistence in labour markets or true state dependence from our data. In this case, past labour market states (in one-year lag) significantly affect an individual's current labour market status. More specifically, individuals who were previously in 'bad' labour market states, such as NEET labour market states (unemployment and inactivity), are significantly more likely to be trapped in a vicious cycle of being in the same labour market state in the current wave. In this case, individuals who were unemployed in the previous year's interview are about 17 percentage points more likely to be unemployed at the current interview relative to those who were previously employed. Individuals who were in inactivity state last year are about 43 percentage points more likely to remain inactive at the current wave relative to those who were previously in employment. In contrast, those who were in favourable labour market states also have a higher tendency to have 'good' labour market outcomes in the future.

Furthermore, after controlling for the unobserved heterogeneity and the initial condition problem, as well as taking into account the effects from previous labour market states, the impacts from other covariates become negligible. This finding suggests that the most crucial factor that determines the individual's labour market dynamics are the labour market states themselves while other observable individual characteristics may simply pick up the omission of these past labour market variables.

One limitation of the analysis in this chapter is that we only consider the impacts of one-year lagged labour market states and ignore the effects from other spells of labour market histories. Analysing the impacts from other labour market spells within each wave could help come up with better conclusions for long-term policy implications. This analysis will be addressed in the next chapter where analyses in this chapter are extended using the survival analysis method.

CHAPTER 4

Scarring Effects and the Impact of Business Cycles on the Transition Probability into and out of NEET

Our discussions regarding the state dependence issue in the last chapter have only focused on Markovian dependence and have not discussed other forms of state dependence. This chapter focuses on analysing labour market transitions using duration analysis and sheds more light on the issue of other forms of state dependence, i.e. duration, occurrence, and lagged-duration dependence. We try to address the question of how much the probability of a transition into and out of the NEET state influenced by an individual's history of labour market spells and by the length of time spent in their current labour market spell. In addition, we are also still interested in looking at the impacts of different business cycle periods on the probability of NEET labour market transitions after controlling for duration, occurrence, and lagged-duration dependence.

The study by Heckman and Borjas (1980) was the first to distinguish state dependence into four different types. The first type is Markovian dependence, which has been discussed in the previous chapter. In this type of state dependence, the probability of an employed worker becoming unemployed, for instance, is different from the probability that an unemployed worker will remain unemployed. Our interest in this chapter is in analysing the other three forms of state dependence, namely occurrence, lagged-duration, and duration dependence. Occurrence dependence is where the *number* of previous labour market spells affects the probability of an individual making a transition from certain labour market states into another state or remaining in that particular labour market state. Lagged-duration dependence measures the probability of remaining in a given labour market state or transitioning into another labour market state that is influenced by the *length* of previous labour market spells. Lastly, duration dependence is when the probability of an individual making a transition from a certain labour market state into another state, or remaining in that particular labour market state, is affected by the length of time (the length of duration) spent in that current labour market spell (Heckman et al., 1980, pp. 247-248).

Previous literature suggests several explanations of the importance of analysing the state dependence. Lesner (2015, pp. 1327) argues that if state dependence is a significant factor in the labour market, then it will influence the distribution of labour market (e.g. we can determine individuals who are more likely to escape 'bad' labour market states from those who are less likely to escape these states in the long-run). Moreover, the analysis of state dependence is also crucial for policy interventions. In this case, depending on the results provided in this study regarding which type of state dependence is more important, in terms of both statistical significance and magnitude, appropriate policy recommendations can be designed for different groups of individuals, in particular those suffering the most from the effects of state dependence.

Most of the existing literature regarding state dependence has mainly focused on discussing the persistence in the unemployment state (unemployment scarring), and is limited to analysing duration dependence (see, for example, Narendranathan and Stewart, 1993 for the UK; Carling, 1996 for Sweden; Van den Berg and Van Ours, 1994 , 1996, 1999 for France, the Netherlands, the UK, and the U.S.; Biewen and Steffes, 2010 for Germany; Tumino, 2015 for British males; Bausolla et al., 2015 for Italy and the UK; and Ordine, 1992 for Italy). Nevertheless, many other studies have extended the discussion of labour market transitions using a multi-state and multi-spell analysis (see, among others, Bradley et al., 2003; Haardt, 2005; Frijters et al., 2009; Niedergesäss, 2012; Lesner, 2015).

Much of the discussion regarding unemployment duration is also discussed in relation to receiving unemployment benefits (for example Ehrenberg and Oaxaca, 1976; Lancaster, 1979; Nickell, 1979; Lancaster and Nickell, 1980; Atkinson et al., 1984; Katz and Meyer, 1990; Røed and Zhang, 2003) and the effects of active labour market policy programmes (see Carling et al., 1996 for Sweden and Dolton and O'Neill, 1996 for the UK). It is generally argued that higher benefits may increase the duration of unemployment spells as people may become choosier about accepting a job. However, most studies have shown that when the time of receiving the benefits are due to expire, people will increase their job searching rate, and thus increase the exit rate from unemployment to employment. Nevertheless, some studies also suggest that this pattern may no longer apply if there exists other labour market programmes, such as those targeted to the long-term unemployed or unlimited in duration. Niedergesäss (2012), for example, argues that the availability of time unlimited unemployment assistance programme in Germany may explain the lower exit rate from unemployment to inactivity state.

Differentiating and estimating the three types of state dependence simultaneously is also important partly because these three types of state dependence might influence one another. Hence, omitting one of them from the analysis will bias the estimations for the other types (Niedergesäss, 2012). For example, an individual who is employed in the current spell may also have experienced unemployment periods in the past. In addition, a longer duration of past unemployment periods (lagged duration) does not necessarily imply higher numbers of past unemployment spells (occurrence). In this case, an individual can either have only one long spell of unemployment in the past (i.e. longer lagged-duration dependence but a small number of occurrence dependence) or he may move in-and-out of the unemployment state frequently with short duration in each spell, indicating more numbers of past unemployment spells (higher occurrence dependence) yet a shorter duration of past unemployment periods (i.e. shorter length of lagged-duration dependence).

In terms of policy implications, estimating different types of state dependence simultaneously might provide better results and suggestions for policy. In this case, policies directed towards workers who have experienced a single long-spell of unemployment in the past (i.e. longer lagged-duration dependence) might not be effective – or should be different – for workers who frequently move in-and-out of unemployment spells despite having an equal total length of time spent in previous unemployment spells. The latter workers might be more prone to experiencing unemployment spells in the future than the former ones, or it could be vice versa.

In this regard, some literature has raised the issue of job mobility in the labour market, such as whether having short-term jobs is better for future labour market outcome than extending job search duration in order to get a better job matched. In the former case, having multiple temporary jobs may also indicate more numbers of unemployment spells, whereas in the latter case we may instead observe a one-time long spell of unemployment. Cockx and Picchio (2012, pp. 647) state that "on the one hand, accepting a short-term job may signal low ambition or skills reducing thereby the chances of conversion to a stable position. On the other hand, by accepting a short-term job a worker could also signal her motivation, acquire access to informal networks and avoid deterioration of human capital, facilitating thereby the search for a longer lasting job". Evidence in the UK tends to suggest that short-term employment are stepping stones to permanent employment (see Booth et al., 2002).[87]

When comparing the relative importance of the three different types of state dependence, most previous studies have shown significant impact of duration dependence on labour market transitions although evidence of the relative importance between occurrence and lagged-duration dependence is mixed. Several studies such as Doiron and Gørgens (2008) and Niedergesäss (2012) only find evidence of occurrence dependence, whereas lagged-duration dependence is found to be insignificant. Meanwhile, other studies show evidence of both occurrence and lagged-duration dependence (see for example Lesner, 2015; Cockx et al., 2012). Meanwhile, evidence for the European countries tends to suggest a negative duration dependence, i.e. the longer someone being in a given state, the less likely he will exit the state.

As discussed in the previous chapter, persistence in the labour market may arise from two different channels. First, an individual's past labour market history may affect his labour market status in the future. This relationship is defined as 'true (genuine) state dependence' or the 'scarring effect'. In the case of unemployment persistence, for example, Heckman et al. (1980) argue that the greater the number of previous unemployment spells and the longer the duration of previous unemployment periods, the more likely an individual will remain unemployed in the future due to several reasons which will be explained later in this chapter. The second channel by which labour market persistence may occur is due to individual characteristics, which can be both observed and unobserved. If individuals differ in some unmeasured or unobserved characteristics, their probability of being in a particular labour market state is influenced by these unmeasured characteristics and is thus not affected by the experience of previous labour market states. In situations where these unmeasured characteristics are correlated over time, the observable labour market history may appear to be a determinant of the future labour market state solely because this labour market history can act as a proxy variable for those correlated unobservable

[87] Note that the analysis regarding temporary and permanent jobs is beyond the scope of our study. In addition, other studies also show that factors such as wage and institutional regulations (e.g. permanent employment protection) play a significant role in explaining one's job mobility trends (see Topel and Ward, 1992; Casquel and Cunyat, 2008; Stewart, 2007; Kahn, 2010).

characteristics. As a consequence, failure to control for unobserved heterogeneity will make the relationship between the past and current labour market status spurious (Heckman et al., 1980; Tumino, 2015).

With respect to the second channel, individuals are different in their innate abilities and motivation or in terms of their attitudes towards receiving a job offer. Those with higher motivation and more willingness to accept any job offer may be more likely to be employed and have shorter unemployment durations in the past compared to their counterparts with a lower acceptance rate. Mroz and Savage (2006, pp. 261), in the context of the youth labour market, argue that youths with weak preferences for work, *ceteris paribus*, have a tendency to work less over time, and thus observed variables such as past unemployment experiences will be endogenous and regression analyses of the impacts of these unemployment histories on future unemployment spells will be biased. Unfortunately, these innate ability or motivation variables are unobserved by the researchers. However, as in other estimations of transition probabilities, in analysing the duration models, it is crucial to account for these unobserved individual heterogeneity in our models. The next section will discuss how we account for this issue by adding a random-effect into all our models.

The main objective of this chapter is to provide comprehensive analyses of the effects of the three types of state dependence (namely the duration, occurrence, and lagged-duration dependence) on labour market transition probabilities between employment, education (or training), unemployment, and inactivity. Utilizing the 18 waves of the British Household Panel Survey (BHPS) data, these effects are examined for those individuals aged 16-65 who are not retired and still engage in either the employment, education (or training), unemployment, or inactivity states.[88]

[88] We are not using the Understanding Society data, since the nature of questions (or interview) regarding labour market status (economic activity) is different from that of the BHPS. In particular, in the sub-dataset of individual questionnaires (*w_indresp*), there is no follow-up information regarding the start and the end dates of their current labour market status or economic activity (*w_jbstat*). There is, however, information available about the start and end dates of employment; hence, this is only applicable for those who are reported as being employed and is not available for others who engage in other labour market statuses. In addition, unlike the BHPS, there is no separate questionnaire (or sub-dataset) focusing on the respondent's labour market histories for each wave. There is, however, a separate questionnaire limited to employment history (*w_empstat*), yet this questionnaire is not available for all waves. For these reasons and for consistency in the formation of our sample, we decide to focus only on the BHPS dataset.

The methodology used in this chapter is the discrete-time duration analysis in the spirit of previous works by Allison (1982, 2014), Lancaster (1990) and Jenkins (1995). This approach is referred as the multi-spell duration (MSD) approach by Gørgens and Hyslop (2016), which is a more extensive version of the dynamic binary response (DBR) approach discussed in the previous chapter. While the DBR approach focuses on state occupancy probabilities, the MSD approach focuses on the transition probabilities between spells or the probability that the current-state spell ends. Although the DBR approach is more widely used than the MSD approach in previous studies that examine the state dependence issue, only few studies implement this approach when estimating hazard rates and spell durations (Gørgens et al., 2016).[89]

Furthermore, our estimation of duration models will extend the time unit being analysed from the restrictive year-to-year transitions to monthly transitions between labour market statuses, taking into account both transitions between interview waves and within the same interview wave. The importance of choosing an appropriate time-unit interval for analysis has been discussed in previous studies (such as Ordine, 1992; Bhuller et al., 2014; and Baussola et al., 2015). Bhuller et al. (2014) finds evidence that the degree of estimated state dependence increases with the level of time aggregation. In addition, unlike previous state dependence estimations that ignore the length of duration in each labour market state, in duration analysis the length of time spent in each labour market state is a key component of the models. In this case, individuals from each labour market state will be observed from the start of that labour market spell until they either leave the state or until the sample period ends. Thus, the main information needed for our duration analysis is the start and end dates of each labour market status, including all past histories of labour market experiences.

The BHPS dataset utilized for the purpose of this chapter allows us to perform these analyses, since information regarding respondent's labour market status (or economic activities) is always followed by questions regarding the start and end dates

[89] The study by Gørgens et al. (2016) focuses on comparing these two approaches in modelling discrete-time two-state panel data. They apply these two approaches in estimating an empirical case study of individual poverty experiences in the United States using the US Panel Study of Income Dynamics (PSID) dataset. Their main finding indicates that the MSD models dominate and provide better within-sample predictions than the more restrictive DBR models. They further argue that the commonly used first-order DBR models are nested within a simple MSD model, and, in the case of duration analysis, the DBR models possess strong restrictions on state dependence as well as on the effects of observed and unobserved heterogeneity.

(i.e. the date, month, and year) of each labour market spell. Moreover, each wave of the BHPS data is also equipped with an additional, separate sub-dataset regarding the respondent's labour market history, including information on the start and end dates of each labour market experience. Thus, by merging all this information together from each wave, we are able to construct month-to-month labour market transition histories for each individual throughout the sample period (examined period).

4.1 Research Questions

In this chapter, we are interested in addressing the following research questions:

1) Is there any evidence of other forms of state dependence, i.e. duration, occurrence, and lagged-duration dependence?
2) Controlling for the three forms of state dependence simultaneously, which type of state dependence is more dominant?
3) What evidence can be found regarding cross-state dependence effects, e.g. how do past employment spells affect the probability of being unemployed in the future, or how do past unemployment experiences influence one’s risk of future inactivity, etc.?
4) After taking into account all types of state dependence, what is the impact of the business cycle on the labour market transition probabilities?

4.2 Literature Review

As previously mentioned, the existing literature regarding state dependence has mainly focused on disscussing the persistence in the unemployment state and is limited to analysing duration dependence. Most of these studies find strong evidence of negative duration dependence in unemployment, which implies that the longer the unemployment spell, the lower the probability of exiting unemployment.

One study by Long (2009), for example, analyses the unemployment duration for the UK labour market, focusing on the impacts of regional labour market conditions on someone’s probability of leaving unemployment. Using discrete time proportional hazards model and the 17 waves of BHPS data, this study finds evidence of negative duration dependence. This study, however, only takes into account men who are between the ages of 18 to before 60 years old; thus, there is no evidence for those aged below 18 years old and adults who are 60 and above who may still engage in the labour market.

Other studies of unemployment duration and unemployment persistence have extended their analyses to estimate competing risks models, as opposed to single-risk models, to distinguish the nature of exit from unemployment (for example, Narendranathan and Stewart, 1993; and Ismail and Kollamparambil, 2015). Knowledge regarding the multi-exits model in unemployment duration analysis is important partly because those who leave the unemployment state may not always end up being in employment. A study by Böheim and Taylor (2000) utilizes the first seven waves of the BHPS data to analyse the impacts of individual and local labour market characteristics on the probability of unemployment spells ending with moves into full and part-time employment, self-employment, and economic inactivity. They also include previous labour market experience, for different labour market states, into their estimations. Their findings confirm the importance of taking into account previous labour market experience in estimating the exit probability from unemployment, especially in the case for men. Moreover, they also find evidence of unemployment scarring and argue that policies to reduce short-term unemployment incidences would have long-term effects.

An increasing numbers of studies have also extended their analyses of state dependence by estimating the labour market flows across different states (multi-state analysis), not only unemployment, as well as taking into account the other forms of state dependence, occurrence and lagged-duration dependence, as regressors (see Bradley et al., 2003; Haardt, 2005; Frijters et al., 2009; Niedergesäss, 2012; Lesner, 2015). In line with findings in most previous studies on unemployment scarring, these studies also support the existence of labour market persistence or scarring in other states of the labour market. Bradley et al. (2003), for instance, investigates labour market transitions in the UK using the first seven waves of the BHPS data. They distinguish the labour market into five states: high-skilled employment, intermediate-skilled employment, low-skilled employment, unemployment, and out of the labour force. In general their results suggest that workers with better skills tend to be re-employed in good jobs, whereas the unskilled workers are trapped in a vicious cycle of being employed in low-skilled sectors or otherwise exiting either into unemployment or out of the labour force.

Using a Dutch panel dataset from January 1989 through December 1997, Frijters et al. (2009) examines the impact of labour market persistence on current labour market transition rates between employment, unemployment, and non-participation. They find that longer previous employment spells are associated with increasing future transition rates into work and higher incomes during employment. On the other hand, longer previous non-employment spells decrease the exit rates of non-employment to work yet also decrease the transition rates from employment to other states. Moreover, they also find that previous incomes in non-employment increase the future transition from employment to the unemployment state.

Niedergesäss (2012), in the case of German prime-age men, discovered significant effects of duration and occurrence dependences, while lagged-duration dependence is found to have small impacts on labour market transitions. Moreover, this study also finds that labour market transitions are more affected by more recent labour market outcomes than by labour market outcomes that occurred earlier. Another more recent study by Lesner (2015) analyses the role of state dependence in the Danish labour market, particularly by focusing on its effects through wage. Labour market dynamics are defined as transitions between employment, unemployment, and out of the labour force states, including transitions from employment to other employment state. In this study, transitions from employment to other employment states are transitions between employers or firms rather than transitions within a firm. Utilizing weekly observations of the individual labour market states from a Danish dataset spanning 19 years (1985 to 2003) and information on yearly wages and observable characteristics, this study finds significant impacts from all types of state dependence (Markovian, occurrence, lagged duration, and duration dependences) both directly on the labour market transitions and indirectly through wages.

Some studies focus their analyses of labour market transitions on specific groups, such as on young people (Lynch, 1985; Van der Berg and Van Ours, 1999; Russell and O’Connell, 2001; Doiron et al., 2008; Cockx et al., 2012; Mlatsheni and Leibbrandt, 2015). Doiron et al. (2008) study on Australian youths finds significant effects of occurrence dependence but not for lagged-duration dependence for those without post-secondary education, i.e. previous employment (unemployment) spells increase the probability of future employment (unemployment), but the duration of past spells do not matter. They argue that the lack of lagged-duration dependence suggests that the on-the-job human capital acquired by these youths from past employment is limited or not transferable to other employment experience. In contrast, results for youths with post-secondary education show significant evidence of lagged-duration dependence, which implies that the length of both employment and unemployment spells does matter in determining their future labour market outcomes.

A study by Cockx et al. (2012) finds evidence for both occurrence and lagged-duration dependence in the case of Belgian youths. They find that previous unemployment experience increases the probability of transition from employment to unemployment but not to another employment state, whereas previous employment increases the hiring rate and decreases the probability of being fired from a job. As for the lagged-duration dependence, this study finds that a longer previous unemployment duration is associated with a lower chance of making transitions from employment to either unemployment or another working state (job-to-job transition), whereas a longer previous employment duration is associated with a lower employment to unemployment transition and a lower job-to-job transition in the case of young women. Lagged employment duration, however, is not a significant factor that determines unemployment to employment transition. Thus, this study concludes that unemployment scarring only occurs through its occurrence, but not through its duration, and that unemployment scarring due to its occurrence only affects the transition rate from employment to unemployment but not the job-to-job transition.

One recent study by Flek et al. (2015), in the case of youth unemployment duration in Spain and the Czech Republic during the latest Great Recession period in 2007-2010, compares the impact of state dependence on youths and on the prime-age group. This study reveals that during the peak of the Great Recession, both youths and adults in the prime-age group are exposed to longer unemployment spells and job searches, although the adverse impact of long-term unemployment on youths tends to be relatively worse than that for prime-age adults. Moreover, results from proportional hazard model estimations show that in most cases the probability of escaping unemployment, and hence finding a new job, tends to be higher if the unemployment spells last less than one year. One exception, however, is for unemployed youths in

Spain during the early period of the Great Recession, where their employment prospects were deeply worsened, such that unemployment duration alone had no significant impacts. In terms of policy recommendation, their study reveals that unemployed youths have the best chance of being employed within an unemployment spell lasting 3-4 months, thus any policies to support youth unemployment better be shifted between this time span.

Evidence for the older age groups can be found in previous studies, among others, by Haardt (2005) and Cappellari et al. (2005) for the UK labour market. Haardt (2005) analyses the labour market transitions, both from employment to non-employment and the return from non-employment to employment, of older men and women in the UK utilizing the first 13 waves of the BHPS data. The empirical analysis is based on a discrete-time survival analysis model. Moreover, the definition of employment used is based on the number of working hours, in which positive working hours are defined as employed and zero working hour means non-employed. The author finds that benefits and health status are the main determinants of retirement and that older women are more likely than men to move between work and non-work. In addition, this study also finds that having employment experience in their younger years decreases the likelihood of exiting from work and increases their probability of returning to work for these older people, although the impact of this early employment experience is relatively weak.

Using a longitudinal dataset from the UK Labour Force Survey (LFS), Cappellari et al. (2005) also examines the transitions between employment, unemployment and inactivity for older men and women aged 50 to the State Pension Age. Using two approaches of Markov modelling and duration modelling, the main findings from this study show that the labour market transitions for these older people are both state dependent and duration dependent. The former implies that if an individual experiences a period of inactivity, this will determine whether that individual will be inactive in the next period, whereas the latter suggests that the longer an individual remains inactive, the harder it will be to make this individual re-engage with the labour market. This study also reveals that most transitions occur early in the spell and remaining in the initial state reduces the likelihood of exiting from that state.[90] Thus, this study proposes the importance for early intervention as soon as an individual experiences a period of inactivity, since, at least for these older individuals, once they become inactive it will be hard to encourage their desire to enter the labour market again.

Having discussed some findings on the different forms of state dependence, explanations regarding the mechanisms through which past labour market experiences affect future labour market outcomes should also be discussed. Economic theories of labour market scarring have suggested several different explanations for how true (genuine) state dependence may occur. These mechanisms are generally different depending on the origin and destination states of the labour market being analyzed. This section elaborates some of these mechanisms for each labour market state origin, along with discussions of some relevant previous studies on each topic.

Unemployment

As previously mentioned, most existing studies regarding duration analyses focus their analyses on the impact of unemployment duration on the transition probability from the unemployment state. For example, Van der Berg and Van Ours (1994) estimates the unemployment exit probabilities using the cross country dataset from the French, Dutch, and UK labour market while their other study in 1999 focuses on the French youth labour market. They utilize the nonparametric approach in the former study and parametric functional forms in the latter study to address the issue of unobserved heterogeneity using the survival analysis method.

In the former study, the authors find strong negative duration dependence among British men (but this is insignificant for women) and a non-monotonic (inverted U-shaped) duration dependence in the case of Dutch unemployed individuals (i.e. an increase in duration dependence from the first to the second quarter and a decrease from the second to the third quarter), while there is no strong evidence of duration dependence for the French unemployed during their first year of unemployment. As

[90] A similar finding is found in Wilke (2005) for the 26 to 41 year old working population in West Germany during the 1980s and 1990s, where the author finds that most unemployed individuals in the data exit to employment during the first three months of their unemployment duration.

for the findings in the French youth labour market, negative duration dependence is also found to be highly significant for youth females while for young males the negative duration dependence is found to be significant only after one year of unemployment. Most other studies that investigate the transition probability from unemployment into the employment state also find similar evidence of negative unemployment duration dependence (see, among others, Frijters et al., 2009; Cockx et al., 2012; Niedergesäss, 2012; Lesner, 2015).

Similarly, past unemployment experiences may decrease the probability of exiting unemployment, and thus increase the probability of future unemployment. This phenomenon is commonly known as the 'scarring effect' or, in this case, unemployment scarring. If such a condition occurs, then transition probabilities from unemployment are assumed to depend negatively on both occurrence and lagged-duration dependence. Several studies have found supporting findings for this phenomenon (see Winter-Ebmer and Zweimüller, 1992; Arulampalam et al., 2000, 2001; Gregg, 2001; Mroz et al., 2006; McQuaid et al., 2016).

There are several reasons that can explain the evidence of negative state dependence in unemployment transition probability, in particular the exit probability from unemployment into the employment state. The first reason is the role of human capital, where it is argued that individuals being unemployed for long durations will lose some of their skills during unemployment and hence their human capital will depreciate (Pissarides, 1992; Ljungqvist and Sargent, 1998; Mroz et al., 2006). As a consequence, their probability of being re-employed decreases along with the time spent in unemployment. Another reason is due to crowding in the labour market or negative signalling. In this case, when sorting out multiple suitable job applications, potential employers are not able to observe a job applicant's productivity and motivation. Thus, they will use information regarding a candidate's previous unemployment experiences and, perhaps, other labour market histories as proxy of their productivity and motivation (Vishwanath, 1989; and Lockwood, 1991).

Those candidates will then be ranked according to their previous unemployment durations and firms will choose applicants who have been unemployed for the shortest duration (Blanchard and Diamond, 1994). In this regard, Blanchard et al. (1994) for the European unemployment in the 1980s shows that the probability of being re-employed is higher for employed workers, should they become unemployed, rather than for those who are currently unemployed. This phenomenon is also known as the stigma effect, since those with longer unemployment durations are stigmatized as giving ‘negative’ signalling for potential employers in terms of them having low productivity or a lack of motivation (Biewen and Steffes, 2010).

Gibbons and Katz (1991) in the case of displaced workers in the US shows that workers who were displaced through layoffs are more likely to have experienced a spell of unemployment after displacement compared to workers who were displaced by plant closings. One explanation suggested by the authors is because workers displaced by layoffs have higher expectation of being recalled to their previous jobs, thus reducing their search intensity for new jobs, than workers displaced by plant closings. Supporting evidence of the importance of recall expectations is also found in Katz and Meyer (1990). This study shows that among the unemployment insurance (UI) recipients in Missouri, workers who expected to be recalled have a lower new job finding rate than other UI recipients.

Contrary to the above studies, other studies find positive duration dependence in unemployment, i.e. the probability of leaving unemployment would increase as one remains longer in unemployment. A recent study by Mlatsheni and Leibbrandt (2015), for instance, finds a positive unemployment duration dependence in the case of youth labour market in Cape Town, South Africa. This finding implies that the longer someone is in the unemployment state, the more likely he will exit unemployment and move into an employment state. The authors argue that their finding of positive duration dependence in unemployment is due to the job queue notion, where, at least in Cape Town and the rest of South Africa, individuals with longer unemployment spells will eventually find a job later in their lives. Another study by Serneels (2004) shows that the non-negative finding in unemployment duration dependence among young unemployed men in urban Ethiopia is best explained by the labour market segmentation hypothesis. They argue that people will queue in unemployment for a good job, however as time continues, more people will lower their reservation wage and accept a bad job. This study finds that this hypothesis holds for young unemployed men in urban Ethiopia.

De Jesus and Mapa (2015) finds mixed results for unemployment duration dependence among Filipino jobseekers. They find positive duration dependence in the initial period of unemployment and a negative duration dependence thereafter. The authors also argue that one of the reasons for the former case is because jobseekers tend to keep their reservation wages for a certain time during their unemployment and then they will eventually accept job offers with lower wages than they were initially willing to accept (De Jesus et al., 2015, pp.18).[91]

The evidence of positive duration dependence in unemployment for developed countries is mostly discussed in relation to the unemployment benefits system and the active labour market policy programme. It is argued that people are more likely to stay in unemployment when they receive benefits. However, the presence of unemployment benefits which are limited in duration can motivate the unemployed workers to reduce their reservation wage as their unemployment benefits are due to expire, thus inducing an increase in the exit rate from unemployment to employment. Consequently, under this scenario, the duration dependence will be positive. Several studies that find a positive duration dependence in unemployment as a result of the unemployment benefits system are, for example, Katz and Meyer (1990) for the US and Hernaes and Strom (1996) for Norway.[92]

In other countries such as Sweden, where there exists labour market programmes which are targeted at the long-term unemployed who are close to the date of benefit exhaustion, the fall in the reservation wage over the spell of unemployment might be less pronounced and the exit rate from unemployment to employment nearing the benefit exhaustion would also be less obvious. The availability of labour market programmes, in particular those targeted at the long-term unemployed, would produce a positive duration dependence in unemployment, since the probability to leave

[91] This study also finds, among others, that the probability of exiting unemployment to employment is lower for youths and older jobseekers (as compared to their prime-age counterparts), married women, jobseekers with no experience and a college diploma (compared to the less educated jobseekers), jobseekers living in areas with high unemployment rates, and those having higher amounts of cash transfers from external sources.

[92] In the context of developing countries, the unemployment benefits system is often unavailable. Serneels (2004) utilizes the household support (household wealth) variable as a proxy for unemployment benefits to test whether the positive duration dependence in unemployment can be explained by the benefits hypothesis. In contrast with the findings in developed countries, this study shows that in the case of Ethiopia, household support cannot explained the positive duration dependence in unemployment.

unemployment will be higher for the long-term unemployed. This explains the positive duration dependence in unemployment obtained in some studies such as Van den Berg and Van Ours (1994) for the Netherlands, and Edin (1989) and Carling et al. (1996) for Sweden.

Another possible explanation for the various findings in unemployment duration dependence is due to changes in labour demand (Serneels, 2004). Although there are many factors that can influence demand for labour, but in generally demand for labour increases during an economic upsurge. Thus, in this period, the long-term unemployed would be more likely to get a job, and thus create a positive duration dependence. Previous literature by Arulampalam and Stewart (1995) and Van den Berg and Van der Klaauw (2000), for example, show how the exit from unemployment, and hence unemployment duration, is affected by the local unemployment rate and changes in business cycle, respectively.

Transition from unemployment to inactivity (or out of the labour force) may also occur due to the discouragement or habituation effect. With respect to the discouragement effect, Schweitzer and Smith (1974, pp. 250) argue that unemployed individuals who view their chance of getting a job as low might be expected to end their job-search activities altogether after a short time, rather than devoting their time, effort, and shoe leather cost for something that they feel would be pointless. Clark et al. (2001) states that individuals who have been unemployed for some time may become used to their situation, and they refer to this phenomenon as 'habituation'. Thus, if any of these two hypotheses hold, we would expect a positive duration dependence effect, at least in the very long-run, in the transition probability from unemployment to the inactivity state, since the longer the duration of unemployment the more likely individuals are to give up searching for a job and decide to drop out from the labour force.

Several studies analysing transition from unemployment to inactivity, however, find a contradictory result of negative duration dependence instead (see Cappellari et al., 2005; Frijters et al., 2009; Niedergesäss, 2012). Niedergesäss (2012) argues that this result can be explained by the fact that unemployment assistance in Germany is unlimited in duration; hence, as long as the unemployed person remains registered as being unemployed (provided that they pass a means-test), they will continue to receive the unemployment assistance.[93] In the case of British older men, Cappellari et al. (2005) also finds evidence of negative duration dependence for unemployment transition probabilities to either employment or inactivity.[94]

Employment

Transitions from employment to unemployment states are normally assumed to depend negatively on the current duration. That is, the longer the current employment duration, the less likely an individual will leave that employment state. One explanation is due to a sorting effect, as suggested by Mortensen (1986) in Niedergesäss (2012), in which workers who are relatively more productive would face lower risks of being laid off, and thus have a higher probability to 'survive' in their current job. Another possible reason is because of institutional setting. For example, protection against dismissals for permanent contract workers would increase their employment durations relative to those workers with only temporary contracts. On the other hand, the explanations for transitions from employment to inactivity (out of the labour force) are not discussed as much in previous literature. Some possible natural reasons for such transitions are due to planned decisions such as retirement or maternal/paternal leave (Cappellari et al., 2005; Niedergesäss, 2012). However, it is generally assumed that transitions from employment to inactivity possess a negative duration dependence.

Persistence in employment can also occur due to past employment experiences, either due to occurrence or lagged-duration dependence or both. One possible explanation is that past employment experiences may give positive 'signals' to potential employers that the individual has higher productivity or a higher motivation to work. Another reason suggested by Ioannides and Loury (2004) is that past employment periods may help workers to build up networking, which may then help them find new employment should they be searching for one. On the other hand, past

[93] There are two types of unemployment benefits in Germany: 1) Unemployment insurance (UI) benefits which are paid only for a limited period, in which the duration of payment depends on age and employment record; and 2) Unemployment assistance benefits which are unlimited in duration.
[94] Cappellari et al. (2005) actually finds an increase in transition out of unemployment for British older men within the first three years of unemployment, where the destination of transition is mostly into employment rather than inactivity. Beyond a certain point, however, transitions from unemployment become relatively rare.

employment experiences may not always guarantee future employment if human capital gained in previous employment is firm-specific, and hence this may not be suitable or relevant for future employment (Ljungqvist and Sargent, 1998). As a consequence, new employers may be reluctant to pay the higher reservation wage set by these workers as they try to avoid losses in their earnings. Hence, this pattern may instead increase the job search durations for those workers who are looking for a new job.

Inactivity

The transition from inactivity to other labour market states has not been explained well in the previous literature. Niedergesäss (2012) argues that this issue is mostly due to the fact that the inactivity (out of the labour force) state consists of relatively heterogeneous types of individuals. However, this kind of transition can be viewed as similar to that of a transition from the unemployment state. Transition from the inactivity state to employment, for instance, may exhibit negative duration dependence, since individuals being out of the labour force for a long duration will cause their human capital to depreciate. Moreover, persistence in the inactivity state can also occur due to the 'habituation' hypothesis if those inactive individuals become used to their situation.

Education

As explained in the previous chapter, discussions regarding transitions from education in exisiting literature are mostly, if not completely, limited to analyses regarding young people, and this is more widely known as the school-to-work transition (STWT) analysis. Moreover, almost none of these studies, to the best of our knowledge, have ever made estimations about the transition back into the education system from other labour market states. In the context of school-to-work transitions, several studies have also attempted to include the impacts of previous labour market experiences or durations on the probability of school leavers obtaining a job (see Biggeri and Grilli, 2001; Lassibille et al., 2001; Burgess et al., 2003; Audas et al., 2005).

Using a panel sample of four years (1994 – 1998) from a Hungarian dataset, Audas et al. (2005) investigates the transitions of young people between education, employment, and unemployment. They use a dynamic discrete econometric panel model, which allows for duration dependence and individual unobserved heterogeneity, to capture the diversity of initial conditions faced by these young people in the labour market (Audas et al., 2005, pp. 3). They show the importance of making good career decisions in the early stage, and that having attended Vocational/Technical schools as well as working during the first summer following matriculation are associated with lower likelihoods of being unemployed.

A study by Lassibille et al. (2001) examines the school-to-work transition for Spanish school leavers. They focus on the duration of unemployment and the mismatch in the youth labour market. They find that highly educated people have a shorter length of unemployment, whereas those with upper secondary education have more difficulty in finding a job at the beginning of their working life compared to others. Moreover, family background has no significant impact on the length of unemployment while young women are more likely to be unemployed than young men.

Another study by Andrews et al. (2002) analyzes the 'training preferences' at school, 'training destinations', and the labour market outcomes in the school-to-work transition using data from Lancashire Careers Service. After controlling for unobserved heterogeneity, they find that relatively advantaged young persons (e.g. those coming from good family backgrounds or having no criminal records) are the ones who exit compulsory schooling first to either employment or 'good' youth training programmes. Moreover, they also find variations in results based on ethnicity and educational qualifications. For ethnicity, the results suggest that ethnic minority school-leavers are excluded from training schemes that match their preference and instead enter a mismatching job for females or any job for males. With regard to educational qualifications, those with the highest qualifications are the most likely to get a job, those with intermediate qualifications tend to get matching youth training schemes, and those without any qualifications eschew youth training.[95]

[95] This finding supports the notion that there is a complementarity between educational qualifications and the propensity to train in occupations which offer general training (Andrews et al, 2002, pp. 217).

4.3 Data and Method

4.3.1 The sample

The main data source for this chapter is the British Household Panel Survey (BHPS) Waves 1-18. The earliest interview date in the BHPS was in September 1991 (the beginning of the BHPS survey) while the last interview date was in April 2009. Thus, our sample period (examined period) is between September 1991-April 2009.[96] The key advantage of using the BHPS dataset is the availability of labour market history information (retrospective labour market statuses) and the labour market status at the interview date in each wave, including follow-up questions regarding the start and the end dates for each labour market status. This information allows us not only to construct a sequential history of labour market spells throughout an individual's career during the sample period (examined period), but also enables us to determine the length of duration in each labour market spell. In addition, the reported labour market history information is not only available for those who are in employment state but also for all other labour market (economic activity) statuses.

Similar to previous chapters, eligible individuals included in our sample for the purpose of this chapter are those males and females: (1) between the ages of 16-65 years old in each wave; (2) who engage in one of the labour market states (i.e. employment, education or training, unemployment, and inactivity); and (3) who have not yet retired. We restrict our sample at age 65 since most individuals above this age are at their pension age, and thus labour market transitions become very rare.[97] In addition, new individuals may also be included in the sample after the first wave if they have just turned 16 years old after the first wave or if they are new members in the household. As a result, individuals who are included in the sample since the first

[96] There are only few respondents who were interviewed in 2009. The total number only account for less than one percent of the total sample that we use in our analysis.

[97] Although we still observe some transitions from the retirement state back into the labour market, the total observations are very small, i.e. only about 0.4 percent from our total selected sample. Other studies such as Haardt (2005) censors the labour market spells at age 70 since the author focuses on older workers. De Jesus and Mapa (2015) restrict their sample up to the age of 64 while Meghir and Whitehouse (1997) restrict their sample at the age 65.

wave in 1991 can be observed for up to 18 years, those included in the second wave in 1992 can be observed for up to 17 years and so forth.

Individuals leave or are dropped from the sample if they either: (1) enter the retirement state; (2) reach the age of above 65 year olds; (3) are no longer interviewed in subsequent wave(s) and have left the survey permanently; or (4) have any missing information on any relevant variables needed for estimations. Thus, our final sample is an unbalanced panel sample with complete information regarding the labour market status (both current and past experiences), labour market durations, and other individual as well as household characteristics.

Having selected these individuals, we then observe their labour market information, both current and retrospective labour market spells, and follow them from the start of the labour market spell until either the spell ends (and they make a transition into another labour market spell) or the sample period (examined period) ends at wave 18 (right-censored). Based on the calendar time information given in each wave regarding the start and the end dates of each labour market status, the respondent's labour market histories are then sorted in the right sequential order, i.e. from the earliest spell until the latest spell during our sample period.

Having arranged the individual's labour market histories in the right order, we can then determine the length of time each individual spent in a particular labour market state at a given point in their labour market history. Given the length of time or duration spent in a particular labour market state, we can further convert this information into a discrete person-time unit of analysis, in this study monthly units of analysis (hereafter referred to the person-months).[98] Regardless of the calendar time, the total number of person-months for each labour market spell can be the same for different individuals or for different labour market spells of the same individual.

The final sample that we use for our estimation consists of 16,467 males and females (aged 16-65) who have complete information regarding all of the explanatory variables, as well as their labour market statuses and its durations. This sample

[98] The information on calender time is available in days, months, and years. However, there are many missing values on the 'days', thus we use the unit of analysis at the monthly level.

generates a total of 64,901 labour market spells, which converted into a slightly more than 1.2 million person-months.[99]

Similar to the previous empirical chapters, the dependent variables of labour market states are constructed from the self-reported labour market status information and are disaggregated into four mutually-exclusive categories: employment, education, unemployment and inactivity. In this chapter, however, not only do we consider the current labour market status at the time of interview in each wave, but we also account for retrospective labour market statuses in order to estimate the labour market history variables, in terms of occurrence and lagged-duration dependence. Moreover, information regarding the length of each labour market spell is also important to estimate duration (and lagged-duration) dependence.

The most common cases that we found in the BHPS data are for interrupted labour market spells, known as left-censoring. Left-censoring refers to cases where any labour market transition events occur prior to the respondent's entering the study (Cleves et al., 2010). In the BHPS, individuals who were interviewed in 1991, for example, might have already entered or engaged in labour market activities prior to 1991, thus they had already been at risk of making labour market transitions even before they were surveyed in 1991.

While retrospective information regarding labour market statuses can be obtained prior to 1991, most of the time-varying variables, which are needed for our empirical analyses, such as marital status, health status, household type, and number of children are only available from the year 1991 onwards. For this reason, we will not consider any events that occur prior to September 1991 (the first BHPS interview), or before the respondent first entered the study, into our estimations except by including them as explanatory variables instead of as part of our estimated models. In other words, any events of transitions that happened before September 1991, or before the respondent first entered the survey, will be considered as the respondent's past labour

[99] Note that different studies may generate different number of labour market spells per person, often due to differences in the definition of what constitutes as 'spell'. In this study, a spell can be either employment, education, unemployment, or inactivity. Other studies might have different definition for their labour market spells. Utilizing the same dataset of BHPS, but only from waves 1-13, for older workers aged 40 to 70 years old, Haardt (2005) defines a spell as either employment or non-employment. In this study, the author generates a total sample of 8,361 people that translates into 14,412 spells and a little less than 700,000 person-months.

market histories, which will be used as regressors that account for state dependence or labour market history variables (either occurrence or lagged-duration dependence).[100]

In addition, our sample is also right-censored because: (1) the event of labour market transition may have not yet occurred for some individuals when the study period ends (in our case the end of the study period is in April 2009), or (2) individual(s) may leave the survey before the sample period ends and are no longer observed in the survey permanently. Figure 11 and Figure 12 give an illustration of these two cases. Figure 11 gives an illustration of our general sampling strategy for a hypothetical individual whose labour market histories since he first completed compulsory education are observed, and is right-censored because we do not observe any transition for the last spell of inactivity state during the sample period.

Meanwhile, Figure 12 illustrates another imaginary person who leaves the survey prematurely before the examined period ends, thus his last spell of employment is also right-censored. In our study, we ignore the observations after the end of the sampling period, since we do not have information about these events and we assume that the time of (right-) censoring is independent of the hazard rate (or the transition probability rates) for the occurrence events as suggested by Allison (1982, pp. 71) and Lesner (2015).

[100] In several studies such as by Haardt (2005), Frijters et al. (2009), and Lesner (2015) this strategy is also adopted in order to address the initial condition problem within the context of the survival analysis. Other studies that address the initial condition issue using different methods can be found, for example, in D'Addio and Rosholm (2002a), D'Addio & Rosholm (2002b), Prowse (2005), Niedergesäss (2012).

Figure 11 The General Sampling Strategy (an example for a hypothetical individual)

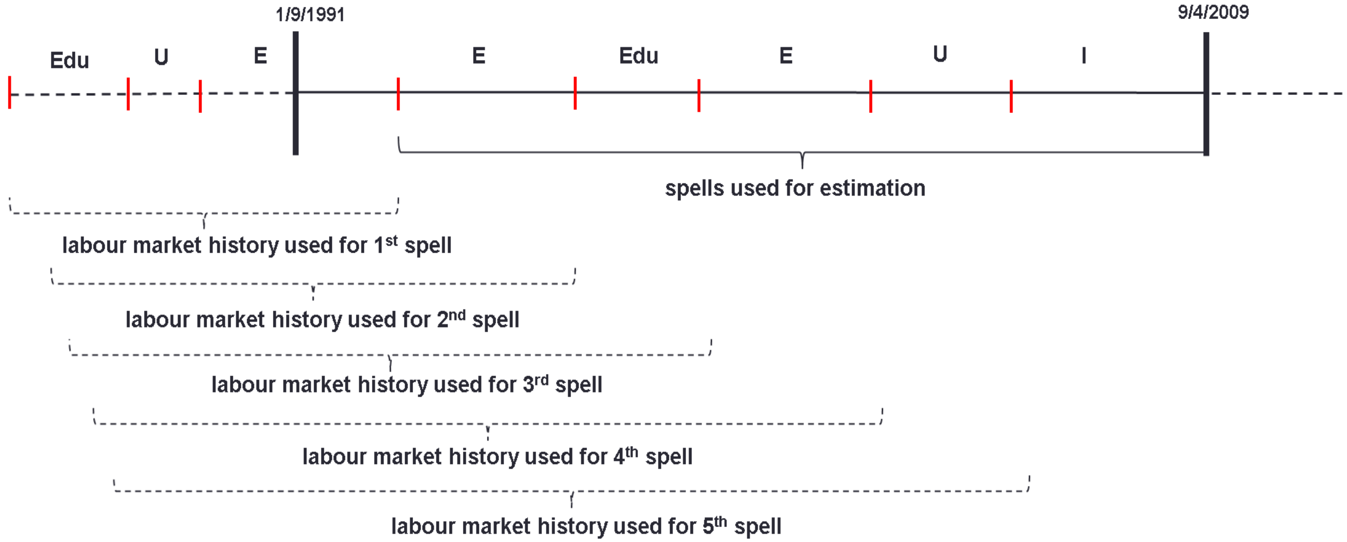
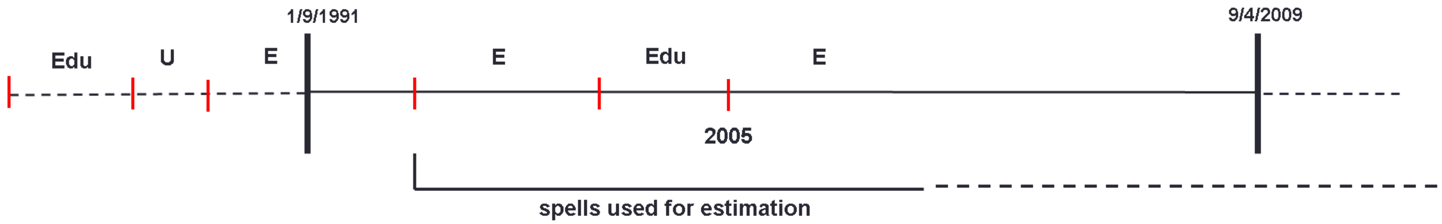


Figure 12 An Example of the Right-censoring Case for an Individual Who Left the Survey Prematurely



4.3.2 The econometric model

Analyses on labour market duration and state dependence are usually modelled by using the survival analysis method. For the purpose of this chapter, we adapt the econometric modelling of the discrete-time survival analysis in the spirit of previous literature by Allison (1982 and 2014) on discrete-time methods for event histories analyses. This study has motivated other successor studies in the same topic, such as Lancaster (1990) and Jenkins (1995 and 2005). One of the aims of our empirical estimation is to investigate the effect of state dependence on the labour market transitions probabilities between employment, education, unemployment, and inactivity states. Lancaster (1990) characterizes such dynamic transitions by a hazard rates method. In analysing these transitions in the labour market, our study focuses on the month-to-month changes in the labour market status.

Following Allison (1982), in the survival analysis discrete-time models, there are several assumptions to be made. First, it is assumed that the time-unit of study can only take positive integer values, such that $t = 1, 2, 3\ldots$, where in our case t is measured in months. Secondly, an individual i (with $i = 1, \ldots, n$ where n is the total number of individuals in the sample) is assumed to be observed beginning at a random natural starting month at $k = 1$. This individual is then followed and continue to be observed until the t^{th} month, at which point either the individual makes a transition into another labour market spell (thus, a transition event occurs), or the observation is right-censored (where this censoring is assumed to be independent of the hazard rate). The latter case implies that the individual can be observed up to and at t but cannot be observed at $t+1$ onwards. Based on Jenkins (2005), the general discrete-time hazard rate can then be defined as follows:

$$P_{it} = \Pr(T_i = t \mid T_i \geq t) \tag{4.1}$$

where T is a discrete random variable representing the time at which the end of the spell occurs or the uncensored time of event occurrence for a person i. Equation (4.1) gives the conditional probability that a transition from a state occurs at time t, given that it has not already occurred (Allison, 1982, pp. 72).

We can then specify the hazard rate in Equation (4.1) to depend on time and the explanatory variables. In this study, we view labour market dynamics for an individual, *i*, as making transitions between four (mutually exclusive) labour market states (i.e. employment, education, unemployment, and inactivity). The labour market origin states, denoted as *O*, are the same as the destination states, denoted as *D*, in which *O* = *D* = {Employment (*E*), Education or training (*Edu*), Unemployment (*U*), and Inactivity (*I*)}. We do not, however, model virtual transitions; that is, we do not model transitions between the origin unemployment to destination unemployment and between the origin inactivity to destination inactivity.[101] Thus, for the origin state of *O* = *U*, the destination states can only be either *D* = *E*, *Edu*, *I*; similarly, for origin state *O* = *I* the destination states can only be either *D* = *E*, *Edu*, *U*. In addition, we also model multi-events, referred to as the 'competing-risks', and multi-spells or repeated events for each origin state for every individual.

Therefore, the discrete-time hazard function for an individual *i*, who is making the *l*-th spell of transition between origin state, *O*, to a destination state, *D*, and to let this hazard rate depend on time and explanatory variables can be described as

$$P_{tiOD}^{(l)} = 1 - \exp[-\exp(\alpha_{tOD}^{(l)} + \beta_{1OD}^{(l)}\, x_{tiOD}^{(l)} + \beta_{2OD}^{(l)}\, h_{tiOD}^{(l)} + v_{iOD}^{(l)})] \qquad (4.2)$$

with $\forall_{O,D} \in \{E, Edu, U, I\}$ and $O \neq D$. From this Equation, α represents the baseline hazard function; x_i captures both time-invariant and time-varying observable explanatory variables (thus, the equation still applies when $x_{tiOD}^{(l)} = x_{iOD}^{(l)}$, i.e. when some variables are time constant), which will be explained more thoroughly in the next section; the variable h_i represents the previous labour market history, capturing both the total number of previous labour market spells (occurrence dependence) and the total duration of previous labour market spells (lagged-duration dependence)[102], and v_i is the individual specific time-invariant unobserved heterogeneity to account

[101] In this regard, if we find any records for transitions from unemployment to unemployment, or from one inactivity status to another inactivity status, then we would simply extend the calendar time duration of the previous spell of unemployment or inactivity, respectively.

[102] Heckman and Borjas (1980) shows a general model that combines duration dependence, occurrence dependence, and lagged-duration dependence by defining the hazard function as $P_{ij}^{(l)}(t_{ij}^{(l)}) = g_{ij}^{(l)}\,(t_{ij}^{(l)}, \ldots, t_{ij}^{(1)}, t_{ji}^{(l)}, \ldots, t_{ji}^{(1)})$, *i*,*j* = 1, 2, *i*≠ *j* where $P_{ij}^{(l)}$ is the hazard rate for the *l*-th spell of event *i*; $t_{ij}^{(l)}$ is the duration of the *l*-th spell of event *i* for an individual who begins life in state *i*; while $t_{ji}^{(l)}$ is the duration of the *l*-th spell of event *i* for an individual who begins life in state *j*. If the first argument of the function has a zero derivative for all values of the right-hand side variables, then there is no duration dependence. If the remaining arguments have zero derivatives for all values of the right-hand side variables, then there is no lagged-duration dependence. And if the function of g(.) is stationary across spells, *l*, then there is no occurrence dependence (Heckman and Borjas, 1980, pp. 256).

for unobserved differences in individual characteristics, such as ability or motivation. This variable captures the impact of true state dependence, which is the main interest of our estimation. Moreover, we assume that v_i follows a Normal distribution with a mean of zero, i.e. $v_i \sim N(0, \sigma_v^2)$.[103]

Equation (4.2) is the random effect discrete time representation of the continuous-time proportional hazard function, which may be solved to yield the so called complementary log-log function (Allison, 1982, pp. 72), such that:

$$\log[-\log(1 - P_{tiOD}^{(l)})] = \alpha_{tOD}^{(l)} + \beta_{1OD}^{(l)}\, x_{tiOD}^{(l)} + \beta_{2OD}^{(l)}\, h_{tiOD}^{(l)} + v_{iOD}^{(l)} \tag{4.3}$$

In this study, we choose the complementary log-log functional form for our hazard regressions because our data is interval-censored. A study by Haardt (2005, pp. 6), which also observes the monthly labour market transitions from the BHPS data, states that while using the BHPS data and observing the monthly transitions about each person's labour market status, people in the data may actually make their transitions on a daily basis. In this case, the 'interval censored' implies that although the actual labour market transition process is continuous (or discrete with smaller time units than what we observe in the data), the data is grouped into intervals (hence, the data is interval-censored), which in this case is grouped by monthly intervals.

In order to define the likelihood function for the entire sample, the likelihood contribution for an individual *i* consists of two components: (1) the contribution of all the completed spells, and (2) the contribution of the censored spell (Jenkins, 2005). The likelihood for the whole sample can be expressed as follows

$$L = \prod_{i=1}^{n} \left[\left(\frac{P_{tiOD}^{(l)}\,(v_{iOD}^{(l)})}{1 - P_{tiOD}^{(l)}\,(v_{iOD}^{(l)})} \right)^{\delta i} \prod_{k=1}^{t} (1 - P_{kiOD}^{(l)}\,(v_{iOD}^{(l)})) \right] \tag{4.4}$$

where $\delta_i = 1$ for those individuals with completed (uncensored) spells, and $\delta_i = 0$ for those with censored spells.

[103] See Heckman (1981b), Flinn and Heckman (1982), Heckman and Singer (1984), D'Addio and Rosholm (2002a), Haardt (2005), Niedergesäss (2012), Gørgens and Hyslop (2016) for more discussions and different methods to model unobserved heterogeneity (e.g. using the mass point approach).

We then define a new binary indicator of dependent variable, y_{ik}, where y_{ik} = 1 if individual i makes a transition in month k, or y_{ik} = 0 otherwise, such that

$\delta_i = 1 \rightarrow y_{ik} = 1$ for $k = T_i$; $y_{ik} = 0$ otherwise

$\delta_i = 0 \rightarrow y_{ik} = 0$ for all k

Thus, by taking the logarithm of Equation (4.4) the log-likelihood function can be written as

$$\log L = \sum_{i=1}^{n}\sum_{k=1}^{t}\left[y_{ki}\log P_{kiOD}^{(l)}\,(v_{iOD}^{(l)}) + (1 - y_{ki})\log(1 - P_{kiOD}^{(l)}\,(v_{iOD}^{(l)}))\right] \quad (4.5)$$

We can then substitute the appropriate function for $P_{kiOD}^{(l)}$ as in Equation (4.2) into Equation (4.5) and maximize the log-likelihood function using the Maximum Likelihood (ML) approach with respect to $\alpha(t)$ and β. Moreover, Equation (4.5) has precisely the same form as the standard likelihood function for a binary regression model (Allison, 1982 and Jenkins, 2005).

Note that from Equation (4.2), we impose the restriction $O \neq D$ (instead of $O \neq D$ iff $O = U$ or $O = I$), because for all $O = D \rightarrow y_{it} = 0$ for all t.[104] In other words, persistent workers and continuing students are not of our interest for regressions, and thus they are considered as censored spells and are included as the base category for the dependent variables.[105] Therefore, for each origin state, there will be three destination states for the regressions. Nevertheless, we are still interested in assessing transitions or events between employment-to-employment ($O = E$, $D = E$) and education-to-education ($O = Edu$, $D = Edu$), since it will determine the values of the labour market history variables, which are needed as one of the explanatory variables in the equation.

[104] Our censored spells for each origin also include those transitions from each origin into the retirement state. This is because at time t they still occupy the origin state, but we do not observe the events, since we do not model the state of retirement. Therefore, all transitions from any origin O into the retirement state imply that $\delta_i = 0 \rightarrow y_{it} = 0$ for all t. The number of transitions into the retirement state in our sample are very small, only less than 2 percent from the total transitions from each origin state.

