Age structure and the UK unemployment rate

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Abstract

The proportion of youths in the labour force has fallen dramatically over the past 15 years, following the collapse in the fertility rate in the 1970s *('the baby bust').* Given that youths always have higher unemployment rates than adults, this shift in the composition of the labour force towards those with lower unemployment rates may have been responsible for a fall in the aggregate unemployment rate. Using data from the Labour Force Survey, we estimate that about 55 basis points of the 565 basis point fall in the UK unemployment rate between 1984 and 1998 can be accounted for by changes in the age structure of the labour force. Changes in the fraction of each age group that is economically active will also affect the composition of the labour force (and therefore potentially the unemployment rate); however, even when we control for changing labour force participation rates by age, demographically driven shifts in the age composition of the labour force still explain about 40 basis points of the fall in the unemployment rate. Finally, we estimate that demographic change will have a negligible impact on the unemployment rate over the next decade, on the basis of recent labour force projections.

1 Introduction

Most models of the labour market take it as given that inflationary pressures develop when unemployment falls below its natural or equilibrium rate—this assumption is at the heart of the Phillips curve relationship, and the expectations-augmented models that followed it. So recent developments in the labour market have puzzled economists: in August 1999, for example, the number of people out of work and claiming benefit fell to a 19-year low and yet the RPIX inflation rate was at its lowest level for more than five years.

One explanation of this puzzle is that the natural or equilibrium unemployment rate may have fallen, enabling the actual unemployment rate to fall substantially without generating a pick-up in inflation. Mainstream explanations for such a fall in the natural rate have tended to focus on the decline in union bargaining power, reduced generosity of unemployment benefits and increased deregulation in the labour market. This paper examines another supply-side explanation, which has received less attention in the United Kingdom: that the natural rate has fallen because of changes in the age composition of the labour force. Youths[(1)] always have higher unemployment rates than adults, and presumably have higher natural rates as well. The proportion of youths in the labour force almost halved over the past decade, so we would expect the aggregate unemployment rate and the natural rate to have fallen as a result.

Most of the existing literature investigating the impact of demographic change on the unemployment rate has focused on the US labour market. In a recent influential paper, Shimer (1998) claims that demographic factors explain the bulk of low-frequency fluctuations in US unemployment since World War II, raising the aggregate unemployment rate by about 2 percentage points over the 1960s and 1970s, and then reducing it by about 1½ percentage points thereafter. This paper provides a comparable quantitative estimate of the fall in the UK unemployment rate that can be accounted for by the decline in the youth share of the labour force.

Section 2 presents two key stylised facts, which together suggest that demographic change could play a significant role in explaining recent developments in the UK labour market. First, that the proportion of youths in the UK labour force has fallen dramatically over the past decade. Second,

(1) 'Youths' here refers to the 16–24 age group.

that youths always have higher unemployment rates than adults, and that this can be attributed to the fact that they have higher inflow rates into unemployment. Section 3 analyses why youths might have higher equilibrium unemployment rates than adults. We argue that the youth unemployment problem is caused either by high quit rates among younger workers, or by firms discriminating against their younger employees when they lay off workers. This is consistent with youths having high unemployment rates because they have high inflow rates into unemployment.

In Section 4 we survey the 'shift-share' methodology developed in the literature, and use it to provide a range of estimates of the impact on the unemployment rate of demographic change in the labour force. We conclude