[105] In our dataset, most transitions from employment to employment are between paid employment and self-employment. Some transitions may also occur between employers or between occupation levels within the same job or employer. This is not, however, the interest of our study. Thus, we solely recognize the transitions between employment to employment regardless of the nature of such transitions; e.g. we consider transitions between paid employment and self-employment as similar to transitions between employers or between occupation levels within the same employer.

Moreover, the functional form of the baseline hazard, α , that will be used in this estimation is the non-parametric piecewise-constant baseline hazard. In this regard, we create a series of duration-interval-specific dummy variables, one for each spell of person-month, and group them into several duration intervals to avoid the case where duration intervals have no event of transitions. The sign of its coefficient will determine the type of duration dependence. If $\partial P_{tiOD}^{(l)} / \partial \alpha_{tOD}^{(l)} > 0$, then a positive duration dependence is said to exist, while if $\partial P_{tiOD}^{(l)} / \partial \alpha_{tOD}^{(l)} < 0$, then we have a negative duration dependence. A negative duration dependence implies that the longer someone has occupied a particular state, the less likely he is to leave that state, whereas the reverse is true for positive duration dependence. In our regression analyses, we estimate our models without a constant term in order to estimate the models with a fully non-parametric baseline hazard (Jenkins, 2005).

In this study, we will estimate both the single-risk and competing-risks models to take into consideration the nature of exits from each origin state. The estimation of the random effect complementary log-log (*cloglog*) function with unobserved heterogeneity will utilize the STATA option '*xtcloglog*.' Meanwhile, as suggested by Allison (1982, pp. 88), in the discrete-time survival analysis, the Maximum Likelihood estimations for competing-risks models must be done simultaneously for all kinds of exits. In this study, our competing-risks models are estimated jointly, making use of the STATA option '*gsem*' by defining the family-and-link option of *Bernoulli* and *cloglog* respectively.

In our empirical analysis, we are allowing for spells from the same origin state of the same individual to be correlated with each other (hereafter, this type of model will be labelled as the 'id1'). Thus, a particular *l*-th spell of event *OD* for person *i*, may be influenced by (or dependent on) the other spells of event from the same origin state (*O*). For comparison purpose, we also estimate the models that allow for each spell to be independent (labelled as the 'id2') and those without considering the unobserved heterogeneity (hereafter referred to as 'homogeneous' models), using the standard complementary log-log (*cloglog*) function. The homogeneous model allows us to analyse the presence of state dependence controlling for the observable individual characteristics but not for the unobservable ones. Thus, results obtained from this model cannot be interpreted as evidence of true state dependence.

In the STATA '*xtcloglog'* function, the random effects model is calculated using quadrature (i.e. the individual specific time invariant unobserved heterogeneity is integrated out using quadrature points), which is an approximation whose accuracy depends partially on the number of integration points used (see STATA, 2015). In the heterogeneous models with correlated spells of the same origin (referred to as the 'heterogeneous id1' models), we use '*gsem*' to integrate out multivariate origin individual specific time invariant unobserved heterogeneity which is correlated over destinations. However, in most of our random-effects competing-risks model estimations, the regressions failed to converge when we allow for different random-effect terms for each destination state. In such cases, to achieve convergence in our regressions and in an attempt to get better quadrature approximation, we restrict the unobserved heterogeneity random-effect terms to be equal for all destination states (hereafter will be labelled as 'M1').

Lastly, with regard to estimations from the origin state of Education (*Edu*), we also try to estimate several different regressions: first, we estimate the models only for the young people and analyse all of their spells from education during the sample period; in the second estimation, we estimate the models for all age groups but by only taking into consideration those spells from education which occur after someone has already had at least one previous labour market status other than being in education. This is to avoid any bias in estimation because labour market information records for many of the adults in our sample do not start from their first education spell(s). In other words, for most of these adults, we do not observe their education spells before they enter the labour market. Therefore, to make the analysis somewhat consistent with the education spells of the young people, we make restriction to only include those education spells after someone has already been previously engaged in other labour market statuses other than being in education.[106]

[106] We also tried to estimate the regression for all age groups and their entire spells of education, and another regression where we analyse the model only for young people's first education spell. The latter regression aims to investigate the school-to-work transitions for first time school leavers. However, both regressions were poorly fitted and most of the results did not converge and have a lack of significancies. Therefore, we do not present the discussions of these models.

4.3.2.1 Specification tests

Since we will perform several regressions for each model, we would like to test whether the more sophisticated models are behaviourally distinct, or better, than the less sophisticated models. For example, we would like to test if the heterogeneous models with unobservable terms are better than the homogeneous models without the unobserved heterogeneity. In order to address this problem, we will perform a log-likelihood ratio test.

A likelihood ratio test is a statistical test used to compare the goodness-of-fit of two models and to see whether the two models are statistically and significantly different from each other. If the difference is statistically significant, then the less restrictive model (the one with more variables) is said to fit the data significantly better than the more restrictive model. This test is performed based on the log-likelihood ratio of the two models. The log-likelihood ratio test statistic is calculated by

$$LR = -2 \ln (L(R)/L(LR)) = 2 (LL(LR) - LL (R)) \tag{4.6}$$

where L: likelihood of the respective model; LL: log-likelihood of the respective model; LR: the less restrictive model (the one with more variables); and R: the more restrictive model (the one with less variables).

This test statistic follows the chi-squared distribution with degrees of freedom equal to the difference in the number of variables added to the model. In other words, it is the difference in the number of parameters between the two models. In STATA, we can use the function '*lrtest*' to perform the likelihood ratio test between the two models.

4.3.2.2 Explanatory variables

Generally, our explanatory variables consist of both individual and household characteristics, personal labour market histories and the duration of the current labour market spell to capture the effects of state dependence, and a time dummy variable representing the business cycle. The two explanatory variables indicating gender and ethnicity are time-invariant; hence, the values are always the same for all labour market spells of a specific individual. There are at least three time-varying variables in our models which are age, the business cycle, and labour market duration.

The variable age is generated by using information regarding the individual's birth month and the birth year and comparing this information with the calendar date of each labour market spell. Since our data is on a monthly basis, we also convert the age of each individual into months. Thus, this variable varies between each person-month. The dummy variables of business cycle periods are generated in the same manner as the age variable, in which we make use of the calendar time of each labour market spell. Since each of our observations represents the month of the labour market spell in each corresponding year, we can create the dummy variables for different business cycle periods in monthly intervals. The classification of business cycle periods is similar to the previous chapters, except that we omit the period after the Great Recession since we do not utilize the US survey dataset.

As discussed previously, the duration variable is created from each person-month for each spell type. Since the maximum person-month in our dataset used for our regressions is 208 (about 17 years of duration), thus we need to create 208 dummy variables. To avoid the case of no events in any duration dummy, we grouped together these dummy variables into nine categories: (1) up to 3 months, (2) up to 6 months, (3) up to 9 months, (4) up to 12 months, (5) up to 18 months, (6) up to 2 years, (7) up to 3 years, (8) up to 5 years, and (9) above 5 years. Therefore, the (discrete) hazard of our piecewise constant baseline function is assumed to be constant within the interval of each dummy category. For every individual, the person-month is reset to one for each new labour market spell. The duration variable is different from the age variable since the person-month is reset to one for each new labour market spell, whereas the age variable continues to 'tick' throughout all labour market spells for each individual. Thus, the multiple-spell structure of our data enables us to separate the identification of age and duration effects.

The labour market history variable for an individual is split into two parts: (1) the cumulative number of labour market history, and (2) the cumulative duration of labour market history (in total number of months). The former variable represents the occurrence dependence, which describes the accumulated number of times someone has been in a given state (up to) before the current spell. Meanwhile, the latter variable indicates the lagged-duration dependence that describes the accumulated duration of time a person has been in a given state (up to) before the current moment. These variables are updated at the beginning of each spell and are both time-varying and spell-specific. They are spell-specific because the values are constant within the same spell for the same person, but they are also time-varying because as a certain transition occurs at a particular time, the values will be different for the next spell. In sum, the values of these variables are constant within the same spell for each person but may be different between different spells for the same individual, depending on whether the person made a labour market transition and the type of transition the person made. Table 20 shows an example of how we construct the labour market history variables for occurrence dependence and lagged-duration dependence.

Table 20 The Structure of the Labour Market History Variables

Pid	Labour market status	Calendar time	Person month	Occurrence dependence *E*	*U*	*I*	*Edu*	Lagged-duration dependence t*E*	t*U*	t*I*	t*Edu*
1	*E*	Oct 1991 –	1	0	0	0	0	0	0	0	0
		Dec 1991	2	0	0	0	0	0	0	0	0
1	*Edu*	Dec 1991 –	1	1	0	0	0	2	0	0	0
		Dec 1992	2	1	0	0	0	2	0	0	0
			.	1	0	0	0	2	0	0	0
			.	1	0	0	0	2	0	0	0
			12	1	0	0	0	2	0	0	0
1	*U*	Dec 1992 –	1	1	0	0	1	2	0	0	12
		(right	.								
		censored)	.								
2	*U*	July 2005 –	1	0	0	0	0	0	0	0	0
		Sept 2005	2	0	0	0	0	0	0	0	0
2	*E*	Sept 2005 –	1	0	1	0	0	0	2	0	0
		Sept 2006	2	0	1	0	0	0	2	0	0
			.	0	1	0	0	0	2	0	0
			.	0	1	0	0	0	2	0	0
			12	0	1	0	0	0	2	0	0
2	*U*	Sept 2006 –	1	1	1	0	0	12	2	0	0
		Jan 2007	2	1	1	0	0	12	2	0	0
			3	1	1	0	0	12	2	0	0
			4	1	1	0	0	12	2	0	0
2	*I*	Jan 2007 –	1	1	2	0	0	12	6	0	0
		Sept 2008	.	1	2	0	0	12	6	0	0
			.	1	2	0	0	12	6	0	0
			20	1	2	0	0	12	6	0	0
2	*Edu*	Sept 2008 –	1	1	2	1	0	12	6	20	0
		(right	.								
		censored)	.								

In addition, since our sample includes those individuals from the age of 16 years old, we also include previous education spells in the labour market history variables. This variable is particularly important in the case of the labour market histories of young people, since their first (initial) labour market spell that can be observed in the data is mostly of being in education.[107]

The other explanatory variables (such as education, marital status, number of children, household type, etc.) are defined similarly as in the previous chapters. The values of these variables are updated at the beginning of each labour market spell. Detailed information on the sources of all explanatory variables can be seen in Table A.2 in Appendix A.

4.4 Descriptive Statistics

In this section, we present the descriptive statistics from our final estimation sample which are used in our regressions. Table 21 summarizes the number of spells and person-months for each origin state while Table 22 reports the number of labour market spells by origin and destination state.

From Table 22, we can see that among the employed, around 10 percent of employment spells end with a transition into unemployment, while only slightly more than 6 percent terminate in inactivity. The majority of employment spells in our data are transitions between employment states and censored spells. As for the education spells, more than 30 percent of transitions from education terminate with employment while about 15 percent end with unemployment. The education spells that end up in inactivity state only account for less than 10 percent. Moreover, a majority of unemployment spells terminate with employment, which account for around 70 percent of the total unemployment spells, while exits to other states from unemployment only account for less than 7 percent. In addition, more than half of the inactivity spells also end with employment and only about 15 percent of the spells exit to other labour market states.

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[107] We also tried to re-estimate the regressions without previous education variables, and the results for all other variables, including other labour market history variables, in all models do not change. Thus, our results are still robust with or without education history variables.

Table 21 Total Number and Duration of Labour Market Spells by Origin State

	Labour market origin				
	E	*Edu*	*U*	*I*	*Total*
Number of spells	46,548	4,890	8,250	5,213	64,901
Number of person-month	984,503	78,109	70,791	143,673	1,277,076
Mean duration (months)	26.65	14.34	16.7	38.1	26.63
Standard deviation of duration (months)	28	12.52	23.25	36.88	28.75

Source: BHPS Waves 1 – 18.
Note: Include only spells which start at or after 1991, and with non-missing relevant information; [a] include censored spells at wave 18.

Table 22 Number and Percentage of Labour Market Spells by Origin and Destination States

	Labour market origin			
Destination:	*E*	*Edu*	*U*	*I*
Censored Spells[a]	11,750 (25.24%)	1,241 (25.38%)	1,197 (14.51%)	1,708 (32.76%)
Employment (*E*)	26,073 (56.01%)	1,759 (35.97%)	5,963 (72.28%)	2,671 (51.24%)
Education (*Edu*)	976 (2.10%)	850 (17.38%)	530 (6.42%)	357 (6.85%)
Unemployment (*U*)	4,846 (10.41%)	756 (15.46%)	N/A	477 (9.15%)
Inactivity (*I*)	2,903 (6.24%)	284 (5.81%)	560 (6.79%)	N/A
Total	46,548 (100%)	4,890 (100%)	8,250 (100%)	5,213 (100%)

Source: BHPS Waves 1 – 18.
Note: Include only spells which start at or after 1991, and with non-missing relevant information; [a] include censored spells at wave 18.

Table 23 reports the percentages of labour market transitions from each origin state by age group. Transitions from employment to NEET, either to unemployment or inactivity, primarily occur for the prime age groups (aged 25-49) and older youths (aged 20-24), while only about 12 percent of these transitions are made by teenagers and the oldest age group. On the other hand, transitions from the origin state of education are mainly for young people. For these young people, transitions from education mostly end up in either unemployment or employment. In contrast, the lowest percentage of transition from the education state is for the oldest age group.

Table 23 Labour Market Transitions by Origin-Destination State in Spell Pairs and Age Group (column percentages)

	Labour market transitions			
Age group:	censored[a]	*E → U*	*E → I*	*E → Edu*
16 – 19	2.88	12.45	3.51	32.74
20 – 24	9.93	24.94	14.11	37.32
25 – 35	29.89	27.71	35.54	21.41
36 – 49 (base)	37.37	22.89	31.37	7.48
50 – 65	19.93	12.02	15.47	1.04
	censored[a]	*Edu → U*	*Edu → I*	*Edu → E*
16 – 19	38.49	37.00	25.18	34.55
20 – 24	41.23	34.32	31.21	39.35
25 – 35	11.90	18.10	23.40	16.96
36 – 49 (base)	7.11	8.31	16.67	7.87
50 – 65	1.27	2.28	3.55	1.27
	censored[a]	*U → E*	*U → Edu*	*U → I*
16 – 19	10.58	13.33	38.24	10.17
20 – 24	20.03	25.62	26.77	20.90
25 – 35	24.95	26.96	18.74	26.18
36 – 49 (base)	24.66	22.72	13.00	25.24
50 – 65	19.78	11.38	3.25	17.51
	censored[a]	*I → E*	*I → Edu*	*I → U*
16 – 19	1.87	3.54	35.19	8.15
20 – 24	7.77	13.53	26.69	22.69
25 – 35	26.32	35.85	21.11	30.62
36 – 49 (base)	32.34	34.49	13.78	25.11
50 – 65	31.71	12.60	3.23	13.44

Source: BHPS Waves 1 – 18.
Note: Include only spells which start at or after 1991, and with non-missing relevant information; [a] include censored spells at wave 18.

Furthermore, transitions into education from all origin states are primarily for the young people, especially teenagers. Meanwhile, prime-age individuals (aged 25-49) who are in NEET also seem to make significant transitions into the education state. In this case, nearly 20 percent of transitions from NEET (i.e. unemployment and inactivity) into the education state are found for individuals aged 25-35 years old. The corresponding percentage for the mature prime-age individuals, aged 36-49, is about 13 percent. Similarly, about 21 percent of transitions from employment to education are observed for the prime-age workers (aged 25-35), while for the mature prime-age workers (aged 36-49) the percentage is only about 7 percent. Moreover, our data also suggests that transitions back into the education state from any origin state are the least likely to happen for the oldest age group.

Similar to transitions from the employment state, the majority of transitions out of the NEET states, both unemployment and inactivity, occur for the older youths (aged 20-24) and prime-age groups (aged 25-49). In the case of transitions from unemployment to employment, for example, about 26 percent of these transitions occur for the older youths and individuals in the younger prime age-group (aged 25-35). Meanwhile, the corresponding percentages for transitions from inactivity to employment state are about 13 percent and 35 percent for older youths and younger prime-age individuals, respectively. This may suggest that while unemployed older youths have similar chance to return to employment as compared to their younger prime-age counterparts, the inactive prime-age individuals have a higher likelihood to return to employment as compared to these older youths.

With regards to the business cycles, Table 24 presents the number of labour market transitions from each origin state that take place during each business cycle period. Transitions out of the employment state seem to occur during the aftermath period of the early 1990s recession in 1994 – 1997 and prior to the Great Recession period in 2005 – 2007. This can be caused by our data limitations, since our sample period only lasts until April 2009, which is in the early period of the Great Recession.

The number of transitions from education do not show a clear pattern, although there seems to be a decrease in the percentage of transitions out of the education state during the early 1990s recession and the Great Recession period. That is, during these two recession periods the exit percentages out of the education state only account for less than 10 percent in all cases, except for transition from education to inactivity which accounts for about 10 percent. This supports the notion that people, especially young people, have a higher staying on rates in education during recession (see Clark, 2011; Jenkins and Taylor, 2012).

Furthermore, most of the transitions out of the unemployment and inactivity states happen during stable economic condition during 1994 – 2000. The number of transitions from these states are small during the Great Recession period in 2007, which again seems to suggest higher staying on rates in both unemployment and inactivity states during this period. In addition, the percentages of transitions out of the inactivity state also appear to be very low during the early 1990s recession, i.e. only less than 10 percent for all transitions.

Table 24 Labour Market Transitions by Origin-Destination State in Spell Pairs and Business Cycle (column percentages)

	Labour market transitions			
	censored[a]	*E→U*	*E→I*	*E→Edu*
Business cycle period:				
Recession Sept91-Dec93	4.30	9.19	6.14	5.82
Non-Recession Jan94-Dec97	16.38	23.19	18.98	16.94
Non-Recession Jan98-Dec00 (base)	18.17	19.25	20	20.27
Recession Jan01-Dec02	15.10	14.36	17.33	17.05
Non-Recession Jan03-Dec04	16.06	12	14.21	16.63
Recession Jan05-Aug07	21.13	16.01	17.19	17.15
Recession Sept07- Apr09	8.86	6.01	6.14	6.13
	censored[a]	*Edu→U*	*Edu→I*	*Edu→E*
Recession Sept91-Dec93	5.77	9.38	6.38	6.08
Non-Recession Jan94-Dec97	14.99	19.97	13.38	17.13
Non-Recession Jan98-Dec00 (base)	16.57	16.89	18.44	17.42
Recession Jan01-Dec02	14.38	16.76	15.25	16.84
Non-Recession Jan03-Dec04	15.51	11.80	17.02	16.49
Recession Jan05-Aug07	22.62	17.69	18.79	19.16
Recession Sept07- Apr09	9.71	7.51	10.28	6.89
	censored[a]	*U→E*	*U→Edu*	*U→I*
Recession Sept91-Dec93	9.95	11.13	12.81	8.66
Non-Recession Jan94-Dec97	21.50	23.83	25.81	20.90
Non-Recession Jan98-Dec00 (base)	16.78	19.29	16.06	19.21
Recession Jan01-Dec02	14.59	13.77	13.77	16.76
Non-Recession Jan03-Dec04	12.85	12.53	10.90	16.20
Recession Jan05-Aug07	17.25	14.42	11.28	14.31
Recession Sept07- Apr09	7.07	5.03	9.37	3.95
	censored[a]	*I→E*	*I→Edu*	*I→U*
Recession Sept91-Dec93	3.53	4.28	4.99	7.27
Non-Recession Jan94-Dec97	16.22	16.95	14.66	21.15
Non-Recession Jan98-Dec00 (base)	19.34	21.11	18.77	17.40
Recession Jan01-Dec02	15.25	18.23	15.25	14.54
Non-Recession Jan03-Dec04	15.95	14.46	16.13	19.38
Recession Jan05-Aug07	21.07	17.26	18.77	13.22
Recession Sept07- Apr09	8.64	7.70	11.44	7.05

Source: BHPS Waves 1 – 18.

Note: Include only spells which start at or after 1991, and with non-missing relevant information; [a] include censored spells at wave 18.

With respect to the duration of each spell of labour market transition, Table 25 presents the percentages of labour market transitions from each origin state that occur in each monthly duration interval. Results from this Table show that out of the total number of transitions from employment to unemployment, around 30 percent occur in the first 3 months of the employment spell; hence, those surviving employment during the first three months of employment account for the remaining 70 percent.

In addition, for all other destination states, the results from Table 25 generally show that transitions from the employment state tend to happen mostly during the first 9 months of employment. Moreover, as the employment duration gets longer, the percentages of those who make transitions become lower, implying more survival rates or more people staying on in employment. This suggests that short-term employment is still vulnerable and will become more stable and secure as the employment durations become longer.

Similar patterns are also found for transitions from unemployment and inactivity states. In all transitions models from the origin unemployment and inactivity, a majority of the transitions take place in the first 6 to 9 months of the unemployment and inactivity spell respectively. For instance, nearly 50 percent of transitions from unemployment to employment occur within the first 3 months of the unemployment spell. Meanwhile, slightly more than a quarter of the total transitions from inactivity to employment state happen during the first three months of inactivity.

Similarly, around 35 percent of exits to unemployment from inactivity happen in the first 3 months of inactivity. As the durations of unemployment and inactivity become longer, the less likely they will make transitions out of these states, since the percentages of exit transitions become smaller the longer the unemployment and inactivity durations. Based on these descriptive statistics data, we can argue that any policies towards assisting the unemployed or those who drop out from the labour force should be carried out quickly when the individuals are still in the early state because the longer they have been in that state, the harder it will be to help them exit the state.

Table 25 Labour Market Transitions by Origin-Destination State in Spell Pairs and Duration (column percentages)

	Labour market transitions			
Duration:	censored[a]	*E*→*U*	*E*→*I*	*E*→*Edu*
1 – 3 months	12.98	31.05	18.91	29.83
4 – 6 months	10.68	20.57	15.72	17.26
7 – 9 months	9.03	11.38	13.05	10.08
10 – 12 months	7.77	8.42	10.18	11.43
13 – 18 months	11.99	8.84	11.12	13.83
up to 2 years	9.22	5.61	8.56	6.03
up to 3 years	12.93	5.90	8.25	6.86
up to 5 years	14.04	5.31	8.53	3.53
above 5 years	11.35	2.92	5.68	1.14
	censored[a]	*Edu*→*U*	*Edu*→*I*	*Edu*→*E*
1 – 3 months	17.38	14.61	11.35	9.95
4 – 6 months	14.66	15.15	7.45	10.53
7 – 9 months	13.04	14.75	18.79	11.57
10 – 12 months	10.90	15.55	16.31	16.61
13 – 18 months	15.23	6.84	3.19	8.51
up to 2 years	11.63	12.87	17.38	17.19
up to 3 years	11.74	13.54	17.73	15.74
above 3 years	5.40	6.7	7.8	9.9
	censored[a]	*U*→*E*	*U*→*Edu*	*U*→*I*
1 – 3 months	26.48	48.65	40.34	31.26
4 – 6 months	15.50	21.28	18.55	16.76
7 – 9 months	10.70	9.75	12.24	12.43
10 – 12 months	7.87	6.50	9.75	10.36
13 – 18 months	10.55	6.13	10.33	10.36
up to 2 years	6.81	3.16	2.87	5.84
up to 3 years	8.41	2.43	3.63	5.27
up to 5 years	7.63	1.59	1.91	5.65
above 5 years	6.06	0.51	0.38	2.07
	censored[a]	*I*→*E*	*I*→*Edu*	*I*→*U*
1 – 3 months	9.42	25.89	46.63	34.36
4 – 6 months	7.61	15.32	12.32	19.38
7 – 9 months	6.56	11.59	7.92	10.35
10 – 12 months	5.78	7.89	7.33	9.69
13 – 18 months	9.74	10.58	6.16	5.51
up to 2 years	8.15	6.53	4.11	5.73
up to 3 years	13.10	7.93	5.57	6.39
up to 5 years	17.30	8.16	6.45	4.41
above 5 years	22.34	6.10	3.52	4.19

Source: BHPS Waves 1 – 18.

Note: Include only spells which start at or after 1991, and with non-missing relevant information; [a] include censored spells at wave 18.

Evidence from the education origin state shows mixed results. The number of transitions out of the education state tend to get larger the longer the duration. There seems, however, to be a cut off point during the thirteenth to eigthteenth month of being in education. In this case, the percentage of those who make transitions out of the education state is lower during the 13-18 months of being in education as compared to the earlier months. Moreover, unlike transitions from employment or from other states, the percentages of transitions from education do not get smaller as the education durations become longer, although being in education for 3 years or more appears to decrease the probability of making transitions.

With respect to the impacts of previous labour market histories on each transition model based on our raw data analysis, Table 26 provides the mean of previous labour market occurences (i.e. the mean of the previous number of labour market spells). Results from Table 26 show, for example, that those who make transitions from employment to inactivity tend to have more spells of inactivity in the past. Similarly, individuals who succeed in exiting the unemployment state to employment seem to have the highest average of previous employment spells. An interesting figure is for those who make transitions into inactivity. These individuals not only have higher means of previous inactivity spells, but they also tend to have a higher number (or mean) of previous unemployment spells. This suggests that some unemployed individuals might get discouraged and thus decide to give up looking for job and drop out from the labour force.

Meanwhile, Table 27 presents the mean durations of current spells and previous spells of labour market histories by each transition model. In general, those who make transitions out of the employment (inactivity) state have an average of one to one and a half years of the current employment (inactivity) spell duration. Similarly, individuals who make transitions out of the education state have an average duration of current education spell between 15 to 18 months.

On the other hand, those making transitions from the unemployment state to any of the Non-NEET states, either to employment or education, have lower means for a current duration of less than 10 months. This implies that most individuals in our sample who successfully make transitions out of the unemployment state to the Non-NEET states are those with relatively shorter means of unemployment durations.

Whereas those who exit unemployment and end up being inactive have longer means of unemployment duration valued at around 12 months.

In regard to the average duration of previous labour market states (lagged-durations), results from Table 27 suggest that those who make transitions into the inactivity state tend to have higher means for inactivity duration in the past. Moreover, those unemployed who end up being inactive and those inactive individuals who terminate being in unemployment also seem to have higher means of previous unemployment and inactivity durations in the past. The unemployed individuals who end up being inactive, for example, have average durations of previous unemployment and inactivity experiences of nearly 11 and 12 months, respectively.

Table 26 The Average Number of Spells of Occurrence Dependence by Origin and Destination States (in means)

Labour Market Transitions	Occurrence Dependence			
	E	*Edu*	*U*	*I*
O : Employment				
Censored Spells[a]	3.2	0.39	0.46	0.27
E → Edu	1.45	**1.33**	0.39	0.19
E → U	3.04	0.76	**1.2**	2.75
E→ I	3.2	0.44	0.60	**0.74**
O : Education				
Censored Spells[a]	0.82	1.36	0.26	0.18
Edu → U	0.88	1.34	**0.63**	0.18
Edu → I	1.37	1.33	0.43	**0.57**
Edu → E	**1.07**	1.38	0.33	0.18
O : Unemployment				
Censored Spells[a]	2.28	0.6	0.77	0.33
U → E	**2.93**	0.78	1.06	0.26
U → Edu	1.42	**1.15**	0.75	0.18
U → I	2.33	0.65	0.92	**0.42**
O : Inactivity				
Censored Spells[a]	2.25	0.28	0.51	0.43
I → E	**3.32**	0.46	0.54	0.68
I → Edu	1.41	**1.19**	0.46	0.45
I → U	2.54	0.7	**0.87**	0.51

Source: BHPS Waves 1 – 18.

Note: Include only spells which start at or after 1991, and with non-missing relevant information; [a] include censored spells at wave 18.

Table 27 The Average Months of Duration Dependence and Lagged-duration Dependence by Origin and Destination States (in months)

Labour Market Transitions	Duration	Lagged-duration dependence			
		E	*Edu*	*U*	*I*
O : Employment					
Censored Spells[a]	52.87	86.35	22.85	2.75	8.57
E → Edu	11.5	19.5	85.03	2.18	3.23
E → U	12.73	51.98	42.9	9.7	6.11
E→ I	18.05	61.25	25.53	5.35	21.61
O : Education					
Censored Spells[a]	28.03	13.55	93.85	2.28	4.18
Edu → U	15.21	14.48	84.74	6.11	3.26
Edu → I	17.33	21.54	78.59	4.13	16.72
Edu → E	18.30	15.88	91.60	2.66	3.77
O : Unemployment					
Censored Spells[a]	35.32	55.65	32.87	9.06	10.92
U → E	6.85	56.3	45.42	6.79	5.53
U → Edu	8.14	23.46	67.50	5.76	3
U → I	12.1	49.76	34.71	10.74	11.47
O : Inactivity					
Censored Spells[a]	78.27	65.14	14.61	8.29	15.3
I → E	17.33	66.17	25.58	4.67	16.37
I → Edu	13.18	22.49	70	3.38	7.99
I → U	13.47	51.78	39.67	10.53	10.3

Source: BHPS Waves 1 – 18.
Note: Include only spells which start at or after 1991, and with non-missing relevant information; [a] include censored spells at wave 18.

Table D.1 in Appendix D provides descriptive statistics on the proportions (except for the number of children, which is in its means) for other explanatory variables used in our regressions by each state of origin. From Table D.1, the proportion of the sample for those who are employed predominantly consist of individuals in the prime age groups (25-49 years old), females, whites, those who are married, those who live in the South East region of the UK, those who live in housing as a couple with children, and those who pay mortgage for their housing. Meanwhile, those who are in the education state are mostly young people aged below 24 years old, females, those with an A-Level or GCSE education background, those who are not married, and those in Wales or Scotland.

As for those who are unemployed, a majority of them are prime-age adults (aged 25-49 years old) and also older youths (aged 20-24 years old), males, who are mostly without education or with a GCSE/O level qualifications, who are not married, who live in Wales or Scotland, live in household type as of couple with children, and those who pay mortgages or live in a local authority rented house. Lastly, those individuals in our sample who are in inactivity predominantly are those in the older age groups, females, those without education or only with GCSE/O level qualifications, are married, live in Wales or Scotland, live in a type of household as couple with children, and those who pay mortgages or live in a local authority rented house.

4.5 Empirical Results

This part of the chapter reports the empirical results for both the single-risk and the competing-risks models, where separate regressions are conducted for each labour market origin. In the single-risk model, estimation for each destination state is regressed separately while for the competing-risks models estimations for all destination states are regressed simultaneously. In addition, we also estimate both homogeneous and heterogeneous models, the ones without and with unobservable heterogeneity respectively, for comparison. In the heterogeneous models, we also estimate the models that allow for correlation between spells of the same origin for each person (hereafter labelled as 'id1') and those that assume independent spells (hereafter labelled as 'id2').

Our main interest is to examine the impacts of true state dependence and the business cycles on the transition probabilities from each origin state, by controlling for correlations between spells of the same origin state for the same person. Therefore, we focus our discussions on the outputs obtained from the 'heterogeneous id1' models. The complete results for all models are presented in Appendix D.

4.5.1 Single-risk Models

4.5.1.1 Specification test

In general, for all origin state estimations, the results obtained from both the heterogeneous and homogeneous models are similar in sign but lower in magnitude for those obtained from the heterogeneous models. This finding is as expected because the heterogeneous models pick up the effects of unobserved individual heterogeneity, something that is not considered in the homogeneous models.

In order to compare the goodness-of-fit of all our regression models, Table 28 reports the summary of the log-likelihood values for each model specification. From this Table, we can see that the goodness-of-fit of the heterogeneous models are better than the homogeneous models, indicated by the maximized log-likelihood values that are less negative (closer to zero) for the heterogeneous models compared to those of the homogeneous models.

In addition, in each regression output from the heterogeneous models, or the random effects cloglog models (*xtcloglog*), we can obtain a likelihood-ratio test of $\rho = 0$. This test compares the pooled estimator (i.e. the homogeneous model using the *cloglog*) with the panel estimator (i.e. the heterogeneous model using the *xtcloglog*), where if we do not reject the H0: $\rho = 0$, then the panel-level variance component is not important and thus the panel estimator is no different from the pooled estimator. In almost all of our outputs, the results of the likelihood ratio test, with degress of freedom (df) equal to one (i.e. the difference in the number of parameters between the two models)[108], are very significant; thus, we can reject the null hypothesis of $\rho = 0$ and conclude that our heterogeneous models are significantly different from our homogeneous models.

The likelihood ratio tests for transition probabilities from inactivity are only significant for the transition models from inactivity to Non-NEET states and from inactivity to the employment (*E*) state. On the other hand, the heterogeneous models from inactivity to education and unemployment states are not statistically different from the homogeneous models, since for these two models the likelihood ratio tests insignificantly different from zero (i.e. in both models the values of p-value = 0.491). Similarly, most of the estimated heterogeneous models from the origin state of education are not statistically significantly different from the homogeneous model specifications.

[108] Note that results from the heterogeneous models, or the random effects cloglog models (*xtcloglog*) include an additional panel-level variance component, which is parameterized as the log of the standard deviation, labelled as ‘lnsig2u’ in the output.

Table 28 Summary of Log-likelihood Values for the Single-Risk Models

Origin State	Employment (*E*)	Unemployment (*U*)	Inactivity (*I*)	Education (*Edu*) (all age)	Education (*Edu*) (youths)
	Model Specifications				
Destination State	**Homogeneous**				
NEET/Non-NEET[1]	-41071.701	-19262.104	-12646.94	-3256.0991	-3590.7023
Employment (*E*)	N/A	-18105.893	-11626.49	-4544.6321	-5984.0571
Unemployment (*U*)	-26771.463	N/A	-2642.3505	-2397.1803	-2889.6403
Inactivity (*I*)	-18270.052	-3033.204	N/A	-1160.6263	-1020.2502
Education (Edu)	-6277.1619	-2792.4711	-1796.8494	N/A	N/A
Destination State	**Heterogeneous (id1)[2]**				
NEET/Non-NEET[1]	-40911.252	-19240.299	-12643.946	-3253.4657	-3590.7025
Employment (*E*)	N/A	-18071.768	-11623.858	-4542.8853	-5984.0573
Unemployment (*U*)	-26628.406	N/A	-2642.3502	-2395.8885	-2889.307
Inactivity (*I*)	-18235.562	-3032.193	N/A	-1160.5207	-1020.2503
Education (Edu)	-6272.2785	-2791.2786	-1796.8496	N/A	N/A
Destination State	**Heterogeneous (id2)[3]**				
NEET/Non-NEET[1]	-41018.425	-19212.065	-12632.625	-3250.988	-3589.7567
Employment (*E*)	N/A	-18049.565	-11608.668	-4544.6323	-5984.0574
Unemployment (*U*)	-26717.002	N/A	-2642.3676	-2392.9887	-2887.4483
Inactivity (*I*)	-18248.633	-3027.8701	N/A	-1159.7233	-1020.2503
Education (Edu)	-6277.1632	-2790.4019	-1796.8494	N/A	N/A
Total observations	984,503	70,791	143,673	47,137	62,034
No. of parameters	63	61	63	62	56

Note: 1) Destination for origin Employment and Education is NEET, while destination for origin Unemployment and Inactivity is Non-NEET; 2) heterogeneous (id1) is the random-effect cloglog models with correlated spells of the same origin; 3) heterogeneous (id2) is the random-effect cloglog models with independent spells .

In the transition models from education that only consider education spells for youths, none of the likelihood ratio tests are statistically significant, implying that the ρ is not significantly different from zero. This suggests that these heterogeneous models are not statistically different from those in the homogeneous models. Meanwhile, the likelihood ratio tests for the transition models from education which include both youths and adults are mostly significant, except for the transition model from education to inactivity (with p-value = 0.323).

Furthermore, we also try to regress separate estimations for the heterogeneous models for comparison. The 'heterogeneous id2' models relax the assumption for correlation between spells of the same origin by assuming that each spell is independent of the others. Having this assumption affects our heterogeneous models because now we have to adjust the random effect term to account for the independency of each spell.[109] All results of the covariates are still robust in both types of specifications, although in most cases the magnitudes of the observed variables are lower in the case of heterogeneous models with correlated spells of the same origin (i.e. 'heterogeneous id1' models).

Comparing the goodness-of-fit between the heterogeneous models with correlated spells of the same origin ('heterogeneous id1') and the heterogeneous models with independent spells ('heterogeneous id2'), we obtain mixed results as can be observed in Table 28. Estimated models from the origin state of employment show more negative log-likelihood values (or higher numbers in absolute term) for all 'heterogeneous id2' models compared to the 'heterogeneous id1' specifications. On the other hand, models from the other origin states mostly show log-likelihood values that are less negative for heterogeneous models with independent spells ('id2') than those with correlated spells ('id1'), while in some cases the reverse is true.

4.5.1.2 The impact of age and business cycle

Table 29 summarizes our main variables of interest, which are the age and business cycle variables.

[109] This implies that the hazard rates of a particular transition, say, from unemployment to employment, are assumed to be independent to other spells of transitions from the unemployment origin state.

Table 29 The Impact of Age and Business Cycle (Single-Risk Models)

Destination state	NEET/Non-NEET[1)]		E		U		I		Edu	
	dy/dx	P-value	dy/dx	P-value	dy/dx	P-value	dy/dx	P-value	dy/dx	P-value
Origin state: *E*										
36-49 (base)										
16-19	0.00697	0.000			0.00424	0.000	0.00066	0.094	0.00266	0.000
20-24	0.00403	0.000			0.00195	0.000	0.00143	0.000	0.00079	0.000
25-35	0.00054	0.026			-0.0004	0.041	0.00085	0.000	0.00021	0.003
50-65	0.00101	0.002			0.00055	0.046	0.00047	0.011	-0.00023	0.002
Non-recession Jan98-Dec00 (base)										
Recession Sept91-Dec93	0.00293	0.000			0.00265	0.000	0.00017	0.528	-0.00021	0.128
Non-recession Jan94-Dec97	0.00160	0.000			0.00143	0.000	0.00010	0.588	-0.00010	0.342
Recession Jan01-Dec02	0.00039	0.195			0.00006	0.786	0.00035	0.067	0.00001	0.920
Non-recession Jan03-Dec04	-0.00060	0.048			-0.00047	0.042	-0.00011	0.574	0.00005	0.654
Recession Jan05-Aug07	-0.00008	0.781			0.00009	0.712	-0.00014	0.459	-0.00005	0.669
Recession Sept07-Apr 2009	-0.00059	0.130			-0.00003	0.920	-0.00045	0.059	-0.00014	0.306
Origin state: *U*										
36-49 (base)										
16-19	0.0212	0.030	-0.0026	0.731			-0.0013	0.404	0.0110	0.000
20-24	0.0183	0.020	0.0101	0.118			0.0000	0.996	0.0014	0.223
25-35	0.0133	0.026	0.0095	0.057			-0.0002	0.870	0.0001	0.906
50-65	-0.0342	0.000	-0.0283	0.000			0.0001	0.918	-0.0027	0.004
Non-recession Jan98-Dec00 (base)										
Recession Sept91-Dec93	-0.0406	0.000	-0.0357	0.000			-0.0012	0.343	0.0014	0.293
Non-recession Jan94-Dec97	-0.0171	0.001	-0.0161	0.000			-0.0003	0.750	0.0021	0.057
Recession Jan01-Dec02	-0.0090	0.091	-0.0106	0.027			0.0007	0.559	0.0002	0.861
Non-recession Jan03-Dec04	-0.0054	0.371	-0.0060	0.260			0.0018	0.185	0.0004	0.751
Recession Jan05-Aug07	-0.0179	0.003	-0.0155	0.003			-0.0013	0.255	-0.0015	0.153
Recession Sept07-Apr 2009	-0.0193	0.009	-0.0255	0.000			-0.0034	0.010	0.0040	0.021

Table 29 (continued)

Destination state	NEET/Non-NEET1)		E		U		I		Edu	
	dy/dx	P-value	dy/dx	P-value	dy/dx	P-value	dy/dx	P-value	dy/dx	P-value
Origin state: *I*										
36-49 (base)										
16-19	0.0217	0.000	0.0001	0.981	0.0014	0.180			0.0103	0.000
20-24	0.0055	0.006	0.0029	0.118	0.0016	0.040			0.0019	0.001
25-35	0.0003	0.777	0.0001	0.951	0.0007	0.171			0.0003	0.352
50-65	-0.0106	0.000	-0.0100	0.000	-0.0014	0.000			-0.0008	0.002
Non-recession Jan98-Dec00 (base)										
Recession Sept91-Dec93	-0.0066	0.000	-0.0060	0.000	0.0014	0.095			-0.0005	0.363
Non-recession Jan94-Dec97	-0.0031	0.009	-0.0026	0.023	0.0013	0.015			-0.0003	0.400
Recession Jan01-Dec02	0.0023	0.087	0.0021	0.104	0.0000	0.936			0.0003	0.464
Non-recession Jan03-Dec04	-0.0018	0.177	-0.0024	0.056	0.0011	0.044			0.0004	0.320
Recession Jan05-Aug07	-0.0022	0.087	-0.0027	0.025	-0.0006	0.141			0.0003	0.447
Recession Sept07-Apr 2009	0.0028	0.128	0.0003	0.850	0.0002	0.711			0.0019	0.006
Origin state: *Edu (all age group)*										
36-49 (base)										
16-19	-0.00317	0.335	0.00283	0.470	-0.00352	0.229	-0.00050	0.767		
20-24	-0.00397	0.175	0.00020	0.952	-0.00363	0.177	-0.00086	0.542		
25-35	-0.00039	0.874	0.00522	0.049	-0.00119	0.608	0.00038	0.739		
50-65	0.00518	0.312	-0.00092	0.841	0.00246	0.589	0.00334	0.267		
Non-recession Jan98-Dec00 (base)										
Recession Sept91-Dec93	0.01024	0.008	0.00765	0.074	0.00552	0.053	0.00362	0.174		
Non-recession Jan94-Dec97	0.00427	0.079	0.00825	0.006	0.00370	0.068	0.00016	0.907		
Recession Jan01-Dec02	-0.00054	0.805	0.00183	0.501	0.00021	0.911	-0.00090	0.453		
Non-recession Jan03-Dec04	-0.00500	0.014	0.00023	0.932	-0.00395	0.019	-0.00142	0.232		
Recession Jan05-Aug07	-0.00557	0.003	-0.00731	0.002	-0.00334	0.038	-0.00233	0.028		
Recession Sept07-Apr 2009	-0.00858	0.000	-0.01661	0.000	-0.00705	0.000	-0.00196	0.097		

Table 29 (continued)

Destination state	NEET/Non-NEET[1)]		E		U		I		Edu	
	dy/dx	P-value	dy/dx	P-value	dy/dx	P-value	dy/dx	P-value	dy/dx	P-value
Origin state: *Edu (youths only)*										
16-19 (base)										
20-24	-0.00300	0.024	-0.00768	0.000	-0.00144	0.207	-0.00180	0.023		
Non-recession Jan98-Dec00 (base)										
Recession Sept91-Dec93	0.00166	0.490	0.00118	0.719	0.00275	0.196	-0.00155	0.145		
Non-recession Jan94-Dec97	0.00217	0.211	0.00058	0.787	0.00324	0.038	-0.00115	0.149		
Recession Jan01-Dec02	0.00037	0.825	0.00313	0.164	0.00098	0.498	-0.00068	0.418		
Non-recession Jan03-Dec04	-0.00264	0.083	-0.00072	0.732	-0.00213	0.100	-0.00048	0.568		
Recession Jan05-Aug07	-0.00328	0.019	-0.00578	0.002	-0.00193	0.113	-0.00139	0.053		
Recession Sept07-Apr 2009	-0.00359	0.027	-0.00765	0.000	-0.00204	0.154	-0.00150	0.067		

Note: 1) Destination for origin Employment and Education is NEET, while destination for origin Unemployment and Inactivity is Non-NEET; 2) results are in marginal effects; 3) results are obtained from the random-effect (heterogeneous) with correlated spells of the same origin models; 4) we also control for other covariates, which are: gender, ethnicity, educational attainment, marital status, health status, number of children, household type, house tenure, region of residence, and labour market histories.

In terms of the effect from the age variable on the exit probabilities from employment, results for exit into NEET states indicate that compared to the mature prime-age adults (aged 36-49 years old), young people are more likely to exit employment into NEET states, particularly into the unemployment state. That is, teenagers and older youths are about, respectively, 0.4 and 0.2 percentage points more likely to exit employment for unemployment compared to the base age group.

In contrast, the transition probabilities from unemployment to employment for youths, both teenagers and older youths, are insignificant at 10% confidence level. However, the result for unemployed older youths (aged 20-24) alone is significant at 15% confidence level. In addition, compared to the base group, youths also seem to have higher probability of making transitions from employment to inactivity, where older youths tend to be the ones who are more likely to leave employment for inactivity by about 0.14 percentage point. Transitions from inactivity to employment are insignificant for both teenagers and older youths. Thus, these findings may imply that although older youths are less likely to exit employment for unemployment and are more likely to exit unemployment for employment, they also face a higher risk of being inactive compared to teenagers.

The prime-age workers aged 25-35 appear to be less prone to exiting employment for unemployment as compared to the mature prime-age group (36-49 year olds), yet they also have a higher exit probability to the inactivity state. Moreover, the unemployed prime age individuals (25-35 year olds) have a significantly higher chance to escape unemployment for employment by about one percentage point, while exit to other destinations are insignificant. Whereas, most of the exit probabilities results from inactivity and education states are insignificant. From this finding, we may expect that individuals aged 25-35 may be more favoured by the employers compared to individuals in other age groups, partly because they are at their early prime-age in their career which may indicate higher productivity compared to the other age groups.

As for workers in the oldest age group (aged 50-65), the probability of making a transition into the NEET states is found to be highly significant. For this age group, the transition probabilities out of employment to the NEET states, both unemployment and inactivity, are significant and positive although the magnitudes of these effects are rather small. At the same time, individuals in this age group who are NEET, either unemployed or inactive, are significantly less likely to make transitions out of these NEET states to any destination. Unemployed individuals aged 50-65, for example, are about 3 percentage points less likely to make a transition from unemployment to employment. Likewise, individuals in this age group who are inactive, have a significant lower likelihood to exit to the employment state by about one percentage point. From this finding, we may expect that individuals in this group might be inactive by their own decisions, such as to take care of their family in their old age.

The transition probabilities into the education states show the expected results. In this case, young people, especially teenagers, are the ones who are significantly more likely to make transitions back into education compared to the base group. Inactive teenagers, for instance, have a higher probability returning to education by about one percentage point, while the corresponding marginal effect for older youths aged 20-24 is about 0.2 percentage point. On the other hand, adults in the oldest age group (50-65 year olds) are significantly less likely of making transitions back into education from all origin states.

For the unemployed youths we find that, when compared to the base group, teenagers are the ones who have higher probabilities of making transitions into education, while the result for older youths is statistically insignificant. This is as expected, since going back to further education might still be a better option for teenagers rather than being unemployed, partly because some of these teenagers who are still under 18 years old are not eligible to apply for unemployment benefits or Jobseeker's Allowance (JSA).

The impacts of different business cycle periods are also apparent from the results in Table 28, particularly from the early 1990s recession. During the first recession period between 1991 to 1993, the probability of exiting employment to NEET, particularly into the unemployment state, increased significantly compared to the base period, where the hazard rates during this period increased by about 0.29 and 0.27 percentage point for exit to NEET and unemployment state, respectively. During this period, we also observe a lower probability for workers to make a transition into education relative to the base period. The probability of transitioning out of employment to unemployment persists until the recovery period in 1994-1997. This finding supports the finding from the analysis of the raw data in the introductory chapter, which shows that the unemployment rate keeps on increasing beyond the end period of the early 1990s recession. In this case, unemployment rates only start to recover around two to three years after the recession period ends in 1991.

The exit probability from unemployment to Non-NEET, including the employment state, during the early 1990s recession is significantly lower compared to the base period by around 4 percentage points. This adverse impact persists until the following non-recession period in 1994-1997, in which the transition probability from unemployment to Non-NEET is still significantly lower by 2 percentage points. Similar trends are also found in the transition probability from inactivity to employment. However, we also find a higher significant probability of transition from inactivity to unemployment during the early 1990s recession, and its following non-recession period between 1994-1997, by about 0.1 percentage point. This may suggest that individuals who were inactive during the early 1990s recession might try to return to the labour market to compensate for the financial loss that they faced due to the recession. Unfortunately, as the economy was in recession, they only ended up being unemployed.

Furthermore, we also observe some evidence of a large probability of observing transitions from education to employment and unemployment during the early 1990s recession by about one percentage point. This may again imply that students who needed financial support during this recession might choose to return to the labour market and leave their education. This result is in contrast with the previous literature which suggests higher participation in education during recessions, although most of these studies are referring to the latest Great Recession rather than the early 1990s recession.

The impacts of the dot.com recession in the early 2000s do not seem to be very significant in the case of employment exit probabilities, except for transitions into inactivity. On the other hand, the transition probability from unemployment to employment is still significantly lower by about one percentage point. This may indicate that while workers were not too affected during this recession as their employment exit probabilities are found to be mostly insignificant, the unemployed were the ones who felt the adverse impact of the early 2000s recession.

Moreover, the period during 2003-2004 is associated with a relatively stable condition for workers as their probabilities of exiting employment into NEET, particularly to unemployment states, are significantly lower by about 0.1 percentage point at a 5% confidence level. However, individuals who were inactive during this period seem to be at a disadvantage, since during this period their exit probability to employment significantly decreased by 0.2 percentage point and their exit probability to unemployment increased by about 0.1 percentage point. Meanwhile, transition probabilities from unemployment and education are insignificant during this period.

As suggested in much previous literature regarding the increase in unemployment rate prior to the Great Recession, we also find evidence that the transition probability from unemployment to employment is significantly lower during the years 2005-2007 by about 0.2 percentage point. Similarly, the exit probability from inactivity to employment during the same period is also significantly lower by about 0.3 percentage point. Supporting these results, the transition probabilities out of the education state, for both youth group and the all age group, show significantly lower hazard rates to all destination states. This may indicate that there had been an increasing participation in education prior to the Great Recession in the mid-2000s, as suggested by Jenkins et al. (2012). This finding is also consistent with that found in Gregg et al. (2011), in so far as trends in the UK youth labour market had worsened several years prior to the start of the Great Recession, particularly during the period between 2004 and 2007.

As for the latest recession, our results tend to suggest significant lower exit probabilities from unemployment and education to almost all destination states. In this case, unemployed individuals are about 3 percentage points less likely to exit to employment, and 0.3 percentage points less likely to exit to inactivity. The latter finding seems to suggest that unemployed individuals during the Great Recession period tended to choose to keep looking for jobs rather than completely dropping out from the labour force and being inactive. Uncertainty of getting a job and the tight economic situation of the time may encourage more people to stay actively engaged in the labour force, even if they are not able to find a job. However, they may, at the very least, hold on to the unemployment benefits to support their lives while continuing to look for any job opportunities.

During the same period we also find significantly higher probabilities of exit from unemployment and inactivity to education state by about 0.4 and 0.2 percentage points, respectively. The results from education to all destination states also show a significant and negative marginal effects by about one percentage point, implying higher staying-on rates in education during this recession. These findings support the notion of previous studies where it is argued that in developed countries education enrolments at higher education usually increase during recession, since declining labour market opportunities during recessions causes the opportunity costs of schooling become lower and thus young people would instead seek to invest in their future employability (see Ferreira and Schady, 2009; Marcus and Gavrilovic, 2010). These results are also consistent with that presented in Barakat et al. (2010), in which the education participation rates, especially in tertiary education, increased during the Great Recession in the late-2000s.

Meanwhile, the exit probability results from employment and inactivity states are mostly insignificant. In transition from employment models, only the results for transition into inactivity are found to be significantly negative. This finding supports the idea of labour 'hoarding' which took place during the Great Recession, as suggested in Gregg et al. (2011) and Coulter (2016). In this case, employers might be reluctant to dismiss their current, 'valuable', workers, who are more equipped with firm-specific skills, even at the cost of lower productivity. One possible explanation is to avoid transaction costs from recruiting new workers, such as training costs or other costs related to hiring new workers into the firm. As a consequence, those who are currently working during this recession are be able to retain their positions while unemployed individuals are also more likely to stay out of job, since new job opportunities can hardly be found.

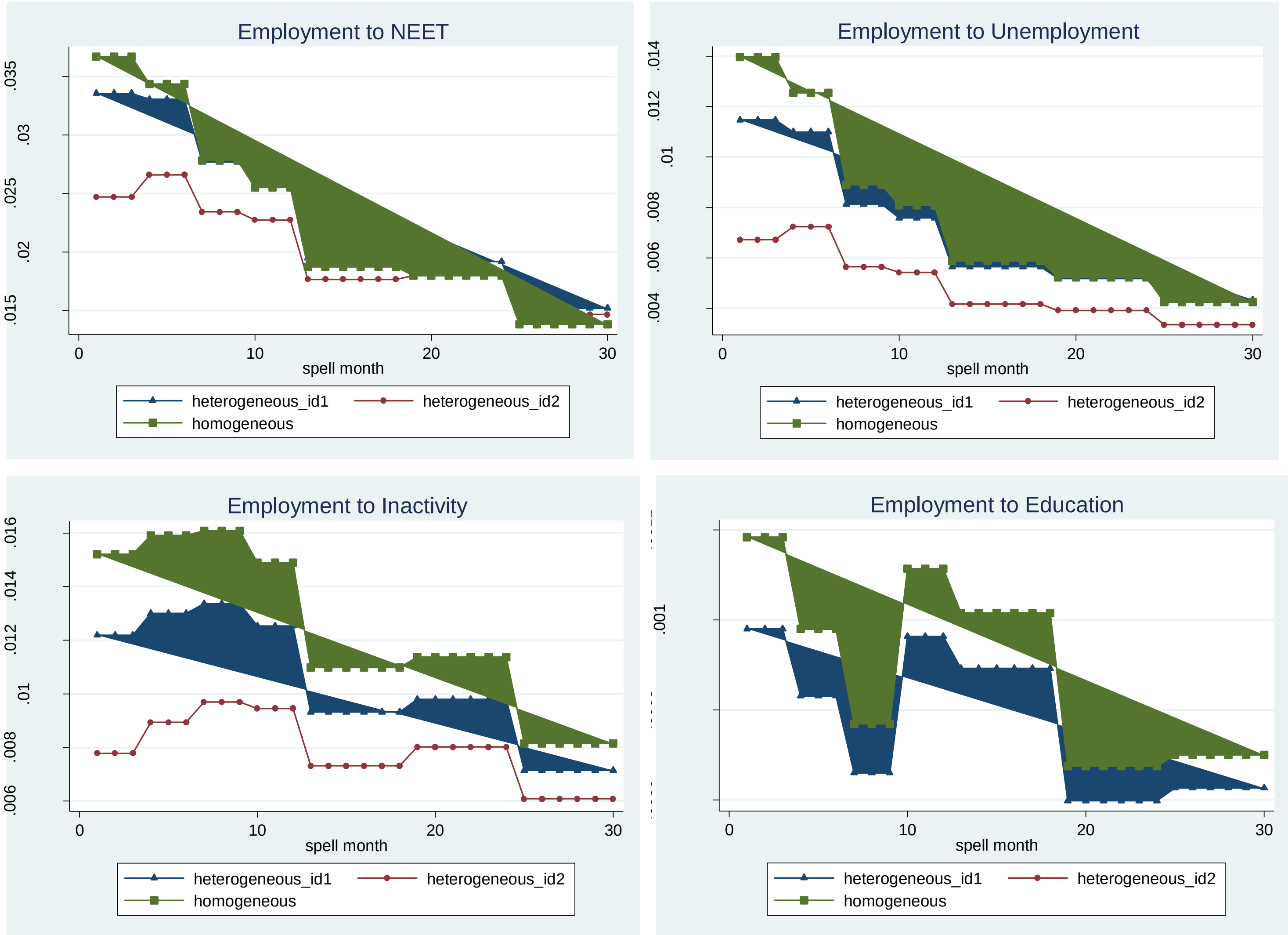
Furthermore, as shown in Coulter (2016), much of the employment growth which occurred during the Great Recession has been in part-time or insecure jobs as well as self-employment. Moreover, Gregg and Wadsworth (2011) also shows that there has been a higher growth of part-time work during the 1980s and 1990s recessions; particularly during the 1980s recession, there was a large increase in the share of part-time work due to government policy to subsidise short-time working in many major manufacturing plants (Gregg et al., 2011). This suggests that during an economic downturn, the total hours of work tends to fall faster than employment as overtime working might be cut and some people may move into part-time work as they struggle to find full-time jobs during recessions.

4.5.1.3 The effect of state dependence

Our finding regarding duration dependence is robust for all labour market origins and for all types of model specifications. In this case, we find strong evidence of negative duration dependence in all cases. A negative duration dependence implies that the longer an individual occupies a particular labour market at the present time, the less likely he will exit that state in the future. This result also supports the notion of persistence in labour market state which was found in the previous chapter, that is, individuals who occupy a 'bad' current labour market outcome will be trapped in a vicious cycle of unfavourable labour market outcomes in the future. In contrast, individuals with a 'good' current labour market experiences are in a virtuous circle of favourable labour market outcomes in the future. This finding is in line with previous studies, such as by Haardt (2005), Frijters et al. (2009), Niedergesäss (2012), and Lesner (2015).

In the transition models from employment to unemployment and to both NEET states, the negative impacts of duration dependence constantly get larger (more negative) the longer the duration of the current spell of employment. This pattern can also be seen from Figure 13. Individuals who have been working up to 3 months, for example, are about 2.17 percentage points less likely to exit employment for unemployment while the corresponding magnitude for those who have been working for more than 5 years reaches 2.84 percentage points.

Figure 13 Within-sample Prediction of Transitions rates from Employment State



Moreover, transition from the employment to inactivity state shows slightly higher hazard rates (less negative magnitudes) during the fourth to the ninth months of employment compared to the first three months of employment, but these magnitudes tend to become more and more negative thereafter. In general, individuals with up to 3 months of working duration are 1.57 percentage points less likely to become inactive, and this hazard rate gets more negative up to 1.76 percentage points for those who have been working for more than 5 years. Meanwhile, between four to nine months of working duration, the negative marginal effects account for 1.55 percentage points.

As for transition from employment to education, there is a tendency of increasing hazard rates during the tenth to twelfth months of employment. This might be because employers may send their workers for training or other related programmes to enhance the workers' firm-specific skills before these workers start their second year in that firms. However, after the twelfth month, the hazard rates of transitions into the education state tend to get lower (more negative) the longer the current employment durations.

Similar to transitions from employment state, the duration dependence results for transitions from unemployment and inactivity states also show that the hazard rates of exiting the unemployment state to all other states tend to get lower (i.e. more negatives in magnitude) the longer the current unemployment duration, especially after the first three months of unemployment. These trends are depicted in Figure 14 and Figure 15 for transitions from unemployment and inactivity, respectively.

In the case of duration dependence from unemployment state, the first three months of the current unemployment spell duration, for instance, is associated with 23.7 percentage points of lower hazard rate for the unemployed to end up in Non-NEET states. The hazard rate becomes slightly higher (i.e. less negative) by about 1.3 percentage points during the fourth to the sixth month of unemployment, after which it becomes more negative again. After more than five years of an unemployment duration, the probability of exiting unemployment becomes even lower with the corresponding marginal effects values reaching above 24 percentage points for exit to either both Non-NEET states or to the employment state alone.

Figure 14 Within-sample Prediction of Transitions rates from Unemployment State

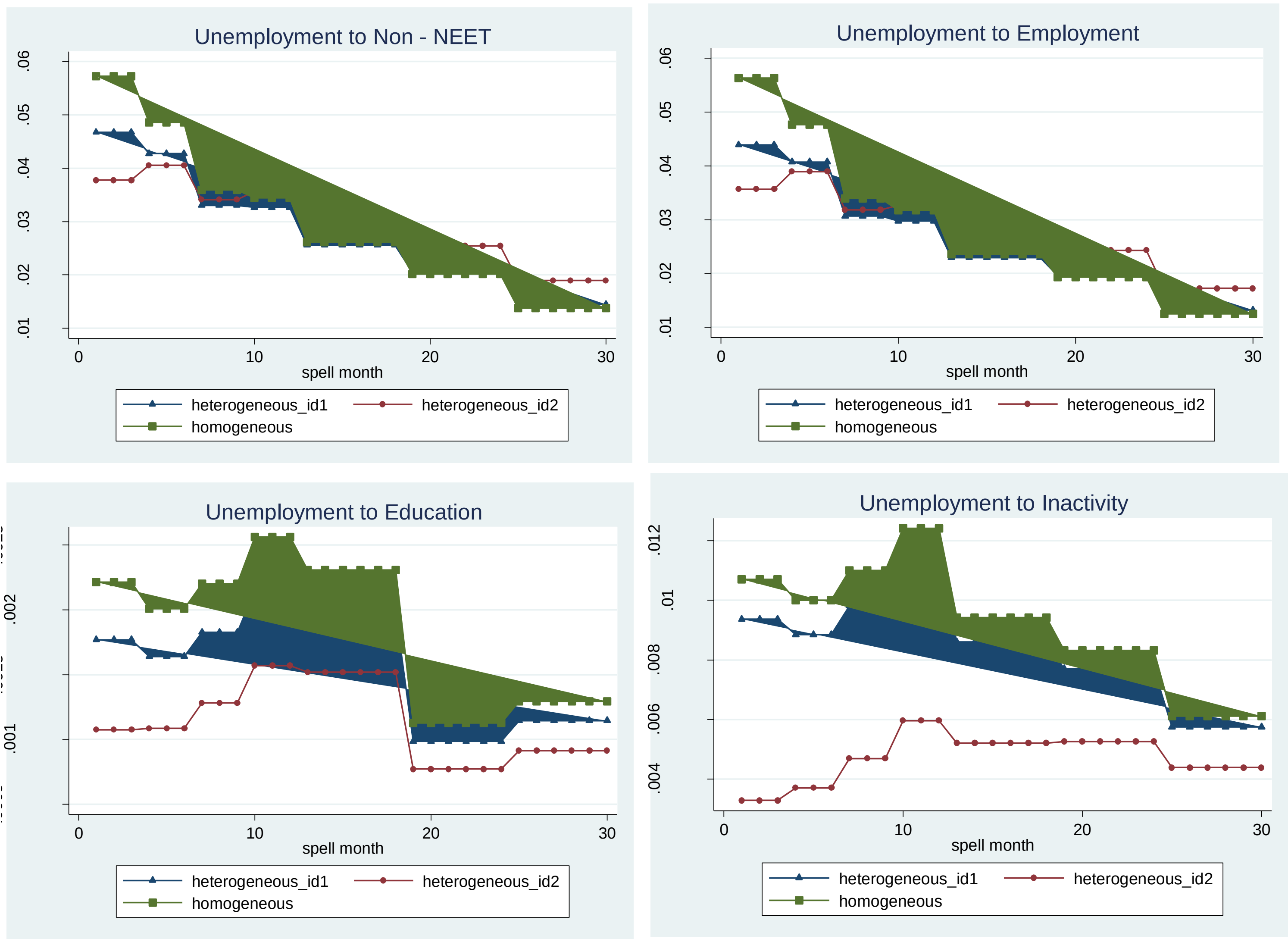
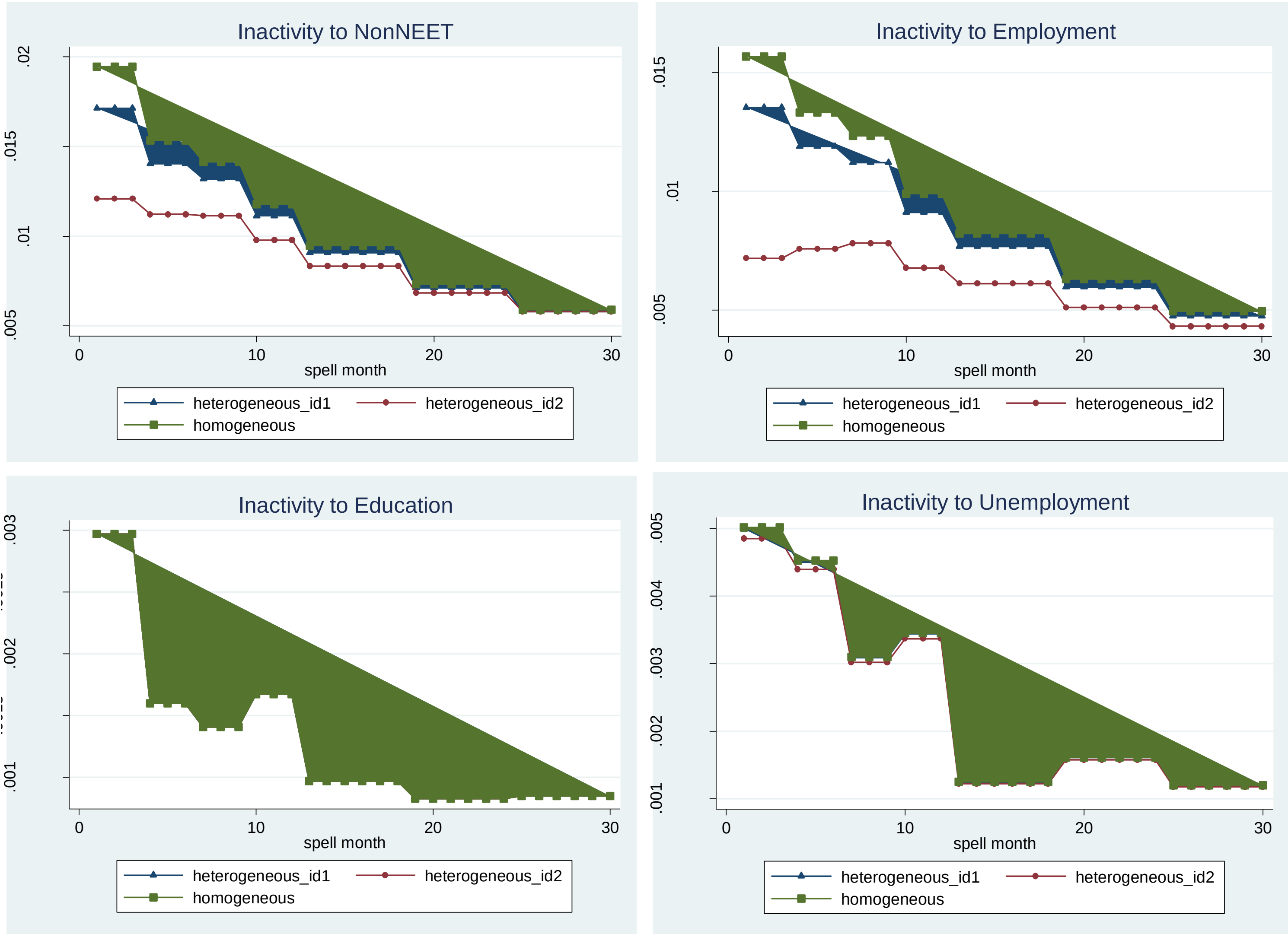


Figure 15 Within-sample Prediction of Transitions Rates from Inactivity State

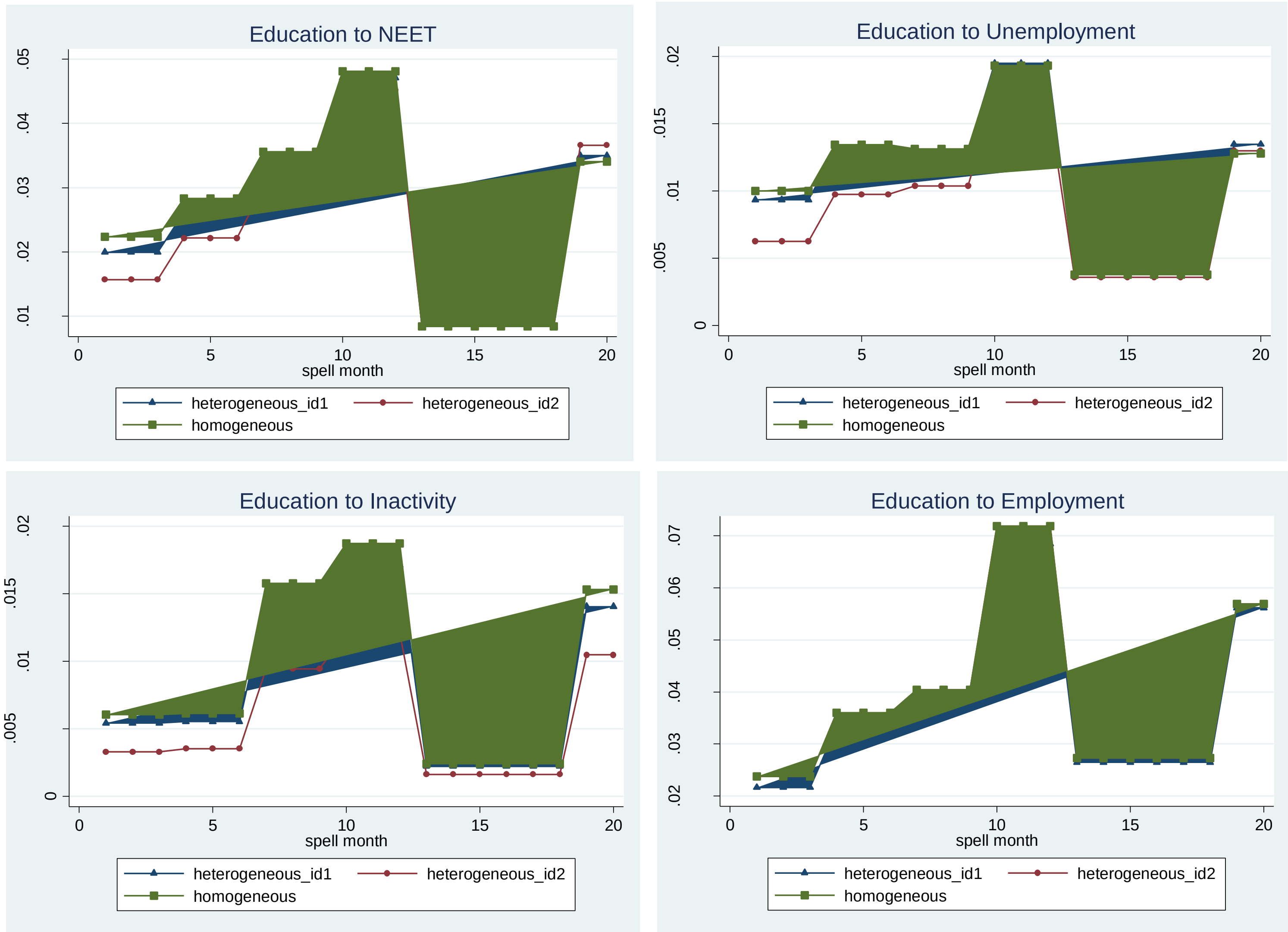


This evidence of negative duration dependence in the hazard rate from unemployment is consistent with previous studies for the UK such as by Atkinson et al. (1984), Van den Berg and Van Ours (1994), Böheim and Taylor (2000), Cappellari et al. (2005), and Long (2009). Our findings also seem to suggest that any policies to help the unemployed should be undertaken within the first year of unemployment, or more effectively within six months of unemployment, since people with unemployment spells that last over a year are much harder to help.

In the transitions from inactivity state, individuals who have been inactive between 4 to 6 months, for example, have a lower probability of making transition from inactivity to the employment state by nearly 7 percentage points while the corresponding hazard rate for those who have been inactive for more than 5 years is above 9 percentage points. The estimated hazard rates for transitions from inactivity to education and unemployment states also show similar patterns, although there is a tendency of a slight increase (i.e. less negative magnitudes) in these hazard rates during the tenth to twelth months. After one year of inactivity, the hazard rates of leaving the inactivity state seem to be continuously lower.

Similar to the results from other origin models, duration dependence in transition probabilities from education are also found to be negative in all transition models. However, the negative impacts of duration dependence in education do not continuously get stronger (i.e. more negatives in magnitudes), where the impacts are found to be smaller, i.e. less negative, after around 12 and 18 months of education. As can be observed from Figure 16, in all transition models from education, the hazard rates of leaving the education state tend to increase after 10 to 12 months of education. After one year of education, the hazard rates become much lower (i.e. more negatives), before they start increasing again after the 18 months of education. We also find similar trends from the education model in Table D.9 of Appendix D, which takes into account all education spells but only for young people. This finding may simply reflect the fact that the higher or post-secondary education system in the UK, which is taken by individuals aged 16 and above, generally lasts for one to three years, after which students leave the education state to other labour market destinations.

Figure 16 Within-sample Prediction of Transitions Rates from Education State



The negative duration dependence in employment supports the importance of human capital accumulation during employment that would improve individual's productivity along with a longer working tenure. In addition, this finding is in line with the sorting effect notion suggested by Mortensen (1986) in Niedergesäss (2012, pp. 4) in which workers who are relatively more productive face lower risks of being laid off and thus have a higher probability of 'surviving' in their current job. Worker's productivity in this case might be reflected by their tenure, where workers with longer working years of experience are more likely to possess firm-specific skills which in turn increase their value to the present job.

Furthermore, the negative duration dependence in the NEET states, i.e. unemployment and inactivity, can be explained by several factors. The negative duration dependence in inactivity can be explained by the 'habituation' phenomenon argued by Clark et al. (2001) for unemployment. In the case of inactivity, the longer individuals are inactive, the more likely they become used to the situation, and hence they will be less likely to leave this state in the future. Moreover, the negative duration dependence in transition probability from unemployment to employment can be explained by several reasons such as depreciations in human capital and 'negative signalling' or stigma effects for potential employers (Vishwanath, 1989; Lockwood, 1991; Pissarides, 1992; Ljungqvist and Sargent, 1998; Mroz and Savage, 2006; Biewen and Steffes, 2010).

Meanwhile, the negative duration dependence in transition probabilities from unemployment to inactivity is consistent with previous works by Cappellari et al. (2005) for the UK and Niedergesäss (2012) for Germany, although it contradicts the discouragement notion by Schweitzer and Smith (1974). In this case, people might choose to keep actively looking for jobs instead of dropping out of the labour force by being inactive (or going to further education) in order to be eligible for the government's labour market programmes or to receive the unemployment benefits.[110]

[110] Analysing the impact of unemployment benefits system or other labour market programmes on duration dependence is beyond the scope of our study. However, as previously discussed, previous studies suggest that unemployment benefits induce people to stay in unemployment; yet as the benefits are reaching its expiry date, people tend to increase their job-search rate. Review on the labour market programmes in the UK can be seen in, for example, Dolton et al. (1996) and Van Reenen (2004).

The results from other forms of state dependence, i.e. the occurrence and lagged-duration dependence, mostly show significant effects on the labour market transition probabilities for all labour market origins although their impacts are not as strong as that of the duration dependence. These results are presented in Table 30. In the case of transitions from employment, the cumulative number of past employment histories (occurrence dependence) significantly lowers the probability of workers exiting into unemployment and education while the result for transition into inactivity is very insignificant. Meanwhile, lagged duration dependence of past employment significantly reduces the probability of exiting from employment into other labour market states although the magnitudes are smaller than that of occurrence dependence.

These findings could be explained by the networking idea (Ioannides and Loury, 2004), where workers' past employment experiences broaden their networking which may help them in finding new employment if they are looking for a new job. Another possible explanation could be due to 'positive signalling', where workers with more working experiences are considered as having higher productivity than their counterparts with less or no working experience. As a result, employers tend to retain these workers with 'positive signals' or that potential employers are more attracted to hire these workers when screening the new applicants.

With regard to the state dependence from other labour market states, the results for unemployment labour market history indicate that workers with more numbers of previous spells of unemployment (occurrence dependence) are more at risk of making transitions out of employment into NEET states, in particular exiting to the unemployment state. Previous unemployment durations (lagged duration dependence) also positively relate to the probability of workers leaving employment to unemployment. The impacts from lagged duration dependence, however, are less pronounced than the impacts from occurrence dependence. Similarly, worker transitions from employment to inactivity are significantly affected by occurrences in unemployment but not their lagged duration. These findings imply that even short unemployment spells in the past are scarring for worker employment probabilities in the future. In contrast, it is the previous unemployment durations, and not their occurence, that significantly decrease a worker's likelihood of returning to education or participating in government training. This may indicate that for workers who have been long unemployed in the past, going back to education is no longer desirable.

Table 30 The Effect of State dependence (Single-Risk Model)

Destination state	NEET/Non-NEET 1)		E		U		I		Edu	
	dy/dx	P-value	dy/dx	P-value	dy/dx	P-value	dy/dx	P-value	dy/dx	P-value
Origin state: *E*										
Occurrence dependence										
Sum_E	-0.00012	0.027			-0.00014	0.001	-0.00001	0.696	-0.00007	0.011
Sum_U	0.00174	0.000			0.00135	0.000	0.00034	0.000	0.00002	0.706
Sum_I	0.00171	0.000			0.00031	0.044	0.00098	0.000	0.00017	0.034
Sum_Edu	0.00011	0.484			0.00026	0.024	-0.00031	0.008	0.00014	0.001
Lagged-duration dependence										
Sum_tE	-0.00003	0.000			-0.00002	0.000	-0.00001	0.000	-0.00001	0.000
Sum_tU	0.00002	0.003			0.00001	0.006	0.00001	0.182	-0.00002	0.011
Sum_tI	0.00000	0.265			-0.00001	0.001	0.00000	0.776	-0.00001	0.007
Sum_tEdu	-0.00001	0.015			-0.00001	0.008	0.00000	0.526	0.00000	0.166
Origin state: *U*										
Occurrence dependence										
Sum_E	-0.0065	0.000	-0.0034	0.000			-0.0004	0.047	-0.0013	0.000
Sum_U	0.0278	0.000	0.0246	0.000			0.0009	0.024	0.0022	0.000
Sum_I	-0.0071	0.111	-0.0091	0.009			0.0010	0.070	0.0003	0.735
Sum_Edu	-0.0095	0.002	-0.0014	0.547			0.0000	0.967	0.0005	0.241
Lagged-duration dependence										
Sum_tE	0.0001	0.013	0.0001	0.007			0.0000	0.565	0.0000	0.409
Sum_tU	-0.0016	0.000	-0.0017	0.000			0.0000	0.469	-0.0001	0.004
Sum_tI	-0.0003	0.035	-0.0002	0.096			-0.00002	0.133	-0.0001	0.039
Sum_tEdu	0.0002	0.003	0.0001	0.082			0.0000	0.359	0.0000	0.771

Table 30 (continued)

Destination state	NEET/Non-NEET 1)		E		U		I		Edu	
	dy/dx	P-value	dy/dx	P-value	dy/dx	P-value	dy/dx	P-value	dy/dx	P-value
Origin state: *I*										
Occurrence dependence										
Sum_E	0.0010	0.000	0.0012	0.000	-0.0001	0.183			-0.0003	0.006
Sum_U	-0.0007	0.222	-0.0007	0.147	0.0005	0.001			0.0002	0.399
Sum_I	0.0052	0.000	0.0042	0.000	0.0011	0.000			0.0010	0.000
Sum_Edu	-0.0002	0.823	-0.0008	0.229	-0.0001	0.757			0.0002	0.190
Lagged-duration dependence										
Sum_tE	-0.00003	0.001	-0.00002	0.009	0.0000	0.873			-0.00001	0.020
Sum_tU	-0.0002	0.000	-0.0002	0.000	0.0000	0.942			-0.00005	0.022
Sum_tI	-0.00004	0.008	-0.00003	0.029	-0.00001	0.287			-0.00001	0.102
Sum_tEdu	0.0000	0.915	0.0000	0.649	0.0000	0.218			0.0000	0.259
Origin state: *Edu (all age group)*										
Occurrence dependence										
Sum_E	-0.00082	0.032	0.00178	0.000	-0.00124	0.001	0.00009	0.639		
Sum_U	0.00397	0.000	0.00136	0.205	0.00404	0.000	-0.00011	0.804		
Sum_I	0.00272	0.005	-0.00167	0.222	0.00021	0.835	0.00190	0.000		
Sum_Edu	0.00180	0.010	0.00246	0.005	0.00092	0.117	0.00067	0.075		
Lagged-duration dependence										
Sum_tE	0.000005	0.799	-0.00001	0.832	0.00000	0.988	0.00000	0.644		
Sum_tU	0.00005	0.329	-0.00005	0.583	0.00001	0.695	0.00002	0.597		
Sum_tI	0.00003	0.288	-0.00002	0.659	-0.00004	0.184	0.00002	0.014		
Sum_tEdu	-0.00001	0.343	-0.00001	0.628	-0.00002	0.099	0.00001	0.236		

Table 30 (continued)

Destination state	NEET/Non-NEET[1)]		E		U		I		Edu	
	dy/dx	P-value	dy/dx	P-value	dy/dx	P-value	dy/dx	P-value	dy/dx	P-value
Origin state: *Edu (youths only)*										
Occurrence dependence										
Sum_E	0.00101	0.171	0.00214	0.018	0.00101	0.114	0.00006	0.881		
Sum_U	0.00370	0.000	0.00338	0.026	0.00334	0.000	0.00001	0.987		
Sum_I	0.00377	0.003	-0.00348	0.092	0.00111	0.404	0.00231	0.000		
Sum_Edu	0.00064	0.278	0.00390	0.000	0.00054	0.297	0.00007	0.792		
Lagged-duration dependence										
Sum_tE	-0.00011	0.143	0.00013	0.104	-0.00008	0.208	-0.00004	0.322		
Sum_tU	0.00015	0.115	0.00010	0.604	0.00008	0.375	0.00008	0.071		
Sum_tI	-0.00005	0.535	0.00010	0.348	-0.00012	0.271	0.00001	0.763		
Sum_tEdu	-0.00001	0.478	-0.00001	0.401	-0.00001	0.399	0.00000	0.964		

Note: 1) Destination for origin Employment and Education is NEET, while destination for origin Unemployment and Inactivity is Non-NEET; 2) results are in marginal effects; 3) results are obtained from the random-effect (heterogeneous) with correlated spells of the same origin models; 4) we also control for other covariates, which are: age, gender, ethnicity, educational attainment, marital status, health status, number of children, household type, house tenure, region of residence, and business cycle.

Furthermore, regarding labour market experiences of inactivity, the results show that the previous number of inactivity spells significantly increase a worker's probability of making transitions from employment to the NEET states, either unemployment or inactivity state, as well as into the education state. Surprisingly, the length of previous inactivity duration lowers a worker's probability of being unemployed and going back into education while it has no impact on a worker's exit probability into inactivity itself. This may imply that one long spell of inactivity in the past is not scarring for workers, but as they experience many spells in-and-out of the inactivity state they become more at risk of leaving the employment state. Meanwhile, the lagged-duration from previous education experiences are mostly insignificant in all models while occurrence of past education spells does increase the exit probabilities from employment to unemployment and education states and decrease the transition probability from employment to inactivity.

The above findings are similar to previous studies by Niedergesäss (2012) and Doiron et al. (2008) in that these two studies also find stronger effect from occurrence dependence than that of lagged duration dependence in the exit transition probabilities from employment. Niedergesäss (2012), for instance, in the case of German prime-age men finds that an additional spell of unemployment and out of the labour force increases the probability of transition from employment to unemployment and out of the labour force, respectively. The author argues that these findings suggest the existence of unemployment scarring for workers regardless of its duration, while individuals who have spent time away from the labour market may have lost their attachment to the labour market and thus more likely to leave the labour force again.[111]

In the case of transitions from unemployment state, our results show that previous numbers of unemployment spells are associated with a positive probability of making transitions out of the unemployment state into the Non-NEET states, either to employment or education as well as into the inactivity state.[112] On the other hand,

[111] As for the study by Doiron et al. (2008), the authors state that the significant result for occurrence, but not lagged-, duration dependence indicates that the on-the-job human capital acquired by young people in Australia (at least in their sample) from past employment is limited or not transferable to other employment experience.
[112] Again, similar finding is also found in Niedergesäss (2012), in which past unemployment spells increase the probability of the German unemployed men to become employed. The author argues that this finding is possibly because those individuals who were more often employed in the past were also previously more often unemployed.

previous unemployment durations significantly lower an individual's probability of escaping unemployment, although the impacts (in terms of marginal effects values) are comparatively much smaller than those from occurrence dependence.

These results suggest that unemployment occurrence dependence itself may not be scarring, but it is a long spell of unemployment experience that will be scarring for the unemployed. In other words, unemployed individuals with a long duration of previous unemployment, even if for only one spell, are more scarred and discriminated in the labour market than their unemployed counterparts who have many (but short) spells of past unemployment experiences. The latter group of unemployed can still be helped or still have a higher chance of escaping from unemployment and finding a job. This further implies that employers might be more sensitive to potential applicants who have long been unemployed than those with many spells of being in-and-out of the unemployment state, since the latter group of individuals may also possess more job experiences even if only for short periods.

Nevertheless, results from previous employment experiences suggest that having many spells of employment in the past is not enough to help the unemployed to exit the unemployment state. It is the cumulative past employment durations, however, that is proven to increase the probability for the unemployed to make a transition into employment. This may indicate that human capital gained in long-term jobs is considered as transferable by future employers. The most disadvantaged unemployed individuals are those with previous inactivity experiences, where both occurrence and lagged-duration of previous inactivity experiences significantly decrease the hazard rates of transition out of unemployment to either employment or the education state. In contrast to previous findings from employment models, we find stronger effects from previous education lagged-duration dependence than the impacts from its occurrence, where a longer lagged-duration of education is associated with higher exit probability from unemployment while the occurrence of past education spells are relatively insignificant, except to decrease the exit probability from unemployment to employment.

On the first sight, our results seem to suggest that having many experiences of working in short-term or temporary jobs could be beneficial for the unemployed to return to employment in the future. However, we cannot be sure about the quality of their future employment, i.e. whether they will end up in a stable long-term employment.[113] Taking into account the results for the transition from employment to unemployment, the results indicate that even a short-term past unemployment spell is scarring, since it increases the probability of exiting employment to unemployment. Thus, this may suggest poor job matches for workers with more frequent transitions between employment and unemployment. In addition, the impact of past employment experiences on the transition probability from unemployment to employment, which shows that a longer past employment duration helps the unemployed to return to employment but not a higher numbers of previous employment spells, may further support our findings that it is a long-term stable job experience that is desirable to help the unemployed individuals to return to employment.

Similar to findings from the origin state of unemployment, we once again find that a cumulative number of past inactivity experiences are not scarring for exit probability from inactivity, but having long periods of inactivity in the past is scarring. In this case, occurrence dependence in inactivity is not scarring for future probability of being inactive, since our results for all models indicate that occurrence in inactivity increases the probability of exiting the inactivity state for any destination states, while having a long period of inactivity in the past is significantly associated with a lower probability of making transitions from inactivity to Non-NEET states. These findings suggest that individuals who have many spells of being in-and-out of inactivity state in the past still have a higher chance of leaving inactivity and returning to actively engage in the labour force by getting a job or being unemployed, or to leave for further education. However, having experienced long periods of inactivity in the past will make them less likely to escape from that state in the future. One reason can be because they have already become used to the situation and have accepted their current state.

Previous unemployment experiences, both occurrence and lagged-duration dependence, tend to decrease the probabilities of exiting inactivity to Non-NEET states. We do, however, find a slight evidence that previous number of unemployment spells increase the probability of transition from inactivity to unemployment, although the impact of previous unemployment duration is insignificant. Taking into

[113] One study that finds that short-term jobs are stepping stones to permanent employment in the context of the UK is by Booth et al. (2002).

consideration earlier results for the transition from unemployment to inactivity, we also find that previous inactivity spells significantly increase the transition from unemployment to inactivity, and although the lagged-duration of past inactivity seems to lower this transition but its significancy is relatively weak. These results indicate that inactive individuals who were previously unemployed may have more attachment to the labour market. However, as they move in-and-out of the labour force, they may get discouraged and thus giving up looking for jobs altogether. This is also consistent with the 'discouragement' effect as suggested by Schweitzer and Smith (1974).

Moreover, the impacts of previous employment experiences on the probabilities of exiting inactivity are also found to be negative in most cases, in particular the impact from the lagged-duration dependence of employment. It is only the cumulative number of previous employment spells (occurrence dependence) that significantly increases the transition probability from inactivity to employment. In other models, however, both occurrence and lagged-duration dependence of employment tend to decrease the transition probabilities out of inactivity. This implies that, even though some spells of previous employment might help the inactive individuals to get a job, yet even a long duration of past employment spells is still unhelpful in getting them out of the inactivity state in the future. This finding can be explained by the 'habituation' effect suggested by Clark et al. (2001), where once individuals have spent time being out of the labour force, they might become used to their situation of being inactive and thus less likely to return to the labour market.

In the case of transition from education state, the impacts from previous labour market experiences are not very significant, in particular the impact from lagged-duration dependence. Some evidences are found for occurrence dependence, where previous spells of employment, unemployment, and inactivity significantly increase the transition probabilities from education to employment, unemployment, and inactivity states respectively. Meanwhile, previous spells of education themselves only significantly increase the probability of making transition from education to employment and inactivity but not to unemployment. Moreover, the effect from the lagged-duration dependence of education only significantly lowers the transition probability from education to the unemployment state whereas the results for all other destinations are insignificant.

Summing up our analyses regarding the impacts of the three different types of state dependence altogether, we argue that the negative impact from duration dependence may provide evidence for persistence in the labour market in our data. In this case, the longer the current spell of a particular labour market state, the more likely individuals are to stay in that labour market state in the future. In addition, we also find that in all models from different labour market origins, it is the duration dependence that plays a more significant role and strongly determines the transition probabilities to different destination states. This suggests that an individual's current labour market outcome has a stronger effect than labour market outcomes in the past. Moreover, in the case of transitions from unemployment and inactivity states, we find that previous number of unemployment (inactivity) spells themselves are not scarring. On the other hand, the lagged-duration of previous unemployment (or inactivity) spells do lower the exit probability from unemployment (or inactivity) state; however, the effects of lagged-duration dependence in both models are much lower than that of the occurrence dependence.

4.5.1.4 The effect of other covariates

In general, after controlling for unobserved heterogeneity and different types of state dependence, the effects from other covariates are relatively negligible. One exception is for the education variable. In this case, having higher education, as compared to having no education, significantly lowers an individual's probability of leaving employment for either unemployment or inactivity and increases the probability of exiting the NEET states, both unemployment and inactivity. Moreover, it is only those with a higher degree, A level, or other professional qualifications who tend to be more likely to leave employment for further education or training.

Compared to females, males are significantly less likely to leave employment for inactivity or education; however, they also have a higher chance of leaving employment for unemployment. Likewise, males are found to have a higher probability of exiting education for unemployment but a lower probability of exiting education into inactivity compared to their female counterparts. Supporting these findings, the exit probability results from unemployment also show that males are significantly less likely to escape from unemployment to any destination, compared to their female counterparts.

Both the male employed and unemployed are significantly less likely to make transitions into the inactivity state relative to their female counterparts. These results may suggest gender discrimination in the labour market and different attitudes between males and females towards leaving employment. In this case, when females have to leave their jobs, they tend to choose dropping out of the labour force altogether while males still prefer to look for new job opportunities. Another possible explanation is related to family responsibilities or 'division of labour' in the household, in which females have more incentive to drop out of the labour force to take care of the family while males, who are more likely to be breadwinners, are encouraged to stay active in the labour force.

Ethnicity does not seem to have a very significant role in transition probabilities from employment. Compared to Whites, Asians have a significantly higher probability of leaving employment for unemployment and education while those from other ethnicities have a higher likelihood of exiting employment for inactivity and also education. Meanwhile, being Black does not have any significant impact on the probability of leaving employment when compared to their White counterparts. In contrast, we find a significant ethnic discrimination for the unemployed, in which the labour market tends to favour unemployed Whites in getting a job compared to the non-Whites. In other words, being non-White is associated with a lower probability of exiting unemployment, particularly to the employment state.

Furthermore, being married or ever married (relative to being single) as well as having children are associated with lower probabilities of exiting employment to unemployment but a higher probability of exiting into inactivity. Similarly, being married and having more children is strongly associated with a lower probability of exiting inactivity. Again, this may relate to family responsibilities, where being married or having children encourages people to put extra attention into family matters at the cost of leaving their jobs.

Similar to our static probability results, our results in this chapter also show that being healthy is also an important factor to stay in the Non-NEET states, since not being in an excellent or good health condition is associated with a higher likelihood of leaving employment to all destination states and lower chance of leaving the NEET states, either unemployment or inactivity. In addition, we also find that having a poor (or even fair) health condition increases the probability of moving from unemployment to inactivity. This implies that unemployed people are more likely to give up looking for jobs and drop out from the labour force when they have a bad health condition.

Several household characteristics are found to be significant. Compared to living alone, living as couples lowers the transition probability from employment into education and NEET, in particular into the inactivity state. Living with other adults also significantly lowers the transition probability from employment into inactivity compared to living alone, whereas living alone but with children increases one's probability of leaving employment to unemployment. The last finding can be related to the need to find better jobs when an individual has to take care of their own children by themselves.

In terms of tenure types, compared to those who own their house outright, individuals who are paying off mortgages are less likely to leave employment and have a higher chance of exiting the unemployment state to either employment or education. Similar findings in the UK are also found by Cappellari et al. (2005) and Long (2009), where it is argued that the need for financial resources to repay mortgages encourages people to stay employed. On the other hand, individuals who live in a local authority or housing association accommodation, and some others who rent, have a higher probability of making a transition out of employment to NEET, and similarly a lower chance of leaving unemployment for employment.

The regional effect seems to be more homogeneous and supports previous findings by Cappellari et al. (2005), where those living outside central London have a significantly higher probability of leaving employment into any labour market destination states. As for transition probabilities from the unemployment state, we find that relative to those unemployed living in central London, unemployed individuals who live in the northern part of the UK, in particular in the North West and Northern Ireland, are less likely to escape from the unemployment to employment state, hence they have a lower probability of being re-employed. Only those unemployed who live in South East, relative to those living in central London, are found to be significantly more likely to move to employment. This result is consistent with previous work by Long (2009) who also finds similar findings regarding regional effects on the probability of leaving unemployment. Moreover, this finding also supports the notion that the regions in the southern part of the UK, particularly London, offer more job opportunities than regions in the northern part of the UK.

4.5.2 Competing-Risks Models

Our discussions so far are based on the results obtained from the single-risk models, in which regressions for each destination state from the same origin are estimated separately. In this section, we extend our models by simultaneously estimating different destination states from each origin, the so called competing-risks model. In this part of the chapter, we aim to analyse whether there are any significant differences from the impacts of true state dependence, and other covariates, on the hazard rates.

Unfortunately, not all estimated heterogeneous models achieved convergence, in particular when we allow for a different random effects term for each type of destination state. In order to overcome this problem, we tried to simplify the models by estimating only two different destination states (hereafter, referred to as the 'bivariate' models), instead of three destination states (hereafter, denoted as the 'trivariate' models), for each origin state. As for the three destination states (trivariate) models, we further try to simplify the models by restricting the random effect terms to be the same for all destination states (this random effect term will be labelled as 'M1').

Despite achieveing convergence in all model specifications, the homogeneous models do not reveal the impact of true state dependence, since these models ignore the unobservable time-invariant individual heterogeneity. These models will only be used to test the goodness-of-fit of our heterogeneous models by comparing the log-likelihood values between the two types of models to calculate the likelihood ratio test statistics. Therefore, our following discussion in this section will be based on the best outputs that can be achieved from the heterogeneous models for each origin state.

In order to compare the goodness-of-fit of the models, the log-likelihood values from each model specification are reported in Table 31 and Table 32 report, while the detailed outputs for all competing-risks models from each origin state are presented in Appendix D in terms of the coefficient values and robust standard error estimations.

Overall, our findings are robust even after we take into account different exits for each origin state simultaneously. Thus, our discussion in this section will focus more on the model specification tests by each origin state, and explain, if any, dissimilarities between the results found in the single-risk models and those found in the competing-risks models.

4.5.2.1 Transition probabilities from the employment origin

Almost all specifications for the competing-risks models from the origin state of employment successfully achieved convergence. In general, the log-likelihood values from the heterogeneous models are better (i.e. closer to zero) than those from the homogeneous models. The likelihood ratio test for the trivariate models between homogeneous and heterogeneous specifications (the one using the different random effect terms of M1, M2, and M3 and allowing for correlated spells denoted by 'id1') with 9 degrees of freedom (df = 9), i.e. the difference in the number of parameters between the two models, is very significant with the associated p-value equal to 8.446e-79. This implies that the less restrictive model with more variables (heterogeneous model) fits the data significantly better than the more restrictive homogeneous model without any additional random effect terms to control for unobservable characteristics.

Performing similar calculations for the bivariate models, the likelihood ratio test (with df = 5) between the homogeneous and heterogeneous (the one using the M1 and M2 random effect terms) specifications is statistically very significant (p-value = 4.277e-77), thus the less restrictive heterogeneous bivariate model is significantly better than the homogeneous one. The associated test statistic for the bivariate heterogeneous model, with the same random effect term for all destinations (M1), and the bivariate homogeneous model (with df = 3) produces the chi-square test-statistic equal to 321.820 and a corresponding p-value equal to 1.882e-69. This implies that the bivariate heterogeneous model is a better fit for our data than the homogeneous model.

Table 31 Summary of Log-likelihood Values for the Bivariate Competing-risks Models

Origin state	Obs	Model Specifications					
		Homogeneous[1]		Heterogeneous (id1)[2]		Heterogeneous (id2)[3]	
		Log-likelihood	Converged	Log-likelihood	Converged	Log-likelihood	Converged
		Bivariate[4]		Bivariate (M1,M2)[4a]			
Employment (*E*)	984,503	-45041.515	YES	-44858.13	YES	-44954.261	YES
Unemployment (*U*)	70,791	-20898.364	YES	-20854.003	NO	-20824.281	NO
Inactivity (*I*)	143,673	-13423.339	YES	-13420.432	NO	-13418.881	NO
Education (all age groups) (*Edu*)	47,137	-3557.8066	YES	-3549.3745	YES	-3551.8573	YES
Education (youths) (*Edu*)	62,034	-3926.6527	YES	-3925.4759	NO	-3901.4981	NO
				Bivariate (M1)[4b]			
Employment (*E*)	984,503	-45041.515	YES	-44880.606	YES	-44955.497	YES
Unemployment (*U*)	70,791	-20898.364	YES	-20847.905	YES	-20812.777	YES
Inactivity (*I*)	143,673	-13423.339	YES	-13420.3	YES	-13402.673	NO
Education (all age groups) (*Edu*)	47,137	-3557.8066	YES	-3556.4311	YES	-3552.1377	YES
Education (youths) (*Edu*)	62,034	-3926.6527	YES	-3902.2648	YES	-3898.9536	YES

Note: 1) Homogeneous models do not control for unobservable heterogeneity; 2) Heterogeneous models control for unobservable heterogeneity, and (id1) refers to panel level random effects with correlated spells from the same origin; 3) Heterogeneous models control for unobservable heterogeneity, and (id2) refers to panel level random effects assuming that all spells are independent; 4) Bivariate models are constructed as follows: for Origin (*O*) = Employment (*E*) → Destinations = Unemployment (*U*) and Inactivity (*I*), Origin (*O*) = Education (*Edu*) → Destinations = Unemployment (*U*) and Inactivity (*I*), for *O* = Unemployment (*U*) → Destinations = Employment (*E*) and Education (*Edu*), for *O* = Inactivity (*I*) → Destinations = Employment (*E*) and Education (*Edu*); 4a) random effect term M1 is assigned for the first destination, and M2 for the second destination; 4b) random effect term M1 is assigned for both destinations.

Table 32 Summary of Log-likelihood Values for the Trivariate Competing-risks Models

Origin state	Obs	Model Specifications					
		Homogeneous[1]		Heterogeneous (id1)[2]		Heterogeneous (id2)[3]	
		Log-likelihood	Converged	Log-likelihood	Converged	Log-likelihood	Converged
		Trivariate[4]		Trivariate (M1, M2, M3)[4a]			
Employment (*E*)	984,503	-51318.677	YES	-51122.873	YES	-51344.651	NO
Unemployment (*U*)	70,791	-23931.568	YES	-23910.777	NO	-23922.521	NO
Inactivity (*I*)	143,673	-16065.689	YES	-16076.074	NO	-16120.547	NO
Education (all age groups) (*Edu*)	47,137	-8095.1038	YES	-8091.2579	YES	-8101.8917	NO
Education (youths) (*Edu*)	62,034	-9860.2391	YES	-9871.6464	NO	-9860.8125	NO
				Trivariate (M1)[4b]			
Employment (*E*)	984,503	-51318.677	YES	-51279.279	NO	-51232.205	YES
Unemployment (*U*)	70,791	-23931.568	YES	-23876.483	YES	-23832.806	YES
Inactivity (*I*)	143,673	-16065.689	YES	-16059.546	YES	-16041.366	NO
Education (all age groups) (*Edu*)	47,137	-8095.1038	YES	-8093.3984	NO	-8096.5606	NO
Education (youths) (*Edu*)	62,034	-9860.2391	YES	-9860.2412	NO	-9856.0241	YES

Note: 1) Homogeneous models do not control for unobservable heterogeneity; 2) Heterogeneous models control for unobservable heterogeneity, and (id1) refers to panel level random effects with correlated spells from the same origin; 3) Heterogeneous models control for unobservable heterogeneity, and (id2) refers to panel level random effects assuming that all spells are independent; 4) Trivariate models are constructed as follows: for $O = E$ → Destinations = *U*, *I*, and *Edu*, for $O = Edu$ → Destinations = *U*, *I*, and *E*, for $O = U$ → Destinations = *E*, *Edu*, and *I*, for $O = I$ → Destinations = *E*, *Edu*, and U; 4a) random effect term M1, M2, M3 are assigned for the first, second,and third destination respectively; 4b) random effect term M1 is assigned for all three destinations.

Furthermore, comparing among the heterogeneous models, the models which allow the random effect terms to be different (but correlated) for each destination state have better log-likelihood values than the more restrictive models that constrain the random effects to be the same for all destination states. For instance, in the trivariate specification, the likelihood ratio test with df = 5 generates a test statistic equal to 312.813 with a corresponding p-value = 1.760e-65. Thus, we can conclude that the less restrictive model with more variables, in this case with a different random effect term for each destination state, is a better fit for our data and is statistically better than the more restrictive model that constrains the random effect terms to be the same for all destinations. Applying the same test statistics for the bivariate models, the calculated likelihood ratio test statistic with two degrees of freedom is 44.953 and a p-value of 1.732e-10. Thus, the less restrictive model with different random effects terms is again more preferred.

Another modification to the heterogeneous models is to estimate the models with correlated spells of the same origin ('heterogeneous id1') and those with independent spells ('heterogeneous id2'). As can be analysed from Table 31 and Table 32, the log-likelihood values for heterogeneous employment models that assume all spells are independent ('id2') are in most cases more negative (or higher in absolute term) than the log-likelihood values for employment models which treat spells from the same origin as being correlated with each other ('id1'). One exception is for the trivariate model with the restrictive random effect of M1, where the log-likelihood value from the model with correlated spells is more negative than that of model that assumes independent spells. However, the former model that assumes correlated spells does not achieve convergence. Therefore, based on our discussions up to this point, the chosen specification model to be interpreted for the origin of employment (*E*) is the heterogeneous trivariate model with correlated spells. The output for this model is presented in Table D.7 of Appendix D.

Table D.7 presents the output from our chosen competing-risks model for the origin state of employment (*E*). The estimated variances of the three random effects are 0.768, 0.506, and 0.428 respectively for the destination state to unemployment, inactivity, and education. The associated standard deviations for those variances are 0.876, 0.711, and 0.654 respectively. This implies that a 1-standard deviation change in the random effect corresponds to a exp(0.876) = 2.40 change in the exit probabilities to unemployment state relative to staying in the employment state (the base category). Similarly, the relative changes for the exit to inactivity and education states due to a 1-standard deviation change in the random effect are exp(0.711) = 2.04 and exp(0.654) = 1.92 respectively.

Moreover, the estimated covariance between the random effect on transition model to inactivity (M2) and the one for transition to unemployment (M1) is 0.202, implying an estimated correlation of 0.324 ($0.202/\sqrt{(0.768 \times 0.506)}$). In the same manner, we can find the estimated correlation between the random effect for the exit model to education (M3) and the one for the exit to unemployment (M1) to be equal to 0.518 ($0.297/\sqrt{(0.428 \times 0.768)}$) while the estimated correlation between the random effect of exit to education (M3) and inactivity (M2) is 0.494 ($0.230/\sqrt{(0.428 \times 0.506)}$). All of the covariances are statistically significant, suggesting that the random effect for each type of exit destination is correlated with those of the other spells.

In terms of the values and significances of the explanatory variables, the results in the competing-risks models are similar to those previously found in the single-risk models when we estimate each destination model separately. The impacts of duration and other state dependence are also robust, both in their magnitudes and significances. We still find evidence of negative duration dependence in all destinations models from employment, suggesting that the longer someone is employed, the less likely she will exit employment. Moreover, the competing-risks results also support previous findings in the single-risk models, in which the impact of duration dependence is much stronger than the effects from previous labour market histories in terms of occurrence and lagged-duration dependence.

In addition, even after controlling for other destination states, we still find evidence that labour market scarring is more strongly caused by the occurrence of previous labour market histories rather than lagged-durations. In this case, the occurrence of unemployment is scarring because a higher accumulative number of previous unemployment spells, but not accumulative past durations, significantly increases the hazard rates for transitions from employment to unemployment. Likewise, the occurrence dependences of previous spells of inactivity and education significantly increase the transitions probabilities from employment to inactivity and education state respectively, while its lagged-durations are not significant.

4.5.2.2 Transition probabilities from the unemployment origin

In the case of transition from the origin state of unemployment, the competing-risks models with random effects, both the bivariate and trivariate models do not converge when we estimate the less restrictive specifications that allow for different random effects terms for each destination state. Moreover, the log-likelihood values for the less restrictive heterogeneous models, with different random effects terms for each destination state, are surprisingly not closer to zero and instead are more negative compared to the more restrictive heterogeneous models which assign the same random effects for all destination states.

Comparing the more restrictive heterogeneous models with the ones without controlling for the random effects (homogeneous models), we find that adding the random effects into the model's specification results in a statistically significant improvement in model fit. The likelihood ratio test for the bivariate model between the two specifications with 3 degrees of freedom generates a test statistic equal to 100.92 and a very low p-value (Prob > chi2 = 9.865e-22). Using the same calculation method, the corresponding test statistic for the trivariate model is 110.172 and the associated p-value is also very low (Prob > chi2 = 6.689e-23), implying that adding the random effect terms does significantly improve the model's fit, hence the heterogeneous models are more preferred than the homogeneous ones.

Furthermore, the log-likelihood values of the heterogeneous models with correlated spells ('id1') are more negative than the log-likelihood values for the heterogeneous models that assume each spell from unemployment is independent to the other spells ('id2'). This is the case in all specifications for both bivariate and trivate models. However, the main findings from both specifications are similar, except that the standard errors are higher in the models that allow for spells to be independent. Moreover, all random effect terms are statistically significant for all types of destinations. The estimated variance of the random effects is 0.2042, implying a standard deviation of 0.452. This suggests that a 1-standard deviation change in the random effect corresponds to a exp(0.452) = 1.572 change in the transition probabilities relative to the base category (in this case the censored unemployment spells). This estimated variance value, however, is not statistically significant.

In terms of variables that represent the state dependence from other labour market states, Table D.8 reports the results from the heterogeneous competing-risks model from the origin state of unemployment with correlated spells (id1) and the same random effects (M1) for all destinations. To compare the results with those previously discussed for the single-risk models, we will use the findings obtained from the heteronegeneous models with correlated spells ('id1') for our discussions in this section.

For all observed characteristics, the impacts are still the same as those found in the single-risk models when we estimate each transition model separately by its destination. Moreover, the negative impact of duration dependence is found to be stronger in the competing-risks models than those in the single-risk models. This implies that after controlling for different exit states, the current durations of unemployment spells even more strongly influence the probability of an individual being unemployed in the future.

In regard to the other types of state dependence, most of the results are also consistent with that observed in the single-risk models. One exception is for the impacts of occurrence and lagged-duration dependence from past education experiences on the transition probability model from the unemployment to employment state, which is now insignificant in the competing-risks model. Another exception is in the transition model from unemployment to inactivity, where once we control for other destination routes in the competing-risks model the effects from previous employment occurrence become less significant in reducing the hazard rates of transitions from unemployment to inactivity. Similarly, in the transition model with correlated spells from unemployment to inactivity, the impacts from lagged-duration of past unemployment spells become insignificant. Conversely, the reverse is true for the effects from the occurrence dependence of unemployment.

On the other hand, the effects from occurrence of past inactivity spells become more significant and positive, suggesting that a higher number of previous inactivity spells significantly increase the probability of unemployed individuals ending up inactive in the future. This could be explained by the notions of discouragement or habituation effects suggested by Schweitzer and Smith (1974) and Clark et al. (2001).

In addition, the results from the competing-risks model also support the evidence of positive occurrence dependence, but negative lagged-duration dependence, of previous unemployment spells, as was previously found in the single-risk models. Again, this finding suggests that past unemployment occurrences themselves may not be scarring, but it is long spells of unemployment experiences that will be scarring for unemployed individuals in their probabilities to exit the unemployment state.

4.5.2.3 Transition probabilities from the inactivity origin

Similar to the transition models from the unemployment state, the competing-risks estimations with random effects from the origin state of inactivity also do not converge when the models allow for different (but correlated) random effect terms for each destination state. The heterogeneous competing-risks models from the origin state of inactivity only find convergence when we use the more restrictive specification to the model by assigning the same random effect term for all destination states.

Furthermore, the likelihood ratio tests also confirm that the heterogeneous models with random effects are a better fit for our data than the homogeneous ones, although the significancies of the test statistics are not as strong as those obtained from the origin of employment and unemployment state models. In this case, the likelihood ratio tests between the homogeneous model and the corresponding heterogeneous model, the one that converges with the less restrictive random effect terms, produce a p-value equal to 0.108 and 0.015 for the bivariate and trivariate model, respectively. These test statistics are still significant at the 10 percent confidence level, thus it can be said that the heterogeneous models with additional random effect terms are better than the homogeneous models without random effects.

Comparing among the heterogeneous models, those models that assume for independent spells (id2) have more negative log-likelihood values than those that allow for correlation between spells (id1). Moreover, none of the heterogeneous models that assume independent spells achieve convergence. The covariate results from both model specifications are also similar. Thus, we will use the heterogeneous competing-risks model with correlated spells and more restrictive random effects

(M1[id1]) as the benchmark for discussions in this section. The corresponding results for this model are presented in Table D.9.

Furthermore, only the random effects term for the unemployment state destination that is significant, while the random effects for exit type to education is not significant. The estimated variance of the random effects is 0.1513, which is associated with a standard deviation of 0.389, implying that a 1-standard deviation change in the random effect corresponds to a exp(0.389) = 1.476 change in the transition probabilities relative to the base category, which is the censored inactivity spells.

In general, all results in the competing-risks model are still robust and reproduce those results found for the single-risk models. Strong evidence for negative duration dependence in inactivity is still apparent, implying that the longer an individual is in the inactivity state the less likely he will escape this state in the future. Moreover, the effects of duration dependence are stronger than the effects from other types of state dependence, i.e. the occurrence and lagged-duration dependence, suggesting that the current spell of inactivity duration is a more important determinant for transition probabilities from inactivity as compared to other labour market spells in the past.

As for the other forms of state dependence, the results still reveal that cumulative numbers of past inactivity experiences (occurrence dependence) are not scarring, since the results for all models indicate that occurrence in inactivity increases the probability of exiting the inactivity state for other states. In contrast, having longer periods of inactivity in the past (lagged-duration dependence) is scarring, since it lowers the exit probability out of the inactivity state.

4.5.2.4 Transition probabilities from the education origin

The competing-risks model estimations from the origin state of education only converged for model that includes all different age groups, but only estimates those education spells after someone previously engaged in at least one labour market spell other than being in education. Meanwhile, the estimations that specifically focus on young people, and consider their entire labour market spells from the origin state of education, do not converge almost for all specifications. Similar to other competing-risks model estimations from other origin states, the heterogeneous model specifications are statistically significant in fitting our data better than the homogeneous models. Moreover, the log-likelihood values for heterogeneous models with correlated spells ('id1') are almost always closer to zero compared to the ones that assume independent spells ('id2'). Fortunately, the trivariate heterogeneous model with correlated spells successfully converged. This model is presented in Table D.10 and will be used for our interpretation in this section.

Comparing the overall results from Table D.10 with those previously discussed for the single-risk models from education, we do not find any significant changes regarding the impacts from all observed characteristics, including the impacts from the three different types of state dependence. The competing-risks results still show significant evidence of negative duration dependence in education, implying the persistence of being in education for most students. Meanwhile, the impacts from occurrence and lagged-duration dependence from other labour market states are not as strong as the impacts from duration dependence. Moreover, unlike the competing-risks model from employment, none of the estimated random effect terms covariances in the education model are statistically significant.

4.6 Summary

In this last chapter of the thesis, we extend our analysis on state dependence to include estimations for three different forms of state dependence, as suggested by Heckman and Borjas (1980), namely the duration, occurrence, and lagged-duration dependence. We estimate the single-risk and competing-risks models for both homogeneous specification, which ignores the impacts from individual time-invariant unobserved heterogeneity, and heterogeneous specification, which controls for the unobserved heterogeneity. We further try to re-estimate the models by relaxing the assumption that labour market spells from the same origin are correlated with each other, i.e. we re-estimate the models by assuming that all labour market spells are independent. Performing the likelihood ratio tests, we find that the heterogeneous models are better than the homogeneous models in all cases and hence can explain our data better. Moreover, in most cases, the estimated log-likelihood values for heterogeneous models with correlated spells of the same origin are closer to zero, thus have better goodness-of-fit compared to the heterogeneous models that assume independent spells.

In general, results obtained from both single-risk and competing-risk estimations are robust. First, consistent with previous literature, we find strong evidence of negative duration dependence in all models from different origin states. Negative duration dependence in employment and education implies persistence in employment and education for workers and students, respectively. However, the results for the transition models from education state should be taken with cautious given that education tends to be fixed in length by system. As shown in our results, the negative duration dependence for the education models tends to get less negative after one to three years. This may correspond to the length of higher or post-secondary education system in the UK, which is taken by most individuals aged 16 and above. Meanwhile negative duration dependence in unemployment and inactivity supports the notion of a 'scarring effect' from current labour market spell durations on the future probability of being unemployed or inactive, respectively.

Moreover, the impacts from occurrence and lagged-duration dependence, including those from other labour market states, are relatively small compared to the effects from duration dependence. In addition, in the transition probabilities from the NEET states (i.e. unemployment and inactivity), we find that the impacts of occurrence dependence are not scarring, but instead it is the lagged-duration dependence that is scarring. In this case, the cumulative previous spells of unemployment (or inactivity) increases the probability of exiting the unemployment (or inactivity) state for any destination states, while having a long period of unemployment (or inactivity) in the past is significantly associated with a lower probability of making transitions out of unemployment (or inactivity) state. This may imply that having a one-time long spell of previous unemployment (or inactivity) history in the past is much worse than having had multiple periods of being in-and-out of unemployment (or inactivity) state.

CHAPTER 5

Conclusion and Policy Recommendation

This thesis aims to analyse the determinants and scaring effects of economic inactivity and unemployment – NEET (Not in Education, Employment or Training) – in the UK. Our particular interest is to investigate the impacts of different business cycle periods on NEET transitions. We utilize the British Household Panel Survey (BHPS) Waves 1-18 and the Understanding Society (US) survey Waves 1-5 as our source of data. Moreover, our analysis involves both static and dynamic investigation of labour market behaviour. The analysis on labour market dynamics is particularly important in shedding more light on the issue of labour market persistence and the scarring effect, which can then be used as valuable information for policy interventions.

This study contributes to the existing literature by applying the concept of NEET (not in education, employment or training) not only to the young people but also to older age groups. Another contribution is to include estimations for different business cycle phases, both recession and non-recession periods. By disaggregating the business cycle into several non-overlapping periods, we are able to examine whether all recession or non-recession periods have similar effects on the labour market behaviour of individuals. In addition, in our labour market transition estimations, not only do we estimate the transition out of education or training, commonly known as the school-to-work transition, but we also analyse the reverse transition probabilities from other labour market states into the education or training state.

From the three empirical analyses reported in this study, several conclusions can be drawn. From the static labour market probability estimations using the multinomial logit models we find that young people have a higher probability of being unemployed relative to their adult counterparts by about 5 percentage points. However, their probability of being inactive is lower by 2 percentage points, except for the older youth females who have a higher probability of being inactive by about 3 percentage points. Moreover, for these young people, particularly teenagers, they still have a higher chance of going into further education, which could be a better alternative rather than completely dropout from the labour force.

Meanwhile, most individuals in the adult age groups face the risk of being both unemployed and economically inactive. Specifically, adults aged 50 years and above have a higher probability of being inactive by about 3 and 11 percentage points for males and females, respectively. Compared to the mature prime-age adults (35-49 years old), the younger prime-age adults (25-35 years old) also have a higher probability of being unemployed by about one percentage point. Moreover, prime-age females aged 25-35 also face a higher risk of being economically inactive by more than one percentage point.

With regard to business cycle periods, we find no gender disparity in our results, but we do find that the impacts of recession are different for each age group. In this case, we find supporting evidence that recessions adversely affect the youth labour market harder than the labour market for adults. During the early 1990s recession, the older youths (aged 20-24) and the oldest age group (aged 50-65) were affected the most by the recession. The probability of unemployment for older youths increased by about 8 and 5 percentage points for male and female, respectively. While the corresponding marginal effects for the oldest age group are around 5 and 1 percentage points for male and female, respectively. In addition, the probability of being inactive for the oldest age group also increased by about 2 and 9 percentage points for male and female, respectively.

During the Great Recession in the late 2000s, both teenagers (16-19 year olds) and older youths experienced the hardest impacts of the recession, although teenagers are also found to have a higher chance of being in education during this period. Moreover, our results show that the adverse impacts of the Great Recession are larger than those found for the early 1990s recession. The adverse impacts from these two recessions persist until the following non-recession periods in 1994-1997 and 2011-2013, respectively. On the other hand, after disaggregating our estimations by both gender and age group, the adverse impacts of the dot.com recession in the early 2000s are less obvious.

Results for regional differences reveal that compared to the London area, the regions outside London are a good place for teenagers to find employment, yet these regions are not a good place to go for education, whereas the reverse is true in the case of older youths. However, for both teenagers and older youths, living outside London is also associated with higher chance of being unemployed and a lower probability of being inactive. Moreover, in the case of adult males, compared to living in the London area, residing in other regions, particularly in the northern regions, is associated with a lower probability of employment as well as a higher probability of being unemployed and inactive. The opposite case is found to be true for adult females in most cases. Thus, living in the London area offers higher employment opportunities for adult males, but not for adult females.

The impact of the recessions is also found to be different by region. During the early 1990s recession, unemployment incidence is larger for those living in the southern regions than those living in the northern regions. It is only the probability of being inactive which is found to be larger for the northern regions than the southern regions during this period (i.e. by about 3 percentage points for the northern region as compared to 2 percentage points for the southern region). On the other hand, in line with our expectation, the adverse impacts of the dot.com recession in the early 2000s and the Great Recession in late 2000s are more pronounced for the northern regions than the southern regions, during which the probability of being in NEET – unemployed and inactivity – increased by more than 5 percentage points in the northern regions as compared to only about 4.5 percentage points for the southern regions.

In the second empirical chapter, we try to find the presence of true state dependence in our data by estimating the impact of the previous labour market state on the current labour market state at the interview date of each survey, controlling for the unobservable individual time-invariant heterogeneity as well as the initial condition problem. We find strong evidence of persistence in the labour market states or true state dependence from our data. In this case, past labour market states (in one-year lag) significantly affect an individual's current labour market status. In other words, individuals who were previously in 'bad' labour market states, such as unemployment or inactivity, are significantly more likely to be trapped in a vicious cycle of being in the same labour market state in the current wave. More specifically, we find that individuals who were unemployed in the last year's interview, are about 18 percentage points more likely to be unemployed at the current interview relative to those who were previously employed. Whereas, individuals who were in inactivity last year, are about 42 percentage points more likely to remain inactive at the current wave relative to those who were previously in employment.

In contrast, those who were in favourable labour market states also have a higher tendency to have ‘good’ labour market outcomes in the future. Moreover, after taking into account the effects from previous labour market states, by also controlling for individual unobserved heterogeneity, the impacts from other covariates becomes negligible. This finding suggests that the most crucial factor that determines the individual’s labour market dynamics is the labour market states themselves, while other observable individual characteristics may simply pick up the omission of these past labour market variables.

The analysis of labour market dynamics in the second empirical chapter is limited to estimating the impact of one-year lagged labour market states. In the third empirical chapter, we extend our analysis on labour market persistence by taking into consideration the retrospective labour market state information and other forms of state dependence (i.e. duration, lagged-duration, and occurrence dependence).

Utilizing the discrete-time (survival analysis) duration models for both single-risk and competing-risks specifications, we find strong evidence of negative duration dependence in all models for all origin states. This implies that the longer someone has occupied a given labour market state, the less likely she is to leave that state. The negative duration dependence in employment and education implies persistence in employment and education for workers and students, respectively. However, the results for the transition models from education state should be taken with cautious given that education tends to be fixed in length by system. As shown in our results, the negative duration dependence for the education models tends to get less negative after one to three years. This may correspond to the length of higher or post-secondary education system in the UK, which is taken by most individuals aged 16 and above. Meanwhile, the negative duration dependence in unemployment and inactivity supports the notion of the ‘scarring effect’ from the current labour market spell’s duration on the probability of being unemployed or inactive in the future.

Furthermore, the impacts from occurrence and lagged-duration dependence are relatively small compared to the effects from duration dependence. In the transition probabilities from unemployment and inactivity, we find that the impacts of occurrence dependence are not scarring, but instead it is the lagged-duration dependence that is scarring. This finding suggests that having a one-time long spell of previous unemployment (or inactivity) in the past is worse than having multiple short spells of being in-and-out of the unemployment (or inactivity) state. However, taking into account the results for the transition from employment to unemployment, and vice versa, in which we find that occurrence of past unemployment is scarring for workers and that a longer past employment duration helps the unemployed to return to employment but not a higher numbers of previous employment spells, may further suggest that it is a long-term stable job experience that is more desirable for individual's future employment probability.

5.1 Policy Recommendation

Based on our findings from the three empirical chapters in this study, we find that older youths (aged 20-24 years old) and the oldest individuals (aged 50-65) are the ones who are more vulnerable to fall into NEET – unemployment or inactivity – labour market states. Thus, our results tend to suggest that policy interventions should be more directed towards these groups. Specifically for the young people, our findings support the existing labour market programmes, such as the Jobseeker's Allowance (JSA) and other Active Labour Market Policies (ALMP) programmes for youths, in order to assist the young people making smooth transition from school to the labour market.[141] Moreover, as we find that teenagers (aged 16-19) tend to take harbour in education during recession period, especially during the last Great Recession, widening access to higher education (HE) for older youths (aged 20-24) may also give better options for these young people to evade the risk of being NEET, in particular during economic downturns.

As for individuals in the oldest age group, since they have the highest risk of being economically inactive, labour market interventions should aim to help these individuals to re-engage into the labour market. Cappellari et al. (2005, pp. 8) state that the UK Government has introduced a wide range of policies for older workers either to prevent early employment exits or to overcome barriers to labour market re-

[141] Note that the impact evaluation of these existing labour market programmes is beyond the scope of our study.

engagement, such as through the Jobcentre back-to-work programmes for those unemployed and the Employment and Support Allowance (previously called the Incapacity Benefit) for those inactive. We also argue that increasing the provision of training or apprenticeship programmes that are tailored for the needs of these older segments of the population may also help insulate these older individuals against the risk of being NEET. Moreover, as shown in Bruce et al. (2000) that there seems to be a pattern of re-entry to the labour force particularly to self-employment by the older Americans, such pattern might also be applied to older individuals in the UK to help them re-engage into the labour force. Promoting part-time work or self-employment among older age groups, such as through the existing New Enterprise Allowance programme, might be one way to overcome the higher risk of being inactive among these groups.[142]

Furthermore, since we find strong evidence of different adverse impacts of economic recessions on different age groups, labour market policies during the periods of recession should be implemented more vigorously than during periods of non-recession. Moreover, as we show that different recessions are different in length and depth, and that the impacts of different recession periods on the labour market are different by age group, thus labour market policies during recessions should be adapted to the severity of the recessions and to the different impacts on different group of individuals.

In addition, based on the finding of negative duration dependence in our labour market transition models, especially those from the NEET labour market states, we argue that any policy to tackle the issue of NEET – unemployment and inactivity – should be aimed and implemented as early as possible in a person's career, since the longer an individual is in the NEET labour market states, the less likely they will move from these states. Our findings of duration dependence further suggest that policy interventions to tackle NEET problem are best implemented during the first three to six months of one's current unemployment or inactivity spell.

[142] One study by Curran and Blackburn (2001) shows that the burgeoning of entrepreneurship among older people in the UK is not very significant. Thus, further study regarding part-time work and entrepreneurship among older people in the UK may be of interest.

The most novel finding from this study is perhaps regarding the occurrence and lagged-duration dependence results for the transition models from the NEET – unemployment and inactivity – states. As previously discussed, we find that occurrence dependence of previous unemployment and inactivity spells, respectively, is not found to be scarring, instead it is the respective unemployment and inactivity lagged-duration dependence that is scarring. This implies that having short but many job experiences or trainings is better for an individual's future labour market outcome, in terms of their probability to exit the unemployment or inactivity state, than being in one long spell of unemployment or inactivity. This finding seems to suggest the need for flexibility in the labour market, as to provide more short-term or part-time job opportunities, or for the government or academic institutions to provide more apprenticeship trainings or short-term technical courses for those individuals who are in the NEET labour market states.

A policy report for the UK written by Brinkley (2015) shows that despite adopting a liberal labour market approach (i.e. more flexible labour market), yet the UK still performs relatively badly in terms of productivity, employment security, and youth unemployment as compared to other OECD countries. Moreover, by comparison to other OECD countries, the UK has a very high share of permanent employment while the Jobseeker's Allowance (JSA) rates are relatively very low. It is also argued that although a key advantage of flexible labour markets is that workers could be reallocated to new jobs more frequently, thus generating high levels of employment and lower unemployment, they may also lead to greater wage inequality and insecurity. The latter factor might occur since a 'hiring and firing' culture becomes more frequent in flexible labour markets, and those with little bargaining power will be most disadvantaged.

A desirable labour market might be one that offers a balanced combination of flexibility and protection, such as employment security. This type of labour market is recently known with the notion of 'flexicurity'. The idea of this concept rests on the assumption that flexibility and security are not contradictory but complementary (Viebrock and Clasen, 2009, pp. 307). Several European countries, particularly Denmark and the Netherlands, have been regarded as models that adopt the idea of ‘flexicurity’ labour markets.[143] Further study might be needed to assess whether the idea of ‘flexicurity’ labour market is relevant and will be effective in the context of UK labour market.

5.2 Limitation of Study

This thesis tries to depart from the existing literature by attempting to model all labour market status information, including labour market status of being in education, for different age groups. However, we acknowledge some limitations in our study. Firstly, we model our labour market states based solely on the self-reported labour market or economic activity status in each survey dataset, thus we do not take into account other supporting information in the survey. If we take additional information for example regarding the question whether or not respondents were looking for work at the time of the survey, we may find students who were also looking for work. In this case, based on the ILO definition of unemployment, these students could also be included as being unemployed. However, since our main objective in this study is to apply the concept of NEET (Not in Education, Employment or Training), thus our main concern is on individual main labour market status at the time of the survey.

Secondly, since our main interest is in the labour market transitions in-and-out of the NEET states, i.e. unemployment and inactivity, we have not yet modelled the employment-to-employment labour market transitions. However, they are included as explanatory variables in the form of labour market histories. Moreover, we do not differentiate between different types of employment-to-employment transitions, such as whether these transitions occurred between different employers or within the same employer but for different job levels, or if they occurred between temporary (part-time) and permanent job status. Thus, the analysis of whether part-time jobs will lead to permanent jobs is beyond the scope of our study. Similarly, differences in wage level between jobs are not considered, thus we cannot conclude whether an individual who makes transition between employment states is aiming to get a better income

[143] A full review on ‘flexicurity’ in Danish and Dutch labour markets can be seen in Viebrock and Clasen, (2009).

level. We argue that this is because our main interest in this study specifically lies in the dynamics between different labour market states.

Thirdly, in regard to transition models from unemployment state, we also do not take into consideration whether or not the unemployed are receiving benefits. Previous literature suggests that the exit rates from unemployment to employment tend to increase when the benefits are due to expire. However, the programme assessment analysis of unemployment benefits or other assistance programmes for the unemployed is beyond the scope of our study.

Lastly, the effect of different business cycle periods in all of our models is estimated using only a set of time dummy variables. Further estimations of the models which are disaggregated by each non-overlapping business cycle period might be of interest, thus we could obtain more information regarding the magnitude of state dependence or the scarring effect for different business cycle conditions.

Appendices

Appendix A
Explanations of Data and Variables

A.1 The British Household Panel Survey and Understanding Society Survey

The dataset used in this thesis was obtained from the British Household Panel Survey (BHPS) wave 1 until wave 18, and from the first five waves of the United Kingdom Household Longitudinal Study (UKHLS), also known as the Understanding Society (US) study.[146] The BHPS is an annual household survey which was first carried out in September 1991 (wave 1) until the last interview in April 2009 (wave 18). The first wave was designed as a nationally representative random sample of the population of Great Britain living in private (non-institutional) households in the Autumn of 1991, consisting of more than 5,000 households and around 10,000 individual interviews.

All individuals aged 16 and over were eligible to be interviewed for the individual questionnaire as well as on their labour market experiences. The same individuals were followed and re-interviewed from wave to wave at annual intervals, even if they had split-off from the original households in the previous wave. Similarly, new members of the sample households were also eligible to be interviewed. At each BHPS interview, respondents were asked about their individual demographic characteristics and income, their household composition and other household related information, as well as detailed information regarding their current labour market status and previous labour market experiences.

The BHPS data is appropriate for this research as it provides information regarding individual and household socio-demographic characteristics, which are needed for the purpose of our analyses. This information, among others, include individual's current labour market status and retrospective labour market history, educational attainment, ethnicity, age, gender, health status, number of children, type of accommodation, and region of residence. Moreover, in regard to labour market status information, eligible respondents were also asked to recall the start dates of each labour market spell, both current and retrospective spells. Therefore, for each labour market spell experienced by the respondents, we can obtain information regarding the spell duration, which is required to analyse the duration dependence and state

[146] Throughout this thesis, we will use the abbreviation BHPS and US to refer to the British Household Panel Survey and the Understanding Society survey, respectively.

dependence models. Finally, the length of observations also allows us to identify several episodes of recession, particularly the recession in the early 1990s until the recent Great Recession in 2008.

In order to maximize the number of observations and to capture longer impacts of the Great Recession, we combine the BHPS dataset with its successor study of the Understanding Society (US), which began in 2009. Similar to the BHPS, the Understanding Society (US) study is also a multi-topic household survey covering a wide range of information regarding social and economic change in Britain both at the household as well as individual levels. From wave 2 onwards, the Understanding Society sample also consisted of all respondents from the BHPS study who were still active at wave 18 of the BHPS and did not refuse consent to be part of the Understanding Society sample (Knies, 2015). Thus, information collected from BHPS sample members in Understanding Society wave 2 may be treated as if it were information collected in BHPS wave 19 (or wave 20 in our study). The latest round of the Understanding Society survey that will be used in our study is the Understanding Society wave 5, where interviews were conducted in 2013-2014.[147] Thus, in our study, the Understanding Society survey waves 1-5 are considered as the extended BHPS data of Waves 19-23.

Table A.1 and A.2 below, respectively, summarize the dependent and all of the independent variables which are used in our empirical analyses, along with information regarding the source of data from the BHPS and the US survey questionnaires to generate these variables.

[147] More detailed explanation regarding sampling design, attrition, etc. for the BHPS and the US data can be found in Taylor et al. (2010) and Knies (2015), respectively.

Table A.1 Dependent Variables

Variable	Values	Source
NEET and Non-NEET	NEET 1. Employed (self-employed, in-paid employment, on maternity leave, unpaid worker in family business, working in an apprenticeship) 2. Education (full-time student, on a government training) 3. Unemployed (unemployed) 4. Inactive (family care, long-term sick, disabled, others)	BHPS: Dataset: Individual (*windresp*); Job history (*wjobhist)* Question: *wjbstat;* *wjhstat* US: Dataset: Individual (*w_indresp*) Question: *w_jbstat*

Table A.2 Independent Variables

Variable	Values	Source
Personal Characteristics		
1. Age group	1 = 36 – 49 (base category) 2 = 16 – 19 3 = 20 – 24 4 = 25 – 35 5 = 50 – 65	BHPS: Dataset: Individual (*windresp*) Question: *wage*, *wdoby*, *wdobm* US: Dataset: Individual (*w_indresp*) Question: *w_age_cr*, *w_birthy*
2. Sex	1 = Female (base category) 2 = Male	BHPS: Dataset: Individual (*windresp*) Question: *wsex* US: Dataset: Individual (*w_indresp*) Question: *w_sex*
3. Ethnicity (race)	1 = White (base category) 2 = Black 3 = Asian 4 = Others	BHPS: Dataset: Individual (*windresp*) Question: *wrace* (Wave 1-12), *wracel* (Wave 13-18) US: Dataset: Individual (*w_indresp*) Question: *w_race* (Wave 1-2), *w_racel_dv l* (Wave 3-5)

4. Educational background	0 = no educ/qualification (base category) 1 = higher/first degree 2 = A level & etc 3 = GCSE/O level 4 = CSE level 5 = Professional qualifications/Apprenticeships and Other qualifications	BHPS: Dataset: Individual (*windresp*) Question: *wschool*, *wqfedhi*, *wqfachi* US: Dataset: Individual (*w_indresp*) Question: *w _school*, *w_qfhigh*, *w_hiqual_dv*
5. Marital status	1 = Never/not married (base category) 2 = Married 3 = Ever married	BHPS: Dataset: Individual (*windresp*) Question: *wmastat* US: Dataset: Individual (*w_indresp*) Question: *w _marstat*
6. Health status	1 = Excellent and Good (base category) 2 = Fair 3 = Poor and Very poor	BHPS: Dataset: Individual (*windresp*) Question: *whlstat* US: Dataset: Individual (*w_indresp*) Question: *w _ sf1*

7. Ownchild	Continuous number of child/children owned	BHPS: Dataset: Individual (*windresp*) Question: *wnchild* US: Dataset: Individual (*w_indresp*) Question: *w_nchild_dv*
8. Region Note: southern and northern information in the brackets are for the Multinomial logit models by region	1 = London (southern) (base category) 2 = North East (northern) 3 = North West (northern) 4 = Yorkshire & Humber (northern) 5 = East Midlands (southern) 6 = West Midlands (southern) 7 = East (southern) 8 = South East (southern) 9 = South West (southern) 10 = Wales (northern) 11 = Scotland (northern) 12 = Northern Ireland and Channel Island (northern)	BHPS: Dataset: Individual (*windresp*) Question: *wregion2* US: Dataset: Individual (*w_indresp*) Question: *w_gor_dv*

Household Characteristics		
9. Type of Housing (hhtype)	1 = Single no child (base category) 2 = Single with child 3 = Couple no child 4 = Couple with child 5 = 2+ Adults 6 = Other	BHPS: Dataset: Household (*whhresp*) Question: *whhtype* US: Dataset: Individual (*w_indresp*) Question: *w_hhtype_dv*
10. House Tenure (hhtenure)	1 = owned outright (base category) 2 = owned with mortgage 3 = local authority rented 4 = housing assoc. rented 5 = rented from employer&other rented 6 = rented private unfurnished 7 = rented private furnished	BHPS: Dataset: Household (*whhresp*) Question: *wtenure* US: Dataset: Household (*w_hhresp*) Question: *w_tenure_dv*

Other Variables		
11. Business cycle periods Note: years in the brackets and the last category (category 8) are for analyses in Chapter 2 and 3 only	1 = Non-recession January 1998 – December 2000 (1998 – 2000/BHPS wave 8-10) (base category) 2 = Recession July 1990 – December 1993 (1991 – 1993/BHPS wave 1-3) 3 = Non-recession January 1994 – December 1997 (1994 – 1997/BHPS wave 4-7) 4 = Recession January 2001 – December 2002 (2001 – 2002/BHPS wave 11-12) 5 = Non-recession January 2003 – December 2004 (2003 – 2004/BHPS wave 13-14) 6 = Recession January 2005 – August 2007 (2005 – 2006/BHPS wave 15-16) 7 = Recession September 2007 – December 2010 (2007 – 2010/BHPS wave 17-18, and US Wave 1-2) 8 = Non-recession 2011 – 2013 (US wave 1-2)	Office for National Statistics Data: UK real gross domestic product (GDP) and UK unemployment rate (UR) 16-64 year olds
12. Labour market history (occurrence dependence) a. sum_E b. sum_U	Total number of <u>times</u> of previous employment spells up to before the current labour market state. Total number of <u>times</u> of previous unemployment spells up to before the current labour market state	Own calculation using information from: BHPS: Dataset: Individual (*windresp*); Job history (*wjobhist)* Question: *wjbstat*, *wcjsbgd*, *wcjsbgm*, *wcjsbgy*; *wjhstat*, *wjhbgd*, *wjhbgm*, *wjhbgy*, *wjhendd*, *wjhendm*, *wjhendy*,

c. sum_I d. sum_Ed	Total number of times of previous inactivity spells up to before the current labour market state Total number of times of previous education/training spells up to before the current labour market state	
13. Labour market history (lagged-duration dependence) e. sum_tE f. sum_tU g. sum_tI h. sum_tEd	Total length of duration (in months) of previous employment spells up to before the current labour market state. Total length of duration (in months) of previous unemployment spells up to before the current labour market state Total length of duration (in months) of previous inactivity spells up to before the current labour market state Total length of duration (in months) of previous education/training spells up to before the current labour market state	Own calculation using information from: BHPS: Dataset: Individual (*windresp*); Job history (*wjobhist)* Question: *wjbstat*, *wcjsbgd*, *wcjsbgm*, *wcjsbgy*; w*jhstat*, *wjhbgd*, *wjhbgm*, *wjhbgy*, *wjhendd*, *wjhendm*, *wjhendy*,

14. Duration dependence a. up to 3 months b. up to 6 months c. up to 9 months d. up to 12 months e. up to 18 months f. up to 2 years g. up to 3 years h. up to 5 years i. above 5 years	1 = if duration from 1 – 3 months 0 = otherwise 1 = if duration from 4 – 6 months 0 = otherwise 1 = if duration from 7 – 9 months 0 = otherwise 1 = if duration from 10 – 12 months 0 = otherwise 1 = if duration from 13 – 18 months 0 = otherwise 1 = if duration from 19 – 24 months 0 = otherwise 1 = if duration from 25 – 36 months 0 = otherwise 1 = if duration from 37 – 60 months 0 = otherwise 1 = if duration from 61 months and above 0 = otherwise	Own calculation using information from: BHPS: Dataset: Individual (*windresp*); Job history (*wjobhist)* Question: *wjbstat*, *wcjsbgd*, *wcjsbgm*, *wcjsbgy*; *wjhstat*, *wjhbgd*, *wjhbgm*, *wjhbgy*, *wjhendd*, *wjhendm*, *wjhendy*,

Appendix B
Detailed Results of the Multinomial Logit Estimations

B.1 Descriptive Results

Table B.1 Descriptive Statistics of the Multinomial Logit by Male Age Group

Variables	Age Group				
	16-19	20-24	25-35	36-49	50-65
Employed (base)	0.268	0.626	0.868	0.873	0.793
Education	0.103	0.139	0.077	0.060	0.066
Unemployed	0.616	0.215	0.024	0.005	0.002
Inactive	0.013	0.021	0.031	0.062	0.139
White (base)	0.855	0.862	0.874	0.891	0.930
Black	0.044	0.037	0.030	0.029	0.021
Asian	0.087	0.087	0.080	0.066	0.040
Others	0.014	0.014	0.016	0.013	0.009
No education (base)	0.090	0.055	0.065	0.113	0.220
Higher/1stdegree	0.020	0.208	0.307	0.285	0.220
A level	0.320	0.338	0.178	0.151	0.146
GCSE/O level	0.456	0.217	0.212	0.199	0.160
CSE level	0.061	0.041	0.037	0.031	0.010
Prof qualif/Others	0.054	0.141	0.200	0.221	0.244
Never/not married (base)	0.998	0.947	0.525	0.224	0.125
Married	0.002	0.053	0.449	0.694	0.743
Evermarried			0.026	0.082	0.132
Health Excellent/Good (base)	0.865	0.836	0.828	0.791	0.703
Health Fair	0.113	0.131	0.132	0.148	0.194
Health Poor	0.022	0.033	0.039	0.061	0.103
No children	0.992	0.913	0.577	0.430	0.871
1-3 children	0.008	0.086	0.404	0.547	0.126
4+ children		0.001	0.019	0.023	0.003
Single no child (base)	0.026	0.081	0.114	0.119	0.149
Single with child	0.154	0.062	0.024	0.028	0.020
Couple no child	0.013	0.123	0.251	0.152	0.394
Couple with child	0.494	0.306	0.457	0.590	0.243
2+ Adults	0.302	0.409	0.144	0.106	0.186
Other	0.011	0.019	0.010	0.005	0.008
Owned outright (base)	0.139	0.152	0.089	0.108	0.345
Owned mortgage	0.531	0.389	0.555	0.654	0.440
Local auth. Rented	0.142	0.127	0.106	0.097	0.104
Housing assoc. rented	0.067	0.059	0.047	0.044	0.046
Employer rented & other	0.013	0.016	0.016	0.011	0.013
Rented unfurnished	0.049	0.082	0.096	0.056	0.037
Rented furnished	0.059	0.176	0.091	0.030	0.015

Table B.1 (Continued)

Variables	Age Group				
	16-19	20-24	25-35	36-49	50-65
London (base)	0.102	0.115	0.116	0.107	0.086
North East	0.041	0.043	0.043	0.040	0.039
North West	0.087	0.091	0.096	0.089	0.086
Yorkshire & Humber	0.081	0.086	0.081	0.072	0.067
East Midlands	0.082	0.080	0.073	0.069	0.072
West Midlands	0.079	0.074	0.074	0.072	0.072
East	0.069	0.071	0.073	0.075	0.083
South East	0.113	0.108	0.106	0.112	0.112
South West	0.061	0.067	0.066	0.073	0.081
Wales	0.106	0.096	0.091	0.094	0.099
Scotland	0.113	0.116	0.121	0.121	0.121
NI & Channel Island	0.063	0.054	0.062	0.076	0.082
Non-recession 1998-2000 (base)	0.096	0.098	0.107	0.090	0.081
Recession 1991-1993	0.075	0.080	0.083	0.063	0.054
Non-recession 1994-1997	0.090	0.117	0.108	0.084	0.071
Recession 2001-2002	0.078	0.077	0.082	0.076	0.071
Non-recession 2003-2004	0.067	0.068	0.068	0.068	0.065
Recession 2005-2006	0.063	0.064	0.063	0.065	0.064
Recession 2007-2010	0.269	0.257	0.262	0.281	0.286
Non-recession 2011-2013	0.263	0.238	0.227	0.274	0.308
Total observations	12,975	15,041	36,336	51,855	39,606

Table B.2 Descriptive Statistics of the Multinomial Logit by Female Age Group

Variables	Age Group				
	16-19	20-24	25-35	36-49	50-65
Employed (base)	0.237	0.578	0.703	0.748	0.709
Education	0.073	0.082	0.046	0.038	0.037
Unemployed	0.649	0.204	0.025	0.009	0.002
Inactive	0.040	0.136	0.226	0.205	0.251
White (base)	0.864	0.867	0.864	0.886	0.927
Black	0.047	0.040	0.039	0.038	0.028
Asian	0.077	0.079	0.080	0.061	0.036
Others	0.013	0.013	0.017	0.015	0.009
No education (base)	0.076	0.045	0.070	0.129	0.254
Higher/1stdegree	0.020	0.226	0.322	0.284	0.220
A level	0.343	0.329	0.165	0.128	0.106
GCSE/O level	0.462	0.229	0.234	0.228	0.199
CSE level	0.043	0.031	0.030	0.028	0.011
Prof qualif/Others	0.056	0.141	0.178	0.203	0.209
Never/not married (base)	0.993	0.888	0.438	0.186	0.086
Married	0.007	0.112	0.508	0.664	0.693
Evermarried			0.055	0.150	0.221
Health Excellent/Good (base)	0.838	0.806	0.804	0.760	0.693
Health Fair	0.126	0.146	0.139	0.160	0.197
Health Poor	0.036	0.048	0.056	0.079	0.110
No children	0.953	0.760	0.375	0.390	0.926
1-3 children	0.047	0.238	0.590	0.590	0.073
4+ children	0.000	0.002	0.036	0.020	0.000
Single no child (base)	0.025	0.061	0.059	0.062	0.143
Single with child	0.156	0.112	0.135	0.135	0.051
Couple no child	0.032	0.177	0.210	0.125	0.402
Couple with child	0.450	0.281	0.496	0.523	0.174
2+ Adults	0.324	0.352	0.092	0.151	0.221
Other	0.013	0.017	0.007	0.005	0.008
Owned outright (base)	0.125	0.113	0.065	0.115	0.385
Owned mortgage	0.507	0.378	0.547	0.631	0.394
Local auth. rented	0.161	0.152	0.140	0.114	0.112
Housing assoc. rented	0.070	0.070	0.067	0.056	0.050
Employer rented & other	0.007	0.014	0.012	0.009	0.010
Rented unfurnished	0.060	0.111	0.102	0.056	0.038
Rented furnished	0.070	0.161	0.067	0.020	0.010

Table B.2 (Continued)

Variables	Age Group				
	16-19	20-24	25-35	36-49	50-65
London (base)	0.106	0.113	0.120	0.103	0.093
North East	0.034	0.034	0.040	0.039	0.040
North West	0.086	0.091	0.095	0.090	0.089
Yorkshire & Humber	0.072	0.079	0.080	0.073	0.067
East Midlands	0.070	0.073	0.067	0.069	0.062
West Midlands	0.074	0.079	0.075	0.071	0.071
East	0.067	0.073	0.073	0.072	0.079
South East	0.110	0.107	0.107	0.112	0.116
South West	0.070	0.068	0.061	0.070	0.079
Wales	0.116	0.098	0.088	0.093	0.098
Scotland	0.115	0.117	0.118	0.125	0.118
NI & Channel Island	0.080	0.068	0.075	0.083	0.087
Non-recession 1998-2000 (base)	0.091	0.099	0.100	0.084	0.077
Recession 1991-1993	0.061	0.075	0.075	0.059	0.050
Non-recession 1994-1997	0.090	0.097	0.099	0.078	0.067
Recession 2001-2002	0.077	0.078	0.078	0.072	0.070
Non-recession 2003-2004	0.068	0.065	0.065	0.065	0.064
Recession 2005-2006	0.069	0.063	0.060	0.062	0.062
Recession 2007-2010	0.282	0.275	0.273	0.290	0.288
Non-recession 2011-2013	0.263	0.248	0.251	0.290	0.322
Total observations	14,426	17,610	46,109	64,348	43,368

B.2 Empirical Results

Table B.3 Multinomial Logit Model Full Results, Male

	EMPLOYED			EDUCATION			UNEMPLOYED			INACTIVE		
VARIABLE	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|
36-49 (base)												
16-19	-0.420	0.016	0.000	0.400	0.017	0.000	0.038	0.005	0.000	-0.018	0.002	0.000
20-24	-0.097	0.006	0.000	0.075	0.005	0.000	0.039	0.004	0.000	-0.017	0.001	0.000
25-35	0.000	0.003	0.907	0.008	0.001	0.000	0.004	0.002	0.067	-0.013	0.001	0.000
50-65	-0.034	0.004	0.000	-0.003	0.001	0.000	0.012	0.003	0.000	0.025	0.002	0.000
White (base)												
Black	-0.068	0.010	0.000	0.016	0.002	0.000	0.048	0.007	0.000	0.003	0.004	0.351
Asian	-0.058	0.007	0.000	0.012	0.002	0.000	0.041	0.005	0.000	0.005	0.003	0.076
Others	-0.065	0.015	0.000	0.018	0.004	0.000	0.035	0.011	0.001	0.012	0.007	0.084
No education (base)												
Higher/1stdegree	0.123	0.007	0.000	0.000	0.001	0.617	-0.085	0.005	0.000	-0.039	0.003	0.000
A level	0.096	0.007	0.000	0.007	0.001	0.000	-0.076	0.005	0.000	-0.027	0.003	0.000
GCSE/O level	0.083	0.007	0.000	0.001	0.001	0.218	-0.058	0.005	0.000	-0.026	0.003	0.000
CSE level	0.094	0.009	0.000	-0.006	0.001	0.000	-0.061	0.007	0.000	-0.027	0.004	0.000
Prof qualif/Others	0.090	0.007	0.000	-0.001	0.001	0.186	-0.061	0.005	0.000	-0.027	0.003	0.000
Never/not married (base)												
Married	0.066	0.004	0.000	-0.008	0.001	0.000	-0.049	0.003	0.000	-0.009	0.002	0.000
Evermarried	0.025	0.006	0.000	-0.005	0.002	0.027	-0.015	0.005	0.003	-0.005	0.002	0.014
Health Excellent/Good (base)												
Health Fair	-0.091	0.004	0.000	-0.001	0.000	0.022	0.033	0.002	0.000	0.060	0.003	0.000
Health Poor	-0.373	0.011	0.000	0.001	0.001	0.518	0.055	0.005	0.000	0.317	0.011	0.000
Number of children												
ownchild	-0.005	0.002	0.014	-0.006	0.001	0.000	0.010	0.001	0.000	0.001	0.001	0.117

VARIABLE	EMPLOYED dy/dx	Std Err	P>|z|	EDUCATION dy/dx	Std Err	P>|z|	UNEMPLOYED dy/dx	Std Err	P>|z|	INACTIVE dy/dx	Std Err	P>|z|
Single no child (base)												
Single with child	-0.021	0.008	0.012	0.008	0.001	0.000	0.008	0.006	0.207	0.005	0.004	0.191
Couple no child	0.040	0.005	0.000	-0.004	0.001	0.000	-0.025	0.004	0.000	-0.011	0.002	0.000
Couple with child	0.026	0.005	0.000	0.006	0.001	0.000	-0.020	0.004	0.000	-0.012	0.003	0.000
2+ Adults	-0.007	0.005	0.182	0.003	0.001	0.000	0.008	0.004	0.037	-0.005	0.002	0.044
Other	0.015	0.013	0.226	-0.003	0.001	0.008	-0.008	0.009	0.415	-0.005	0.007	0.496
Owned outright (base)												
Owned mortgage	0.033	0.003	0.000	-0.002	0.001	0.005	-0.020	0.003	0.000	-0.012	0.002	0.000
Local auth. rented	-0.180	0.008	0.000	-0.002	0.001	0.003	0.125	0.006	0.000	0.056	0.004	0.000
Housing assoc. rented	-0.153	0.010	0.000	-0.001	0.001	0.397	0.103	0.007	0.000	0.051	0.005	0.000
Employer rented & other	0.041	0.007	0.000	0.002	0.002	0.252	-0.029	0.005	0.000	-0.013	0.003	0.000
Rented unfurnished	-0.038	0.006	0.000	-0.001	0.001	0.049	0.028	0.005	0.000	0.012	0.003	0.000
Rented furnished	-0.059	0.007	0.000	0.034	0.003	0.000	0.022	0.005	0.000	0.004	0.003	0.208
London (base)												
North East	-0.039	0.009	0.000	0.000	0.001	0.798	0.018	0.007	0.005	0.021	0.005	0.000
North West	-0.029	0.006	0.000	0.000	0.001	0.821	0.014	0.005	0.003	0.015	0.003	0.000
Yorkshire & Humber	-0.011	0.006	0.074	0.000	0.001	0.954	0.006	0.005	0.210	0.005	0.002	0.048
East Midlands	-0.009	0.006	0.114	-0.002	0.001	0.042	0.005	0.004	0.282	0.006	0.002	0.018
West Midlands	-0.007	0.006	0.178	-0.001	0.001	0.113	0.006	0.004	0.190	0.003	0.002	0.176
East	0.002	0.006	0.682	-0.001	0.001	0.242	-0.005	0.004	0.257	0.004	0.003	0.162
South East	0.007	0.005	0.204	-0.001	0.001	0.465	-0.005	0.004	0.183	-0.001	0.002	0.803
South West	0.006	0.006	0.270	-0.001	0.001	0.205	-0.009	0.005	0.043	0.004	0.002	0.118
Wales	-0.024	0.006	0.000	-0.001	0.001	0.114	0.009	0.005	0.068	0.016	0.003	0.000
Scotland	-0.012	0.006	0.048	0.000	0.001	0.716	0.003	0.004	0.476	0.009	0.003	0.001
NI & Channel Island	-0.045	0.008	0.000	0.001	0.001	0.356	0.021	0.006	0.001	0.023	0.004	0.000

VARIABLE	EMPLOYED dy/dx	Std Err	P>|z|	EDUCATION dy/dx	Std Err	P>|z|	UNEMPLOYED dy/dx	Std Err	P>|z|	INACTIVE dy/dx	Std Err	P>|z|
Non-recession 1998-2000 (base)												
Recession 1991-1993	-0.051	0.005	0.000	0.001	0.001	0.224	0.047	0.004	0.000	0.003	0.001	0.017
Non-recession 1994-1997	-0.032	0.004	0.000	0.002	0.001	0.000	0.022	0.003	0.000	0.007	0.001	0.000
Recession 2001-2002	-0.008	0.003	0.004	0.000	0.001	0.664	0.003	0.002	0.268	0.006	0.001	0.000
Non-recession 2003-2004	-0.003	0.003	0.337	0.001	0.001	0.308	-0.002	0.003	0.379	0.005	0.001	0.000
Recession 2005-2006	-0.004	0.003	0.271	0.001	0.001	0.129	-0.002	0.003	0.397	0.005	0.001	0.000
Recession 2007-2010	-0.047	0.003	0.000	0.004	0.001	0.000	0.032	0.003	0.000	0.011	0.001	0.000
Non-recession 2011-2013	-0.044	0.003	0.000	0.004	0.001	0.000	0.029	0.003	0.000	0.011	0.001	0.000
Observations	155,813											
Log likelihood	-75605.135											

Note: 1) Results are in terms of marginal effects; 2) robust standard errors (standard errors are adjusted by pid cluster)

Table B.4 Multinomial Logit Model Full Results, Female

	EMPLOYED			EDUCATION			UNEMPLOYED			INACTIVE		
VARIABLE	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|
36-49 (base)												
16-19	-0.395	0.012	0.000	0.417	0.014	0.000	0.039	0.004	0.000	-0.060	0.005	0.000
20-24	-0.131	0.008	0.000	0.080	0.004	0.000	0.026	0.003	0.000	0.025	0.006	0.000
25-35	-0.029	0.004	0.000	0.011	0.001	0.000	0.006	0.002	0.000	0.012	0.004	0.001
50-65	-0.091	0.006	0.000	-0.007	0.001	0.000	-0.005	0.002	0.002	0.103	0.006	0.000
White (base)												
Black	-0.002	0.010	0.859	0.021	0.003	0.000	0.017	0.003	0.000	-0.036	0.008	0.000
Asian	-0.223	0.012	0.000	0.012	0.001	0.000	0.035	0.004	0.000	0.176	0.011	0.000
Others	-0.088	0.021	0.000	0.010	0.003	0.000	0.027	0.007	0.000	0.050	0.018	0.006
No education (base)												
Higher/1stdegree	0.276	0.009	0.000	0.000	0.001	0.645	-0.043	0.003	0.000	-0.233	0.009	0.000
A level	0.217	0.010	0.000	0.012	0.001	0.000	-0.039	0.003	0.000	-0.190	0.009	0.000
GCSE/O level	0.170	0.010	0.000	0.002	0.001	0.033	-0.028	0.003	0.000	-0.143	0.009	0.000
CSE level	0.113	0.017	0.000	-0.007	0.001	0.000	-0.019	0.005	0.000	-0.087	0.016	0.000
Prof qualif/Others	0.207	0.010	0.000	0.000	0.001	0.833	-0.032	0.003	0.000	-0.174	0.009	0.000
Never/not married (base)												
Married	-0.009	0.006	0.141	-0.015	0.001	0.000	-0.024	0.002	0.000	0.048	0.005	0.000
Evermarried	0.024	0.007	0.001	-0.006	0.002	0.007	-0.013	0.003	0.000	-0.006	0.006	0.317
Health Excellent/Good (base)												
Health Fair	-0.128	0.005	0.000	-0.002	0.001	0.000	0.019	0.002	0.000	0.111	0.004	0.000
Health Poor	-0.396	0.009	0.000	-0.004	0.001	0.000	0.017	0.002	0.000	0.383	0.009	0.000
Number of children												
ownchild	-0.087	0.003	0.000				0.001	0.001	0.315	0.092	0.002	0.000
Single no child (base)												
Single with child	-0.075	0.009	0.000	0.009	0.001	0.000	0.009	0.003	0.005	0.058	0.008	0.000
Couple no child	0.037	0.008	0.000	-0.005	0.001	0.000	-0.003	0.003	0.320	-0.030	0.007	0.000
Couple with child	-0.028	0.009	0.001	0.008	0.001	0.000	-0.015	0.003	0.000	0.036	0.008	0.000
2+ Adults	-0.008	0.008	0.302	0.006	0.001	0.000	0.001	0.003	0.851	0.001	0.007	0.852
Other	-0.030	0.021	0.156	-0.003	0.001	0.039	0.008	0.008	0.301	0.025	0.019	0.194

VARIABLE	EMPLOYED dy/dx	EMPLOYED Std Err	EMPLOYED P>|z|	EDUCATION dy/dx	EDUCATION Std Err	EDUCATION P>|z|	UNEMPLOYED dy/dx	UNEMPLOYED Std Err	UNEMPLOYED P>|z|	INACTIVE dy/dx	INACTIVE Std Err	INACTIVE P>|z|
Owned outright (base)												
Owned mortgage	0.100	0.006	0.000	-0.001	0.001	0.127	-0.014	0.002	0.000	-0.085	0.006	0.000
Local auth. rented	-0.141	0.010	0.000	-0.004	0.001	0.000	0.047	0.003	0.000	0.098	0.009	0.000
Housing assoc. rented	-0.144	0.011	0.000	-0.002	0.001	0.014	0.043	0.004	0.000	0.104	0.011	0.000
Employer rented & other	0.056	0.015	0.000	0.001	0.002	0.534	-0.005	0.005	0.309	-0.053	0.014	0.000
Rented unfurnished	-0.035	0.009	0.000	-0.003	0.001	0.004	0.016	0.003	0.000	0.022	0.008	0.009
Rented furnished	-0.066	0.010	0.000	0.030	0.002	0.000	0.019	0.004	0.000	0.017	0.010	0.072
London (base)												
North East	0.006	0.013	0.605	-0.001	0.001	0.706	-0.007	0.004	0.071	0.001	0.011	0.919
North West	0.010	0.010	0.298	0.000	0.001	0.994	-0.002	0.003	0.567	-0.009	0.009	0.331
Yorkshire & Humber	-0.001	0.011	0.898	-0.003	0.001	0.003	-0.006	0.003	0.050	0.010	0.010	0.289
East Midlands	0.014	0.011	0.184	-0.002	0.001	0.052	-0.013	0.003	0.000	0.000	0.010	0.960
West Midlands	0.017	0.010	0.085	0.000	0.001	0.658	-0.003	0.003	0.363	-0.014	0.009	0.114
East	-0.001	0.011	0.942	-0.002	0.001	0.027	-0.008	0.003	0.010	0.011	0.010	0.255
South East	0.025	0.010	0.011	-0.002	0.001	0.086	-0.012	0.003	0.000	-0.011	0.009	0.224
South West	0.004	0.011	0.737	-0.003	0.001	0.007	-0.012	0.003	0.000	0.012	0.010	0.264
Wales	0.001	0.011	0.917	-0.001	0.001	0.614	-0.006	0.003	0.075	0.005	0.010	0.601
Scotland	0.029	0.010	0.003	0.001	0.001	0.433	-0.006	0.003	0.044	-0.024	0.009	0.006
NI & Channel Island	-0.020	0.012	0.084	-0.001	0.001	0.613	-0.013	0.003	0.000	0.034	0.011	0.001
Non-recession 1998-2000 (base)												
Recession 1991-1993	-0.050	0.007	0.000	-0.002	0.001	0.020	0.009	0.002	0.000	0.044	0.006	0.000
Non-recession 1994-1997	-0.036	0.005	0.000	0.001	0.001	0.133	0.004	0.002	0.036	0.031	0.005	0.000
Recession 2001-2002	-0.018	0.004	0.000	-0.001	0.001	0.321	0.002	0.002	0.214	0.017	0.004	0.000
Non-recession 2003-2004	-0.017	0.005	0.001	-0.001	0.001	0.146	0.002	0.002	0.256	0.016	0.004	0.000
Recession 2005-2006	-0.022	0.006	0.000	0.000	0.001	0.720	0.003	0.002	0.152	0.020	0.005	0.000
Recession 2007-2010	-0.060	0.005	0.000	0.002	0.001	0.029	0.022	0.002	0.000	0.036	0.005	0.000
Non-recession 2011-2013	-0.060	0.006	0.000	0.002	0.001	0.004	0.025	0.002	0.000	0.033	0.005	0.000
Observations						185,861						
Log likelihood						-121188.720						

Note: 1) Results are in terms of marginal effects; 2) robust standard errors (standard errors are adjusted by pid cluster)

Table B.5 Multinomial Logit Model Full Results, Male Aged 16-19

	EMPLOYED			EDUCATION			UNEMPLOYED			INACTIVE		
VARIABLE	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|
White (base)												
Black	-0.096	0.023	0.000	0.122	0.027	0.000	-0.022	0.013	0.085	-0.004	0.002	0.072
Asian	-0.147	0.014	0.000	0.175	0.017	0.000	-0.024	0.009	0.012	-0.004	0.002	0.027
Others	-0.117	0.037	0.002	0.125	0.043	0.003	-0.009	0.023	0.710	0.000	0.005	0.942
No education (base)												
Higher/1stdegree/A level	0.055	0.017	0.001	0.054	0.021	0.009	-0.095	0.013	0.000	-0.014	0.004	0.000
GCSE/O level	0.040	0.016	0.011	0.055	0.020	0.006	-0.080	0.013	0.000	-0.014	0.004	0.000
CSE level	0.212	0.027	0.000	-0.227	0.030	0.000	0.021	0.022	0.337	-0.006	0.006	0.332
Others	0.195	0.028	0.000	-0.154	0.030	0.000	-0.031	0.019	0.099	-0.010	0.005	0.023
Never/not married (base)												
Married/ever married	0.161	0.119	0.178	-0.131	0.123	0.288	-0.022	0.038	0.558	-0.008	0.001	0.000
Health Excellent/Good (base)												
Health Fair	0.019	0.013	0.154	-0.062	0.016	0.000	0.038	0.009	0.000	0.006	0.002	0.016
Health Poor	-0.043	0.024	0.073	-0.001	0.030	0.969	0.029	0.019	0.114	0.015	0.008	0.046
Number of children												
ownchild	0.593	0.184	0.001	-0.876	0.254	0.001	0.264	0.070	0.000	0.019	0.010	0.063
Single no child (base)												
Single with child	-0.128	0.038	0.001	0.189	0.043	0.000	-0.064	0.028	0.021	0.004	0.004	0.360
Couple no child	0.321	0.061	0.000	-0.358	0.057	0.000	0.036	0.042	0.380	0.001	0.005	0.898
Couple with child	-0.111	0.038	0.003	0.198	0.043	0.000	-0.090	0.028	0.001	0.003	0.004	0.441
2+ Adults	0.185	0.038	0.000	-0.114	0.042	0.006	-0.072	0.027	0.008	0.002	0.004	0.585
Other	0.080	0.064	0.213	-0.098	0.073	0.181	0.023	0.046	0.613	-0.006	0.003	0.106
Owned outright (base)												
Owned mortgage	0.029	0.015	0.056	-0.028	0.016	0.086	0.003	0.008	0.736	-0.003	0.002	0.128
Local auth. rented	0.024	0.019	0.219	-0.164	0.021	0.000	0.137	0.013	0.000	0.003	0.003	0.370
Housing assoc. rented	0.030	0.024	0.205	-0.137	0.026	0.000	0.105	0.016	0.000	0.002	0.004	0.503
Employer rented & other	0.034	0.048	0.472	0.016	0.050	0.745	-0.040	0.018	0.023	-0.010	0.002	0.000
Rented unfurnished	0.028	0.027	0.296	-0.082	0.029	0.005	0.052	0.015	0.001	0.002	0.005	0.705
Rented furnished	-0.192	0.015	0.000	0.228	0.019	0.000	-0.033	0.010	0.002	-0.003	0.005	0.583

VARIABLE	EMPLOYED dy/dx	EMPLOYED Std Err	EMPLOYED P>|z|	EDUCATION dy/dx	EDUCATION Std Err	EDUCATION P>|z|	UNEMPLOYED dy/dx	UNEMPLOYED Std Err	UNEMPLOYED P>|z|	INACTIVE dy/dx	INACTIVE Std Err	INACTIVE P>|z|
London (base)												
North East	0.081	0.028	0.004	-0.100	0.032	0.002	0.014	0.016	0.384	0.005	0.004	0.186
North West	0.056	0.022	0.012	-0.085	0.025	0.001	0.028	0.014	0.036	0.001	0.003	0.714
Yorkshire & Humber	0.123	0.024	0.000	-0.138	0.026	0.000	0.014	0.013	0.263	0.001	0.003	0.742
East Midlands	0.100	0.023	0.000	-0.131	0.026	0.000	0.025	0.013	0.054	0.006	0.004	0.081
West Midlands	0.094	0.023	0.000	-0.156	0.026	0.000	0.060	0.015	0.000	0.002	0.003	0.483
East	0.082	0.024	0.001	-0.101	0.027	0.000	0.009	0.014	0.530	0.010	0.005	0.024
South East	0.103	0.021	0.000	-0.108	0.024	0.000	0.003	0.012	0.796	0.002	0.003	0.473
South West	0.094	0.025	0.000	-0.103	0.028	0.000	0.009	0.014	0.540	-0.001	0.003	0.802
Wales	0.080	0.022	0.000	-0.110	0.025	0.000	0.029	0.014	0.036	0.001	0.003	0.663
Scotland	0.149	0.023	0.000	-0.175	0.026	0.000	0.026	0.013	0.050	0.001	0.003	0.729
NI & Channel Island	0.065	0.026	0.015	-0.062	0.029	0.035	0.001	0.014	0.969	-0.003	0.002	0.202
Non-recession 1998-2000 (base)												
Recession 1991-1993	-0.030	0.029	0.291	0.005	0.029	0.870	0.028	0.013	0.028	-0.002	0.002	0.263
Non-recession 1994-1997	-0.058	0.026	0.024	0.073	0.025	0.004	-0.012	0.010	0.240	-0.003	0.002	0.038
Recession 2001-2002	-0.033	0.026	0.202	0.033	0.026	0.208	0.000	0.010	0.979	0.000	0.002	0.893
Non-recession 2003-2004	-0.074	0.028	0.007	0.094	0.028	0.001	-0.021	0.010	0.040	0.001	0.002	0.565
Recession 2005-2006	-0.074	0.029	0.010	0.079	0.029	0.007	-0.005	0.012	0.674	0.000	0.002	0.945
Recession 2007-2010	-0.291	0.022	0.000	0.252	0.023	0.000	0.032	0.010	0.001	0.007	0.002	0.001
Non-recession 2011-2013	-0.341	0.022	0.000	0.318	0.022	0.000	0.017	0.010	0.088	0.006	0.003	0.020
Observations	12,975											
Log likelihood	-10798.355											

Note: 1) Results are in terms of marginal effects; 2) robust standard errors (standard errors are adjusted by pid cluster)

Table B.6 Multinomial Logit Model Full Results, Male Aged 20-24

	EMPLOYED			EDUCATION			UNEMPLOYED			INACTIVE		
VARIABLE	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|
White (base)												
Black	-0.171	0.032	0.000	0.120	0.030	0.000	0.052	0.023	0.027	0.000	0.005	0.941
Asian	-0.146	0.023	0.000	0.130	0.021	0.000	0.022	0.015	0.131	-0.007	0.003	0.009
Others	-0.273	0.054	0.000	0.258	0.053	0.000	0.016	0.028	0.568	-0.001	0.007	0.855
No education (base)												
Higher/1stdegree	0.177	0.028	0.000	0.040	0.015	0.007	-0.189	0.025	0.000	-0.028	0.008	0.001
A level	0.034	0.028	0.215	0.232	0.017	0.000	-0.239	0.024	0.000	-0.027	0.008	0.001
GCSE/O level	0.180	0.027	0.000	0.007	0.014	0.633	-0.159	0.025	0.000	-0.027	0.008	0.001
CSE level	0.239	0.033	0.000	-0.050	0.015	0.001	-0.168	0.030	0.000	-0.021	0.009	0.021
Prof qualif/Others	0.151	0.028	0.000	0.056	0.017	0.001	-0.184	0.025	0.000	-0.023	0.008	0.006
Never/not married (base)												
Married/Ever married	0.085	0.022	0.000	-0.081	0.017	0.000	-0.007	0.015	0.637	0.003	0.005	0.578
Health Excellent/Good (base)												
Health Fair	-0.067	0.013	0.000	-0.010	0.009	0.279	0.056	0.010	0.000	0.021	0.004	0.000
Health Poor	-0.157	0.029	0.000	0.006	0.023	0.807	0.051	0.019	0.007	0.100	0.019	0.000
Number of children												
ownchild	0.199	0.044	0.000	-0.273	0.051	0.000	0.068	0.012	0.000	0.006	0.003	0.032
Single no child (base)												
Single with child	-0.007	0.028	0.802	-0.003	0.020	0.877	0.010	0.021	0.623	0.000	0.005	0.955
Couple no child	0.171	0.019	0.000	-0.098	0.013	0.000	-0.066	0.016	0.000	-0.007	0.004	0.140
Couple with child	0.051	0.021	0.015	-0.016	0.015	0.290	-0.027	0.016	0.090	-0.007	0.004	0.078
2+ Adults	-0.078	0.019	0.000	0.062	0.013	0.000	0.017	0.015	0.272	-0.001	0.004	0.902
Other	0.077	0.033	0.018	-0.079	0.019	0.000	0.000	0.028	0.999	0.002	0.009	0.859
Owned outright (base)												
Owned mortgage	0.048	0.014	0.001	-0.012	0.010	0.223	-0.027	0.011	0.012	-0.010	0.004	0.008
Local auth. rented	-0.107	0.021	0.000	-0.028	0.012	0.022	0.123	0.017	0.000	0.012	0.006	0.036
Housing assoc. rented	-0.080	0.025	0.001	-0.014	0.015	0.351	0.082	0.020	0.000	0.012	0.007	0.102

VARIABLE	EMPLOYED dy/dx	Std Err	P>|z|	EDUCATION dy/dx	Std Err	P>|z|	UNEMPLOYED dy/dx	Std Err	P>|z|	INACTIVE dy/dx	Std Err	P>|z|
Employer rented & other	0.050	0.031	0.110	0.018	0.024	0.440	-0.053	0.023	0.023	-0.016	0.005	0.003
Rented unfurnished	0.034	0.020	0.092	-0.010	0.015	0.482	-0.016	0.014	0.250	-0.007	0.005	0.148
Rented furnished	-0.162	0.021	0.000	0.243	0.018	0.000	-0.069	0.012	0.000	-0.012	0.004	0.008
London (base)												
North East	-0.081	0.030	0.008	0.014	0.019	0.444	0.055	0.024	0.021	0.011	0.008	0.141
North West	-0.056	0.023	0.015	0.020	0.016	0.213	0.023	0.016	0.142	0.013	0.006	0.035
Yorkshire & Humber	-0.067	0.023	0.004	0.033	0.016	0.041	0.033	0.017	0.051	0.000	0.004	1.000
East Midlands	-0.031	0.023	0.188	0.008	0.015	0.595	0.019	0.017	0.268	0.004	0.005	0.441
West Midlands	-0.028	0.023	0.222	0.020	0.017	0.233	0.014	0.016	0.365	-0.006	0.003	0.057
East	-0.016	0.024	0.491	0.006	0.017	0.732	0.008	0.017	0.616	0.002	0.006	0.704
South East	-0.025	0.022	0.269	0.035	0.017	0.033	-0.012	0.014	0.425	0.001	0.005	0.895
South West	-0.005	0.025	0.834	0.000	0.017	1.000	0.009	0.018	0.632	-0.003	0.004	0.372
Wales	-0.037	0.023	0.112	0.003	0.016	0.858	0.030	0.017	0.081	0.004	0.005	0.391
Scotland	-0.054	0.023	0.020	0.047	0.017	0.007	0.006	0.016	0.678	0.001	0.004	0.864
NI & Channel Island	-0.063	0.030	0.033	0.034	0.022	0.124	0.027	0.021	0.200	0.002	0.005	0.668
Non-recession 1998-2000 (base)												
Recession 1991-1993	-0.070	0.022	0.002	-0.015	0.017	0.394	0.086	0.016	0.000	-0.002	0.003	0.536
Non-recession 1994-1997	-0.041	0.018	0.022	0.000	0.015	0.977	0.042	0.013	0.001	-0.001	0.003	0.695
Recession 2001-2002	0.016	0.018	0.359	-0.031	0.015	0.034	0.011	0.011	0.319	0.003	0.003	0.254
Non-recession 2003-2004	0.007	0.021	0.740	-0.029	0.017	0.088	0.015	0.013	0.256	0.007	0.004	0.057
Recession 2005-2006	-0.045	0.022	0.045	0.031	0.020	0.122	0.010	0.013	0.435	0.004	0.004	0.274
Recession 2007-2010	-0.068	0.018	0.000	-0.003	0.014	0.811	0.062	0.011	0.000	0.009	0.003	0.002
Non-recession 2011-2013	-0.058	0.019	0.002	-0.022	0.015	0.125	0.069	0.013	0.000	0.012	0.004	0.003
Observations						15,041						
Log likelihood						-11972.602						

Note: 1) Results are in terms of marginal effects; 2) robust standard errors (standard errors are adjusted by pid cluster)

Table B.7 Multinomial Logit Model Full Results, Male Aged 25-35

	EMPLOYED			EDUCATION			UNEMPLOYED			INACTIVE		
VARIABLE	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|
White (base)												
Black	-0.094	0.016	0.000	0.033	0.007	0.000	0.054	0.012	0.000	0.007	0.004	0.099
Asian	-0.035	0.009	0.000	0.015	0.003	0.000	0.018	0.007	0.009	0.001	0.002	0.593
Others	-0.074	0.023	0.001	0.028	0.010	0.003	0.035	0.014	0.016	0.011	0.007	0.123
No education (base)												
Higher/1stdegree	0.120	0.013	0.000	0.010	0.003	0.000	-0.099	0.010	0.000	-0.031	0.005	0.000
A level	0.099	0.013	0.000	0.007	0.003	0.005	-0.086	0.010	0.000	-0.021	0.005	0.000
GCSE/O level	0.089	0.013	0.000	-0.001	0.002	0.523	-0.068	0.010	0.000	-0.020	0.005	0.000
CSE level	0.088	0.016	0.000	-0.006	0.002	0.013	-0.061	0.014	0.000	-0.021	0.006	0.000
Prof qualif/Others	0.087	0.013	0.000	0.006	0.003	0.015	-0.072	0.010	0.000	-0.021	0.005	0.000
Never/not married (base)												
Married	0.059	0.005	0.000	-0.009	0.002	0.000	-0.045	0.004	0.000	-0.004	0.001	0.003
Evermarried	0.020	0.010	0.051	-0.007	0.004	0.069	-0.011	0.009	0.184	-0.002	0.002	0.453
Health Excellent/Good (base)												
Health Fair	-0.057	0.006	0.000	0.001	0.002	0.653	0.028	0.004	0.000	0.028	0.003	0.000
Health Poor	-0.195	0.018	0.000	0.000	0.003	0.873	0.042	0.008	0.000	0.152	0.016	0.000
Number of children												
ownchild	-0.007	0.003	0.012	-0.003	0.002	0.065	0.009	0.002	0.000	0.001	0.001	0.296
Single no child (base)												
Single with child	-0.037	0.015	0.014	0.011	0.006	0.053	0.023	0.011	0.039	0.003	0.004	0.528
Couple no child	0.028	0.006	0.000	-0.002	0.002	0.374	-0.017	0.005	0.000	-0.009	0.003	0.000
Couple with child	0.016	0.007	0.015	0.000	0.002	0.948	-0.009	0.005	0.056	-0.007	0.003	0.015
2+ Adults	-0.036	0.007	0.000	0.013	0.002	0.000	0.025	0.006	0.000	-0.002	0.003	0.384
Other	-0.014	0.020	0.483	0.006	0.008	0.449	0.010	0.016	0.533	-0.002	0.005	0.694
Owned outright (base)												
Owned mortgage	0.042	0.007	0.000	-0.008	0.002	0.001	-0.025	0.005	0.000	-0.009	0.003	0.000
Local auth. rented	-0.108	0.011	0.000	-0.002	0.003	0.502	0.092	0.009	0.000	0.019	0.004	0.000
Housing assoc. rented	-0.113	0.015	0.000	0.005	0.004	0.239	0.089	0.012	0.000	0.019	0.005	0.001

	EMPLOYED			EDUCATION			UNEMPLOYED			INACTIVE		
VARIABLE	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|
Employer rented & other	0.023	0.012	0.057	0.002	0.005	0.751	-0.020	0.010	0.047	-0.005	0.004	0.272
Rented unfurnished	-0.011	0.009	0.194	-0.002	0.003	0.512	0.013	0.007	0.054	0.000	0.003	0.994
Rented furnished	-0.033	0.009	0.000	0.025	0.004	0.000	0.009	0.007	0.185	-0.001	0.003	0.691
London (base)												
North East	-0.041	0.012	0.001	0.003	0.003	0.315	0.024	0.010	0.012	0.013	0.005	0.004
North West	-0.035	0.008	0.000	0.005	0.002	0.047	0.023	0.006	0.000	0.008	0.003	0.013
Yorkshire & Humber	-0.023	0.008	0.005	0.006	0.003	0.022	0.013	0.007	0.045	0.004	0.003	0.141
East Midlands	-0.028	0.009	0.001	0.002	0.003	0.364	0.021	0.007	0.002	0.005	0.003	0.094
West Midlands	-0.014	0.008	0.074	0.004	0.003	0.173	0.008	0.006	0.193	0.002	0.003	0.371
East	-0.003	0.008	0.664	0.004	0.003	0.115	-0.003	0.006	0.619	0.002	0.003	0.529
South East	0.009	0.006	0.158	-0.001	0.002	0.774	-0.004	0.005	0.463	-0.005	0.002	0.013
South West	0.006	0.008	0.424	0.005	0.003	0.137	-0.011	0.006	0.052	0.000	0.002	0.943
Wales	-0.012	0.008	0.141	-0.002	0.002	0.445	0.010	0.006	0.131	0.004	0.003	0.181
Scotland	-0.023	0.008	0.003	0.012	0.003	0.000	0.007	0.006	0.242	0.003	0.003	0.233
NI & Channel Island	-0.025	0.010	0.013	-0.001	0.003	0.790	0.018	0.008	0.028	0.008	0.004	0.038
Non-recession 1998-2000 (base)												
Recession 1991-1993	-0.054	0.008	0.000	0.008	0.004	0.033	0.045	0.007	0.000	0.001	0.002	0.415
Non-recession 1994-1997	-0.029	0.006	0.000	0.009	0.003	0.002	0.017	0.005	0.000	0.002	0.001	0.074
Recession 2001-2002	-0.007	0.005	0.137	-0.001	0.002	0.561	0.005	0.004	0.201	0.004	0.001	0.004
Non-recession 2003-2004	-0.002	0.005	0.697	0.000	0.003	0.974	0.001	0.004	0.831	0.001	0.001	0.309
Recession 2005-2006	0.001	0.005	0.867	-0.001	0.003	0.710	-0.003	0.004	0.511	0.003	0.002	0.085
Recession 2007-2010	-0.037	0.005	0.000	0.002	0.002	0.376	0.028	0.004	0.000	0.008	0.001	0.000
Non-recession 2011-2013	-0.029	0.005	0.000	-0.002	0.002	0.407	0.022	0.004	0.000	0.008	0.002	0.000
Observations	36,336											
Log likelihood	-14789.894											

Note: 1) Results are in terms of marginal effects; 2) robust standard errors (standard errors are adjusted by pid cluster)

Table B.8 Multinomial Logit Model Full Results, Male Aged 36-49

	EMPLOYED			EDUCATION			UNEMPLOYED			INACTIVE		
VARIABLE	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|
White (base)												
Black	-0.045	0.012	0.000	0.012	0.004	0.007	0.031	0.008	0.000	0.002	0.005	0.638
Asian	-0.021	0.008	0.009	0.004	0.002	0.061	0.020	0.006	0.002	-0.002	0.003	0.538
Others	-0.006	0.013	0.665	0.007	0.004	0.049	0.001	0.009	0.904	-0.002	0.007	0.743
No education (base)												
Higher/1stdegree	0.073	0.008	0.000	0.004	0.001	0.000	-0.042	0.006	0.000	-0.035	0.005	0.000
A level	0.059	0.009	0.000	0.002	0.001	0.028	-0.037	0.006	0.000	-0.024	0.005	0.000
GCSE/O level	0.051	0.009	0.000	0.000	0.001	0.815	-0.027	0.006	0.000	-0.024	0.005	0.000
CSE level	0.060	0.011	0.000	0.000	0.001	0.782	-0.038	0.008	0.000	-0.022	0.007	0.001
Prof qualif/Others	0.051	0.009	0.000	0.002	0.001	0.031	-0.026	0.006	0.000	-0.026	0.005	0.000
Never/not married (base)												
Married	0.032	0.005	0.000	0.000	0.001	0.821	-0.027	0.004	0.000	-0.005	0.002	0.019
Evermarried	0.015	0.007	0.027	0.001	0.001	0.534	-0.009	0.005	0.069	-0.006	0.003	0.018
Health Excellent/Good (base)												
Health Fair	-0.075	0.005	0.000	0.000	0.001	0.708	0.026	0.003	0.000	0.049	0.004	0.000
Health Poor	-0.365	0.020	0.000	0.001	0.002	0.471	0.050	0.006	0.000	0.314	0.019	0.000
Number of children												
ownchild	-0.009	0.002	0.000	0.001	0.000	0.004	0.006	0.001	0.000	0.002	0.001	0.063
Single no child (base)												
Single with child	-0.010	0.013	0.413	-0.002	0.002	0.210	-0.001	0.008	0.878	0.014	0.008	0.073
Couple no child	0.027	0.007	0.000	-0.001	0.002	0.766	-0.014	0.005	0.003	-0.012	0.004	0.001
Couple with child	0.037	0.007	0.000	-0.003	0.002	0.112	-0.021	0.005	0.000	-0.014	0.004	0.001
2+ Adults	0.002	0.008	0.760	-0.001	0.002	0.461	0.005	0.005	0.352	-0.006	0.004	0.123
Other	0.033	0.022	0.131	0.003	0.005	0.582	-0.028	0.012	0.019	-0.008	0.013	0.558
Owned outright (base)												
Owned mortgage	0.036	0.006	0.000	-0.003	0.001	0.022	-0.013	0.003	0.000	-0.020	0.004	0.000
Local auth. rented	-0.187	0.014	0.000	0.003	0.002	0.167	0.124	0.010	0.000	0.060	0.008	0.000
Housing assoc. rented	-0.177	0.016	0.000	0.009	0.004	0.016	0.111	0.012	0.000	0.057	0.009	0.000

	EMPLOYED			EDUCATION			UNEMPLOYED			INACTIVE		
VARIABLE	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|
Employer rented & other	0.031	0.010	0.003	0.003	0.004	0.455	-0.015	0.007	0.033	-0.019	0.006	0.001
Rented unfurnished	-0.051	0.010	0.000	0.002	0.002	0.469	0.038	0.007	0.000	0.012	0.006	0.055
Rented furnished	-0.071	0.013	0.000	0.009	0.003	0.012	0.055	0.010	0.000	0.007	0.007	0.298
London (base)												
North East	-0.020	0.011	0.078	0.002	0.002	0.232	0.005	0.007	0.464	0.012	0.006	0.057
North West	-0.019	0.007	0.011	0.000	0.001	0.942	0.010	0.006	0.073	0.009	0.004	0.017
Yorkshire & Humber	-0.011	0.008	0.165	0.004	0.002	0.032	0.002	0.006	0.747	0.005	0.004	0.187
East Midlands	0.001	0.007	0.856	0.000	0.001	0.954	-0.004	0.005	0.388	0.003	0.004	0.409
West Midlands	-0.002	0.007	0.796	0.001	0.001	0.246	-0.001	0.005	0.855	0.002	0.003	0.617
East	0.006	0.007	0.362	0.000	0.001	0.734	-0.007	0.005	0.178	0.001	0.004	0.816
South East	0.013	0.006	0.030	0.000	0.001	0.998	-0.010	0.004	0.021	-0.003	0.003	0.347
South West	0.001	0.007	0.873	0.002	0.001	0.194	-0.006	0.005	0.219	0.004	0.004	0.300
Wales	-0.025	0.009	0.005	0.002	0.002	0.220	0.008	0.006	0.194	0.015	0.005	0.002
Scotland	-0.008	0.007	0.292	0.003	0.001	0.033	0.000	0.005	0.994	0.005	0.004	0.192
NI & Channel Island	-0.043	0.011	0.000	0.003	0.002	0.127	0.023	0.008	0.006	0.017	0.005	0.001
Non-recession 1998-2000 (base)												
Recession 1991-1993	-0.030	0.007	0.000	0.000	0.002	0.904	0.028	0.005	0.000	0.003	0.002	0.221
Non-recession 1994-1997	-0.020	0.005	0.000	-0.001	0.002	0.739	0.015	0.004	0.000	0.006	0.002	0.003
Recession 2001-2002	-0.002	0.004	0.542	-0.001	0.002	0.418	-0.001	0.003	0.687	0.005	0.001	0.001
Non-recession 2003-2004	-0.001	0.004	0.772	0.000	0.002	0.983	-0.005	0.003	0.075	0.007	0.002	0.000
Recession 2005-2006	0.000	0.005	0.924	-0.002	0.002	0.281	-0.003	0.003	0.329	0.005	0.002	0.010
Recession 2007-2010	-0.027	0.004	0.000	-0.003	0.002	0.068	0.018	0.003	0.000	0.012	0.002	0.000
Non-recession 2011-2013	-0.023	0.005	0.000	-0.005	0.002	0.004	0.014	0.003	0.000	0.013	0.002	0.000
Observations						51,855						
Log likelihood						-18051.714						

Note: 1) Results are in terms of marginal effects; 2) robust standard errors (standard errors are adjusted by pid cluster)

Table B.9 Multinomial Logit Model Full Results, Male Aged 50-65

	EMPLOYED			EDUCATION			UNEMPLOYED			INACTIVE		
VARIABLE	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|
White (base)												
Black	-0.015	0.022	0.505	0.001	0.001	0.556	0.026	0.015	0.079	-0.012	0.012	0.315
Asian	-0.127	0.023	0.000	0.000	0.000	0.511	0.088	0.016	0.000	0.040	0.015	0.008
Others	-0.111	0.041	0.007	-0.001	0.000	0.000	0.063	0.028	0.026	0.048	0.027	0.072
No education (base)												
Higher/1stdegree	0.132	0.011	0.000	0.001	0.001	0.155	-0.059	0.007	0.000	-0.074	0.008	0.000
A level	0.093	0.013	0.000	0.000	0.000	0.679	-0.041	0.007	0.000	-0.052	0.009	0.000
GCSE/O level	0.083	0.013	0.000	0.000	0.000	0.306	-0.033	0.007	0.000	-0.050	0.009	0.000
CSE level	0.072	0.023	0.001	0.001	0.001	0.525	-0.029	0.014	0.036	-0.044	0.016	0.008
Prof qualif/Others	0.095	0.012	0.000	0.000	0.000	0.141	-0.045	0.007	0.000	-0.050	0.008	0.000
Never/not married (base)												
Married	0.063	0.013	0.000	-0.001	0.001	0.135	-0.036	0.008	0.000	-0.027	0.009	0.002
Evermarried	0.025	0.013	0.065	-0.001	0.000	0.106	-0.013	0.008	0.122	-0.011	0.009	0.201
Health Excellent/Good (base)												
Health Fair	-0.156	0.008	0.000	0.000	0.000	0.366	0.018	0.004	0.000	0.139	0.007	0.000
Health Poor	-0.564	0.014	0.000	0.000	0.000	0.384	0.023	0.005	0.000	0.542	0.015	0.000
Number of children												
ownchild	-0.008	0.007	0.262	0.000	0.000	0.996	0.008	0.004	0.035	0.000	0.005	0.997
Single no child (base)												
Single with child	0.002	0.025	0.949	0.000	0.001	0.877	-0.004	0.015	0.810	0.002	0.016	0.903
Couple no child	0.053	0.013	0.000	0.000	0.000	0.340	-0.028	0.008	0.001	-0.024	0.009	0.006
Couple with child	0.064	0.014	0.000	0.000	0.000	0.821	-0.031	0.009	0.001	-0.033	0.009	0.000
2+ Adults	0.032	0.014	0.020	0.001	0.001	0.192	-0.014	0.009	0.111	-0.019	0.009	0.039
Other	0.025	0.033	0.450	-0.001	0.000	0.012	-0.013	0.021	0.536	-0.011	0.026	0.661
Owned outright (base)												
Owned mortgage	0.030	0.006	0.000	0.000	0.000	0.082	-0.014	0.004	0.000	-0.017	0.004	0.000
Local auth. rented	-0.272	0.020	0.000	0.005	0.002	0.002	0.118	0.013	0.000	0.149	0.014	0.000
Housing assoc. rented	-0.203	0.022	0.000	0.001	0.001	0.117	0.081	0.013	0.000	0.121	0.017	0.000

VARIABLE	EMPLOYED dy/dx	Std Err	P>|z|	EDUCATION dy/dx	Std Err	P>|z|	UNEMPLOYED dy/dx	Std Err	P>|z|	INACTIVE dy/dx	Std Err	P>|z|
Employer rented & other	0.070	0.014	0.000	0.001	0.001	0.533	-0.040	0.006	0.000	-0.031	0.011	0.007
Rented unfurnished	-0.067	0.018	0.000	0.000	0.000	0.842	0.034	0.011	0.002	0.033	0.012	0.006
Rented furnished	-0.095	0.025	0.000	0.005	0.003	0.143	0.073	0.019	0.000	0.017	0.013	0.210
London (base)												
North East	-0.074	0.022	0.001	0.000	0.001	0.391	0.015	0.013	0.255	0.059	0.016	0.000
North West	-0.037	0.014	0.010	0.001	0.001	0.481	-0.005	0.009	0.529	0.042	0.010	0.000
Yorkshire & Humber	0.001	0.013	0.921	0.000	0.001	0.937	-0.009	0.009	0.323	0.007	0.008	0.349
East Midlands	-0.010	0.014	0.450	0.000	0.001	0.608	-0.002	0.009	0.779	0.013	0.009	0.125
West Midlands	-0.010	0.014	0.455	0.000	0.001	0.708	0.000	0.009	0.997	0.010	0.008	0.222
East	-0.001	0.014	0.932	0.000	0.001	0.721	-0.007	0.009	0.401	0.009	0.008	0.299
South East	-0.020	0.013	0.130	0.000	0.001	0.527	0.010	0.009	0.282	0.010	0.008	0.199
South West	-0.004	0.014	0.803	0.000	0.001	0.676	-0.011	0.009	0.213	0.014	0.009	0.103
Wales	-0.037	0.015	0.014	-0.001	0.001	0.328	-0.007	0.009	0.460	0.045	0.010	0.000
Scotland	-0.022	0.015	0.136	0.000	0.001	0.468	-0.005	0.009	0.551	0.028	0.009	0.003
NI & Channel Island	-0.076	0.019	0.000	0.000	0.001	0.974	0.010	0.011	0.398	0.067	0.013	0.000
Non-recession 1998-2000 (base)												
Recession 1991-1993	-0.065	0.013	0.000	0.000	0.001	0.948	0.047	0.009	0.000	0.017	0.008	0.022
Non-recession 1994-1997	-0.069	0.010	0.000	0.001	0.001	0.401	0.035	0.007	0.000	0.034	0.007	0.000
Recession 2001-2002	-0.011	0.007	0.122	-0.001	0.001	0.061	0.002	0.005	0.678	0.010	0.005	0.030
Non-recession 2003-2004	-0.001	0.008	0.853	-0.001	0.001	0.278	-0.002	0.006	0.772	0.004	0.005	0.454
Recession 2005-2006	0.003	0.009	0.766	-0.001	0.001	0.065	-0.008	0.006	0.151	0.007	0.006	0.219
Recession 2007-2010	-0.036	0.008	0.000	-0.001	0.001	0.110	0.024	0.006	0.000	0.013	0.005	0.011
Non-recession 2011-2013	-0.033	0.009	0.000	-0.001	0.001	0.232	0.022	0.006	0.000	0.012	0.006	0.044
Observations	39,606											
Log likelihood	-17788.341											

Note: 1) Results are in terms of marginal effects; 2) robust standard errors (standard errors are adjusted by pid cluster)

Table B.10 Multinomial Logit Model Full Results, Female Aged 16-19

	EMPLOYED			EDUCATION			UNEMPLOYED			INACTIVE		
VARIABLE	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|
White (base)												
Black	-0.134	0.019	0.000	0.160	0.022	0.000	-0.019	0.009	0.033	-0.008	0.004	0.036
Asian	-0.172	0.013	0.000	0.171	0.017	0.000	-0.005	0.010	0.626	0.006	0.006	0.351
Others	-0.101	0.034	0.003	0.125	0.038	0.001	-0.014	0.016	0.356	-0.009	0.008	0.227
No education (base)												
Higher/1stdegree/A level	0.116	0.016	0.000	-0.024	0.021	0.256	-0.071	0.011	0.000	-0.021	0.006	0.001
GCSE/O level	0.072	0.016	0.000	-0.008	0.020	0.706	-0.047	0.011	0.000	-0.017	0.006	0.003
CSE level	0.198	0.030	0.000	-0.229	0.035	0.000	0.030	0.020	0.130	0.001	0.008	0.944
Others	0.250	0.026	0.000	-0.234	0.030	0.000	-0.012	0.017	0.460	-0.004	0.007	0.594
Never/not married (base)												
Married	0.143	0.070	0.040	-0.286	0.089	0.001	0.094	0.038	0.015	0.049	0.026	0.060
Evermarried												
Health Excellent/Good (base)												
Health Fair	0.015	0.012	0.199	-0.059	0.014	0.000	0.033	0.008	0.000	0.011	0.004	0.004
Health Poor	-0.007	0.021	0.756	-0.048	0.026	0.067	0.036	0.013	0.007	0.020	0.008	0.017
Number of children												
ownchild	0.412	0.072	0.000	-0.775	0.086	0.000	0.214	0.025	0.000	0.150	0.011	0.000
Single no child (base)												
Single with child	-0.122	0.032	0.000	0.213	0.035	0.000	-0.070	0.024	0.004	-0.021	0.014	0.131
Couple no child	0.273	0.044	0.000	-0.290	0.043	0.000	0.013	0.028	0.636	0.004	0.016	0.802
Couple with child	-0.111	0.032	0.000	0.219	0.034	0.000	-0.084	0.024	0.000	-0.024	0.014	0.086
2+ Adults	0.115	0.032	0.000	-0.016	0.033	0.637	-0.075	0.023	0.001	-0.025	0.014	0.078
Other	0.098	0.056	0.081	-0.113	0.063	0.071	0.004	0.037	0.910	0.011	0.020	0.585
Owned outright (base)												
Owned mortgage	0.028	0.014	0.041	-0.011	0.015	0.471	-0.012	0.007	0.088	-0.006	0.004	0.170
Local auth. rented	0.041	0.018	0.025	-0.122	0.021	0.000	0.070	0.011	0.000	0.011	0.005	0.051
Housing assoc. rented	0.006	0.022	0.782	-0.080	0.025	0.001	0.060	0.013	0.000	0.014	0.007	0.046

VARIABLE	EMPLOYED dy/dx	EMPLOYED Std Err	EMPLOYED P>|z|	EDUCATION dy/dx	EDUCATION Std Err	EDUCATION P>|z|	UNEMPLOYED dy/dx	UNEMPLOYED Std Err	UNEMPLOYED P>|z|	INACTIVE dy/dx	INACTIVE Std Err	INACTIVE P>|z|
Employer rented & other	0.049	0.049	0.318	-0.002	0.053	0.967	-0.030	0.017	0.084	-0.017	0.007	0.017
Rented unfurnished	0.051	0.022	0.019	-0.082	0.024	0.001	0.025	0.012	0.035	0.006	0.006	0.340
Rented furnished	-0.151	0.015	0.000	0.181	0.018	0.000	-0.022	0.009	0.021	-0.009	0.005	0.063
London (base)												
North East	0.043	0.028	0.130	-0.044	0.030	0.149	-0.002	0.014	0.894	0.002	0.007	0.744
North West	0.065	0.022	0.003	-0.089	0.024	0.000	0.026	0.012	0.025	-0.002	0.007	0.749
Yorkshire & Humber	0.032	0.022	0.149	-0.085	0.026	0.001	0.046	0.013	0.000	0.007	0.007	0.318
East Midlands	0.053	0.023	0.022	-0.055	0.026	0.036	0.000	0.010	0.980	0.002	0.007	0.790
West Midlands	0.057	0.022	0.011	-0.044	0.024	0.071	-0.006	0.009	0.513	-0.007	0.006	0.258
East	0.034	0.021	0.109	-0.053	0.025	0.032	0.017	0.013	0.186	0.001	0.007	0.852
South East	0.062	0.020	0.002	-0.063	0.023	0.006	0.005	0.010	0.577	-0.005	0.006	0.420
South West	0.084	0.023	0.000	-0.085	0.025	0.001	0.004	0.011	0.717	-0.003	0.007	0.691
Wales	0.058	0.022	0.009	-0.070	0.025	0.004	0.013	0.010	0.224	0.000	0.007	0.964
Scotland	0.079	0.021	0.000	-0.095	0.024	0.000	0.024	0.011	0.026	-0.008	0.006	0.143
NI & Channel Island	0.007	0.023	0.777	0.010	0.026	0.714	-0.010	0.011	0.329	-0.006	0.007	0.400
Non-recession 1998-2000 (base)												
Recession 1991-1993	0.039	0.029	0.176	-0.067	0.029	0.022	0.026	0.010	0.012	0.002	0.005	0.634
Non-recession 1994-1997	-0.038	0.024	0.110	0.026	0.024	0.278	0.007	0.008	0.335	0.004	0.004	0.292
Recession 2001-2002	0.000	0.024	0.995	-0.015	0.025	0.533	0.013	0.008	0.117	0.003	0.004	0.537
Non-recession 2003-2004	0.015	0.027	0.569	-0.016	0.028	0.573	0.003	0.008	0.682	-0.003	0.004	0.476
Recession 2005-2006	-0.031	0.026	0.243	0.008	0.028	0.762	0.022	0.009	0.013	0.000	0.004	0.953
Recession 2007-2010	-0.164	0.021	0.000	0.124	0.022	0.000	0.038	0.007	0.000	0.002	0.004	0.551
Non-recession 2011-2013	-0.220	0.020	0.000	0.186	0.021	0.000	0.032	0.008	0.000	0.002	0.004	0.582
Observations							14,426					
Log likelihood							-11361.45					

Note: 1) Results are in terms of marginal effects; 2) robust standard errors (standard errors are adjusted by pid cluster)

Table B.11 Multinomial Logit Model Full Results, Female Aged 20-24

	EMPLOYED			EDUCATION			UNEMPLOYED			INACTIVE		
VARIABLE	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|
White (base)												
Black	-0.146	0.030	0.000	0.118	0.027	0.000	0.020	0.015	0.175	0.008	0.013	0.555
Asian	-0.227	0.025	0.000	0.081	0.018	0.000	0.077	0.016	0.000	0.068	0.016	0.000
Others	-0.186	0.047	0.000	0.089	0.038	0.019	0.087	0.032	0.006	0.010	0.021	0.634
No education (base)												
Higher/1stdegree	0.340	0.033	0.000	-0.009	0.020	0.657	-0.158	0.025	0.000	-0.173	0.023	0.000
A level	0.146	0.034	0.000	0.198	0.022	0.000	-0.183	0.024	0.000	-0.161	0.023	0.000
GCSE/O level	0.271	0.033	0.000	-0.022	0.020	0.256	-0.138	0.024	0.000	-0.110	0.022	0.000
CSE level	0.281	0.043	0.000	-0.069	0.021	0.001	-0.121	0.030	0.000	-0.091	0.026	0.001
Prof qualif/Others	0.270	0.034	0.000	0.034	0.022	0.120	-0.163	0.025	0.000	-0.140	0.023	0.000
Never/not married (base)												
Married	0.070	0.017	0.000	-0.104	0.010	0.000	-0.021	0.008	0.013	0.056	0.012	0.000
Evermarried												
Health Excellent/Good (base)												
Health Fair	-0.048	0.013	0.000	-0.016	0.008	0.052	0.028	0.008	0.001	0.036	0.007	0.000
Health Poor	-0.119	0.024	0.000	-0.023	0.013	0.079	0.036	0.014	0.008	0.106	0.019	0.000
Number of children												
ownchild	0.018	0.024	0.460	-0.134	0.026	0.000	0.022	0.009	0.016	0.094	0.007	0.000
Single no child (base)												
Single with child	-0.158	0.025	0.000	-0.022	0.017	0.193	0.056	0.014	0.000	0.124	0.015	0.000
Couple no child	0.104	0.018	0.000	-0.076	0.012	0.000	-0.006	0.011	0.544	-0.022	0.010	0.025
Couple with child	-0.070	0.021	0.001	-0.015	0.015	0.324	0.005	0.011	0.638	0.079	0.012	0.000
2+ Adults	-0.106	0.018	0.000	0.074	0.013	0.000	0.027	0.010	0.010	0.005	0.010	0.586
Other	-0.047	0.037	0.195	-0.036	0.021	0.086	0.022	0.022	0.329	0.061	0.022	0.005
Owned outright (base)												
Owned mortgage	0.073	0.015	0.000	-0.021	0.010	0.029	-0.041	0.009	0.000	-0.010	0.006	0.097
Local auth. rented	-0.073	0.020	0.000	-0.049	0.012	0.000	0.063	0.014	0.000	0.058	0.010	0.000
Housing assoc. rented	-0.127	0.025	0.000	-0.021	0.014	0.138	0.044	0.015	0.005	0.105	0.015	0.000

	EMPLOYED			EDUCATION			UNEMPLOYED			INACTIVE		
VARIABLE	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|
Employer rented & other	0.031	0.033	0.346	-0.013	0.022	0.563	-0.040	0.019	0.037	0.022	0.018	0.209
Rented unfurnished	-0.009	0.020	0.655	-0.032	0.013	0.012	-0.002	0.012	0.900	0.043	0.010	0.000
Rented furnished	-0.199	0.020	0.000	0.198	0.016	0.000	-0.031	0.011	0.004	0.032	0.010	0.001
London (base)												
North East	-0.079	0.034	0.019	0.008	0.019	0.659	0.045	0.021	0.031	0.026	0.019	0.169
North West	-0.043	0.023	0.055	0.030	0.016	0.058	0.019	0.013	0.141	-0.005	0.011	0.626
Yorkshire & Humber	-0.033	0.024	0.163	-0.002	0.015	0.913	0.009	0.013	0.461	0.025	0.013	0.048
East Midlands	-0.012	0.024	0.607	0.003	0.015	0.841	0.001	0.013	0.960	0.009	0.012	0.485
West Midlands	-0.020	0.022	0.361	0.008	0.015	0.599	0.024	0.013	0.060	-0.012	0.010	0.245
East	-0.002	0.024	0.929	-0.010	0.016	0.557	0.012	0.014	0.397	0.000	0.012	0.995
South East	0.009	0.021	0.673	-0.006	0.014	0.659	-0.006	0.012	0.619	0.003	0.011	0.777
South West	-0.005	0.024	0.843	-0.004	0.016	0.788	0.011	0.014	0.442	-0.002	0.012	0.878
Wales	-0.023	0.023	0.314	0.022	0.016	0.181	0.007	0.012	0.585	-0.006	0.011	0.614
Scotland	-0.012	0.022	0.581	0.031	0.016	0.057	-0.001	0.011	0.938	-0.017	0.010	0.079
NI & Channel Island	-0.004	0.026	0.889	0.012	0.018	0.511	0.005	0.014	0.720	-0.013	0.012	0.293
Non-recession 1998-2000 (base)												
Recession 1991-1993	-0.049	0.022	0.025	-0.017	0.016	0.290	0.047	0.014	0.001	0.019	0.009	0.036
Non-recession 1994-1997	-0.049	0.019	0.010	0.020	0.014	0.165	0.022	0.011	0.050	0.007	0.008	0.343
Recession 2001-2002	-0.016	0.018	0.383	0.003	0.014	0.859	0.006	0.011	0.560	0.007	0.007	0.332
Non-recession 2003-2004	-0.012	0.020	0.551	-0.003	0.015	0.871	0.012	0.011	0.274	0.003	0.009	0.755
Recession 2005-2006	-0.009	0.021	0.645	0.012	0.016	0.448	-0.002	0.011	0.819	0.000	0.009	0.970
Recession 2007-2010	-0.064	0.017	0.000	0.008	0.013	0.551	0.036	0.009	0.000	0.020	0.007	0.006
Non-recession 2011-2013	-0.073	0.018	0.000	-0.015	0.013	0.237	0.060	0.011	0.000	0.029	0.009	0.002
Observations	17,610											
Log likelihood	-14399.1890											

Note: 1) Results are in terms of marginal effects; 2) robust standard errors (standard errors are adjusted by pid cluster)

Table B.12 Multinomial Logit Model Full Results, Female Aged 25-35

	EMPLOYED			EDUCATION			UNEMPLOYED			INACTIVE		
VARIABLE	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|
White (base)												
Black	-0.033	0.017	0.047	0.034	0.008	0.000	0.011	0.005	0.020	-0.013	0.013	0.317
Asian	-0.233	0.019	0.000	0.006	0.004	0.139	0.025	0.006	0.000	0.202	0.018	0.000
Others	-0.107	0.033	0.001	0.021	0.008	0.007	0.027	0.011	0.011	0.060	0.028	0.036
No education (base)												
Higher/1stdegree	0.268	0.021	0.000	0.019	0.003	0.000	-0.056	0.006	0.000	-0.231	0.019	0.000
A level	0.212	0.021	0.000	0.020	0.003	0.000	-0.049	0.007	0.000	-0.184	0.019	0.000
GCSE/O level	0.167	0.021	0.000	0.007	0.002	0.003	-0.031	0.006	0.000	-0.143	0.019	0.000
CSE level	0.111	0.031	0.000	-0.006	0.002	0.015	-0.032	0.010	0.002	-0.073	0.029	0.011
Prof qualif/Others	0.215	0.021	0.000	0.015	0.003	0.000	-0.039	0.007	0.000	-0.191	0.019	0.000
Never/not married (base)												
Married	0.000	0.008	0.953	-0.012	0.002	0.000	-0.012	0.003	0.000	0.023	0.007	0.002
Evermarried	0.033	0.012	0.007	-0.007	0.004	0.072	-0.007	0.004	0.064	-0.018	0.010	0.057
Health Excellent/Good (base)												
Health Fair	-0.077	0.008	0.000	-0.001	0.002	0.518	0.017	0.003	0.000	0.061	0.007	0.000
Health Poor	-0.222	0.018	0.000	-0.002	0.003	0.608	0.024	0.005	0.000	0.200	0.017	0.000
Number of children												
ownchild	-0.079	0.004	0.000	0.000	0.001	0.738	0.001	0.001	0.520	0.078	0.004	0.000
Single no child (base)												
Single with child	-0.196	0.015	0.000	0.014	0.004	0.000	0.016	0.006	0.005	0.167	0.013	0.000
Couple no child	0.017	0.011	0.118	0.001	0.003	0.811	0.003	0.005	0.504	-0.022	0.009	0.021
Couple with child	-0.138	0.013	0.000	0.001	0.003	0.758	-0.011	0.005	0.029	0.147	0.011	0.000
2+ Adults	-0.094	0.013	0.000	0.018	0.004	0.000	0.012	0.005	0.026	0.063	0.012	0.000
Other	-0.107	0.038	0.005	0.005	0.009	0.578	0.017	0.015	0.238	0.084	0.032	0.009
Owned outright (base)												
Owned mortgage	0.093	0.013	0.000	-0.002	0.003	0.508	-0.018	0.004	0.000	-0.073	0.012	0.000
Local auth. rented	-0.118	0.017	0.000	0.015	0.004	0.000	0.041	0.006	0.000	0.062	0.015	0.000
Housing assoc. rented	-0.142	0.020	0.000	0.014	0.005	0.002	0.045	0.007	0.000	0.083	0.018	0.000

VARIABLE	EMPLOYED dy/dx	Std Err	P>|z|	EDUCATION dy/dx	Std Err	P>|z|	UNEMPLOYED dy/dx	Std Err	P>|z|	INACTIVE dy/dx	Std Err	P>|z|
Employer rented & other	-0.011	0.030	0.721	0.015	0.008	0.072	0.011	0.011	0.305	-0.016	0.026	0.541
Rented unfurnished	-0.068	0.017	0.000	0.013	0.004	0.001	0.011	0.005	0.041	0.044	0.015	0.004
Rented furnished	-0.065	0.017	0.000	0.033	0.005	0.000	0.011	0.006	0.057	0.020	0.016	0.195
London (base)												
North East	0.043	0.019	0.020	0.011	0.006	0.054	-0.010	0.006	0.106	-0.044	0.016	0.006
North West	0.030	0.015	0.047	0.006	0.003	0.085	-0.001	0.005	0.838	-0.035	0.014	0.010
Yorkshire & Humber	0.026	0.016	0.097	0.005	0.004	0.203	-0.007	0.005	0.155	-0.024	0.014	0.089
East Midlands	0.030	0.017	0.084	0.002	0.004	0.577	-0.018	0.004	0.000	-0.014	0.016	0.388
West Midlands	0.015	0.016	0.360	0.009	0.004	0.011	0.001	0.005	0.801	-0.025	0.014	0.064
East	-0.015	0.018	0.417	0.003	0.004	0.473	-0.003	0.005	0.580	0.015	0.016	0.356
South East	0.051	0.015	0.001	0.001	0.003	0.705	-0.018	0.004	0.000	-0.035	0.013	0.008
South West	-0.003	0.019	0.873	-0.002	0.004	0.652	-0.018	0.005	0.000	0.022	0.018	0.201
Wales	0.034	0.016	0.038	0.009	0.004	0.026	-0.007	0.005	0.213	-0.036	0.014	0.012
Scotland	0.045	0.015	0.004	0.016	0.004	0.000	-0.010	0.005	0.034	-0.050	0.013	0.000
NI & Channel Island	0.038	0.018	0.029	-0.002	0.003	0.494	-0.017	0.005	0.001	-0.019	0.016	0.231
Non-recession 1998-2000 (base)												
Recession 1991-1993	-0.052	0.013	0.000	-0.008	0.004	0.075	0.006	0.004	0.151	0.054	0.012	0.000
Non-recession 1994-1997	-0.031	0.010	0.003	-0.005	0.004	0.242	0.002	0.003	0.559	0.034	0.009	0.000
Recession 2001-2002	-0.017	0.010	0.080	-0.004	0.004	0.240	0.007	0.003	0.031	0.014	0.008	0.098
Non-recession 2003-2004	-0.017	0.011	0.122	-0.007	0.004	0.076	0.003	0.004	0.423	0.022	0.010	0.026
Recession 2005-2006	-0.016	0.012	0.182	-0.003	0.004	0.550	0.001	0.004	0.854	0.018	0.011	0.087
Recession 2007-2010	-0.040	0.010	0.000	-0.004	0.003	0.261	0.023	0.003	0.000	0.021	0.009	0.013
Non-recession 2011-2013	-0.034	0.011	0.001	-0.007	0.003	0.030	0.025	0.004	0.000	0.017	0.009	0.070
Observations							46,109					
Log likelihood							-29190.171					

Note: 1) Results are in terms of marginal effects; 2) robust standard errors (standard errors are adjusted by pid cluster)

Table B.13 Multinomial Logit Model Full Results, Female Aged 36-49

	EMPLOYED			EDUCATION			UNEMPLOYED			INACTIVE		
VARIABLE	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|
White (base)												
Black	0.038	0.013	0.005	0.012	0.004	0.005	0.008	0.004	0.027	-0.058	0.011	0.000
Asian	-0.168	0.018	0.000	0.001	0.002	0.768	0.020	0.005	0.000	0.147	0.017	0.000
Others	-0.063	0.029	0.031	-0.003	0.002	0.080	0.009	0.006	0.130	0.057	0.027	0.037
No education (base)												
Higher/1stdegree	0.234	0.014	0.000	0.011	0.001	0.000	-0.027	0.003	0.000	-0.217	0.013	0.000
A level	0.187	0.016	0.000	0.008	0.002	0.000	-0.022	0.004	0.000	-0.173	0.015	0.000
GCSE/O level	0.159	0.015	0.000	0.002	0.001	0.003	-0.021	0.003	0.000	-0.140	0.014	0.000
CSE level	0.107	0.025	0.000	0.001	0.001	0.395	-0.010	0.005	0.051	-0.098	0.023	0.000
Prof qualif/Others	0.190	0.014	0.000	0.006	0.001	0.000	-0.021	0.003	0.000	-0.175	0.014	0.000
Never/not married (base)												
Married	-0.006	0.009	0.517	-0.005	0.001	0.001	-0.018	0.003	0.000	0.028	0.008	0.000
Evermarried	0.011	0.010	0.269	-0.002	0.002	0.196	-0.008	0.003	0.002	0.000	0.009	0.960
Health Excellent/Good (base)												
Health Fair	-0.134	0.007	0.000	-0.001	0.001	0.081	0.012	0.002	0.000	0.123	0.007	0.000
Health Poor	-0.417	0.014	0.000	-0.003	0.001	0.002	0.010	0.002	0.000	0.410	0.014	0.000
Number of children												
ownchild	-0.085	0.004	0.000	0.001	0.000	0.018	0.001	0.001	0.123	0.083	0.003	0.000
Single no child (base)												
Single with child	0.009	0.014	0.547	0.004	0.001	0.002	-0.002	0.004	0.662	-0.011	0.013	0.391
Couple no child	0.026	0.015	0.078	0.000	0.001	0.768	0.004	0.004	0.334	-0.031	0.014	0.026
Couple with child	0.016	0.014	0.255	0.002	0.001	0.062	-0.017	0.004	0.000	-0.002	0.013	0.873
2+ Adults	-0.006	0.014	0.684	0.002	0.001	0.084	-0.004	0.004	0.309	0.007	0.013	0.588
Other	-0.031	0.042	0.469	0.006	0.006	0.362	0.006	0.012	0.640	0.019	0.041	0.639
Owned outright (base)												
Owned mortgage	0.123	0.011	0.000	-0.003	0.001	0.062	-0.009	0.002	0.000	-0.111	0.011	0.000
Local auth. rented	-0.138	0.017	0.000	0.005	0.002	0.018	0.046	0.005	0.000	0.086	0.016	0.000
Housing assoc. rented	-0.126	0.020	0.000	0.001	0.002	0.592	0.037	0.005	0.000	0.088	0.019	0.000

VARIABLE	EMPLOYED dy/dx	EMPLOYED Std Err	EMPLOYED P>|z|	EDUCATION dy/dx	EDUCATION Std Err	EDUCATION P>|z|	UNEMPLOYED dy/dx	UNEMPLOYED Std Err	UNEMPLOYED P>|z|	INACTIVE dy/dx	INACTIVE Std Err	INACTIVE P>|z|
Employer rented & other	0.117	0.021	0.000	0.000	0.003	0.929	-0.003	0.007	0.643	-0.114	0.020	0.000
Rented unfurnished	0.000	0.016	0.984	0.004	0.003	0.124	0.019	0.005	0.000	-0.023	0.015	0.128
Rented furnished	-0.075	0.023	0.001	0.013	0.005	0.004	0.037	0.007	0.000	0.025	0.021	0.242
London (base)												
North East	0.028	0.019	0.133	-0.002	0.002	0.457	-0.011	0.004	0.012	-0.016	0.018	0.366
North West	0.020	0.016	0.210	0.003	0.002	0.115	-0.006	0.004	0.116	-0.017	0.014	0.238
Yorkshire & Humber	0.034	0.016	0.029	-0.002	0.002	0.146	-0.012	0.004	0.001	-0.020	0.015	0.176
East Midlands	0.024	0.016	0.147	0.001	0.002	0.494	-0.012	0.004	0.001	-0.013	0.015	0.400
West Midlands	0.039	0.015	0.011	0.001	0.002	0.676	-0.007	0.004	0.074	-0.033	0.014	0.019
East	0.012	0.017	0.456	-0.003	0.002	0.085	-0.008	0.004	0.040	-0.002	0.016	0.908
South East	0.016	0.016	0.311	0.001	0.002	0.561	-0.011	0.004	0.003	-0.006	0.015	0.666
South West	0.014	0.017	0.428	0.001	0.002	0.796	-0.011	0.004	0.005	-0.003	0.016	0.832
Wales	0.011	0.017	0.514	0.003	0.002	0.254	-0.009	0.004	0.024	-0.005	0.016	0.758
Scotland	0.034	0.015	0.024	0.006	0.002	0.007	-0.007	0.004	0.068	-0.034	0.014	0.015
NI & Channel Island	-0.021	0.019	0.253	-0.001	0.002	0.453	-0.011	0.004	0.007	0.034	0.017	0.052
Non-recession 1998-2000 (base)												
Recession 1991-1993	-0.027	0.012	0.022	0.004	0.003	0.171	0.001	0.003	0.839	0.022	0.011	0.041
Non-recession 1994-1997	-0.027	0.009	0.003	0.004	0.003	0.175	-0.001	0.003	0.596	0.025	0.008	0.003
Recession 2001-2002	-0.006	0.008	0.464	-0.002	0.002	0.384	-0.005	0.002	0.033	0.012	0.007	0.085
Non-recession 2003-2004	-0.002	0.009	0.801	-0.003	0.002	0.097	-0.002	0.003	0.398	0.008	0.008	0.347
Recession 2005-2006	-0.014	0.010	0.153	-0.003	0.002	0.200	-0.001	0.003	0.769	0.018	0.009	0.050
Recession 2007-2010	-0.049	0.009	0.000	-0.003	0.002	0.114	0.013	0.002	0.000	0.039	0.008	0.000
Non-recession 2011-2013	-0.032	0.010	0.001	-0.005	0.002	0.004	0.011	0.003	0.000	0.026	0.009	0.004
Observations						64,348						
Log likelihood						-37113.073						

Note: 1) Results are in terms of marginal effects; 2) robust standard errors (standard errors are adjusted by pid cluster)

Table B.14 Multinomial Logit Model Full Results, Female Aged 50-65

	EMPLOYED			EDUCATION			UNEMPLOYED			INACTIVE		
VARIABLE	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|
White (base)												
Black	0.054	0.022	0.017	0.000	0.000	0.974	0.011	0.007	0.145	-0.065	0.019	0.001
Asian	-0.293	0.030	0.000	0.000	0.000	0.004	0.022	0.008	0.007	0.272	0.029	0.000
Others	-0.038	0.049	0.435	-0.001	0.000	0.000	0.026	0.015	0.082	0.012	0.044	0.780
No education (base)												
Higher/1stdegree	0.267	0.014	0.000	0.001	0.000	0.010	-0.023	0.004	0.000	-0.245	0.014	0.000
A level	0.214	0.017	0.000	0.000	0.000	0.613	-0.017	0.004	0.000	-0.196	0.016	0.000
GCSE/O level	0.171	0.016	0.000	0.000	0.000	0.673	-0.013	0.004	0.001	-0.158	0.015	0.000
CSE level	0.082	0.040	0.043	0.000	0.001	0.648	-0.002	0.009	0.858	-0.080	0.040	0.043
Prof qualif/Others	0.165	0.015	0.000	0.000	0.000	0.124	-0.016	0.004	0.000	-0.150	0.015	0.000
Never/not married (base)												
Married	-0.028	0.016	0.073	0.000	0.000	0.159	-0.026	0.006	0.000	0.055	0.014	0.000
Evermarried	0.024	0.016	0.129	0.000	0.000	0.929	-0.019	0.006	0.001	-0.004	0.014	0.753
Health Excellent/Good (base)												
Health Fair	-0.188	0.009	0.000	0.000	0.000	0.027	0.016	0.003	0.000	0.172	0.009	0.000
Health Poor	-0.535	0.013	0.000	0.000	0.000	0.212	0.008	0.003	0.015	0.527	0.013	0.000
Number of children												
ownchild	-0.114	0.016	0.000	0.000	0.000	0.009	0.009	0.004	0.032	0.105	0.015	0.000
Single no child (base)												
Single with child	-0.023	0.022	0.302	0.000	0.000	0.438	0.005	0.006	0.373	0.017	0.020	0.391
Couple no child	0.027	0.016	0.084	0.000	0.000	0.407	-0.006	0.005	0.207	-0.021	0.014	0.141
Couple with child	0.008	0.019	0.658	0.000	0.000	0.673	-0.020	0.005	0.000	0.011	0.018	0.520
2+ Adults	-0.004	0.015	0.783	0.000	0.000	0.729	-0.008	0.004	0.070	0.012	0.014	0.406
Other	-0.011	0.046	0.809	0.001	0.001	0.358	0.007	0.019	0.703	0.003	0.040	0.940
Owned outright (base)												
Owned mortgage	0.093	0.009	0.000	0.000	0.000	0.644	-0.003	0.002	0.149	-0.090	0.009	0.000
Local auth. rented	-0.152	0.018	0.000	0.001	0.001	0.123	0.035	0.006	0.000	0.116	0.017	0.000
Housing assoc. rented	-0.105	0.022	0.000	0.000	0.000	0.591	0.035	0.007	0.000	0.069	0.020	0.001

VARIABLE	EMPLOYED dy/dx	EMPLOYED Std Err	EMPLOYED P>|z|	EDUCATION dy/dx	EDUCATION Std Err	EDUCATION P>|z|	UNEMPLOYED dy/dx	UNEMPLOYED Std Err	UNEMPLOYED P>|z|	INACTIVE dy/dx	INACTIVE Std Err	INACTIVE P>|z|
Employer rented & other	0.071	0.033	0.029	0.000	0.000	0.000	-0.013	0.006	0.051	-0.058	0.032	0.068
Rented unfurnished	0.000	0.020	0.980	0.000	0.000	0.429	0.027	0.007	0.000	-0.028	0.017	0.110
Rented furnished	-0.087	0.036	0.014	0.000	0.000	0.902	0.054	0.016	0.001	0.033	0.031	0.287
London (base)												
North East	-0.027	0.028	0.341	-0.002	0.001	0.012	-0.008	0.008	0.315	0.036	0.026	0.162
North West	0.001	0.023	0.971	-0.001	0.001	0.225	-0.008	0.006	0.152	0.009	0.021	0.679
Yorkshire & Humber	-0.050	0.027	0.065	-0.001	0.001	0.032	-0.004	0.007	0.574	0.055	0.025	0.027
East Midlands	0.005	0.024	0.833	-0.001	0.001	0.357	-0.003	0.007	0.665	-0.001	0.022	0.957
West Midlands	0.009	0.022	0.690	0.000	0.001	0.791	-0.008	0.006	0.188	-0.001	0.020	0.964
East	0.001	0.024	0.969	-0.001	0.001	0.116	-0.021	0.006	0.000	0.021	0.023	0.359
South East	0.012	0.021	0.571	-0.001	0.001	0.514	-0.008	0.006	0.149	-0.003	0.019	0.871
South West	-0.011	0.025	0.661	0.000	0.001	0.761	-0.014	0.006	0.019	0.025	0.023	0.282
Wales	-0.031	0.024	0.199	-0.001	0.001	0.412	-0.008	0.006	0.180	0.040	0.022	0.071
Scotland	0.008	0.022	0.709	0.000	0.001	0.906	-0.013	0.006	0.036	0.004	0.020	0.839
NI & Channel Island	-0.081	0.026	0.002	-0.001	0.001	0.091	-0.017	0.006	0.005	0.099	0.025	0.000
Non-recession 1998-2000 (base)												
Recession 1991-1993	-0.100	0.018	0.000	0.000	0.000	0.604	0.008	0.005	0.107	0.091	0.017	0.000
Non-recession 1994-1997	-0.061	0.013	0.000	0.000	0.000	0.391	0.008	0.005	0.060	0.052	0.012	0.000
Recession 2001-2002	-0.036	0.010	0.000	0.000	0.000	0.478	0.003	0.004	0.409	0.034	0.010	0.001
Non-recession 2003-2004	-0.040	0.012	0.001	0.000	0.000	0.771	0.005	0.004	0.233	0.035	0.011	0.001
Recession 2005-2006	-0.035	0.013	0.008	0.000	0.000	0.504	0.003	0.004	0.444	0.032	0.012	0.009
Recession 2007-2010	-0.033	0.012	0.006	0.000	0.000	0.296	0.015	0.003	0.000	0.018	0.011	0.110
Non-recession 2011-2013	-0.041	0.013	0.002	0.000	0.000	0.525	0.018	0.004	0.000	0.022	0.012	0.074
Observations	43,368											
Log likelihood	-25002.724											

Note: 1) Results are in terms of marginal effects; 2) robust standard errors (standard errors are adjusted by pid cluster)

Table B.15 Multinomial Logit Model Full Results, North Regions

	EMPLOYED			EDUCATION			UNEMPLOYED			INACTIVE		
VARIABLE	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|
36-49 (base)												
16-19	-0.404	0.014	0.000	0.421	0.015	0.000	0.036	0.004	0.000	-0.053	0.004	0.000
20-24	-0.103	0.007	0.000	0.084	0.005	0.000	0.032	0.003	0.000	-0.013	0.004	0.002
25-35	-0.005	0.004	0.186	0.011	0.001	0.000	0.005	0.002	0.006	-0.011	0.003	0.000
50-65	-0.073	0.006	0.000	-0.006	0.001	0.000	-0.002	0.002	0.414	0.080	0.005	0.000
Female (base)												
Male	0.078	0.004	0.000	-0.001	0.000	0.001	0.027	0.002	0.000	-0.103	0.003	0.000
White (base)												
Black	-0.038	0.018	0.030	0.024	0.005	0.000	0.022	0.008	0.008	-0.008	0.012	0.541
Asian	-0.159	0.014	0.000	0.014	0.002	0.000	0.046	0.006	0.000	0.099	0.012	0.000
Others	-0.100	0.031	0.001	0.016	0.005	0.001	0.020	0.010	0.051	0.064	0.025	0.012
No education (base)												
Higher/1stdegree	0.208	0.008	0.000	0.001	0.001	0.131	-0.063	0.004	0.000	-0.147	0.007	0.000
A level	0.154	0.009	0.000	0.011	0.001	0.000	-0.056	0.004	0.000	-0.109	0.008	0.000
GCSE/O level	0.126	0.009	0.000	0.001	0.001	0.204	-0.040	0.004	0.000	-0.088	0.007	0.000
CSE level	0.090	0.015	0.000	-0.006	0.001	0.000	-0.031	0.006	0.000	-0.053	0.013	0.000
Prof qualif/Others	0.156	0.009	0.000	0.000	0.001	0.965	-0.048	0.004	0.000	-0.109	0.007	0.000
Never/not married (base)												
Married	0.040	0.005	0.000	-0.011	0.001	0.000	-0.036	0.003	0.000	0.007	0.004	0.071
Evermarried	0.042	0.007	0.000	-0.003	0.002	0.175	-0.019	0.004	0.000	-0.021	0.004	0.000
Health Excellent/Good (base)												
Health Fair	-0.129	0.004	0.000	-0.002	0.000	0.000	0.023	0.002	0.000	0.108	0.004	0.000
Health Poor	-0.425	0.010	0.000	-0.003	0.001	0.001	0.021	0.003	0.000	0.408	0.010	0.000
Number of children												
ownchild	-0.046	0.003	0.000	-0.005	0.001	0.000	0.007	0.001	0.000	0.045	0.002	0.000

	EMPLOYED			EDUCATION			UNEMPLOYED			INACTIVE		
VARIABLE	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|
Single no child (base)												
Single with child	-0.011	0.009	0.201	0.007	0.001	0.000	0.002	0.004	0.511	0.001	0.007	0.844
Couple no child	0.062	0.007	0.000	-0.005	0.001	0.000	-0.010	0.003	0.001	-0.047	0.006	0.000
Couple with child	0.034	0.008	0.000	0.006	0.001	0.000	-0.014	0.003	0.000	-0.027	0.007	0.000
2+ Adults	0.013	0.007	0.077	0.006	0.001	0.000	0.010	0.003	0.003	-0.029	0.006	0.000
Other	0.024	0.019	0.198	-0.003	0.001	0.027	0.000	0.008	0.984	-0.020	0.016	0.214
Owned outright (base)												
Owned mortgage	0.066	0.005	0.000	-0.001	0.001	0.110	-0.016	0.002	0.000	-0.049	0.004	0.000
Local auth. rented	-0.176	0.009	0.000	-0.003	0.001	0.000	0.085	0.005	0.000	0.094	0.007	0.000
Housing assoc. rented	-0.187	0.012	0.000	0.000	0.001	0.867	0.080	0.006	0.000	0.108	0.010	0.000
Employer rented & other	0.042	0.013	0.001	0.003	0.002	0.215	-0.016	0.006	0.005	-0.029	0.011	0.010
Rented unfurnished	-0.071	0.009	0.000	-0.002	0.001	0.096	0.035	0.004	0.000	0.038	0.007	0.000
Rented furnished	-0.086	0.010	0.000	0.037	0.003	0.000	0.023	0.005	0.000	0.026	0.009	0.003
Non-recession 1998-2000 (base)												
Recession 1991-1993	-0.042	0.006	0.000	-0.001	0.001	0.418	0.017	0.003	0.000	0.026	0.005	0.000
Non-recession 1994-1997	-0.039	0.005	0.000	0.002	0.001	0.065	0.009	0.003	0.001	0.028	0.004	0.000
Recession 2001-2002	-0.021	0.003	0.000	-0.001	0.001	0.230	0.003	0.002	0.150	0.019	0.003	0.000
Non-recession 2003-2004	-0.011	0.004	0.005	0.000	0.001	0.635	-0.003	0.002	0.160	0.014	0.003	0.000
Recession 2005-2006	-0.011	0.004	0.007	0.000	0.001	0.581	-0.005	0.002	0.043	0.016	0.003	0.000
Recession 2007-2010	-0.047	0.004	0.000	0.002	0.001	0.002	0.020	0.002	0.000	0.025	0.003	0.000
Non-recession 2011-2013	-0.054	0.005	0.000	0.003	0.001	0.000	0.022	0.003	0.000	0.028	0.004	0.000
Observations						169,529						
Log likelihood						-100640.54						

Note: 1) Results are in terms of marginal effects; 2) robust standard errors (standard errors are adjusted by pid cluster)

Table B.16 Multinomial Logit Model Full Results, South Regions

VARIABLE	EMPLOYED dy/dx	Std Err	P>|z|	EDUCATION dy/dx	Std Err	P>|z|	UNEMPLOYED dy/dx	Std Err	P>|z|	INACTIVE dy/dx	Std Err	P>|z|
36-49 (base)												
16-19	-0.425	0.013	0.000	0.403	0.015	0.000	0.044	0.004	0.000	-0.023	0.004	0.000
20-24	-0.122	0.006	0.000	0.075	0.004	0.000	0.038	0.003	0.000	0.009	0.004	0.023
25-35	-0.030	0.003	0.000	0.009	0.001	0.000	0.007	0.002	0.000	0.013	0.002	0.000
50-65	-0.050	0.004	0.000	-0.004	0.001	0.000	0.005	0.002	0.014	0.049	0.004	0.000
Female (base)												
Male	0.098	0.004	0.000	-0.001	0.000	0.023	0.024	0.002	0.000	-0.121	0.003	0.000
White (base)												
Black	-0.037	0.006	0.000	0.019	0.002	0.000	0.038	0.004	0.000	-0.020	0.003	0.000
Asian	-0.110	0.007	0.000	0.014	0.001	0.000	0.046	0.004	0.000	0.050	0.005	0.000
Others	-0.069	0.013	0.000	0.015	0.003	0.000	0.040	0.008	0.000	0.014	0.009	0.103
No education (base)												
Higher/1stdegree	0.191	0.008	0.000	-0.0003	0.001	0.701	-0.063	0.004	0.000	-0.128	0.007	0.000
A level	0.155	0.009	0.000	0.009	0.001	0.000	-0.056	0.004	0.000	-0.107	0.007	0.000
GCSE/O level	0.128	0.009	0.000	0.001	0.001	0.065	-0.044	0.004	0.000	-0.086	0.007	0.000
CSE level	0.123	0.013	0.000	-0.007	0.001	0.000	-0.043	0.006	0.000	-0.073	0.010	0.000
Prof qualif/Others	0.138	0.009	0.000	-0.002	0.001	0.084	-0.043	0.004	0.000	-0.093	0.007	0.000
Never/not married (base)												
Married	0.021	0.004	0.000	-0.013	0.001	0.000	-0.032	0.002	0.000	0.024	0.003	0.000
Evermarried	0.024	0.006	0.000	-0.006	0.002	0.003	-0.012	0.004	0.000	-0.006	0.004	0.128
Health Excellent/Good (base)												
Health Fair	-0.084	0.004	0.000	-0.001	0.000	0.002	0.025	0.002	0.000	0.061	0.003	0.000
Health Poor	-0.352	0.011	0.000	-0.0003	0.001	0.755	0.029	0.004	0.000	0.324	0.011	0.000
Number of children												
ownchild	-0.038	0.002	0.000	-0.006	0.001	0.000	0.007	0.001	0.000	0.037	0.001	0.000

	EMPLOYED			EDUCATION			UNEMPLOYED			INACTIVE		
VARIABLE	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|
Single no child (base)												
Single with child	-0.040	0.009	0.000	0.012	0.001	0.000	0.014	0.004	0.002	0.014	0.007	0.044
Couple no child	0.060	0.007	0.000	-0.004	0.001	0.000	-0.014	0.003	0.000	-0.042	0.006	0.000
Couple with child	0.016	0.007	0.026	0.008	0.001	0.000	-0.017	0.003	0.000	-0.007	0.006	0.229
2+ Adults	0.019	0.007	0.005	0.005	0.001	0.000	0.001	0.003	0.652	-0.025	0.006	0.000
Other	0.012	0.016	0.443	-0.003	0.001	0.014	0.000	0.008	0.980	-0.009	0.013	0.471
Owned outright (base)												
Owned mortgage	0.062	0.005	0.000	-0.002	0.001	0.005	-0.019	0.002	0.000	-0.041	0.004	0.000
Local auth. rented	-0.127	0.009	0.000	-0.003	0.001	0.001	0.070	0.005	0.000	0.059	0.007	0.000
Housing assoc. rented	-0.109	0.009	0.000	-0.002	0.001	0.014	0.060	0.005	0.000	0.051	0.007	0.000
Employer rented & other	0.059	0.009	0.000	0.001	0.002	0.419	-0.022	0.005	0.000	-0.039	0.007	0.000
Rented unfurnished	-0.007	0.007	0.267	-0.003	0.001	0.001	0.009	0.004	0.012	0.001	0.005	0.843
Rented furnished	-0.039	0.007	0.000	0.031	0.002	0.000	0.015	0.004	0.000	-0.006	0.006	0.267
Non-recession 1998-2000 (base)												
Recession 1991-1993	-0.055	0.005	0.000	0.000	0.001	0.899	0.036	0.003	0.000	0.019	0.003	0.000
Non-recession 1994-1997	-0.034	0.003	0.000	0.003	0.001	0.000	0.017	0.002	0.000	0.014	0.002	0.000
Recession 2001-2002	-0.006	0.003	0.067	0.000	0.001	0.921	-0.002	0.002	0.356	0.008	0.002	0.001
Non-recession 2003-2004	-0.016	0.004	0.000	0.000	0.001	0.876	0.003	0.003	0.267	0.013	0.003	0.000
Recession 2005-2006	-0.023	0.005	0.000	0.002	0.001	0.057	0.008	0.003	0.008	0.014	0.003	0.000
Recession 2007-2010	-0.069	0.004	0.000	0.004	0.001	0.000	0.033	0.002	0.000	0.033	0.003	0.000
Non-recession 2011-2013	-0.063	0.004	0.000	0.004	0.001	0.000	0.029	0.002	0.000	0.029	0.003	0.000
Observations						172,145						
Log likelihood						-100608.590						

Note: 1) Results are in terms of marginal effects; 2) robust standard errors (standard errors are adjusted by pid cluster)

Appendix C
Detailed Results of the First-order Markov Models

C.1 Empirical Results

Table C.1 Random Effect Probit Models for the Full Sample

	Employment			Education			Unemployment			Inactivity		
	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|
Labour Market Status (t-1)												
Employment (base)												
Education (Edu)	-0.395	0.010	0.000	0.196	0.011	0.000	0.035	0.004	0.000	0.029	0.006	0.000
Unemployment (U)	-0.312	0.007	0.000	0.017	0.002	0.000	0.174	0.007	0.000	0.137	0.005	0.000
Inactive (I)	-0.524	0.006	0.000	0.006	0.001	0.000	0.014	0.002	0.000	0.428	0.007	0.000
36-49 (base)												
16-19	-0.096	0.009	0.000	0.020	0.005	0.000	-0.014	0.003	0.000	0.000	0.006	0.953
20-24	-0.035	0.005	0.000	0.003	0.003	0.304	-0.003	0.003	0.362	0.018	0.004	0.000
25-35	-0.009	0.003	0.001	-0.002	0.002	0.170	-0.004	0.002	0.025	0.016	0.002	0.000
50-65	-0.023	0.003	0.000	-0.003	0.002	0.098	0.008	0.003	0.001	0.013	0.002	0.000
Female (base)												
Male	0.023	0.002	0.000	-0.004	0.001	0.000	0.019	0.001	0.000	-0.048	0.002	0.000
White (base)												
Black	-0.006	0.007	0.377	0.008	0.002	0.002	0.003	0.004	0.463	-0.014	0.006	0.019
Asian	-0.033	0.006	0.000	0.009	0.002	0.000	0.012	0.004	0.003	0.007	0.005	0.196
Others	-0.031	0.011	0.005	0.013	0.004	0.001	0.014	0.007	0.037	0.007	0.009	0.462
No education (base)												
Higher/1stdegree	0.050	0.004	0.000	0.008	0.001	0.000	-0.017	0.003	0.000	-0.025	0.003	0.000
A level	-0.003	0.004	0.485	0.025	0.002	0.000	-0.019	0.003	0.000	-0.011	0.004	0.002
GCSE/O level	-0.004	0.005	0.443	0.022	0.002	0.000	-0.012	0.004	0.001	-0.007	0.004	0.047
CSE level	-0.017	0.007	0.020	0.019	0.004	0.000	-0.011	0.005	0.031	0.000	0.006	1.000
Prof qualif/Others	0.001	0.006	0.889	0.038	0.005	0.000	-0.019	0.004	0.000	-0.015	0.004	0.000

	Employment			Education			Unemployment			Inactivity		
	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|
Never/not married (base)												
Married	-0.001	0.003	0.788	-0.005	0.001	0.000	-0.012	0.002	0.000	0.020	0.003	0.000
Evermarried	0.001	0.005	0.889	-0.001	0.003	0.624	-0.001	0.004	0.809	0.009	0.004	0.035
Health Excellent/Good (base)												
Health Fair	-0.015	0.002	0.000	-0.003	0.001	0.001	0.004	0.002	0.006	0.018	0.002	0.000
Health Poor	-0.084	0.004	0.000	-0.003	0.002	0.085	-0.004	0.002	0.125	0.077	0.003	0.000
Number of children												
ownchild	-0.010	0.001	0.000	0.001	0.001	0.119	-0.003	0.001	0.003	0.010	0.001	0.000
Single no child (base)												
Single with child	-0.005	0.004	0.199	0.003	0.002	0.046	0.003	0.003	0.218	0.008	0.003	0.010
Couple no child	0.024	0.004	0.000	-0.006	0.002	0.001	-0.003	0.002	0.235	-0.008	0.003	0.012
Couple with child	0.001	0.004	0.900	0.001	0.002	0.690	-0.002	0.003	0.405	0.012	0.004	0.002
2+ Adults	-0.001	0.005	0.858	-0.001	0.002	0.576	0.001	0.003	0.770	0.001	0.004	0.731
Other	0.009	0.008	0.279	-0.005	0.003	0.092	0.003	0.006	0.613	0.011	0.007	0.095
Owned outright (base)												
Owned mortgage	0.018	0.002	0.000	-0.001	0.001	0.233	-0.008	0.002	0.000	-0.011	0.002	0.000
Local auth. rented	-0.024	0.004	0.000	-0.002	0.001	0.106	0.018	0.003	0.000	0.010	0.003	0.001
Housing assoc. rented	-0.014	0.005	0.005	-0.005	0.002	0.011	0.012	0.004	0.001	0.011	0.004	0.009
Employer rented & other	0.031	0.008	0.000	-0.004	0.003	0.170	-0.019	0.004	0.000	0.000	0.007	0.978
Rented unfurnished	0.003	0.005	0.569	-0.002	0.002	0.372	0.000	0.004	0.946	0.005	0.005	0.247
Rented furnished	-0.026	0.007	0.000	0.011	0.003	0.000	-0.005	0.004	0.162	0.002	0.006	0.730
London (base)												
North East	-0.009	0.006	0.135	0.001	0.002	0.535	0.002	0.003	0.524	0.002	0.005	0.695
North West	-0.006	0.005	0.222	0.001	0.002	0.774	0.002	0.003	0.478	0.001	0.004	0.761
Yorkshire & Humber	-0.005	0.006	0.421	-0.0002	0.002	0.943	0.002	0.003	0.514	0.0002	0.005	0.971
East Midlands	-0.001	0.006	0.935	-0.004	0.002	0.126	0.002	0.004	0.560	0.001	0.006	0.894
West Midlands	0.004	0.007	0.536	-0.003	0.003	0.263	0.003	0.005	0.507	-0.006	0.007	0.346

	Employment			Education			Unemployment			Inactivity		
	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|
East	0.0003	0.008	0.971	-0.003	0.003	0.315	-0.003	0.005	0.526	0.006	0.007	0.448
South East	0.011	0.010	0.244	-0.003	0.004	0.374	0.002	0.006	0.748	-0.011	0.009	0.227
South West	0.007	0.011	0.542	-0.003	0.004	0.435	-0.002	0.007	0.734	-0.001	0.010	0.890
Wales	-0.0002	0.012	0.984	-0.006	0.004	0.178	0.004	0.008	0.640	0.000	0.011	0.999
Scotland	-0.002	0.013	0.902	-0.001	0.005	0.771	0.005	0.009	0.614	-0.005	0.012	0.669
NI & Channel Island	-0.013	0.016	0.411	-0.005	0.005	0.349				-0.002	0.014	0.905
Non-recession 1998-2000 (base)												
Recession 1991-1993	-0.029	0.003	0.000	0.011	0.002	0.000	0.024	0.003	0.000	-0.002	0.002	0.418
Non-recession 1994-1997	-0.014	0.002	0.000	0.004	0.002	0.005	0.011	0.002	0.000	0.000	0.002	0.920
Recession 2001-2002	-0.002	0.002	0.484	-0.003	0.001	0.014	-0.001	0.002	0.685	0.004	0.002	0.049
Non-recession 2003-2004	-0.003	0.003	0.182	-0.003	0.001	0.053	-0.001	0.002	0.651	0.005	0.002	0.011
Recession 2005-2007	-0.003	0.003	0.317	-0.004	0.002	0.007	-0.004	0.002	0.029	0.010	0.002	0.000
Recession 2007-2010	-0.007	0.003	0.011	-0.006	0.002	0.000	0.001	0.002	0.628	0.011	0.002	0.000
Non-recession 2011-2013	-0.014	0.004	0.000	-0.011	0.002	0.000	0.008	0.003	0.007	0.012	0.003	0.000
Initial Condition												
Initial Labour Market	0.088	0.003	0.000	0.005	0.001	0.000	0.043	0.003	0.000	0.069	0.003	0.000
Initial Age	-0.004	0.001	0.000	0.000	0.000	0.821	0.001	0.000	0.001	0.002	0.000	0.000
Averages of all time-varying covariates[3)]		Yes			Yes			Yes			Yes	
Year-entry dummies		Yes			Yes			Yes			Yes	
Observation		148,874			148,874			148,874			148,874	
Log-likelihood		-33610.644			-8028.774			-19157.993			-23077.059	
lnsig2u	-0.935	0.046		-1.545	0.129		-1.193	0.062		-0.763	0.051	
sigma_u	0.627	0.014		0.462	0.030		0.551	0.017		0.683	0.017	
rho	0.282	0.009		0.176	0.019		0.233	0.011		0.318	0.011	

Note: 1) Results are in terms of marginal effects; 2) Standard errors are robust standard errors; 3) Including the within-individual average of age, education, marital and health status, household type, household tenure, number of children, and region.

Table C.2 Random Effect Probit Models for the 1991 Panel Sample

	Employment			Education			Unemployment			Inactivity		
	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|
Labour Market Status (t-1)												
Employment (base)												
Education (Edu)	-0.437	0.016	0.000	0.211	0.018	0.000	0.050	0.008	0.000	0.027	0.008	0.001
Unemployment (U)	-0.324	0.010	0.000	0.013	0.002	0.000	0.183	0.010	0.000	0.124	0.007	0.000
Inactive (I)	-0.550	0.009	0.000	0.003	0.001	0.018	0.004	0.002	0.072	0.458	0.009	0.000
36-49 (base)												
16-19	-0.095	0.015	0.000	0.022	0.008	0.005	-0.008	0.005	0.101	-0.013	0.011	0.254
20-24	-0.036	0.007	0.000	0.003	0.003	0.334	0.001	0.004	0.782	0.013	0.006	0.034
25-35	-0.012	0.004	0.000	-0.001	0.002	0.444	-0.002	0.002	0.402	0.017	0.003	0.000
50-65	-0.023	0.004	0.000	-0.004	0.001	0.001	0.007	0.003	0.019	0.016	0.003	0.000
Female (base)												
Male	0.024	0.003	0.000	-0.001	0.001	0.059	0.016	0.002	0.000	-0.048	0.002	0.000
White (base)												
Black	-0.004	0.010	0.667	0.008	0.003	0.007	0.006	0.006	0.335	-0.018	0.007	0.010
Asian	-0.016	0.009	0.063	0.007	0.003	0.023	0.020	0.006	0.001	-0.011	0.007	0.115
Others	-0.017	0.014	0.222	0.012	0.005	0.031	0.011	0.008	0.191	0.001	0.012	0.953
No education (base)												
Higher/1stdegree	0.037	0.005	0.000	0.005	0.001	0.000	-0.014	0.004	0.000	-0.016	0.004	0.000
A level	-0.011	0.006	0.055	0.017	0.002	0.000	-0.017	0.004	0.000	-0.004	0.005	0.367
GCSE/O level	-0.009	0.006	0.121	0.014	0.003	0.000	-0.012	0.005	0.008	-0.002	0.005	0.737
CSE level	-0.026	0.009	0.007	0.017	0.005	0.000	-0.011	0.006	0.069	0.000	0.007	0.990
Prof qualif/Others	-0.005	0.007	0.496	0.030	0.006	0.000	-0.019	0.005	0.000	-0.010	0.006	0.082

	Employment			Education			Unemployment			Inactivity		
	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|
Never/not married (base)												
Married	-0.006	0.004	0.176	-0.002	0.001	0.197	-0.012	0.003	0.000	0.023	0.004	0.000
Evermarried	-0.005	0.007	0.480	0.000	0.002	0.947	0.004	0.005	0.418	0.009	0.005	0.099
Health Excellent/Good (base)												
Health Fair	-0.015	0.003	0.000	-0.001	0.001	0.352	0.004	0.002	0.050	0.017	0.002	0.000
Health Poor	-0.085	0.005	0.000	-0.002	0.002	0.276	0.000	0.003	0.906	0.078	0.005	0.000
Number of children												
ownchild	-0.008	0.002	0.000	0.001	0.001	0.156	-0.003	0.001	0.013	0.009	0.001	0.000
Single no child (base)												
Single with child	-0.013	0.005	0.012	0.001	0.002	0.691	0.006	0.003	0.039	0.013	0.004	0.003
Couple no child	0.015	0.005	0.003	-0.004	0.002	0.018	0.003	0.003	0.302	-0.008	0.004	0.069
Couple with child	-0.006	0.006	0.255	-0.001	0.002	0.500	0.005	0.003	0.108	0.011	0.005	0.022
2+ Adults	-0.010	0.007	0.141	0.004	0.003	0.086	-0.002	0.004	0.610	0.005	0.006	0.423
Other	-0.003	0.011	0.784	-0.004	0.003	0.250	0.011	0.008	0.140	0.008	0.009	0.332
Owned outright (base)												
Owned mortgage	0.019	0.003	0.000	-0.001	0.001	0.267	-0.006	0.002	0.002	-0.012	0.003	0.000
Local auth. rented	-0.021	0.005	0.000	-0.001	0.002	0.586	0.014	0.003	0.000	0.012	0.004	0.006
Housing assoc. rented	-0.021	0.007	0.004	-0.002	0.002	0.248	0.010	0.005	0.048	0.021	0.006	0.001
Employer rented & other	0.028	0.011	0.013	-0.003	0.003	0.383	-0.018	0.005	0.000	0.005	0.011	0.638
Rented unfurnished	0.002	0.007	0.816	-0.002	0.002	0.354	-0.003	0.005	0.581	0.012	0.007	0.073
Rented furnished	-0.035	0.009	0.000	0.009	0.003	0.003	-0.002	0.005	0.622	0.005	0.009	0.553
London (base)												
North East	-0.005	0.007	0.446	0.002	0.002	0.469	0.001	0.004	0.834	0.002	0.006	0.700
North West	-0.008	0.006	0.198	0.000	0.002	0.932	0.002	0.003	0.631	0.005	0.005	0.354
Yorkshire & Humber	-0.003	0.007	0.620	0.000	0.002	0.944	0.001	0.004	0.715	-0.002	0.006	0.771
East Midlands	-0.005	0.007	0.503	-0.002	0.002	0.399	0.003	0.004	0.444	0.001	0.007	0.862
West Midlands	0.002	0.008	0.771	-0.002	0.002	0.336	0.003	0.005	0.545	-0.008	0.008	0.282

			Employment				Education		Unemployment		Inactivity	
	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|
East	-0.001	0.009	0.886	-0.004	0.002	0.138	0.000	0.006	0.936	0.003	0.009	0.768
South East	0.010	0.011	0.341	-0.001	0.003	0.739	0.004	0.007	0.572	-0.015	0.010	0.138
South West	0.004	0.013	0.726	0.000	0.003	0.893	0.002	0.008	0.810	-0.009	0.011	0.415
Wales	-0.001	0.014	0.950	-0.005	0.003	0.137	0.008	0.010	0.392	-0.008	0.013	0.541
Scotland	0.002	0.015	0.917	0.000	0.004	0.988	0.004	0.010	0.718	-0.012	0.014	0.388
NI & Channel Island	-0.109	0.075	0.146							0.146	0.064	0.024
Non-recession 1998-2000 (base)												
Recession 1991-1993	-0.028	0.004	0.000	0.006	0.002	0.000	0.019	0.003	0.000	-0.001	0.003	0.812
Non-recession 1994-1997	-0.015	0.003	0.000	0.002	0.001	0.113	0.010	0.002	0.000	0.001	0.002	0.486
Recession 2001-2002	-0.002	0.003	0.601	-0.002	0.001	0.261	-0.001	0.002	0.801	0.004	0.003	0.166
Non-recession 2003-2004	-0.006	0.003	0.094	-0.002	0.002	0.150	0.002	0.002	0.531	0.006	0.003	0.019
Recession 2005-2007	-0.004	0.004	0.265	-0.006	0.002	0.000	0.001	0.002	0.765	0.009	0.003	0.005
Recession 2007-2010	-0.006	0.004	0.083	-0.005	0.002	0.001	0.005	0.003	0.087	0.009	0.003	0.003
Non-recession 2011-2013	-0.015	0.005	0.007	-0.007	0.002	0.000	0.013	0.004	0.002	0.009	0.005	0.068
Initial Condition												
Initial Labour Market	0.067	0.004	0.000	0.001	0.001	0.288	0.036	0.004	0.000	0.060	0.004	0.000
Initial Age	-0.005	0.001	0.000	0.000	0.000	0.408	0.001	0.000	0.001	0.003	0.000	0.000
Averages of all time-varying covariates[3)]		Yes			Yes			Yes			Yes	
Year-entry dummies		Yes			Yes			Yes			Yes	
Observation		80,206			80,206			80,206			80,206	
Log-likelihood		-17476.928			-3026.574			-9533.014			-12023.051	
lnsig2u	-1.049	0.062		-1.670	0.199		-1.476	0.090		-0.850	0.070	
sigma_u	0.592	0.018		0.434	0.043		0.478	0.022		0.654	0.023	
rho	0.259	0.012		0.158	0.026		0.186	0.014		0.299	0.015	

Note: 1) Results are in terms of marginal effects; 2) Standard errors are robust standard errors; 3) Including the within-individual average of age, education, marital and health status, household type, household tenure, number of children, and region.

Table C.3 The Binary Probit Models for the Full Sample

	Employment			Education			Unemployment			Inactivity		
	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|
Labour Market Status (t-1)												
Employment (base)												
Education (Edu)	-0.550	0.010	0.000	0.264	0.011	0.000	0.036	0.004	0.000	0.032	0.005	0.000
Unemployment (U)	-0.486	0.008	0.000	0.018	0.002	0.000	0.286	0.007	0.000	0.150	0.005	0.000
Inactive (I)	-0.726	0.005	0.000	0.005	0.001	0.000	0.017	0.002	0.000	0.632	0.006	0.000
36-49 (base)												
16-19	-0.088	0.007	0.000	0.055	0.005	0.000	-0.005	0.003	0.080	-0.027	0.005	0.000
20-24	-0.029	0.003	0.000	0.019	0.002	0.000	0.008	0.002	0.001	-0.008	0.003	0.002
25-35	-0.005	0.002	0.003	0.005	0.001	0.000	0.002	0.001	0.130	0.001	0.001	0.726
50-65	-0.023	0.002	0.000	-0.008	0.001	0.000	0.002	0.002	0.213	0.023	0.002	0.000
Female (base)												
Male	0.021	0.002	0.000	-0.003	0.001	0.000	0.019	0.001	0.000	-0.046	0.002	0.000
White (base)												
Black	-0.007	0.006	0.213	0.007	0.002	0.002	0.004	0.004	0.385	-0.010	0.005	0.043
Asian	-0.031	0.005	0.000	0.008	0.002	0.000	0.015	0.004	0.000	0.004	0.004	0.332
Others	-0.030	0.010	0.004	0.012	0.004	0.002	0.016	0.007	0.030	0.002	0.008	0.760
No education (base)												
Higher/1stdegree	0.053	0.003	0.000	0.005	0.001	0.000	-0.016	0.002	0.000	-0.029	0.002	0.000
A level	0.022	0.003	0.000	0.015	0.001	0.000	-0.016	0.002	0.000	-0.014	0.002	0.000
GCSE/O level	0.027	0.003	0.000	0.007	0.001	0.000	-0.007	0.002	0.000	-0.013	0.002	0.000
CSE level	0.022	0.005	0.000	-0.001	0.002	0.690	-0.006	0.003	0.088	-0.004	0.004	0.226
Prof qualif/Others	0.036	0.003	0.000	0.009	0.001	0.000	-0.012	0.002	0.000	-0.019	0.002	0.000

	Employment			Education			Unemployment			Inactivity		
	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|
Never/not married (base)												
Married	0.010	0.002	0.000	-0.006	0.001	0.000	-0.015	0.002	0.000	0.011	0.002	0.000
Evermarried	0.012	0.003	0.000	-0.003	0.002	0.072	-0.002	0.002	0.337	-0.005	0.002	0.027
Health Excellent/Good (base)												
Health Fair	-0.032	0.002	0.000	-0.003	0.001	0.002	0.008	0.001	0.000	0.031	0.002	0.000
Health Poor	-0.122	0.004	0.000	-0.001	0.001	0.336	-0.0003	0.002	0.869	0.109	0.003	0.000
Number of children												
ownchild	-0.009	0.001	0.000	-0.001	0.001	0.077	-0.001	0.001	0.176			
Single no child (base)										-0.015	0.003	0.000
Single with child	0.001	0.004	0.828	0.003	0.001	0.021	0.003	0.002	0.188	-0.002	0.003	0.548
Couple no child	0.023	0.003	0.000	-0.004	0.001	0.003	-0.002	0.002	0.277	-0.010	0.003	0.002
Couple with child	0.007	0.003	0.033	0.002	0.001	0.108	-0.003	0.002	0.258	-0.005	0.006	0.392
2+ Adults	0.005	0.004	0.212	0.001	0.002	0.405	0.0003	0.003	0.906			
Other	0.010	0.007	0.133	-0.003	0.003	0.282	0.005	0.005	0.364			
Owned outright (base)										0.008	0.002	0.001
Owned mortgage	0.017	0.002	0.000	-0.001	0.001	0.597	-0.005	0.001	0.000	0.006	0.003	0.045
Local auth. rented	-0.038	0.003	0.000	-0.001	0.001	0.319	0.029	0.002	0.000	-0.008	0.006	0.222
Housing assoc. rented	-0.028	0.004	0.000	-0.003	0.002	0.053	0.026	0.003	0.000	0.000	0.003	0.941
Employer rented & other	0.019	0.007	0.008	-0.001	0.003	0.655	-0.010	0.004	0.016	-0.006	0.004	0.154
Rented unfurnished	-0.012	0.004	0.002	0.001	0.002	0.559	0.014	0.003	0.000			
Rented furnished	-0.039	0.005	0.000	0.016	0.002	0.000	0.009	0.003	0.007	0.010	0.001	0.000
London (base)												
North East	-0.006	0.005	0.195	0.001	0.002	0.722	0.002	0.003	0.538	0.003	0.004	0.401
North West	-0.005	0.004	0.217	0.001	0.002	0.469	0.002	0.003	0.517	0.003	0.003	0.437
Yorkshire & Humber	-0.003	0.004	0.470	0.001	0.002	0.581	0.001	0.003	0.774	0.002	0.003	0.471
East Midlands	-0.001	0.004	0.853	-0.002	0.002	0.299	0.001	0.003	0.841	0.003	0.003	0.333
West Midlands	0.003	0.004	0.398	-0.0002	0.002	0.905	0.0003	0.003	0.914	-0.002	0.003	0.640

	Employment			Education			Unemployment			Inactivity		
	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|
East	-0.002	0.004	0.546	-0.001	0.002	0.755	-0.004	0.003	0.132	0.008	0.004	0.018
South East	0.004	0.004	0.297	0.001	0.002	0.510	0.000	0.003	0.999	-0.003	0.003	0.375
South West	0.001	0.004	0.855	0.001	0.002	0.477	-0.005	0.003	0.080	0.006	0.003	0.101
Wales	-0.004	0.004	0.296	-0.001	0.002	0.587	-0.001	0.003	0.829	0.008	0.003	0.027
Scotland	-0.003	0.004	0.437	0.004	0.002	0.004	-0.002	0.003	0.575	0.003	0.003	0.432
NI & Channel Island	-0.016	0.006	0.014	0.002	0.002	0.480	0.003	0.005	0.588	0.009	0.005	0.100
Non-recession 1998-2000 (base)												
Recession 1991-1993	-0.032	0.003	0.000	0.004	0.002	0.009	0.022	0.002	0.000	0.009	0.002	0.000
Non-recession 1994-1997	-0.015	0.002	0.000	0.001	0.001	0.300	0.008	0.002	0.000	0.006	0.002	0.000
Recession 2001-2002	-0.002	0.002	0.348	-0.002	0.001	0.133	0.0002	0.002	0.894	0.002	0.002	0.283
Non-recession 2003-2004	-0.003	0.002	0.178	-0.0004	0.001	0.795	0.001	0.002	0.757	0.001	0.002	0.627
Recession 2005-2007	-0.003	0.003	0.278	-0.001	0.001	0.688	-0.002	0.002	0.222	0.003	0.002	0.145
Recession 2007-2010	-0.005	0.002	0.032	-0.002	0.001	0.159	0.005	0.002	0.014	0.001	0.002	0.581
Non-recession 2011-2013	-0.005	0.003	0.086	-0.008	0.002	0.000	0.012	0.002	0.000	-0.001	0.002	0.609
Year-entry dummies		Yes			Yes			Yes			Yes	
Observation		148,874			148,874			148,874			148,874	
Log-likelihood		-34882.096			-8248.619			-19715.615			-24114.181	

Note: 1) Results are in terms of marginal effects; 2) Standard errors are robust standard errors.

Table C.4 The Binary Probit Models for the 1991 Panel Sample

	Employment			Education			Unemployment			Inactivity		
	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|
Labour Market Status (t-1)												
Employment (base)												
Education (Edu)	-0.558	0.016	0.000	0.265	0.018	0.000	0.052	0.007	0.000	0.033	0.008	0.000
Unemployment (U)	-0.474	0.012	0.000	0.014	0.002	0.000	0.284	0.011	0.000	0.139	0.007	0.000
Inactive (I)	-0.727	0.007	0.000	0.003	0.001	0.008	0.007	0.002	0.000	0.649	0.009	0.000
36-49 (base)												
16-19	-0.079	0.011	0.000	0.041	0.007	0.000	-0.002	0.005	0.611	-0.030	0.009	0.001
20-24	-0.027	0.005	0.000	0.010	0.002	0.000	0.007	0.003	0.022	-0.007	0.004	0.058
25-35	-0.008	0.002	0.001	0.002	0.001	0.058	0.002	0.002	0.350	0.004	0.002	0.040
50-65	-0.023	0.003	0.000	-0.006	0.001	0.000	0.004	0.002	0.058	0.022	0.002	0.000
Female (base)												
Male	0.022	0.002	0.000	-0.001	0.001	0.067	0.017	0.002	0.000	-0.046	0.002	0.000
White (base)												
Black	-0.009	0.009	0.324	0.008	0.003	0.008	0.007	0.006	0.231	-0.011	0.006	0.060
Asian	-0.020	0.007	0.003	0.006	0.003	0.025	0.021	0.006	0.000	-0.005	0.005	0.375
Others	-0.022	0.014	0.105	0.011	0.005	0.035	0.013	0.009	0.147	-0.001	0.009	0.907
No education (base)												
Higher/1stdegree	0.040	0.004	0.000	0.004	0.001	0.014	-0.013	0.003	0.000	-0.023	0.003	0.000
A level	0.016	0.004	0.000	0.012	0.001	0.000	-0.012	0.003	0.000	-0.011	0.003	0.001
GCSE/O level	0.022	0.004	0.000	0.004	0.001	0.001	-0.006	0.003	0.010	-0.011	0.003	0.000
CSE level	0.013	0.006	0.020	0.002	0.002	0.271	-0.004	0.004	0.338	-0.004	0.005	0.343
Prof qualif/Others	0.028	0.003	0.000	0.007	0.001	0.000	-0.010	0.002	0.000	-0.016	0.003	0.000

	Employment			Education			Unemployment			Inactivity		
	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|
Never/not married (base)												
Married	0.006	0.003	0.061	-0.003	0.001	0.011	-0.016	0.002	0.000	0.013	0.003	0.000
Evermarried	0.009	0.004	0.031	-0.001	0.002	0.368	0.001	0.003	0.735	-0.006	0.003	0.082
Health Excellent/Good (base)												
Health Fair	-0.029	0.003	0.000	-0.001	0.001	0.542	0.007	0.002	0.000	0.026	0.002	0.000
Health Poor	-0.116	0.005	0.000	-0.001	0.001	0.495	0.003	0.002	0.168	0.105	0.005	0.000
Number of children												
ownchild	-0.008	0.001	0.000	0.000	0.001	0.496	-0.001	0.001	0.258	0.009	0.001	0.000
Single no child (base)												
Single with child	-0.006	0.005	0.224	0.001	0.002	0.595	0.006	0.003	0.058	0.007	0.004	0.080
Couple no child	0.017	0.005	0.000	-0.004	0.002	0.015	0.002	0.003	0.515	-0.014	0.004	0.001
Couple with child	0.004	0.005	0.391	-0.001	0.002	0.531	0.002	0.003	0.437	0.000	0.004	0.936
2+ Adults	-0.002	0.006	0.699	0.005	0.002	0.023	-0.005	0.004	0.126	-0.001	0.005	0.863
Other	0.005	0.009	0.588	-0.003	0.003	0.281	0.009	0.007	0.180	-0.006	0.008	0.400
Owned outright (base)												
Owned mortgage	0.018	0.003	0.000	-0.001	0.001	0.570	-0.002	0.002	0.165	-0.017	0.002	0.000
Local auth. rented	-0.036	0.005	0.000	0.000	0.001	0.900	0.028	0.003	0.000	0.005	0.003	0.113
Housing assoc. rented	-0.032	0.006	0.000	-0.001	0.002	0.643	0.028	0.005	0.000	0.005	0.004	0.231
Employer rented & other	0.021	0.009	0.023	0.000	0.003	0.985	-0.007	0.005	0.156	-0.014	0.008	0.095
Rented unfurnished	-0.008	0.006	0.162	0.000	0.002	0.875	0.014	0.004	0.001	-0.003	0.004	0.434
Rented furnished	-0.039	0.007	0.000	0.013	0.003	0.000	0.013	0.005	0.006	-0.013	0.006	0.027
London (base)												
North East	-0.004	0.005	0.503	0.001	0.002	0.679	0.000	0.004	0.919	0.004	0.004	0.415
North West	-0.006	0.005	0.218	0.000	0.001	0.986	0.001	0.003	0.835	0.005	0.004	0.162
Yorkshire & Humber	-0.002	0.005	0.667	0.001	0.002	0.654	-0.001	0.003	0.703	0.003	0.004	0.421
East Midlands	-0.004	0.005	0.423	-0.001	0.002	0.743	0.000	0.003	0.932	0.006	0.004	0.140
West Midlands	0.002	0.005	0.721	-0.001	0.002	0.747	-0.001	0.003	0.663	0.001	0.004	0.779

	Employment			Education			Unemployment			Inactivity		
	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|
East	-0.002	0.005	0.608	-0.002	0.002	0.165	-0.003	0.003	0.301	0.009	0.004	0.029
South East	0.002	0.004	0.625	0.001	0.002	0.468	-0.001	0.003	0.824	0.000	0.004	0.907
South West	-0.001	0.005	0.815	0.003	0.002	0.078	-0.004	0.003	0.229	0.005	0.004	0.179
Wales	-0.005	0.006	0.329	-0.002	0.002	0.184	-0.001	0.004	0.744	0.011	0.005	0.022
Scotland	-0.001	0.005	0.788	0.004	0.002	0.025	-0.006	0.003	0.090	0.006	0.004	0.175
NI & Channel Island	-0.063	0.048	0.193							0.115	0.052	0.026
Non-recession 1998-2000 (base)												
Recession 1991-1993	-0.032	0.003	0.000	0.003	0.001	0.030	0.019	0.002	0.000	0.010	0.002	0.000
Non-recession 1994-1997	-0.016	0.002	0.000	0.000	0.001	0.859	0.009	0.002	0.000	0.007	0.002	0.000
Recession 2001-2002	-0.003	0.003	0.386	-0.001	0.001	0.644	0.000	0.002	0.950	0.002	0.003	0.358
Non-recession 2003-2004	-0.005	0.003	0.134	-0.001	0.002	0.395	0.002	0.002	0.285	0.003	0.002	0.284
Recession 2005-2007	-0.003	0.003	0.347	-0.005	0.002	0.005	0.002	0.002	0.417	0.003	0.003	0.270
Recession 2007-2010	-0.004	0.003	0.198	-0.004	0.002	0.013	0.007	0.002	0.004	0.001	0.003	0.748
Non-recession 2011-2013	-0.006	0.005	0.212	-0.006	0.002	0.000	0.017	0.004	0.000	-0.003	0.004	0.406
Observation		80,206			80,206			80,206			80,206	
Log-likelihood		-18133.094			-3133.932			-9797.095			-12572.622	

Note: 1) Results are in terms of marginal effects; 2) Standard errors are robust standard errors.

Table C.5 Random Effect Probit Models for the Full Sample, Youths

	Employment			Education			Unemployment			Inactivity		
	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|
Labour Market Status (t-1)												
Employment (base)												
Education (Edu)	-0.400	0.014	0.000	0.362	0.014	0.000	0.029	0.007	0.000	-0.004	0.005	0.408
Unemployment (U)	-0.269	0.017	0.000	0.049	0.012	0.000	0.168	0.015	0.000	0.059	0.008	0.000
Inactive (I)	-0.434	0.021	0.000	0.001	0.018	0.965	0.030	0.013	0.020	0.272	0.027	0.000
16-19 (base)												
20-24	0.023	0.011	0.041	-0.017	0.010	0.083	0.012	0.008	0.155	0.000	0.006	0.983
Female (base)												
Male	0.016	0.007	0.032	-0.017	0.006	0.003	0.044	0.005	0.000	-0.043	0.004	0.000
White (base)												
Black	-0.049	0.022	0.024	0.046	0.016	0.005	-0.014	0.013	0.281	0.008	0.011	0.489
Asian	-0.090	0.017	0.000	0.062	0.013	0.000	-0.015	0.010	0.167	0.023	0.010	0.022
Others	-0.147	0.040	0.000	0.117	0.031	0.000	0.020	0.022	0.363	-0.003	0.016	0.864
No education (base)												
Higher/1stdegree/A level	0.030	0.019	0.111	0.111	0.016	0.000	-0.051	0.015	0.001	-0.022	0.011	0.047
GCSE/O level	0.001	0.021	0.968	0.119	0.018	0.000	-0.040	0.017	0.017	-0.017	0.012	0.169
CSE level	-0.004	0.029	0.901	0.079	0.029	0.007	-0.024	0.023	0.294	-0.024	0.015	0.105
Others	0.000	0.027	0.995	0.155	0.025	0.000	-0.049	0.021	0.016	-0.028	0.014	0.047
Never/not married (base)												
Married/ever married	-0.061	0.019	0.001	-0.010	0.022	0.639	0.010	0.014	0.485	0.029	0.011	0.010
Health Excellent/Good (base)												
Health Fair	0.004	0.011	0.730	-0.029	0.010	0.004	0.006	0.008	0.423	0.015	0.005	0.004
Health Poor	-0.029	0.018	0.108	-0.012	0.017	0.489	-0.005	0.012	0.696	0.027	0.009	0.003
Number of children												
ownchild	-0.062	0.014	0.000	-0.037	0.023	0.111	-0.026	0.010	0.008	0.019	0.005	0.000

	Employment			Education			Unemployment			Inactivity		
	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|
Single no child (base)												
Single with child	-0.028	0.020	0.157	-0.001	0.017	0.935	-0.015	0.015	0.323	0.030	0.011	0.005
Couple no child	0.152	0.021	0.000	-0.087	0.017	0.000	-0.049	0.016	0.002	-0.021	0.009	0.026
Couple with child	-0.001	0.019	0.940	0.009	0.016	0.564	-0.029	0.016	0.062	0.020	0.010	0.042
2+ Adults	0.080	0.021	0.000	-0.038	0.017	0.026	-0.037	0.017	0.031	-0.007	0.010	0.502
Other	0.076	0.031	0.015	-0.051	0.028	0.062	-0.037	0.023	0.112	0.019	0.015	0.201
Owned outright (base)												
Owned mortgage	0.011	0.011	0.349	-0.002	0.008	0.829	-0.016	0.009	0.056	-0.001	0.006	0.870
Local auth. rented	-0.028	0.016	0.070	-0.020	0.012	0.101	0.034	0.012	0.004	0.006	0.008	0.399
Housing assoc. rented	-0.019	0.021	0.351	-0.029	0.016	0.073	0.015	0.015	0.322	0.017	0.010	0.077
Employer rented & other	0.036	0.035	0.302	-0.024	0.029	0.408	-0.016	0.025	0.529	-0.006	0.014	0.686
Rented unfurnished	0.019	0.021	0.365	-0.007	0.018	0.690	-0.027	0.014	0.055	0.014	0.012	0.231
Rented furnished	-0.103	0.021	0.000	0.119	0.018	0.000	-0.047	0.013	0.000	0.006	0.011	0.583
London (base)												
North East	-0.053	0.025	0.032	0.033	0.020	0.099	0.003	0.016	0.828	0.014	0.012	0.258
North West	-0.019	0.018	0.299	0.008	0.014	0.574	0.014	0.012	0.250	-0.012	0.010	0.206
Yorkshire & Humber	-0.022	0.020	0.269	0.005	0.015	0.746	0.015	0.013	0.265	-0.004	0.010	0.721
East Midlands	0.010	0.021	0.637	-0.013	0.016	0.419	-0.004	0.014	0.798	-0.007	0.012	0.569
West Midlands	-0.017	0.024	0.470	0.006	0.018	0.749	0.021	0.016	0.168	-0.015	0.014	0.288
East	-0.031	0.027	0.256	0.026	0.021	0.220	-0.005	0.018	0.787	0.000	0.016	0.983
South East	-0.009	0.033	0.788	0.018	0.024	0.444	-0.013	0.020	0.536	-0.011	0.019	0.552
South West	-0.019	0.037	0.604	0.014	0.027	0.620	-0.011	0.023	0.646	-0.004	0.021	0.838
Wales	-0.053	0.040	0.188	0.009	0.029	0.756	0.027	0.028	0.335	-0.004	0.024	0.876
Scotland/NI/Channel Island	-0.077	0.044	0.078	0.046	0.032	0.155	0.020	0.030	0.496	-0.011	0.026	0.671

	Employment			Education			Unemployment			Inactivity		
	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|
Non-recession 1998-2000 (base)												
Recession 1991-1993	-0.192	0.016	0.000	0.192	0.021	0.000	0.034	0.017	0.046	-0.002	0.010	0.814
Non-recession 1994-1997	-0.108	0.014	0.000	0.106	0.018	0.000	0.017	0.012	0.145	0.000	0.009	0.999
Recession 2001-2002	0.031	0.014	0.027	-0.034	0.012	0.003	0.020	0.011	0.079	-0.010	0.007	0.173
Non-recession 2003-2004	0.049	0.017	0.003	-0.060	0.013	0.000	0.027	0.015	0.069	0.000	0.010	0.976
Recession 2005-2007	0.093	0.019	0.000	-0.094	0.014	0.000	0.007	0.015	0.634	0.012	0.012	0.334
Recession 2007-2010	0.138	0.023	0.000	-0.124	0.018	0.000	0.027	0.023	0.227	-0.004	0.015	0.786
Non-recession 2011-2013	0.191	0.035	0.000	-0.182	0.024	0.000	0.064	0.063	0.305	0.019	0.036	0.600
Initial Condition												
Initial Labour Market	0.100	0.011	0.000	0.041	0.010	0.000	0.065	0.012	0.000	0.020	0.008	0.015
Initial Age	0.014	0.003	0.000	-0.021	0.003	0.000	0.003	0.002	0.158	-0.001	0.002	0.661
Averages of all time-varying covariates[3)]		Yes			Yes			Yes			Yes	
Year-entry dummies		Yes			Yes			Yes			Yes	
Observation		12,806			12,806			12,806			12,806	
Log-likelihood		-5216.2465			-3881.2207			-3092.8748			-1542.7385	
lnsig2u	-1.519	0.204		-3.381	1.141		-1.477	0.255		-0.961	0.300	
sigma_u	0.468	0.048		0.184	0.105		0.478	0.061		0.619	0.093	
rho	0.180	0.030		0.033	0.036		0.186	0.039		0.277	0.060	

Note: 1) Results are in terms of marginal effects; 2) Standard errors are robust standard errors; 3) Including the within-individual average of age, education, marital and health status, household type, household tenure, number of children, and region.

Table C.6 Random Effect Probit Models for the 1991 Panel Sample, Youths

	Employment			Education			Unemployment			Inactivity		
	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|
Labour Market Status (t-1)												
Employment (base)												
Education (Edu)	-0.400	0.023	0.000	0.332	0.023	0.000	0.056	0.015	0.000	0.001	0.011	0.943
Unemployment (U)	-0.270	0.028	0.000	0.037	0.017	0.027	0.187	0.026	0.000	0.026	0.011	0.016
Inactive (I)	-0.418	0.046	0.000	-0.010	0.024	0.680	-0.013	0.017	0.456	0.151	0.042	0.000
16-19 (base)												
20-24	0.055	0.018	0.002	-0.047	0.015	0.001	0.014	0.013	0.279	-0.002	0.008	0.844
Female (base)												
Male	0.004	0.013	0.744	-0.002	0.008	0.851	0.043	0.010	0.000	-0.047	0.009	0.000
White (base)												
Black	-0.101	0.049	0.041	0.077	0.034	0.025	-0.020	0.032	0.531	0.063	0.038	0.098
Asian	-0.080	0.033	0.014	0.049	0.028	0.075	0.009	0.028	0.753	0.034	0.026	0.186
Others	-0.130	0.062	0.036	0.136	0.060	0.022	0.002	0.031	0.952	-0.003	0.017	0.871
No education (base)												
Higher/1stdegree/A level	-0.030	0.031	0.336	0.129	0.018	0.000	-0.027	0.025	0.277	-0.026	0.020	0.196
GCSE/O level	-0.070	0.034	0.038	0.137	0.022	0.000	-0.013	0.026	0.603	-0.024	0.021	0.252
CSE level	-0.116	0.042	0.006	0.144	0.032	0.000	0.014	0.033	0.666	-0.026	0.024	0.283
Others	-0.078	0.041	0.058	0.183	0.031	0.000	-0.032	0.030	0.286	-0.033	0.024	0.177
Never/not married (base)												
Married/ever married	-0.110	0.028	0.000	0.011	0.023	0.648	0.041	0.024	0.084	0.057	0.022	0.009
Health Excellent/Good (base)												
Health Fair	0.004	0.016	0.785	-0.006	0.013	0.617	0.001	0.013	0.933	0.001	0.006	0.875
Health Poor	0.004	0.028	0.875	-0.022	0.023	0.339	-0.003	0.020	0.870	0.015	0.013	0.229
Number of children												
ownchild	-0.094	0.024	0.000	0.006	0.022	0.791	-0.043	0.018	0.015	0.022	0.007	0.003

	Employment			Education			Unemployment			Inactivity		
	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|
Single no child (base)												
Single with child	0.038	0.030	0.216	-0.076	0.024	0.002	0.003	0.025	0.905	0.035	0.021	0.094
Couple no child	0.165	0.029	0.000	-0.095	0.021	0.000	-0.041	0.027	0.122	-0.025	0.014	0.076
Couple with child	0.049	0.029	0.087	-0.051	0.023	0.027	-0.002	0.025	0.922	0.012	0.017	0.497
2+ Adults	0.016	0.031	0.611	0.008	0.023	0.718	-0.040	0.026	0.121			
Other	0.086	0.048	0.070	-0.064	0.039	0.106	0.002	0.036	0.962	-0.019	0.014	0.182
Owned outright (base)												
Owned mortgage	0.024	0.020	0.235	-0.001	0.014	0.937	-0.032	0.015	0.033	-0.009	0.012	0.470
Local auth. rented	-0.036	0.027	0.180	0.004	0.018	0.848	0.016	0.021	0.441	-0.001	0.014	0.961
Housing assoc. rented	-0.023	0.042	0.589	-0.032	0.027	0.239	-0.021	0.028	0.453	0.020	0.019	0.314
Employer rented & other	0.058	0.048	0.224	-0.038	0.033	0.255	-0.033	0.038	0.385	-0.012	0.019	0.541
Rented unfurnished	0.046	0.037	0.211	-0.031	0.028	0.276	-0.070	0.025	0.005	0.028	0.023	0.221
Rented furnished	-0.072	0.035	0.037	0.076	0.026	0.003	-0.064	0.022	0.005	0.019	0.023	0.391
London (base)												
North East	-0.040	0.041	0.329	0.053	0.034	0.122	-0.004	0.022	0.864	-0.011	0.017	0.540
North West	-0.036	0.025	0.158	-0.005	0.018	0.781	0.028	0.018	0.113	-0.010	0.009	0.263
Yorkshire & Humber	-0.031	0.028	0.273	-0.012	0.019	0.526	0.024	0.019	0.211	0.000	0.011	0.999
East Midlands	-0.001	0.029	0.970	-0.036	0.020	0.075	0.027	0.020	0.177	-0.003	0.013	0.841
West Midlands	0.002	0.031	0.948	-0.032	0.022	0.133	0.042	0.022	0.057	-0.019	0.013	0.137
East	-0.013	0.036	0.709	-0.022	0.024	0.353	0.027	0.025	0.280	0.008	0.019	0.680
South East	0.007	0.038	0.865	-0.016	0.024	0.516	0.004	0.026	0.880	-0.003	0.017	0.870
South West	-0.029	0.043	0.508	-0.005	0.028	0.853	0.016	0.032	0.620	0.007	0.019	0.730
Wales	-0.023	0.052	0.664	-0.050	0.030	0.094	0.068	0.043	0.120	0.001	0.023	0.960
Scotland/NI/Channel Island	-0.056	0.055	0.302	-0.009	0.033	0.790	0.051	0.043	0.237	-0.003	0.025	0.912

	Employment			Education			Unemployment			Inactivity		
	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|
Non-recession 1998-2000 (base)												
Recession 1991-1993	-0.202	0.025	0.000	0.146	0.018	0.000	0.029	0.019	0.127	-0.006	0.014	0.694
Non-recession 1994-1997	-0.119	0.017	0.000	0.082	0.013	0.000	0.019	0.014	0.187	0.001	0.013	0.950
Initial Condition												
Initial Labour Market	0.068	0.016	0.000	0.015	0.011	0.191	0.095	0.022	0.000	0.055	0.020	0.006
Initial Age	0.008	0.005	0.113	-0.015	0.004	0.000	0.006	0.004	0.111	-0.001	0.002	0.560
Averages of all time-varying covariates[3)]		Yes			Yes			Yes			Yes	
Year-entry dummies		Yes			Yes			Yes			Yes	
Observation		4,309			4,309			4,309			4,309	
Log-likelihood		-1665.256			-1046.061			-1116.076			-408.276	
lnsig2u	-1.382	0.295		-14.349	32.217		-1.621	0.403		-0.477	0.401	
sigma_u	0.501	0.074		0.001	0.012		0.445	0.090		0.788	0.158	
rho	0.201	0.047		0.000	0.000		0.165	0.056		0.383	0.095	

Note: 1) Results are in terms of marginal effects; 2) Standard errors are robust standard errors; 3) Including the within-individual average of age, education, marital and health status, household type, household tenure, number of children, and region.

Table C.7 Random Effect Probit Models for the Full Sample, Adults

	Employment			Education			Unemployment			Inactivity		
	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|
Labour Market Status (t-1)												
Employment (base)												
Education (Edu)	-0.407	0.015	0.000	0.234	0.015	0.000	0.067	0.008	0.000	0.057	0.008	0.000
Unemployment (U)	-0.328	0.008	0.000	0.013	0.002	0.000	0.180	0.007	0.000	0.146	0.005	0.000
Inactive (I)	-0.522	0.007	0.000	0.004	0.001	0.000	0.013	0.002	0.000	0.437	0.007	0.000
36-49 (base)												
25-35	-0.010	0.003	0.000	0.000	0.001	0.701	-0.005	0.002	0.005	0.015	0.002	0.000
50-65	-0.017	0.003	0.000	-0.003	0.001	0.000	0.007	0.002	0.001	0.013	0.002	0.000
Female (base)												
Male	0.025	0.002	0.000	-0.002	0.000	0.000	0.016	0.001	0.000	-0.048	0.002	0.000
White (base)												
Black	0.004	0.008	0.558	0.003	0.002	0.108	0.007	0.005	0.137	-0.019	0.006	0.003
Asian	-0.021	0.007	0.002	0.003	0.002	0.152	0.019	0.005	0.000	0.004	0.006	0.518
Others	-0.015	0.011	0.177	0.003	0.002	0.246	0.013	0.008	0.089	0.009	0.011	0.392
No education (base)												
Higher/1stdegree	0.040	0.004	0.000	0.005	0.001	0.000	-0.017	0.003	0.000	-0.025	0.003	0.000
A level	0.007	0.004	0.089	0.008	0.001	0.000	-0.011	0.003	0.000	-0.008	0.004	0.036
GCSE/O level	0.003	0.005	0.544	0.007	0.001	0.000	-0.007	0.004	0.043	-0.006	0.004	0.113
CSE level	-0.013	0.007	0.088	0.006	0.002	0.008	-0.008	0.005	0.112	0.004	0.006	0.491
Prof qualif/Others	0.008	0.006	0.163	0.017	0.004	0.000	-0.013	0.004	0.002	-0.013	0.005	0.003

	Employment			Education			Unemployment			Inactivity		
	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|
Never/not married (base)												
Married	-0.001	0.003	0.800	-0.002	0.001	0.011	-0.012	0.002	0.000	0.018	0.003	0.000
Evermarried	0.001	0.005	0.828	-0.002	0.002	0.173	-0.003	0.004	0.481	0.010	0.004	0.019
Health Excellent/Good (base)												
Health Fair	-0.016	0.002	0.000	-0.001	0.001	0.091	0.004	0.002	0.011	0.019	0.002	0.000
Health Poor	-0.086	0.004	0.000	-0.001	0.001	0.130	-0.003	0.002	0.199	0.081	0.004	0.000
Number of children												
ownchild	-0.010	0.001	0.000	0.001	0.000	0.180	-0.002	0.001	0.088	0.011	0.001	0.000
Single no child (base)												
Single with chil	-0.004	0.004	0.251	0.003	0.001	0.018	0.003	0.002	0.301	0.006	0.003	0.068
Couple no child	0.015	0.004	0.000	-0.002	0.001	0.143	-0.002	0.002	0.473	-0.007	0.004	0.054
Couple with child	0.001	0.004	0.884	0.000	0.001	0.754	-0.003	0.003	0.318	0.011	0.004	0.005
2+ Adults	-0.010	0.005	0.060	0.002	0.002	0.380	0.005	0.004	0.164	0.006	0.004	0.199
Other	-0.003	0.009	0.727	-0.002	0.002	0.462	0.004	0.006	0.527	0.010	0.007	0.163
Owned outright (base)												
Owned mortgage	0.018	0.002	0.000	-0.001	0.001	0.169	-0.007	0.002	0.000	-0.012	0.002	0.000
Local auth. rented	-0.025	0.004	0.000	0.000	0.001	0.797	0.017	0.003	0.000	0.009	0.003	0.005
Housing assoc. rented	-0.016	0.005	0.003	-0.002	0.001	0.149	0.012	0.004	0.001	0.009	0.005	0.051
Employer rented & other	0.029	0.008	0.001	-0.002	0.002	0.321	-0.021	0.004	0.000	0.002	0.008	0.848
Rented unfurnished	-0.002	0.006	0.770	-0.001	0.002	0.640	0.002	0.004	0.579	0.003	0.005	0.574
Rented furnished	-0.016	0.007	0.030	0.000	0.002	0.853	0.005	0.004	0.267	0.004	0.007	0.522
London (base)												
North East	-0.003	0.006	0.576	-0.002	0.002	0.370	0.003	0.003	0.416	0.000	0.005	0.989
North West	-0.004	0.005	0.408	0.000	0.002	0.953	0.001	0.003	0.706	0.002	0.005	0.693
Yorkshire & Humber	-0.002	0.006	0.758	-0.001	0.003	0.688	0.001	0.004	0.703	-0.001	0.006	0.913
East Midlands	-0.004	0.007	0.590	-0.003	0.003	0.368	0.004	0.004	0.389	0.001	0.007	0.934
West Midlands	0.007	0.008	0.365	-0.004	0.004	0.304	0.001	0.005	0.818	-0.008	0.007	0.300

	Employment			Education			Unemployment			Inactivity		
	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|
East	0.004	0.009	0.662	-0.006	0.004	0.173	-0.003	0.006	0.618	0.005	0.008	0.554
South East	0.015	0.011	0.182	-0.005	0.005	0.284	0.003	0.007	0.669	-0.012	0.010	0.221
South West	0.010	0.012	0.424	-0.005	0.005	0.328	-0.002	0.008	0.803	-0.003	0.011	0.800
Wales	0.007	0.013	0.625	-0.007	0.005	0.196	0.001	0.009	0.885	-0.001	0.013	0.939
Scotland	0.007	0.015	0.625	-0.005	0.006	0.361	0.003	0.010	0.805	-0.006	0.014	0.659
NI & Channel Island	0.003	0.017	0.864	-0.009	0.005	0.101				0.002	0.016	0.894
Non-recession 1998-2000 (base)												
Recession 1991-1993	-0.022	0.003	0.000	0.004	0.002	0.025	0.019	0.003	0.000	-0.001	0.003	0.580
Non-recession 1994-1997	-0.012	0.002	0.000	0.001	0.001	0.167	0.009	0.002	0.000	0.001	0.002	0.622
Recession 2001-2002	-0.001	0.002	0.595	-0.002	0.001	0.013	-0.001	0.002	0.443	0.005	0.002	0.020
Non-recession 2003-2004	-0.002	0.003	0.400	-0.002	0.001	0.055	-0.001	0.002	0.488	0.006	0.002	0.009
Recession 2005-2007	-0.003	0.003	0.338	-0.002	0.001	0.029	-0.004	0.002	0.059	0.010	0.002	0.000
Recession 2007-2010	-0.006	0.003	0.022	-0.003	0.001	0.001	0.001	0.002	0.731	0.012	0.002	0.000
Non-recession 2011-2013	-0.010	0.004	0.007	-0.005	0.001	0.000	0.006	0.003	0.029	0.011	0.003	0.001
Initial Condition												
Initial Labour Market	0.084	0.003	0.000	0.002	0.001	0.075	0.039	0.003	0.000	0.073	0.003	0.000
Initial Age	-0.004	0.001	0.000	0.000	0.000	0.682	0.001	0.000	0.000	0.003	0.000	0.000
Averages of all time-varying covariates[3)]		Yes			Yes			Yes			Yes	
Year-entry dummies		Yes			Yes			Yes			Yes	
Observation		136,068			136,068			136,068			136,068	
Log-likelihood		-28178.006			-4028.3743			-15974.486			-21393.097	
lnsig2u	-0.893	0.050		-1.551	0.167		-1.260	0.069		-0.770	0.053	
sigma_u	0.640	0.016		0.461	0.039		0.533	0.018		0.681	0.018	
rho	0.291	0.010		0.175	0.024		0.221	0.012		0.317	0.011	

Note: 1) Results are in terms of marginal effects; 2) Standard errors are robust standard errors; 3) Including the within-individual average of age, education, marital and health status, household type, household tenure, number of children, and region.

Table C.8 Random Effect Probit Models for the 1991 Panel Sample, Adults

	Employment			Education			Unemployment			Inactivity		
	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|
Labour Market Status (t-1)												
Employment (base)												
Education (Edu)	-0.470	0.021	0.000	0.254	0.021	0.000	0.074	0.012	0.000	0.041	0.011	0.000
Unemployment (U)	-0.336	0.011	0.000	0.012	0.002	0.000	0.189	0.010	0.000	0.133	0.008	0.000
Inactive (I)	-0.548	0.009	0.000	0.003	0.001	0.004	0.005	0.002	0.028	0.461	0.009	0.000
36-49 (base)												
25-35	-0.013	0.003	0.000	0.000	0.001	0.979	-0.002	0.002	0.309	0.016	0.003	0.000
50-65	-0.021	0.003	0.000	-0.003	0.001	0.000	0.007	0.003	0.019	0.017	0.003	0.000
Female (base)												
Male	0.025	0.003	0.000	-0.001	0.001	0.094	0.015	0.002	0.000	-0.047	0.003	0.000
White (base)												
Black	0.005	0.011	0.628	0.003	0.002	0.124	0.007	0.006	0.235	-0.023	0.007	0.002
Asian	-0.009	0.009	0.280	0.004	0.003	0.136	0.020	0.006	0.001	-0.013	0.007	0.063
Others	-0.009	0.015	0.520	0.003	0.003	0.243	0.011	0.009	0.221	0.003	0.014	0.843
No education (base)												
Higher/1stdegree	0.032	0.005	0.000	0.003	0.001	0.000	-0.015	0.004	0.000	-0.016	0.004	0.000
A level	0.000	0.006	0.964	0.007	0.002	0.000	-0.011	0.004	0.010	-0.001	0.005	0.898
GCSE/O level	-0.001	0.006	0.839	0.006	0.002	0.002	-0.010	0.004	0.034	0.001	0.005	0.841
CSE level	-0.014	0.010	0.156	0.005	0.003	0.069	-0.011	0.006	0.071	0.005	0.008	0.466
Prof qualif/Others	0.004	0.007	0.575	0.016	0.006	0.004	-0.015	0.005	0.004	-0.007	0.006	0.242

	Employment			Education			Unemployment			Inactivity		
	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|
Never/not married (base)												
Married	-0.001	0.004	0.765	-0.002	0.001	0.200	-0.012	0.003	0.000	0.018	0.004	0.000
Evermarried	-0.003	0.007	0.611	-0.001	0.002	0.542	0.002	0.005	0.723	0.010	0.006	0.077
Health Excellent/Good (base)												
Health Fair	-0.017	0.003	0.000	-0.001	0.001	0.297	0.004	0.002	0.037	0.018	0.002	0.000
Health Poor	-0.089	0.005	0.000	-0.001	0.001	0.284	0.001	0.003	0.818	0.082	0.005	0.000
Number of children												
ownchild	-0.007	0.002	0.000	0.0004	0.001	0.414	-0.002	0.001	0.103	0.010	0.002	0.000
Single no child (base)												
Single with chil	-0.016	0.005	0.002	0.003	0.001	0.068	0.006	0.003	0.047	0.012	0.004	0.007
Couple no child	0.006	0.005	0.197	-0.002	0.002	0.235	0.004	0.003	0.201	-0.005	0.005	0.307
Couple with child	-0.012	0.006	0.032	-0.0005	0.002	0.785	0.004	0.003	0.188	0.015	0.005	0.003
2+ Adults	-0.010	0.007	0.162	0.001	0.002	0.636	0.001	0.004	0.822	0.011	0.006	0.066
Other	-0.011	0.011	0.303	-0.003	0.002	0.229	0.010	0.008	0.208	0.011	0.009	0.227
Owned outright (base)												
Owned mortgage	0.018	0.003	0.000	-0.002	0.001	0.112	-0.004	0.002	0.025	-0.012	0.003	0.000
Local auth. rented	-0.021	0.006	0.000	-0.001	0.001	0.312	0.015	0.003	0.000	0.012	0.005	0.012
Housing assoc. rented	-0.023	0.008	0.003	-0.002	0.002	0.228	0.012	0.005	0.012	0.019	0.006	0.004
Employer rented & other	0.026	0.011	0.023	-0.002	0.002	0.477	-0.018	0.004	0.000	0.007	0.012	0.553
Rented unfurnished	-0.003	0.008	0.671	-0.002	0.002	0.207	0.003	0.005	0.591	0.010	0.007	0.146
Rented furnished	-0.022	0.010	0.032	0.0003	0.002	0.899	0.009	0.006	0.113	0.003	0.010	0.763
London (base)												
North East	-0.001	0.007	0.876	-0.001	0.001	0.663	0.000	0.004	0.894	0.001	0.006	0.913
North West	-0.005	0.006	0.433	0.0002	0.001	0.867	0.000	0.004	0.953	0.004	0.006	0.483
Yorkshire & Humber	0.001	0.007	0.934	0.0005	0.001	0.750	-0.001	0.004	0.895	-0.004	0.006	0.563
East Midlands	-0.004	0.008	0.626	0.0001	0.002	0.946	0.002	0.005	0.751	-0.001	0.008	0.913
West Midlands	0.005	0.009	0.556	-0.0004	0.002	0.853	0.000	0.006	0.942	-0.011	0.009	0.207

	Employment			Education			Unemployment			Inactivity		
	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|
East	0.001	0.010	0.885	-0.002	0.002	0.387	-0.002	0.007	0.776	0.000	0.010	0.985
South East	0.013	0.012	0.307	0.0004	0.003	0.883	0.002	0.008	0.803	-0.018	0.012	0.116
South West	0.009	0.014	0.544	0.002	0.003	0.641	-0.001	0.009	0.948	-0.013	0.013	0.313
Wales	0.004	0.016	0.817	-0.002	0.003	0.579	0.003	0.011	0.777	-0.012	0.015	0.418
Scotland	0.008	0.017	0.631	0.002	0.004	0.685	-0.001	0.011	0.935	-0.016	0.016	0.319
NI & Channel Island	-0.104	0.069	0.132							0.142	0.063	0.025
Non-recession 1998-2000 (base)												
Recession 1991-1993	-0.022	0.004	0.000	0.002	0.001	0.078	0.018	0.003	0.000	-0.001	0.003	0.760
Non-recession 1994-1997	-0.013	0.003	0.000	0.001	0.001	0.488	0.009	0.002	0.000	0.001	0.002	0.492
Recession 2001-2002	-0.001	0.003	0.861	-0.001	0.001	0.159	0.000	0.002	0.850	0.003	0.003	0.186
Non-recession 2003-2004	-0.004	0.003	0.186	-0.002	0.001	0.094	0.002	0.002	0.474	0.006	0.003	0.025
Recession 2005-2007	-0.003	0.004	0.380	-0.004	0.001	0.000	0.001	0.002	0.644	0.009	0.003	0.005
Recession 2007-2010	-0.006	0.004	0.085	-0.003	0.001	0.002	0.004	0.003	0.079	0.009	0.003	0.005
Non-recession 2011-2013	-0.015	0.005	0.006	-0.004	0.001	0.000	0.012	0.004	0.002	0.007	0.005	0.128
Initial Condition												
Initial Labour Market	0.066	0.004	0.000	0.001	0.001	0.251	0.031	0.004	0.000	0.063	0.004	0.000
Initial Age	-0.005	0.001	0.000	-0.0001	0.000	0.690	0.001	0.000	0.002	0.004	0.001	0.000
Averages of all time-varying covariates[3)]		Yes			Yes			Yes			Yes	
Year-entry dummies		Yes			Yes			Yes			Yes	
Observation		75,897			75,897			75,897			75,897	
Log-likelihood		-15704.228			-1933.0498			-8390.0097			-11520.311	
lnsig2u	-0.996	0.06556		-1.628	0.245		-1.524	0.100		-0.823	0.071	
sigma_u	0.608	0.020		0.443	0.054		0.467	0.023		0.663	0.024	
rho	0.270	0.013		0.164	0.034		0.179	0.015		0.305	0.015	

Note: 1) Results are in terms of marginal effects; 2) Standard errors are robust standard errors; 3) Including the within-individual average of age, education, marital and health status, household type, household tenure, number of children, and region.

Appendix D
Detailed Results of the Discrete-time Duration Models

D.1 Descriptive Results

Table D.1 Descriptive Statistics of the Duration Models (Proportion)

Variables	Origin State			
	Employment	Education	Unemployment	Inactivity
Age				
36-49 (base)	0.373	0.0718	0.244	0.323
16-19	0.030	0.383	0.110	0.020
20-24	0.100	0.411	0.205	0.080
25-35	0.299	0.121	0.251	0.265
50-65	0.199	0.0129	0.190	0.312
Sex				
Female (base)	0.508	0.557	0.389	0.774
Male	0.492	0.443	0.611	0.226
Ethnicity				
White (base)	0.970	0.939	0.950	0.967
Black	0.009	0.022	0.013	0.008
Asian	0.015	0.032	0.030	0.019
Others	0.006	0.007	0.008	0.006
Education				
No education (base)	0.101	0.050	0.242	0.278
Higher/1stdegree	0.179	0.064	0.092	0.070
A level	0.140	0.359	0.128	0.107
GCSE/O level	0.209	0.339	0.227	0.226
CSE level	0.043	0.047	0.088	0.059
Prof qualif/Others	0.328	0.142	0.223	0.259
Marital status				
Never/not married (base)	0.391	0.900	0.590	0.300
Married	0.536	0.077	0.313	0.589
Evermarried	0.073	0.024	0.097	0.111
Health status				
Health Excellent/Good (base)	0.780	0.791	0.640	0.470
Health Fair	0.174	0.166	0.254	0.243
Health Poor	0.047	0.043	0.106	0.287
Number of children				
No children	0.594	0.900	0.714	0.457
1-3 children	0.395	0.098	0.274	0.516
4+ children	0.010	0.002	0.012	0.027
Household Type				
Single no child (base)	0.075	0.091	0.125	0.071
Single with chil	0.086	0.179	0.177	0.132
Couple no child	0.238	0.051	0.175	0.177

Table D.1 (continued)

Variables	Origin State			
	Employment	Education	Unemployment	Inactivity
Couple with child	0.564	0.612	0.474	0.594
2+ Adults	0.022	0.054	0.021	0.006
Other	0.015	0.013	0.028	0.020
Household Tenure				
Owned outright (base)	0.120	0.135	0.146	0.148
Owned mortgage	0.653	0.541	0.358	0.427
Local auth. rented	0.093	0.117	0.296	0.266
Housing assoc. rented	0.031	0.040	0.081	0.068
Employer rented & other	0.013	0.012	0.007	0.008
Rented unfurnished	0.045	0.033	0.055	0.052
Rented furnished	0.045	0.123	0.056	0.032
Region				
London (base)	0.075	0.077	0.075	0.061
North East	0.043	0.040	0.046	0.053
North West	0.083	0.090	0.087	0.085
Yorkshire & Humber	0.074	0.070	0.074	0.076
East Midlands	0.068	0.052	0.085	0.085
West Midlands	0.069	0.061	0.071	0.062
East	0.074	0.059	0.057	0.071
South East	0.122	0.104	0.091	0.082
South West	0.074	0.066	0.064	0.067
Wales	0.111	0.143	0.127	0.131
Scotland	0.148	0.155	0.159	0.146
NI & Channel Island	0.060	0.085	0.066	0.080
Business Cycle Period				
Non-recession Jan98-Dec00 (base)	0.182	0.166	0.170	0.194
Recession Sept91-Dec93	0.043	0.0581	0.101	0.036
Non-recession Jan94-Dec97	0.164	0.151	0.217	0.162
Recession Jan01-Dec02	0.151	0.149	0.145	0.153
Non-recession Jan03-Dec04	0.160	0.155	0.128	0.159
Recession Jan05-Aug07	0.211	0.225	0.170	0.210
Recession Sept07-Dec10	0.088	0.0963	0.069	0.086
Total person-month observations	984,503	78,109	70,791	143,673

D.2 Empirical Results

Table D.2 Single-risk Models from Employment State with Heterogeneity of Correlated Spells (id1)

	E to NEET			E to U			E to I			E to Edu		
	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|
36-49 (base)												
16-19	0.00697	0.00076	0.000	0.00424	0.00056	0.000	0.00066	0.00039	0.094	0.00266	0.00034	0.000
20-24	0.00403	0.00045	0.000	0.00195	0.00033	0.000	0.00143	0.00030	0.000	0.00079	0.00012	0.000
25-35	0.00054	0.00024	0.026	-0.00040	0.00020	0.041	0.00085	0.00015	0.000	0.00021	0.00007	0.003
50-65	0.00101	0.00032	0.002	0.00055	0.00027	0.046	0.00047	0.00018	0.011	-0.00023	0.00008	0.002
Female (base)												
Male	-0.00099	0.00021	0.000	0.00147	0.00016	0.000	-0.00264	0.00012	0.000	-0.00020	0.00007	0.003
White (base)												
Black	0.00002	0.00095	0.986	-0.00003	0.00068	0.960	0.00000	0.00064	0.999	0.00023	0.00037	0.539
Asian	0.00181	0.00089	0.041	0.00249	0.00079	0.002	-0.00043	0.00042	0.310	0.00042	0.00031	0.174
Others	0.00159	0.00134	0.236	0.00010	0.00096	0.921	0.00140	0.00086	0.105	0.00133	0.00078	0.088
No education (base)												
Higher/1stdegree	-0.00400	0.00044	0.000	-0.00297	0.00035	0.000	-0.00088	0.00025	0.001	0.00019	0.00014	0.156
A level	-0.00273	0.00044	0.000	-0.00205	0.00035	0.000	-0.00057	0.00025	0.023	0.00102	0.00014	0.000
GCSE/O level	-0.00240	0.00041	0.000	-0.00179	0.00033	0.000	-0.00052	0.00023	0.022	0.00018	0.00012	0.136
CSE level	-0.00167	0.00054	0.002	-0.00121	0.00042	0.004	-0.00066	0.00031	0.034	0.00000	0.00014	0.976
Prof qualif/Others	-0.00309	0.00040	0.000	-0.00232	0.00032	0.000	-0.00063	0.00022	0.004	0.00028	0.00013	0.030
Never/not married (base)												
Married	-0.00100	0.00029	0.000	-0.00181	0.00022	0.000	0.00053	0.00017	0.002	-0.00040	0.00011	0.000
Evermarried	-0.00103	0.00044	0.019	-0.00052	0.00037	0.163	-0.00031	0.00024	0.187	-0.00035	0.00019	0.059
Health Excellent/Good (base)												
Health Fair	0.00183	0.00025	0.000	0.00099	0.00020	0.000	0.00093	0.00016	0.000	0.00015	0.00009	0.102
Health Poor	0.00455	0.00049	0.000	0.00198	0.00037	0.000	0.00259	0.00031	0.000	0.00011	0.00016	0.470
Number of children												
ownchild	0.00001	0.00016	0.967	-0.00034	0.00014	0.015	0.00021	0.00008	0.011	0.00005	0.00009	0.564

	E to NEET			E to U			E to I			E to Edu		
	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|
Single no child (base)												
Single with child	0.00023	0.00048	0.635	0.00062	0.00036	0.082	-0.00047	0.00032	0.139	-0.00032	0.00021	0.133
Couple no child	-0.00117	0.00045	0.009	-0.00032	0.00033	0.322	-0.00077	0.00031	0.012	-0.00085	0.00019	0.000
Couple with child	-0.00061	0.00045	0.175	-0.00026	0.00032	0.415	-0.00032	0.00031	0.309	-0.00053	0.00020	0.007
2+ Adults	-0.00110	0.00066	0.097	0.00009	0.00050	0.852	-0.00135	0.00041	0.001	0.00005	0.00023	0.838
Other	0.00161	0.00082	0.049	0.00155	0.00061	0.011	-0.00003	0.00054	0.957	-0.00082	0.00024	0.001
Owned outright (base)												
Owned mortgage	-0.00104	0.00031	0.001	-0.00067	0.00024	0.005	-0.00042	0.00020	0.033	-0.00030	0.00011	0.007
Local auth. rented	0.00256	0.00044	0.000	0.00188	0.00034	0.000	0.00067	0.00027	0.012	-0.00044	0.00013	0.001
Housing assoc. rented	0.00156	0.00057	0.006	0.00105	0.00044	0.016	0.00038	0.00035	0.273	-0.00044	0.00017	0.010
Employer rented & other	-0.00027	0.00082	0.743	-0.00085	0.00059	0.151	0.00062	0.00056	0.263	-0.00030	0.00027	0.258
Rented unfurnished	0.00066	0.00052	0.203	0.00052	0.00040	0.190	0.00013	0.00032	0.675	-0.00024	0.00018	0.173
Rented furnished	0.00058	0.00054	0.285	0.00029	0.00040	0.469	0.00023	0.00036	0.533	0.00042	0.00022	0.054
London (base)												
North East	0.00222	0.00060	0.000	0.00166	0.00047	0.000	0.00040	0.00035	0.254	0.00021	0.00019	0.278
North West	0.00127	0.00049	0.009	0.00094	0.00037	0.012	0.00019	0.00029	0.522	0.00035	0.00016	0.024
Yorkshire & Humber	0.00085	0.00048	0.079	0.00063	0.00037	0.087	0.00015	0.00029	0.605	0.00024	0.00016	0.126
East Midlands	0.00155	0.00050	0.002	0.00086	0.00037	0.021	0.00057	0.00031	0.062	0.00021	0.00016	0.182
West Midlands	0.00108	0.00049	0.027	0.00077	0.00037	0.038	0.00023	0.00030	0.443	0.00028	0.00016	0.083
East	0.00168	0.00051	0.001	0.00089	0.00038	0.021	0.00076	0.00031	0.015	0.00021	0.00015	0.182
South East	0.00150	0.00044	0.001	0.00067	0.00033	0.042	0.00081	0.00027	0.003	0.00020	0.00013	0.132
South West	0.00142	0.00049	0.004	0.00087	0.00038	0.021	0.00058	0.00030	0.055	0.00027	0.00016	0.087
Wales	0.00146	0.00046	0.001	0.00109	0.00035	0.002	0.00028	0.00027	0.312	0.00011	0.00013	0.423
Scotland	0.00043	0.00042	0.302	0.00060	0.00032	0.063	-0.00020	0.00025	0.429	0.00049	0.00013	0.000
NI & Channel Island	0.00022	0.00054	0.681	0.00015	0.00042	0.715	0.00001	0.00032	0.976	0.00023	0.00016	0.155
Business Cycle												
Non-recess Jan98-Dec00 (base)												
Recession Sept91-Dec93	0.00293	0.00049	0.000	0.00265	0.00040	0.000	0.00017	0.00028	0.528	-0.00021	0.00013	0.128
Non-recession Jan94-Dec97	0.00160	0.00030	0.000	0.00143	0.00024	0.000	0.00010	0.00018	0.588	-0.00010	0.00010	0.34

	E to NEET			E to U			E to I			E to Edu		
	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|
Recession Jan01-Dec02	0.00039	0.00030	0.195	0.00006	0.00023	0.786	0.00035	0.00019	0.067	0.00001	0.00011	0.920
Non-recession Jan03-Dec04	-0.00060	0.00030	0.048	-0.00047	0.00023	0.042	-0.00011	0.00019	0.574	0.00005	0.00012	0.654
Recession Jan05-Aug07	-0.00008	0.00030	0.781	0.00009	0.00023	0.712	-0.00014	0.00019	0.459	-0.00005	0.00011	0.669
Recession Sept07-Apr 2009	-0.00059	0.00039	0.130	-0.00003	0.00031	0.920	-0.00045	0.00024	0.059	-0.00014	0.00014	0.306
Cummulative labour market history												
Sum_E	-0.00012	0.00005	0.027	-0.00014	0.00004	0.001	-0.00001	0.00003	0.696	-0.00007	0.00003	0.011
Sum_U	0.00174	0.00010	0.000	0.00135	0.00007	0.000	0.00034	0.00007	0.000	0.00002	0.00006	0.706
Sum_I	0.00171	0.00015	0.000	0.00031	0.00015	0.044	0.00098	0.00007	0.000	0.00017	0.00008	0.034
Sum_Edu	0.00011	0.00016	0.484	0.00026	0.00011	0.024	-0.00031	0.00012	0.008	0.00014	0.00004	0.001
Cummulative duration labour market history												
Sum_tE	-0.00003	0.00000	0.000	-0.00002	0.00000	0.000	-0.00001	0.00000	0.000	-0.00001	0.00000	0.000
Sum_tU	0.00002	0.00001	0.003	0.00001	0.00000	0.006	0.00001	0.00000	0.182	-0.00002	0.00001	0.011
Sum_tI	0.00000	0.00000	0.265	-0.00001	0.00000	0.001	0.00000	0.00000	0.776	-0.00001	0.00000	0.007
Sum_tEdu	-0.00001	0.00000	0.015	-0.00001	0.00000	0.008	0.00000	0.00000	0.526	0.00000	0.00000	0.166
Duration (months)												
1 – 3 months	-0.03258	0.00084	0.000	-0.02170	0.00066	0.000	-0.01569	0.00054	0.000	-0.00619	0.00037	0.000
4 – 6 months	-0.03302	0.00085	0.000	-0.02217	0.00067	0.000	-0.01555	0.00054	0.000	-0.00638	0.00037	0.000
7 – 9 months	-0.03461	0.00086	0.000	-0.02377	0.00069	0.000	-0.01551	0.00054	0.000	-0.00661	0.00038	0.000
10 – 12 months	-0.03523	0.00088	0.000	-0.02419	0.00070	0.000	-0.01572	0.00055	0.000	-0.00625	0.00037	0.000
13 – 18 months	-0.03754	0.00088	0.000	-0.02565	0.00070	0.000	-0.01660	0.00055	0.000	-0.00634	0.00037	0.000
≤2yrs	-0.03774	0.00090	0.000	-0.02613	0.00073	0.000	-0.01648	0.00056	0.000	-0.00673	0.00039	0.000
≤3yrs	-0.03956	0.00090	0.000	-0.02700	0.00072	0.000	-0.01743	0.00056	0.000	-0.00670	0.00038	0.000
≤5yrs	-0.03955	0.00090	0.000	-0.02725	0.00073	0.000	-0.01734	0.00056	0.000	-0.00709	0.00040	0.000
>5yrs	-0.04056	0.00094	0.000	-0.02836	0.00078	0.000	-0.01762	0.00058	0.000	-0.00756	0.00047	0.000
Observations		984,503			984,503			984,503			984,503	
Log likelihood		-40911.252			-26628.406			-18235.562			-6272.279	
lnsig2u	-0.616	0.081		-0.263	0.038		-0.700	0.155		-0.888	0.346	
sigma_u	0.735	0.030		0.877	0.038		0.705	0.055		0.641	0.111	
rho	0.247	0.015		0.318	0.019		0.232	0.028		0.200	0.055	

Table D.3 Single-risk Models from Unemployment State with Heterogeneity of Correlated Spells (id1)

	U to NonNEET			U to E			U to Edu			U to I		
	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|
36-49 (base)												
16-19	0.0212	0.0098	0.030	-0.0026	0.0075	0.731	0.0110	0.0024	0.000	-0.0013	0.0015	0.404
20-24	0.0183	0.0079	0.020	0.0101	0.0064	0.118	0.0014	0.0012	0.223	0.0000	0.0013	0.996
25-35	0.0133	0.0060	0.026	0.0095	0.0050	0.057	0.0001	0.0009	0.906	-0.0002	0.0010	0.870
50-65	-0.0342	0.0060	0.000	-0.0283	0.0050	0.000	-0.0027	0.0009	0.004	0.0001	0.0012	0.918
Female (base)												
Male	-0.0195	0.0048	0.000	-0.0139	0.0037	0.000	-0.0011	0.0007	0.130	-0.0042	0.0008	0.000
White (base)												
Black	-0.0256	0.0183	0.162	-0.0242	0.0135	0.074	0.0032	0.0031	0.299	-0.0030	0.0022	0.175
Asian	-0.0432	0.0118	0.000	-0.0328	0.0089	0.000	-0.0013	0.0019	0.496	-0.0013	0.0019	0.482
Others	-0.0335	0.0219	0.126	-0.0306	0.0164	0.061	0.0046	0.0043	0.289	0.0034	0.0042	0.421
No education (base)												
Higher/1stdegree	0.0499	0.0090	0.000	0.0340	0.0069	0.000	0.0050	0.0016	0.001	-0.0002	0.0014	0.863
A level	0.0329	0.0076	0.000	0.0217	0.0060	0.000	0.0049	0.0012	0.000	-0.0005	0.0012	0.656
GCSE/O level	0.0287	0.0068	0.000	0.0174	0.0053	0.001	0.0047	0.0009	0.000	0.0012	0.0010	0.248
CSE level	0.0059	0.0088	0.500	0.0024	0.0069	0.725	0.0013	0.0010	0.180	-0.0001	0.0013	0.959
Prof qualif/Others	0.0449	0.0071	0.000	0.0313	0.0055	0.000	0.0041	0.0011	0.000	0.0007	0.0010	0.502
Never/not married (base)												
Married	0.0087	0.0066	0.185	0.0087	0.0052	0.093	-0.0024	0.0011	0.033	0.0000	0.0010	0.977
Evermarried	-0.0114	0.0095	0.230	-0.0085	0.0075	0.254	0.0008	0.0020	0.671	0.0044	0.0019	0.021
Health Excellent/Good (base)												
Health Fair	-0.0297	0.0043	0.000	-0.0238	0.0035	0.000	-0.0007	0.0008	0.338	0.0028	0.0008	0.001
Health Poor	-0.0218	0.0066	0.001	-0.0203	0.0053	0.000	-0.0013	0.0012	0.268	0.0068	0.0014	0.000
Number of children												
ownchild	-0.0109	0.0039	0.006	-0.0068	0.0031	0.027	-0.0001	0.0008	0.888	0.0007	0.0005	0.156

	U to NonNEET			U to E			U to Edu			U to I		
	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|
Single no child (base)												
Single with child	0.0134	0.0079	0.090	0.0104	0.0063	0.101	-0.0003	0.0015	0.867	-0.0011	0.0011	0.314
Couple no child	0.0290	0.0080	0.000	0.0263	0.0064	0.000	-0.0023	0.0016	0.145	0.0029	0.0015	0.048
Couple with child	0.0238	0.0073	0.001	0.0209	0.0059	0.000	-0.0009	0.0015	0.540	0.0016	0.0012	0.193
2+ Adults	0.0278	0.0125	0.026	0.0252	0.0102	0.013	0.0010	0.0025	0.685	0.0016	0.0027	0.552
Other	0.0154	0.0123	0.210	0.0173	0.0101	0.086	-0.0024	0.0020	0.224	0.0023	0.0024	0.330
Owned outright (base)												
Owned mortgage	0.0243	0.0065	0.000	0.0161	0.0052	0.002	0.0029	0.0010	0.005	-0.0006	0.0011	0.621
Local auth. rented	-0.0324	0.0073	0.000	-0.0290	0.0058	0.000	0.0010	0.0011	0.336	0.0001	0.0012	0.952
Housing assoc. rented	-0.0261	0.0091	0.004	-0.0249	0.0072	0.001	0.0017	0.0015	0.240	-0.0011	0.0015	0.450
Other Rented	0.0090	0.0083	0.275	0.0045	0.0066	0.495	0.0025	0.0014	0.069	-0.0013	0.0014	0.341
London (base)												
North East	-0.0010	0.0136	0.944	-0.0005	0.0104	0.959	0.0005	0.0022	0.834	-0.0009	0.0023	0.703
North West	-0.0212	0.0111	0.057	-0.0165	0.0085	0.053	-0.0002	0.0017	0.929	-0.0017	0.0019	0.370
Yorkshire & Humber	-0.0030	0.0119	0.801	-0.0007	0.0092	0.938	0.0002	0.0018	0.901	-0.0012	0.0020	0.528
East Midlands	-0.0039	0.0118	0.740	0.0001	0.0091	0.994	-0.0009	0.0017	0.595	-0.0031	0.0018	0.084
West Midlands	-0.0062	0.0118	0.597	-0.0031	0.0090	0.733	-0.0014	0.0017	0.428	-0.0035	0.0018	0.053
East	0.0007	0.0121	0.952	0.0018	0.0093	0.849	-0.0023	0.0017	0.183	0.0010	0.0022	0.655
South East	0.0133	0.0110	0.225	0.0112	0.0084	0.185	-0.0010	0.0017	0.558	-0.0034	0.0018	0.054
South West	0.0126	0.0122	0.301	0.0117	0.0094	0.211	-0.0006	0.0018	0.747	-0.0044	0.0018	0.017
Wales	-0.0202	0.0105	0.055	-0.0154	0.0081	0.056	-0.0001	0.0016	0.932	-0.0007	0.0018	0.692
Scotland	-0.0196	0.0101	0.052	-0.0139	0.0078	0.073	0.0000	0.0016	0.977	-0.0033	0.0017	0.051
NI & Channel Island	-0.0503	0.0116	0.000	-0.0381	0.0089	0.000	-0.0018	0.0019	0.356	-0.0012	0.0022	0.563
Business Cycle												
Non-recess Jan98-Dec00 (base)												
Recession Sept91-Dec93	-0.0406	0.0060	0.000	-0.0357	0.0051	0.000	0.0014	0.0013	0.293	-0.0012	0.0013	0.343
Non-recession Jan94-Dec97	-0.0171	0.0050	0.001	-0.0161	0.0044	0.000	0.0021	0.0011	0.057	-0.0003	0.0011	0.750

	U to NonNEET			U to E			U to Edu			U to I		
	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|
Recession Jan01-Dec02	-0.0090	0.0053	0.091	-0.0106	0.0048	0.027	0.0002	0.0011	0.861	0.0007	0.0012	0.559
Non-recession Jan03-Dec04	-0.0054	0.0060	0.371	-0.0060	0.0053	0.260	0.0004	0.0012	0.751	0.0018	0.0014	0.185
Recession Jan05-Aug07	-0.0179	0.0060	0.003	-0.0155	0.0051	0.003	-0.0015	0.0010	0.153	-0.0013	0.0011	0.255
Recession Sept07-Apr 2009	-0.0193	0.0074	0.009	-0.0255	0.0063	0.000	0.0040	0.0017	0.021	-0.0034	0.0013	0.010
Cummulative labour market history												
Sum_E	-0.0065	0.0012	0.000	-0.0034	0.0009	0.000	-0.0013	0.0003	0.000	-0.0004	0.0002	0.047
Sum_U	0.0278	0.0024	0.000	0.0246	0.0019	0.000	0.0022	0.0005	0.000	0.0009	0.0004	0.024
Sum_I	-0.0071	0.0045	0.111	-0.0091	0.0035	0.009	0.0003	0.0009	0.735	0.0010	0.0006	0.070
Sum_Edu	-0.0095	0.0031	0.002	-0.0014	0.0024	0.547	0.0005	0.0004	0.241	0.0000	0.0005	0.967
Cummulative duration labour market history												
Sum_tE	0.0001	0.0000	0.013	0.0001	0.0000	0.007	0.0000	0.0000	0.409	0.0000	0.0000	0.565
Sum_tU	-0.0016	0.0002	0.000	-0.0017	0.0002	0.000	-0.0001	0.0000	0.004	0.0000	0.0000	0.469
Sum_tI	-0.0003	0.0001	0.035	-0.0002	0.0001	0.096	-0.0001	0.0000	0.039	-0.00002	0.0000	0.133
Sum_tEdu	0.0002	0.0001	0.003	0.0001	0.0000	0.082	0.0000	0.0000	0.771	0.0000	0.0000	0.359
Duration (months)												
1 – 3 months	-0.2365	0.0159	0.000	-0.1980	0.0126	0.000	-0.0396	0.0032	0.000	-0.0351	0.0027	0.000
4 – 6 months	-0.2241	0.0159	0.000	-0.1979	0.0127	0.000	-0.0403	0.0032	0.000	-0.0356	0.0028	0.000
7 – 9 months	-0.2355	0.0160	0.000	-0.2163	0.0128	0.000	-0.0396	0.0032	0.000	-0.0349	0.0028	0.000
10 – 12 months	-0.2264	0.0161	0.000	-0.2132	0.0129	0.000	-0.0385	0.0032	0.000	-0.0340	0.0028	0.000
13 – 18 months	-0.2356	0.0160	0.000	-0.2265	0.0128	0.000	-0.0392	0.0032	0.000	-0.0361	0.0028	0.000
≤2yrs	-0.2398	0.0162	0.000	-0.2299	0.0132	0.000	-0.0443	0.0037	0.000	-0.0370	0.0030	0.000
≤3yrs	-0.2490	0.0161	0.000	-0.2446	0.0131	0.000	-0.0433	0.0035	0.000	-0.0393	0.0030	0.000
≤5yrs	-0.2446	0.0161	0.000	-0.2417	0.0131	0.000	-0.0454	0.0038	0.000	-0.0378	0.0029	0.000
>5yrs	-0.2421	0.0168	0.000	-0.2426	0.0142	0.000	-0.0522	0.0058	0.000	-0.0434	0.0035	0.000
Observations	70,791			70,791			70,791			70,791		
Log likelihood	-19240.3			-18071.768			-2791.2786			-3032.193		
lnsig2u	-2.001	0.210		-1.702	0.174		-1.239	0.718		-1.216	0.765	
sigma_u	0.367	0.038		0.427	0.037		0.538	0.193		0.544	0.208	
rho	0.076	0.015		0.100	0.016		0.150	0.091		0.153	0.099	

Table D.4 Single-risk Models from Inactivity State with Heterogeneity of Correlated Spells (id1)

	I to NonNEET			I to E			I to Edu			I to U		
	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|
36-49 (base)												
16-19	0.0217	0.0039	0.000	0.0001	0.0026	0.981	0.0103	0.0022	0.000	0.0014	0.0010	0.180
20-24	0.0055	0.0020	0.006	0.0029	0.0019	0.118	0.0019	0.0006	0.001	0.0016	0.0008	0.040
25-35	0.0003	0.0011	0.777	0.0001	0.0011	0.951	0.0003	0.0003	0.352	0.0007	0.0005	0.171
50-65	-0.0106	0.0010	0.000	-0.0100	0.0010	0.000	-0.0008	0.0003	0.002	-0.0014	0.0004	0.000
Female (base)												
Male	0.0099	0.0013	0.000	0.0083	0.0012	0.000	0.0009	0.0004	0.011	0.0039	0.0005	0.000
White (base)												
Black	0.0022	0.0044	0.626	-0.0006	0.0041	0.882	0.0017	0.0015	0.239	-0.0007	0.0011	0.545
Asian	-0.0014	0.0029	0.634	-0.0034	0.0026	0.185	0.0016	0.0011	0.152	0.0036	0.0017	0.033
Others	0.0031	0.0045	0.486	0.0009	0.0040	0.824	0.0010	0.0016	0.544	-0.0013	0.0010	0.190
No education (base)												
Higher/1stdegree	0.0160	0.0018	0.000	0.0145	0.0017	0.000	0.0017	0.0006	0.002	0.0018	0.0008	0.024
A level	0.0086	0.0014	0.000	0.0055	0.0013	0.000	0.0024	0.0004	0.000	0.0000	0.0005	0.971
GCSE/O level	0.0071	0.0011	0.000	0.0054	0.0011	0.000	0.0015	0.0003	0.000	-0.0001	0.0005	0.769
CSE level	0.0029	0.0015	0.059	0.0031	0.0015	0.046	0.0002	0.0004	0.503	0.0001	0.0007	0.932
Prof qualif/Others	0.0094	0.0011	0.000	0.0074	0.0011	0.000	0.0019	0.0004	0.000	-0.0005	0.0005	0.320
Never/not married (base)												
Married	-0.0040	0.0011	0.000	-0.0036	0.0010	0.000	-0.0011	0.0004	0.006	-0.0018	0.0004	0.000
Evermarried	0.0002	0.0020	0.940	0.0023	0.0021	0.274	-0.0008	0.0006	0.207	-0.0006	0.0007	0.344
Health Excellent/Good (base)												
Health Fair	-0.0051	0.0010	0.000	-0.0049	0.0009	0.000	-0.0001	0.0003	0.836	-0.0003	0.0004	0.410
Health Poor	-0.0122	0.0009	0.000	-0.0110	0.0008	0.000	-0.0012	0.0003	0.000	-0.0013	0.0004	0.000
Number of children												
ownchild	-0.0015	0.0005	0.006	-0.0013	0.0005	0.009	-0.0002	0.0002	0.460	-0.0009	0.0003	0.001

	I to NonNEET			I to E			I to Edu			I to U		
	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|
Single no child (base)												
Single with child	0.0026	0.0020	0.188	0.0027	0.0017	0.117	-0.0004	0.0009	0.659	-0.0004	0.0007	0.572
Couple no child	0.0029	0.0021	0.152	0.0059	0.0019	0.002	-0.0022	0.0008	0.009	-0.0003	0.0007	0.730
Couple with child	0.0017	0.0019	0.366	0.0038	0.0017	0.022	-0.0013	0.0008	0.116	-0.0009	0.0007	0.177
2+ Adults	0.0145	0.0043	0.001	0.0117	0.0039	0.003	0.0014	0.0014	0.319	0.0012	0.0014	0.376
Other	0.0039	0.0033	0.237	0.0088	0.0033	0.008	-0.0026	0.0009	0.004	0.0002	0.0012	0.878
Owned outright (base)												
Owned mortgage	0.0025	0.0013	0.056	0.0026	0.0012	0.032	-0.0001	0.0005	0.916	0.0003	0.0005	0.569
Local auth. rented	-0.0048	0.0014	0.001	-0.0035	0.0013	0.007	-0.0009	0.0005	0.065	-0.0006	0.0005	0.221
Housing assoc. rented	-0.0066	0.0017	0.000	-0.0046	0.0016	0.004	-0.0016	0.0005	0.003	0.0003	0.0007	0.732
Employer rented & other	0.0071	0.0044	0.106	0.0077	0.0042	0.066	-0.0005	0.0013	0.718	-0.0010	0.0012	0.434
Rented unfurnished	0.0003	0.0019	0.887	0.0014	0.0018	0.436	-0.0008	0.0006	0.184	-0.0018	0.0006	0.003
Rented furnished	0.0056	0.0023	0.016	0.0028	0.0021	0.192	0.0012	0.0008	0.130	0.0001	0.0008	0.861
London (base)												
North East	0.0025	0.0024	0.281	0.0032	0.0022	0.137	0.0000	0.0009	0.989	-0.0008	0.0008	0.298
North West	-0.0001	0.0019	0.964	0.0012	0.0017	0.491	-0.0007	0.0007	0.263	0.0001	0.0007	0.925
Yorkshire & Humber	0.0037	0.0021	0.075	0.0041	0.0019	0.030	-0.0003	0.0007	0.709	-0.0001	0.0007	0.849
East Midlands	0.0016	0.0020	0.411	0.0028	0.0018	0.126	-0.0007	0.0007	0.371	-0.0003	0.0007	0.697
West Midlands	0.0032	0.0021	0.127	0.0034	0.0019	0.071	-0.0002	0.0007	0.831	-0.0004	0.0007	0.583
East	0.0019	0.0019	0.312	0.0037	0.0018	0.038	-0.0014	0.0006	0.027	0.0000	0.0007	0.978
South East	0.0085	0.0019	0.000	0.0082	0.0018	0.000	0.0005	0.0007	0.495	0.0013	0.0008	0.098
South West	0.0027	0.0020	0.169	0.0036	0.0018	0.044	-0.0006	0.0007	0.383	-0.0007	0.0007	0.302
Wales	0.0003	0.0018	0.858	0.0018	0.0016	0.278	-0.0008	0.0006	0.203	0.0012	0.0007	0.104
Scotland	0.0016	0.0018	0.376	0.0023	0.0016	0.149	-0.0003	0.0006	0.652	0.0011	0.0007	0.123
NI & Channel Island	-0.0009	0.0021	0.677	0.0019	0.0020	0.353	-0.0018	0.0006	0.005	-0.0001	0.0008	0.898
Business Cycle												
Non-recess Jan98-Dec00 (base)												
Recession Sept91-Dec93	-0.0066	0.0016	0.000	-0.0060	0.0016	0.000	-0.0005	0.0005	0.363	0.0014	0.0008	0.095
Non-recession Jan94-Dec97	-0.0031	0.0012	0.009	-0.0026	0.0012	0.023	-0.0003	0.0004	0.400	0.0013	0.0005	0.015

	I to NonNEET			I to E			I to Edu			I to U		
	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|
Recession Jan01-Dec02	0.0023	0.0013	0.087	0.0021	0.0013	0.104	0.0003	0.0004	0.464	0.0000	0.0005	0.936
Non-recession Jan03-Dec04	-0.0018	0.0013	0.177	-0.0024	0.0012	0.056	0.0004	0.0004	0.320	0.0011	0.0005	0.044
Recession Jan05-Aug07	-0.0022	0.0013	0.087	-0.0027	0.0012	0.025	0.0003	0.0004	0.447	-0.0006	0.0004	0.141
Recession Sept07-Apr 2009	0.0028	0.0018	0.128	0.0003	0.0017	0.850	0.0019	0.0007	0.006	0.0002	0.0006	0.711
Cummulative labour market history												
Sum_E	0.0010	0.0002	0.000	0.0012	0.0002	0.000	-0.0003	0.0001	0.006	-0.0001	0.0001	0.183
Sum_U	-0.0007	0.0005	0.222	-0.0007	0.0005	0.147	0.0002	0.0002	0.399	0.0005	0.0002	0.001
Sum_I	0.0052	0.0005	0.000	0.0042	0.0005	0.000	0.0010	0.0002	0.000	0.0011	0.0002	0.000
Sum_Edu	-0.0002	0.0007	0.823	-0.0008	0.0007	0.229	0.0002	0.0002	0.190	-0.0001	0.0002	0.757
Cummulative duration labour market history												
Sum_tE	-0.00003	0.0000	0.001	-0.00002	0.0000	0.009	-0.00001	0.0000	0.020	0.0000	0.0000	0.873
Sum_tU	-0.0002	0.0000	0.000	-0.0002	0.0000	0.000	0.0000	0.0000	0.022	0.0000	0.0000	0.942
Sum_tI	-0.00004	0.0000	0.008	-0.00003	0.0000	0.029	-0.00001	0.0000	0.102	-0.00001	0.0000	0.287
Sum_tEdu	0.0000	0.0000	0.915	0.0000	0.0000	0.649	0.0000	0.0000	0.259	0.0000	0.0000	0.218
Duration (months)												
1 – 3 months	-0.0685	0.0034	0.000	-0.0665	0.0033	0.000	-0.0117	0.0012	0.000	-0.0147	0.0013	0.000
4 – 6 months	-0.0732	0.0035	0.000	-0.0694	0.0034	0.000	-0.0132	0.0013	0.000	-0.0150	0.0013	0.000
7 – 9 months	-0.0748	0.0035	0.000	-0.0707	0.0034	0.000	-0.0135	0.0013	0.000	-0.0162	0.0013	0.000
10 – 12 months	-0.0784	0.0036	0.000	-0.0746	0.0035	0.000	-0.0131	0.0013	0.000	-0.0159	0.0013	0.000
13 – 18 months	-0.0827	0.0036	0.000	-0.0778	0.0035	0.000	-0.0143	0.0014	0.000	-0.0191	0.0014	0.000
≤2yrs	-0.0877	0.0037	0.000	-0.0824	0.0036	0.000	-0.0147	0.0014	0.000	-0.0183	0.0014	0.000
≤3yrs	-0.0918	0.0037	0.000	-0.0865	0.0036	0.000	-0.0146	0.0014	0.000	-0.0192	0.0014	0.000
≤5yrs	-0.0945	0.0036	0.000	-0.0892	0.0035	0.000	-0.0144	0.0013	0.000	-0.0208	0.0015	0.000
>5yrs	-0.1010	0.0037	0.000	-0.0943	0.0036	0.000	-0.0160	0.0014	0.000	-0.0209	0.0015	0.000
Observations	143,673			143,673			143,673			143,673		
Log likelihood	-12643.9			-11623.858			-1796.8496			-2642.3502		
lnsig2u	-2.188	0.477		-2.121	0.510		-10.307	10.4		-4.892	7.781	
sigma_u	0.335	0.080		0.346	0.088		0.006	0.030		0.087	0.337	
rho	0.064	0.028		0.068	0.032		0.00002	0.0002		0.005	0.035	

Table D.5 Single-risk Models from Education (for All Age Groups) with Heterogeneity of Correlated Spells (id1)

	Edu to NEET			Edu to U			Edu to I			Edu to E		
	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|
36-49 (base)												
16-19	-0.00317	0.00329	0.335	-0.00352	0.00293	0.229	-0.00050	0.00169	0.767	0.00283	0.00392	0.470
20-24	-0.00397	0.00292	0.175	-0.00363	0.00268	0.177	-0.00086	0.00140	0.542	0.00020	0.00324	0.952
25-35	-0.00039	0.00247	0.874	-0.00119	0.00231	0.608	0.00038	0.00115	0.739	0.00522	0.00265	0.049
50-65	0.00518	0.00513	0.312	0.00246	0.00455	0.589	0.00334	0.00301	0.267	-0.00092	0.00460	0.841
Female (base)												
Male	0.00278	0.00126	0.027	0.00410	0.00102	0.000	-0.00193	0.00067	0.004	-0.00194	0.00147	0.187
White (base)												
Black	-0.00383	0.00309	0.215	-0.00538	0.00201	0.008	0.00217	0.00259	0.403	0.00345	0.00538	0.522
Asian	-0.00438	0.00282	0.121	-0.00273	0.00248	0.271	-0.00128	0.00146	0.382	-0.00570	0.00358	0.111
Others	0.00130	0.00526	0.805	-0.00108	0.00388	0.781	0.00736	0.00575	0.200	-0.00282	0.00634	0.656
No education (base)												
Higher/1stdegree	0.00143	0.00375	0.703	-0.00032	0.00328	0.922	0.00158	0.00182	0.384	0.01498	0.00436	0.001
A level	-0.00813	0.00292	0.005	-0.00750	0.00256	0.003	-0.00072	0.00141	0.611	-0.00021	0.00312	0.946
GCSE/O level	-0.00445	0.00284	0.117	-0.00488	0.00247	0.048	0.00038	0.00142	0.787	0.00420	0.00313	0.180
CSE level	0.00078	0.00398	0.845	0.00015	0.00338	0.964	0.00018	0.00207	0.931	0.01457	0.00515	0.005
Prof qualif/Others	-0.00326	0.00301	0.279	-0.00504	0.00262	0.054	0.00153	0.00149	0.305	0.00270	0.00325	0.406
Never/not married (base)												
Married	-0.00278	0.00216	0.197	-0.00292	0.00178	0.100	0.00090	0.00131	0.494	0.00227	0.00306	0.458
Evermarried	-0.00355	0.00252	0.160	-0.00207	0.00233	0.374	-0.00102	0.00117	0.380	0.00659	0.00487	0.176
Health Excellent/Good (base)												
Health Fair	0.00170	0.00151	0.258	0.00263	0.00130	0.044	-0.00104	0.00073	0.155	0.00247	0.00196	0.207
Health Poor	0.00288	0.00264	0.276	0.00226	0.00225	0.316	0.00090	0.00146	0.536	0.00232	0.00325	0.475
Number of children												
ownchild	0.00090	0.00114	0.430	-0.00091	0.00112	0.419	0.00137	0.00053	0.009	0.00119	0.00152	0.433

	Edu to NEET			Edu to U			Edu to I			Edu to E		
	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|
Single no child (base)												
Single with child	0.00568	0.00240	0.018	0.00367	0.00205	0.074	0.00135	0.00137	0.322	0.00510	0.00282	0.071
Couple no child	0.00284	0.00264	0.281	-0.00004	0.00207	0.985	0.00250	0.00182	0.168	0.00556	0.00315	0.077
Couple with child	0.00299	0.00214	0.163	0.00169	0.00182	0.353	0.00054	0.00126	0.666	0.00711	0.00258	0.006
2+ Adults	-0.00196	0.00225	0.382	-0.00202	0.00183	0.268	-0.00030	0.00145	0.838	0.00257	0.00303	0.396
Other	0.00601	0.00538	0.264	0.00488	0.00475	0.304	0.00047	0.00253	0.853	0.01922	0.00792	0.015
Owned outright (base)												
Owned mortgage	-0.00186	0.00173	0.281	-0.00039	0.00143	0.786	-0.00173	0.00100	0.082	0.00003	0.00210	0.991
Local auth. rented	0.00646	0.00250	0.010	0.00294	0.00193	0.128	0.00359	0.00171	0.036	0.00368	0.00296	0.213
Housing assoc. rented	0.00423	0.00330	0.199	0.00409	0.00282	0.148	-0.00073	0.00161	0.652	0.00776	0.00459	0.091
Employer rented & other	-0.00226	0.00459	0.623	0.00021	0.00436	0.961	-0.00251	0.00184	0.172	-0.00789	0.00396	0.046
Rented unfurnished	0.00199	0.00331	0.548	0.00224	0.00293	0.444	-0.00018	0.00171	0.917	0.01200	0.00488	0.014
Rented furnished	0.00391	0.00312	0.210	0.00281	0.00253	0.267	0.00065	0.00179	0.716	0.00312	0.00359	0.385
London (base)												
North East	0.00191	0.00317	0.547	0.00221	0.00272	0.417	-0.00035	0.00153	0.819	0.00013	0.00368	0.973
North West	0.00208	0.00270	0.441	0.00118	0.00223	0.596	0.00062	0.00141	0.659	0.00014	0.00312	0.964
Yorkshire & Humber	-0.00125	0.00265	0.636	-0.00009	0.00231	0.969	-0.00075	0.00131	0.566	0.00367	0.00342	0.283
East Midlands	0.00347	0.00317	0.273	0.00140	0.00256	0.585	0.00214	0.00185	0.247	0.00516	0.00383	0.178
West Midlands	0.00090	0.00286	0.752	0.00249	0.00265	0.348	-0.00083	0.00125	0.507	0.00166	0.00339	0.624
East	0.00029	0.00324	0.928	-0.00002	0.00273	0.996	0.00077	0.00181	0.669	0.00974	0.00426	0.022
South East	0.00023	0.00257	0.928	-0.00120	0.00210	0.569	0.00142	0.00141	0.312	0.00356	0.00313	0.256
South West	0.00053	0.00283	0.850	0.00028	0.00234	0.904	0.00037	0.00157	0.812	0.00644	0.00368	0.080
Wales	0.00551	0.00281	0.050	0.00365	0.00241	0.130	0.00217	0.00145	0.135	0.00214	0.00315	0.498
Scotland	0.00192	0.00238	0.420	0.00066	0.00200	0.741	0.00112	0.00122	0.358	0.00110	0.00270	0.684
NI & Channel Island	-0.00217	0.00284	0.444	-0.00223	0.00230	0.332	0.00022	0.00163	0.894	-0.00073	0.00347	0.834
Business Cycle												
Non-recess Jan98-Dec00 (base)												
Recession Sept91-Dec93	0.01024	0.00385	0.008	0.00552	0.00286	0.053	0.00362	0.00266	0.174	0.00765	0.00428	0.074
Non-recession Jan94-Dec97	0.00427	0.00243	0.079	0.00370	0.00203	0.068	0.00016	0.00136	0.907	0.00825	0.00298	0.006

	Edu to NEET			Edu to U			Edu to I			Edu to E		
	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|
Recession Jan01-Dec02	-0.00054	0.00218	0.805	0.00021	0.00185	0.911	-0.00090	0.00120	0.453	0.00183	0.00272	0.501
Non-recession Jan03-Dec04	-0.00500	0.00204	0.014	-0.00395	0.00168	0.019	-0.00142	0.00118	0.232	0.00023	0.00272	0.932
Recession Jan05-Aug07	-0.00557	0.00190	0.003	-0.00334	0.00161	0.038	-0.00233	0.00106	0.028	-0.00731	0.00231	0.002
Recession Sept07-Apr 2009	-0.00858	0.00196	0.000	-0.00705	0.00155	0.000	-0.00196	0.00118	0.097	-0.01661	0.00218	0.000
Cummulative labour market history												
Sum_E	-0.00082	0.00038	0.032	-0.00124	0.00036	0.001	0.00009	0.00019	0.639	0.00178	0.00041	0.000
Sum_U	0.00397	0.00074	0.000	0.00404	0.00061	0.000	-0.00011	0.00046	0.804	0.00136	0.00107	0.205
Sum_I	0.00272	0.00097	0.005	0.00021	0.00099	0.835	0.00190	0.00044	0.000	-0.00167	0.00137	0.222
Sum_Edu	0.00180	0.00070	0.010	0.00092	0.00059	0.117	0.00067	0.00038	0.075	0.00246	0.00087	0.005
Cummulative duration labour market history												
Sum_tE	0.000005	0.00002	0.799	0.00000	0.00002	0.988	0.00000	0.00001	0.644	-0.00001	0.00003	0.832
Sum_tU	0.00005	0.00005	0.329	0.00001	0.00004	0.695	0.00002	0.00003	0.597	-0.00005	0.00009	0.583
Sum_tI	0.00003	0.00003	0.288	-0.00004	0.00003	0.184	0.00002	0.00001	0.014	-0.00002	0.00004	0.659
Sum_tEdu	-0.00001	0.00001	0.343	-0.00002	0.00001	0.099	0.00001	0.00001	0.236	-0.00001	0.00001	0.628
Duration (months)												
1 – 3 months	-0.06762	0.00542	0.000	-0.04513	0.00446	0.000	-0.02980	0.00340	0.000	-0.11457	0.00739	0.000
4 – 6 months	-0.06417	0.00535	0.000	-0.04216	0.00440	0.000	-0.02972	0.00341	0.000	-0.10569	0.00721	0.000
7 – 9 months	-0.06083	0.00530	0.000	-0.04238	0.00444	0.000	-0.02571	0.00320	0.000	-0.10314	0.00718	0.000
10 – 12 months	-0.05643	0.00523	0.000	-0.03854	0.00435	0.000	-0.02498	0.00318	0.000	-0.09075	0.00697	0.000
13 – 18 months	-0.08095	0.00606	0.000	-0.05444	0.00499	0.000	-0.03364	0.00382	0.000	-0.11110	0.00732	0.000
≤2yrs	-0.06121	0.00532	0.000	-0.04251	0.00446	0.000	-0.02583	0.00320	0.000	-0.09549	0.00699	0.000
≤3yrs	-0.05895	0.00522	0.000	-0.04156	0.00440	0.000	-0.02468	0.00311	0.000	-0.09151	0.00685	0.000
>3yrs	-0.05890	0.00540	0.000	-0.04020	0.00451	0.000	-0.02547	0.00325	0.000	-0.08762	0.00690	0.000
Observations	47,137			47,137			47,137			47,137		
Log likelihood	-3253.466			-2395.889			-1160.521			-4542.885		
lnsig2u	-1.249	0.510		-1.312	0.695		-1.968	2.249		-1.974	0.644	
sigma_u	0.536	0.137		0.519	0.180		0.374	0.420		0.373	0.120	
rho	0.149	0.064		0.141	0.084		0.078	0.162		0.078	0.046	

Table D.6 Single-risk Models from Education (for Youths) with Heterogeneity of Correlated Spells (id1)

	Edu to NEET			Edu to U			Edu to I			Edu to E		
	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|
16-19 (base)												
20-24	-0.00300	0.00133	0.024	-0.00144	0.00114	0.207	-0.00180	0.00079	0.023	-0.00768	0.00188	0.000
Female (base)												
Male	0.00176	0.00088	0.044	0.00229	0.00078	0.003	-0.00060	0.00041	0.147	-0.00033	0.00112	0.770
White (base)												
Black	-0.00282	0.00216	0.192	-0.00323	0.00172	0.060	0.00069	0.00150	0.644	-0.00498	0.00337	0.139
Asian &others	-0.00016	0.00235	0.944	0.00034	0.00217	0.877	-0.00042	0.00101	0.675	-0.00531	0.00261	0.042
No education (base)												
Higher/1stdegree	-0.00847	0.00250	0.001	-0.00853	0.00236	0.000	0.00000	0.00096	0.999	0.00113	0.00264	0.668
A level	-0.00542	0.00236	0.022	-0.00537	0.00224	0.016	-0.00014	0.00089	0.880	0.00421	0.00249	0.091
GCSE/O level	0.00357	0.00315	0.257	0.00265	0.00295	0.368	0.00101	0.00126	0.423	0.01039	0.00366	0.005
CSE level	-0.00407	0.00282	0.148	-0.00641	0.00255	0.012	0.00276	0.00140	0.048	0.00146	0.00301	0.628
Others												
Never/not married (base)	0.00124	0.00528	0.815	-0.00106	0.00419	0.800	0.00332	0.00402	0.409	0.00965	0.00961	0.315
Married												
Health Excellent/Good (base)	0.00334	0.00122	0.006	0.00352	0.00112	0.002	-0.00019	0.00052	0.708	0.00261	0.00159	0.100
Health Fair	0.00588	0.00255	0.021	0.00363	0.00215	0.091	0.00224	0.00141	0.112	0.00421	0.00298	0.157
Health Poor												
Number of children	0.00130	0.00374	0.729	-0.00086	0.00398	0.830	0.00137	0.00128	0.284	0.00132	0.00564	0.815
ownchild												
Single no child (base)												
Single with child	0.00433	0.00232	0.062	0.00331	0.00207	0.109	0.00126	0.00108	0.245	0.01117	0.00256	0.000
Couple no child	0.00678	0.00337	0.045	0.00331	0.00279	0.235	0.00385	0.00209	0.066	0.01672	0.00428	0.000
Couple with child	0.00114	0.00210	0.586	0.00092	0.00187	0.623	0.00036	0.00096	0.705	0.01158	0.00232	0.000
2+ Adults	0.00064	0.00228	0.780	0.00114	0.00216	0.598	-0.00006	0.00096	0.950	0.00323	0.00220	0.142
Other	0.01098	0.00528	0.037	0.00997	0.00492	0.043	0.00096	0.00193	0.620	0.01552	0.00614	0.012

	Edu to NEET			Edu to U			Edu to I			Edu to E		
	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|
Owned outright (base)												
Owned mortgage	-0.00077	0.00124	0.537	-0.00021	0.00110	0.850	-0.00060	0.00061	0.320	-0.00073	0.00158	0.646
Local auth. rented	0.00613	0.00193	0.001	0.00448	0.00166	0.007	0.00150	0.00102	0.142	0.00797	0.00261	0.002
Housing assoc. rented	0.00524	0.00268	0.050	0.00627	0.00254	0.013	-0.00086	0.00100	0.391	0.00443	0.00362	0.221
Employer rented & other	0.00264	0.00495	0.594	0.00381	0.00479	0.425	-0.00099	0.00172	0.566	-0.00218	0.00525	0.677
Rented unfurnished	0.00209	0.00269	0.436	0.00195	0.00244	0.424	0.00041	0.00133	0.758	0.00360	0.00368	0.328
Rented furnished	0.00341	0.00290	0.239	0.00221	0.00249	0.375	0.00123	0.00159	0.440	0.01420	0.00534	0.008
London (base)												
North East	0.00006	0.00252	0.981	0.00069	0.00226	0.759	-0.00089	0.00111	0.426	0.00906	0.00334	0.007
North West	0.00098	0.00207	0.637	0.00071	0.00185	0.700	0.00026	0.00098	0.789	0.00395	0.00242	0.102
Yorkshire & Humber	0.00191	0.00222	0.391	0.00121	0.00195	0.536	0.00082	0.00114	0.473	0.00905	0.00285	0.002
East Midlands	0.00312	0.00238	0.190	0.00200	0.00210	0.341	0.00134	0.00122	0.273	0.00626	0.00292	0.032
West Midlands	0.00283	0.00242	0.244	0.00372	0.00226	0.100	-0.00091	0.00094	0.333	0.00840	0.00292	0.004
East	0.00158	0.00241	0.511	0.00045	0.00210	0.829	0.00125	0.00127	0.324	0.01299	0.00313	0.000
South East	0.00041	0.00198	0.835	-0.00068	0.00172	0.691	0.00127	0.00108	0.239	0.00618	0.00241	0.011
South West	-0.00005	0.00216	0.981	-0.00011	0.00192	0.956	-0.00012	0.00101	0.910	0.01151	0.00295	0.000
Wales	0.00182	0.00197	0.356	0.00192	0.00178	0.282	-0.00005	0.00089	0.959	0.00438	0.00229	0.056
Scotland	0.00009	0.00192	0.962	0.00064	0.00176	0.717	-0.00044	0.00085	0.606	0.00592	0.00232	0.011
NI & Channel Island	-0.00183	0.00210	0.384	-0.00182	0.00186	0.326	0.00004	0.00105	0.970	0.00202	0.00254	0.426
Business Cycle												
Non-recess Jan98-Dec00 (base)												
Recession Sept91-Dec93	0.00166	0.00241	0.490	0.00275	0.00213	0.196	-0.00155	0.00107	0.145	0.00118	0.00328	0.719
Non-recession Jan94-Dec97	0.00217	0.00174	0.211	0.00324	0.00156	0.038	-0.00115	0.00079	0.149	0.00058	0.00216	0.787
Recession Jan01-Dec02	0.00037	0.00166	0.825	0.00098	0.00144	0.498	-0.00068	0.00084	0.418	0.00313	0.00225	0.164
Non-recession Jan03-Dec04	-0.00264	0.00152	0.083	-0.00213	0.00130	0.100	-0.00048	0.00084	0.568	-0.00072	0.00209	0.732
Recession Jan05-Aug07	-0.00328	0.00140	0.019	-0.00193	0.00122	0.113	-0.00139	0.00072	0.053	-0.00578	0.00182	0.002
Recession Sept07-Apr 2009	-0.00359	0.00163	0.027	-0.00204	0.00143	0.154	-0.00150	0.00082	0.067	-0.00765	0.00211	0.000

	Edu to NEET			Edu to U			Edu to I			Edu to E		
	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|
Cummulative labour market history												
Sum_E	0.00101	0.00073	0.171	0.00101	0.00064	0.114	0.00006	0.00038	0.881	0.00214	0.00090	0.018
Sum_U	0.00370	0.00090	0.000	0.00334	0.00080	0.000	0.00001	0.00048	0.987	0.00338	0.00152	0.026
Sum_I	0.00377	0.00125	0.003	0.00111	0.00133	0.404	0.00231	0.00048	0.000	-0.00348	0.00207	0.092
Sum_Edu	0.00064	0.00059	0.278	0.00054	0.00052	0.297	0.00007	0.00028	0.792	0.00390	0.00075	0.000
Cummulative duration labour market history												
Sum_tE	-0.00011	0.00008	0.143	-0.00008	0.00007	0.208	-0.00004	0.00004	0.322	0.00013	0.00008	0.104
Sum_tU	0.00015	0.00010	0.115	0.00008	0.00009	0.375	0.00008	0.00005	0.071	0.00010	0.00018	0.604
Sum_tI	-0.00005	0.00009	0.535	-0.00012	0.00011	0.271	0.00001	0.00002	0.763	0.00010	0.00011	0.348
Sum_tEdu	-0.00001	0.00001	0.478	-0.00001	0.00001	0.399	0.00000	0.00000	0.964	-0.00001	0.00001	0.401
Duration (months)												
1 – 3 months	-0.05480	0.00468	0.000	-0.04432	0.00433	0.000	-0.01700	0.00238	0.000	-0.11925	0.00711	0.000
4 – 6 months	-0.05432	0.00470	0.000	-0.04280	0.00431	0.000	-0.01866	0.00253	0.000	-0.11557	0.00707	0.000
7 – 9 months	-0.05038	0.00462	0.000	-0.04131	0.00429	0.000	-0.01550	0.00232	0.000	-0.11015	0.00699	0.000
10 – 12 months	-0.04978	0.00463	0.000	-0.04038	0.00428	0.000	-0.01580	0.00234	0.000	-0.10048	0.00685	0.000
13 – 18 months	-0.05962	0.00489	0.000	-0.04689	0.00445	0.000	-0.01980	0.00268	0.000	-0.11731	0.00711	0.000
≤2yrs	-0.04634	0.00457	0.000	-0.03837	0.00424	0.000	-0.01441	0.00227	0.000	-0.09540	0.00677	0.000
≤3yrs	-0.04326	0.00452	0.000	-0.03616	0.00421	0.000	-0.01354	0.00223	0.000	-0.09519	0.00678	0.000
>3yrs	-0.04065	0.00467	0.000	-0.03468	0.00435	0.000	-0.01240	0.00226	0.000	-0.08523	0.00684	0.000
Observations	62,034			62,034			62,034			62,034		
Log likelihood	-3590.703			-2889.307			-1020.250			-5984.057		
lnsig2u	-6.216	9.322		-1.989	1.294		-9.617	13.278		-11.895	10.632	
sigma_u	0.045	0.208		0.370	0.239		0.0082	0.054		0.0026	0.014	
rho	0.001	0.011		0.077	0.092		0.0000405	0.00054		4.15e-06	0.00004	

Table D.7 **Competing-risks Models from Employment State with Heterogeneity of Correlated Spells (id1) and Unrestrictive Random Effects for Trivariate Destinations (M1, M2, M3)**

	E to U			E to I			E to Edu		
	Coeff.	Std Err	P>|z|	Coeff.	Std Err	P>|z|	Coeff.	Std Err	P>|z|
36-49 (base)									
16-19	0.765	0.087	0.000	0.250	0.135	0.065	2.111	0.206	0.000
20-24	0.462	0.070	0.000	0.495	0.089	0.000	1.176	0.185	0.000
25-35	-0.065	0.053	0.219	0.328	0.056	0.000	0.466	0.158	0.003
50-65	0.109	0.063	0.085	0.174	0.070	0.012	-0.855	0.347	0.014
Female (base)									
Male	0.355	0.040	0.000	-1.070	0.053	0.000	-0.203	0.072	0.005
White (base)									
Black	0.048	0.174	0.783	0.010	0.229	0.964	0.205	0.324	0.527
Asian	0.533	0.132	0.000	-0.124	0.180	0.492	0.446	0.236	0.059
Others	0.010	0.236	0.965	0.464	0.226	0.040	0.898	0.361	0.013
No education (base)									
Higher/1stdegree	-0.714	0.078	0.000	-0.351	0.089	0.000	0.263	0.205	0.199
A level	-0.432	0.070	0.000	-0.210	0.085	0.013	0.989	0.185	0.000
GCSE/O level	-0.366	0.063	0.000	-0.207	0.075	0.006	0.250	0.185	0.177
CSE level	-0.192	0.086	0.026	-0.245	0.112	0.029	0.008	0.231	0.971
Prof qualif/Others	-0.508	0.063	0.000	-0.243	0.073	0.001	0.360	0.192	0.061
Never/not married (base)									
Married	-0.425	0.054	0.000	0.184	0.060	0.002	-0.508	0.153	0.001
Evermarried	-0.114	0.082	0.167	-0.126	0.102	0.214	-0.414	0.258	0.108
Health Excellent/Good (base)									
Health Fair	0.197	0.040	0.000	0.314	0.049	0.000	0.147	0.087	0.090
Health Poor	0.379	0.064	0.000	0.739	0.068	0.000	0.130	0.153	0.395
Number of children									
ownchild	-0.099	0.031	0.002	0.074	0.031	0.017	0.041	0.093	0.657
Single no child (base)									
Single with child	0.179	0.078	0.022	-0.153	0.105	0.145	-0.202	0.162	0.211
Couple no child	-0.037	0.075	0.623	-0.296	0.100	0.003	-0.854	0.163	0.000

	E to U			E to I			E to Edu		
	Coeff.	Std Err	P>|z|	Coeff.	Std Err	P>|z|	Coeff.	Std Err	P>|z|
Couple with child	-0.021	0.074	0.775	-0.107	0.098	0.275	-0.412	0.148	0.005
2+ Adults	0.049	0.110	0.654	-0.496	0.180	0.006	0.053	0.162	0.741
Other	0.353	0.114	0.002	-0.033	0.167	0.843	-0.815	0.275	0.003
Owned outright (base)									
Owned mortgage	-0.157	0.056	0.005	-0.157	0.069	0.022	-0.305	0.104	0.003
Local auth. rented	0.415	0.068	0.000	0.237	0.085	0.006	-0.416	0.146	0.004
Housing assoc. rented	0.292	0.090	0.001	0.162	0.114	0.155	-0.414	0.205	0.044
Employer rented & other	-0.183	0.155	0.238	0.200	0.165	0.227	-0.297	0.298	0.319
Rented unfurnished	0.164	0.085	0.052	0.041	0.107	0.702	-0.196	0.179	0.275
Rented furnished	0.077	0.086	0.372	0.058	0.118	0.619	0.308	0.156	0.049
London (base)									
North East	0.390	0.109	0.000	0.162	0.132	0.223	0.254	0.228	0.266
North West	0.196	0.095	0.040	0.094	0.115	0.411	0.408	0.181	0.024
Yorkshire & Humber	0.157	0.098	0.109	0.072	0.117	0.538	0.290	0.192	0.130
East Midlands	0.210	0.097	0.030	0.229	0.115	0.046	0.238	0.196	0.226
West Midlands	0.213	0.097	0.029	0.096	0.117	0.412	0.333	0.191	0.080
East	0.200	0.098	0.041	0.308	0.113	0.006	0.247	0.191	0.197
South East	0.148	0.087	0.088	0.301	0.101	0.003	0.219	0.171	0.200
South West	0.207	0.097	0.032	0.239	0.113	0.034	0.308	0.189	0.104
Wales	0.217	0.090	0.016	0.140	0.107	0.193	0.136	0.177	0.443
Scotland	0.106	0.086	0.221	-0.071	0.105	0.499	0.527	0.159	0.001
NI & Channel Island	-0.004	0.113	0.971	0.008	0.129	0.948	0.268	0.197	0.174
Non-recession Jan98-Dec00 (base)									
Recession Sept91-Dec93	0.541	0.066	0.000	0.051	0.093	0.585	-0.207	0.160	0.194
Non-recession Jan94-Dec97	0.316	0.048	0.000	0.032	0.062	0.607	-0.092	0.110	0.399
Recession Jan01-Dec02	0.014	0.053	0.799	0.116	0.063	0.067	-0.0008	0.109	0.994
Non-recession Jan03-Dec04	-0.123	0.058	0.034	-0.035	0.069	0.608	0.036	0.113	0.749
Recession Jan05-Aug07	0.002	0.057	0.978	-0.057	0.069	0.404	-0.068	0.113	0.546
Recession Sept07-Dec10	-0.022	0.076	0.769	-0.177	0.094	0.061	-0.165	0.156	0.288

	E to U			E to I			E to Edu		
	Coeff.	Std Err	P>|z|	Coeff.	Std Err	P>|z|	Coeff.	Std Err	P>|z|
Cummulative labour market history									
Sum_E	-0.022	0.010	0.025	-0.002	0.011	0.889	-0.082	0.029	0.005
Sum_U	0.164	0.023	0.000	0.081	0.030	0.007	-0.038	0.068	0.580
Sum_I	0.068	0.039	0.080	0.263	0.034	0.000	0.152	0.089	0.089
Sum_Edu	0.082	0.031	0.008	-0.107	0.044	0.015	0.133	0.047	0.004
Cummulative duration of labour market history (months)									
Sum_tE	-0.003	0.0004	0.000	-0.004	0.001	0.000	-0.013	0.002	0.000
Sum_tU	0.004	0.001	0.001	0.002	0.002	0.140	-0.017	0.007	0.015
Sum_tI	-0.003	0.001	0.001	0.0004	0.001	0.567	-0.008	0.003	0.008
Sum_tEdu	-0.001	0.0005	0.029	0.0005	0.001	0.502	-0.001	0.001	0.305
Duration (months)									
1 – 3 months	-5.003	0.145	0.000	-5.586	0.177	0.000	-6.627	0.356	0.000
4 – 6 months	-5.040	0.145	0.000	-5.513	0.177	0.000	-6.771	0.356	0.000
7 – 9 months	-5.340	0.147	0.000	-5.479	0.177	0.000	-6.985	0.359	0.000
10 – 12 months	-5.408	0.148	0.000	-5.540	0.178	0.000	-6.598	0.356	0.000
13 – 18 months	-5.699	0.147	0.000	-5.834	0.177	0.000	-6.665	0.351	0.000
≤2yrs	-5.783	0.151	0.000	-5.779	0.179	0.000	-7.056	0.363	0.000
≤3yrs	-5.959	0.150	0.000	-6.090	0.179	0.000	-6.996	0.357	0.000
≤5yrs	-6.007	0.151	0.000	-6.043	0.177	0.000	-7.380	0.373	0.000
>5yrs	-6.268	0.162	0.000	-6.122	0.183	0.000	-7.847	0.444	0.000
Var M1	0.768	0.067							
Var M2	0.506	0.077							
Var M3	0.428	0.144							
Covar M1,M2	0.202	0.058	0.001						
Covar M1,M3	0.297	0.086	0.001						
Covar M2,M3	0.230	0.104	0.027						
Observations					984,503				
Log likelihood					-51122.873				

Table D.8 **Competing-risks Models from Unemployment State with Heterogeneity of Correlated Spells (id1) and Restrictive Random Effects for Trivariate Destinations (M1)**

	U to E			U to Edu			U to I		
	Coeff.	Std Err	P>|z|	Coeff.	Std Err	P>|z|	Coeff.	Std Err	P>|z|
36-49 (base)									
16-19	-0.022	0.075	0.767	1.247	0.236	0.000	-0.150	0.228	0.511
20-24	0.094	0.061	0.126	0.312	0.208	0.133	0.028	0.176	0.875
25-35	0.071	0.048	0.139	0.012	0.179	0.947	-0.033	0.136	0.808
50-65	-0.383	0.060	0.000	-0.672	0.291	0.021	0.052	0.156	0.740
Female (base)									
Male	-0.117	0.034	0.001	-0.115	0.098	0.241	-0.535	0.098	0.000
White (base)									
Black	-0.253	0.148	0.089	0.449	0.325	0.167	-0.488	0.478	0.308
Asian	-0.318	0.106	0.003	-0.177	0.333	0.595	-0.128	0.306	0.676
Others	-0.235	0.185	0.205	0.468	0.401	0.243	0.465	0.403	0.248
No education (base)									
Higher/1stdegree	0.358	0.065	0.000	0.830	0.225	0.000	-0.051	0.196	0.795
A level	0.229	0.060	0.000	0.793	0.190	0.000	-0.098	0.175	0.576
GCSE/O level	0.178	0.054	0.001	0.773	0.169	0.000	0.118	0.135	0.384
CSE level	0.040	0.072	0.582	0.269	0.209	0.199	-0.013	0.192	0.948
Prof qualif/Others	0.314	0.054	0.000	0.672	0.187	0.000	0.045	0.142	0.753
Never/not married (base)									
Married	0.085	0.049	0.084	-0.415	0.199	0.037	-0.032	0.141	0.819
Evermarried	-0.050	0.074	0.497	0.185	0.242	0.445	0.537	0.182	0.003
Health Excellent/Good (base)									
Health Fair	-0.261	0.038	0.000	-0.057	0.114	0.619	0.414	0.106	0.000
Health Poor	-0.264	0.057	0.000	-0.127	0.183	0.490	0.780	0.128	0.000
Number of children									
ownchild	-0.049	0.028	0.081	0.013	0.105	0.898	0.105	0.070	0.133
Single no child (base)									
Single with child	0.124	0.069	0.069	-0.049	0.193	0.801	-0.206	0.186	0.268
Couple no child	0.275	0.068	0.000	-0.358	0.221	0.105	0.340	0.195	0.080
Couple with child	0.241	0.065	0.000	-0.144	0.190	0.447	0.218	0.183	0.234

	U to E			U to Edu			U to I		
	Coeff.	Std Err	P>|z|	Coeff.	Std Err	P>|z|	Coeff.	Std Err	P>|z|
2+ Adults	0.296	0.101	0.003	0.086	0.292	0.769	0.210	0.348	0.545
Other	0.214	0.103	0.038	-0.395	0.317	0.213	0.321	0.297	0.280
Household Tenure									
Owned outright (base)									
Owned mortgage	0.171	0.048	0.000	0.409	0.173	0.018	-0.077	0.148	0.601
Local auth. rented	-0.292	0.060	0.000	0.224	0.192	0.242	0.073	0.161	0.648
Housing assoc. rented	-0.260	0.078	0.001	0.292	0.236	0.215	-0.119	0.211	0.571
Other Rented	0.067	0.062	0.285	0.349	0.210	0.097	-0.161	0.189	0.394
London (base)									
North East	-0.025	0.094	0.789	0.071	0.277	0.799	-0.123	0.257	0.632
North West	-0.148	0.081	0.069	0.048	0.232	0.838	-0.188	0.220	0.393
Yorkshire & Humber	0.018	0.082	0.823	0.060	0.241	0.804	-0.143	0.228	0.530
East Midlands	0.009	0.082	0.914	-0.116	0.245	0.636	-0.439	0.232	0.059
West Midlands	0.011	0.081	0.895	-0.129	0.251	0.607	-0.482	0.246	0.050
East	0.022	0.085	0.792	-0.333	0.280	0.235	0.074	0.229	0.747
South East	0.133	0.075	0.074	-0.142	0.236	0.548	-0.488	0.229	0.033
South West	0.126	0.082	0.125	-0.078	0.256	0.759	-0.645	0.267	0.016
Wales	-0.110	0.076	0.149	0.050	0.220	0.820	-0.055	0.203	0.787
Scotland	-0.099	0.073	0.171	0.055	0.212	0.797	-0.416	0.205	0.042
NI & Channel Island	-0.418	0.098	0.000	-0.158	0.291	0.588	-0.113	0.251	0.653
Business Cycle Period									
Non-recession Jan98-Dec00 (base)									
Recession Sept91-Dec93	-0.375	0.057	0.000	0.273	0.178	0.126	-0.140	0.189	0.458
Non-recession Jan94-Dec97	-0.145	0.045	0.001	0.320	0.147	0.030	-0.018	0.143	0.900
Recession Jan01-Dec02	-0.133	0.051	0.009	0.067	0.168	0.691	0.092	0.150	0.538
Non-recession Jan03-Dec04	-0.081	0.054	0.137	0.089	0.182	0.624	0.215	0.156	0.169
Recession Jan05-Aug07	-0.187	0.053	0.000	-0.210	0.181	0.245	-0.171	0.165	0.299
Recession Sept07-Dec10	-0.344	0.074	0.000	0.538	0.194	0.005	-0.533	0.251	0.034

	U to E			U to Edu			U to I		
	Coeff.	Std Err	P>|z|	Coeff.	Std Err	P>|z|	Coeff.	Std Err	P>|z|
Cummulative labour market history									
Sum_E	-0.013	0.009	0.130	-0.136	0.039	0.000	-0.037	0.027	0.170
Sum_U	0.288	0.019	0.000	0.249	0.071	0.000	0.087	0.053	0.099
Sum_I	-0.084	0.033	0.012	0.002	0.119	0.990	0.128	0.078	0.099
Sum_Edu	-0.007	0.024	0.764	0.017	0.064	0.785	-0.068	0.071	0.340
Cummulative duration of labour market history (months)									
Sum_tE	0.001	0.000	0.025	-0.002	0.001	0.223	-0.001	0.001	0.337
Sum_tU	-0.021	0.002	0.000	-0.015	0.006	0.008	0.003	0.003	0.287
Sum_tI	-0.002	0.001	0.012	-0.008	0.004	0.047	-0.002	0.002	0.155
Sum_tEdu	0.001	0.000	0.127	0.000	0.001	0.943	0.002	0.001	0.190
Duration (months)									
1 – 3 months	-2.176	0.121	0.000	-5.776	0.423	0.000	-4.807	0.343	0.000
4 – 6 months	-2.258	0.122	0.000	-5.935	0.428	0.000	-4.930	0.352	0.000
7 – 9 months	-2.552	0.126	0.000	-5.880	0.431	0.000	-4.867	0.358	0.000
10 – 12 months	-2.588	0.130	0.000	-5.748	0.434	0.000	-4.764	0.363	0.000
13 – 18 months	-2.862	0.130	0.000	-5.857	0.429	0.000	-5.054	0.361	0.000
≤2yrs	-3.031	0.140	0.000	-6.596	0.481	0.000	-5.195	0.379	0.000
≤3yrs	-3.438	0.146	0.000	-6.483	0.465	0.000	-5.519	0.382	0.000
≤5yrs	-3.662	0.159	0.000	-6.832	0.507	0.000	-5.349	0.371	0.000
>5yrs	-4.359	0.227	0.000	-7.902	0.814	0.000	-6.145	0.445	0.000
M1	1.000			-1.418	0.302	0.000	-1.011	0.321	0.002
Var M1	0.204	0.032	0.277						
Observations					70,791				
Log likelihood					-23876.5				

Table D.9 Competing-risks Models from Inactivity State with Heterogeneity of Correlated Spells (id1) and Restrictive Random Effects for Trivariate Destinations (M1)

	I to E			I to Edu			I to U		
	Coeff.	Std Err	P>|z|	Coeff.	Std Err	P>|z|	Coeff.	Std Err	P>|z|
36-49 (base)									
16-19	0.027	0.138	0.844	2.225	0.284	0.000	0.399	0.261	0.126
20-24	0.143	0.091	0.115	0.916	0.258	0.000	0.447	0.196	0.023
25-35	0.009	0.057	0.875	0.197	0.211	0.351	0.207	0.147	0.159
50-65	-0.735	0.078	0.000	-0.947	0.352	0.007	-0.601	0.178	0.001
Female (base)									
Male	0.418	0.057	0.000	0.363	0.131	0.006	1.012	0.111	0.000
White (base)									
Black	-0.047	0.252	0.853	0.574	0.388	0.139	-0.260	0.484	0.592
Asian	-0.234	0.185	0.205	0.548	0.304	0.072	0.818	0.273	0.003
Others	0.029	0.233	0.899	0.361	0.507	0.477	-0.559	0.566	0.324
No education (base)									
Higher/1stdegree	0.850	0.096	0.000	1.037	0.308	0.001	0.407	0.196	0.038
A level	0.387	0.090	0.000	1.274	0.259	0.000	-0.019	0.182	0.919
GCSE/O level	0.393	0.079	0.000	0.947	0.248	0.000	-0.086	0.161	0.593
CSE level	0.222	0.113	0.049	0.228	0.328	0.486	0.003	0.230	0.989
Prof qualif/Others	0.508	0.077	0.000	1.116	0.260	0.000	-0.203	0.164	0.214
Never/not married (base)									
Married	-0.201	0.060	0.001	-0.505	0.199	0.011	-0.593	0.147	0.000
Evermarried	0.127	0.104	0.221	-0.342	0.312	0.274	-0.195	0.203	0.338
Health Excellent/Good (base)									
Health Fair	-0.280	0.055	0.000	-0.029	0.139	0.835	-0.088	0.122	0.471
Health Poor	-0.737	0.066	0.000	-0.624	0.198	0.002	-0.428	0.138	0.002
Number of children									
ownchild	-0.073	0.030	0.014	-0.069	0.097	0.474	-0.279	0.084	0.001
Single no child (base)									
Single with child	0.173	0.121	0.153	-0.117	0.256	0.646	-0.125	0.204	0.539
Couple no child	0.367	0.126	0.004	-0.988	0.327	0.003	-0.096	0.214	0.654
Couple with child	0.250	0.121	0.039	-0.475	0.253	0.060	-0.310	0.203	0.127

	I to E			I to Edu			I to U		
	Coeff.	Std Err	P>|z|	Coeff.	Std Err	P>|z|	Coeff.	Std Err	P>|z|
2+ Adults	0.668	0.189	0.000	0.345	0.323	0.286	0.263	0.312	0.399
Other	0.508	0.179	0.004	-1.410	0.566	0.013	0.018	0.326	0.955
Owned outright (base)									
Owned mortgage	0.142	0.071	0.044	-0.024	0.181	0.892	0.067	0.153	0.660
Local auth. rented	-0.241	0.087	0.006	-0.439	0.219	0.046	-0.213	0.178	0.232
Housing assoc. rented	-0.342	0.117	0.004	-0.896	0.324	0.006	0.090	0.222	0.686
Employer rented & other	0.401	0.188	0.033	-0.208	0.606	0.732	-0.395	0.535	0.460
Rented unfurnished	0.082	0.104	0.430	-0.385	0.299	0.197	-0.785	0.305	0.010
Rented furnished	0.144	0.117	0.219	0.378	0.243	0.119	0.040	0.234	0.863
London (base)									
North East	0.210	0.138	0.129	-0.008	0.336	0.981	-0.304	0.324	0.349
North West	0.070	0.120	0.562	-0.298	0.263	0.258	0.036	0.243	0.882
Yorkshire & Humber	0.256	0.122	0.035	-0.100	0.266	0.708	-0.057	0.272	0.833
East Midlands	0.178	0.121	0.141	-0.262	0.293	0.371	-0.120	0.271	0.659
West Midlands	0.237	0.124	0.057	-0.054	0.266	0.840	-0.173	0.284	0.544
East	0.252	0.117	0.031	-0.668	0.312	0.032	-0.049	0.258	0.851
South East	0.487	0.110	0.000	0.163	0.238	0.494	0.336	0.234	0.150
South West	0.253	0.119	0.034	-0.241	0.278	0.386	-0.315	0.291	0.280
Wales	0.125	0.113	0.269	-0.324	0.247	0.190	0.350	0.229	0.126
Scotland	0.150	0.110	0.173	-0.098	0.233	0.675	0.332	0.225	0.139
NI & Channel Island	0.130	0.133	0.331	-0.947	0.347	0.006	-0.044	0.294	0.882
Business Cycle Period									
Non-recession Jan98-Dec00 (base)									
Recession Sept91-Dec93	-0.384	0.111	0.001	-0.240	0.282	0.394	0.425	0.220	0.054
Non-recession Jan94-Dec97	-0.156	0.067	0.021	-0.162	0.193	0.400	0.407	0.158	0.010
Recession Jan01-Dec02	0.111	0.066	0.092	0.138	0.190	0.469	0.012	0.171	0.943
Non-recession Jan03-Dec04	-0.140	0.072	0.052	0.188	0.190	0.324	0.335	0.164	0.041
Recession Jan05-Aug07	-0.167	0.071	0.020	0.137	0.184	0.455	-0.251	0.184	0.171
Recession Sept07-Dec10	0.010	0.091	0.914	0.657	0.209	0.002	0.100	0.223	0.654

	I to E			I to Edu			I to U		
	Coeff.	Std Err	P>|z|	Coeff.	Std Err	P>|z|	Coeff.	Std Err	P>|z|
Cummulative labour market history									
Sum_E	0.071	0.011	0.000	-0.121	0.044	0.006	-0.026	0.026	0.331
Sum_U	-0.037	0.030	0.209	0.080	0.093	0.387	0.144	0.054	0.007
Sum_I	0.222	0.030	0.000	0.441	0.093	0.000	0.347	0.074	0.000
Sum_Edu	-0.040	0.042	0.337	0.097	0.070	0.167	-0.021	0.076	0.780
Cummulative duration of labour market history (months)									
Sum_tE	-0.001	0.000	0.007	-0.005	0.002	0.019	0.000	0.001	0.824
Sum_tU	-0.009	0.002	0.000	-0.020	0.009	0.020	0.000	0.003	0.992
Sum_tI	-0.001	0.001	0.102	-0.005	0.003	0.101	-0.002	0.002	0.289
Sum_tEdu	0.000	0.001	0.799	-0.001	0.001	0.243	0.002	0.001	0.245
Duration (months)									
1 – 3 months	-3.852	0.195	0.000	-5.065	0.492	0.000	-4.795	0.382	0.000
4 – 6 months	-3.983	0.194	0.000	-5.683	0.504	0.000	-4.917	0.385	0.000
7 – 9 months	-4.041	0.195	0.000	-5.809	0.516	0.000	-5.310	0.397	0.000
10 – 12 months	-4.249	0.198	0.000	-5.636	0.521	0.000	-5.208	0.398	0.000
13 – 18 months	-4.420	0.194	0.000	-6.180	0.526	0.000	-6.234	0.419	0.000
≤2yrs	-4.672	0.199	0.000	-6.340	0.547	0.000	-5.993	0.416	0.000
≤3yrs	-4.900	0.196	0.000	-6.313	0.527	0.000	-6.298	0.411	0.000
≤5yrs	-5.046	0.195	0.000	-6.244	0.514	0.000	-6.819	0.427	0.000
>5yrs	-5.353	0.200	0.000	-6.958	0.544	0.000	-6.911	0.433	0.000
M1	1.000			0.048	0.512	0.926	-1.271	0.533	0.017
Var M1	0.151	0.062	0.339						
Observations				143,673					
Log likelihood				-16059.5					

Table D.10 Competing-risks Models from Education State (for All Age Groups) with Heterogeneity of Correlated Spells (id1) and Unrestrictive Random Effects for Trivariate Destinations (M1, M2, M3)

	Edu to U			Edu to I			Edu to E		
	Coeff.	Std Err	P>|z|	Coeff.	Std Err	P>|z|	Coeff.	Std Err	P>|z|
36-49 (base)									
16-19	-0.285	0.287	0.321	-0.137	0.418	0.744	0.134	0.204	0.512
20-24	-0.312	0.255	0.221	-0.246	0.359	0.493	-0.015	0.180	0.934
25-35	-0.080	0.207	0.700	0.061	0.266	0.818	0.239	0.141	0.090
50-65	0.244	0.347	0.482	0.589	0.418	0.159	-0.001	0.272	0.997
Female (base)									
Male	0.455	0.113	0.000	-0.492	0.184	0.008	-0.089	0.076	0.245
White (base)									
Black	-0.814	0.434	0.061	0.446	0.432	0.301	0.183	0.236	0.439
Asian	-0.239	0.355	0.500	-0.396	0.512	0.439	-0.333	0.240	0.165
Others	-0.040	0.495	0.935	1.005	0.540	0.063	-0.161	0.371	0.665
No education (base)									
Higher/1stdegree	-0.021	0.253	0.934	0.387	0.440	0.378	0.692	0.208	0.001
A level	-0.773	0.223	0.001	-0.186	0.401	0.643	0.029	0.189	0.878
GCSE/O level	-0.421	0.202	0.037	0.109	0.378	0.773	0.249	0.182	0.170
CSE level	0.018	0.255	0.945	0.054	0.540	0.920	0.657	0.219	0.003
Prof qualif/Others	-0.453	0.219	0.039	0.363	0.382	0.342	0.171	0.191	0.370
Never/not married (base)									
Married	-0.310	0.240	0.196	0.179	0.280	0.523	0.126	0.147	0.394
Evermarried	-0.226	0.296	0.446	-0.295	0.361	0.414	0.299	0.199	0.133
Health Excellent/Good (base)									
Health Fair	0.277	0.126	0.028	-0.261	0.209	0.211	0.113	0.092	0.222
Health Poor	0.231	0.213	0.279	0.190	0.285	0.505	0.114	0.153	0.457
Number of children ownchild	-0.112	0.123	0.365	0.328	0.126	0.009	0.058	0.078	0.457
Single no child (base)									
Single with chil	0.406	0.229	0.076	0.357	0.366	0.329	0.297	0.171	0.083
Couple no child	0.011	0.262	0.966	0.588	0.402	0.143	0.319	0.182	0.080

	Edu to U			Edu to I			Edu to E		
	Coeff.	Std Err	P>|z|	Coeff.	Std Err	P>|z|	Coeff.	Std Err	P>|z|
Couple with child	0.199	0.219	0.365	0.156	0.357	0.661	0.394	0.159	0.013
2+ Adults	-0.286	0.272	0.294	-0.095	0.448	0.833	0.159	0.182	0.383
Other	0.518	0.405	0.201	0.146	0.671	0.828	0.830	0.275	0.003
Owned outright (base)									
Owned mortgage	-0.038	0.172	0.825	-0.463	0.240	0.054	-0.003	0.114	0.978
Local auth. rented	0.340	0.206	0.099	0.594	0.276	0.032	0.167	0.146	0.253
Housing assoc. rented	0.404	0.264	0.126	-0.162	0.396	0.683	0.342	0.194	0.078
Employer rented & other	0.120	0.512	0.815	-0.789	0.763	0.301	-0.484	0.320	0.130
Rented unfurnished	0.228	0.296	0.441	-0.037	0.385	0.924	0.505	0.188	0.007
Rented furnished	0.313	0.255	0.220	0.146	0.360	0.686	0.147	0.177	0.407
London (base)									
North East	0.260	0.288	0.367	-0.077	0.477	0.872	-0.016	0.210	0.939
North West	0.140	0.253	0.580	0.197	0.380	0.605	0.000	0.176	0.998
Yorkshire & Humber	0.026	0.275	0.924	-0.219	0.435	0.614	0.175	0.177	0.324
East Midlands	0.141	0.282	0.617	0.504	0.395	0.203	0.262	0.189	0.165
West Midlands	0.257	0.273	0.348	-0.250	0.415	0.547	0.095	0.184	0.605
East	-0.009	0.322	0.978	0.227	0.456	0.618	0.457	0.188	0.015
South East	-0.123	0.267	0.644	0.361	0.346	0.297	0.188	0.165	0.254
South West	0.088	0.276	0.749	0.119	0.422	0.779	0.313	0.177	0.078
Wales	0.368	0.244	0.132	0.511	0.340	0.134	0.105	0.170	0.536
Scotland	0.076	0.229	0.739	0.280	0.315	0.374	0.048	0.150	0.751
NI & Channel Island	-0.262	0.313	0.403	0.070	0.450	0.876	-0.044	0.200	0.826
Non-recession Jan98-Dec00 (base)									
Recession Sept91-Dec93	0.436	0.204	0.033	0.525	0.332	0.113	0.288	0.155	0.063
Non-recession Jan94-Dec97	0.304	0.164	0.064	0.036	0.257	0.887	0.307	0.114	0.007
Recession Jan01-Dec02	0.033	0.171	0.846	-0.191	0.253	0.449	0.071	0.117	0.542
Non-recession Jan03-Dec04	-0.453	0.196	0.021	-0.310	0.263	0.239	0.005	0.122	0.965
Recession Jan05-Aug07	-0.378	0.177	0.033	-0.590	0.256	0.021	-0.395	0.121	0.001
Recession Sept07-Dec10	-1.021	0.243	0.000	-0.467	0.289	0.106	-1.282	0.180	0.000

	Edu to U			Edu to I			Edu to E		
	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|	dy/dx	Std Err	P>|z|
Cummulative labour market history									
Sum_E	-0.125	0.039	0.001	0.024	0.046	0.604	0.097	0.022	0.000
Sum_U	0.400	0.066	0.000	-0.028	0.112	0.804	0.070	0.055	0.201
Sum_I	0.029	0.109	0.791	0.453	0.104	0.000	-0.090	0.070	0.194
Sum_Edu	0.090	0.065	0.169	0.158	0.092	0.086	0.128	0.045	0.004
Cummulative duration of labour market history (months)									
Sum_tE	0.000	0.002	0.840	0.001	0.002	0.647	-0.001	0.001	0.661
Sum_tU	0.003	0.004	0.520	0.004	0.007	0.618	-0.002	0.004	0.569
Sum_tI	-0.004	0.003	0.234	0.006	0.002	0.015	-0.001	0.002	0.688
Sum_tEdu	-0.002	0.001	0.121	0.002	0.002	0.226	0.000	0.001	0.529
Duration (months)									
1 – 3 months	-4.929	0.493	0.000	-7.162	0.761	0.000	-5.625	0.352	0.000
4 – 6 months	-4.600	0.484	0.000	-7.140	0.761	0.000	-5.195	0.346	0.000
7 – 9 months	-4.605	0.484	0.000	-6.189	0.737	0.000	-5.067	0.345	0.000
10 – 12 months	-4.197	0.477	0.000	-6.006	0.730	0.000	-4.460	0.339	0.000
13 – 18 months	-5.823	0.514	0.000	-8.050	0.818	0.000	-5.435	0.346	0.000
≤2yrs	-4.586	0.479	0.000	-6.203	0.729	0.000	-4.670	0.337	0.000
≤3yrs	-4.490	0.474	0.000	-5.923	0.711	0.000	-4.454	0.332	0.000
>3yrs[a]	-4.346	0.493	0.000	-6.076	0.739	0.000	-4.227	0.343	0.000
Var M1	0.377	0.215							
Var M2	0.140	0.316							
Var M3	0.173	0.100							
Covar M1,M2	- 0.006	0.263	0.982						
Covar M1,M3	- 0.157	0.127	0.218						
Covar M2,M3	0.011	0.159	0.944						
Observations					47,137				
Log likelihood					-8098.4175				

[a] Duration dummies only classified up to 8 categories, since there is no transitions events from education observed for duration above three years.

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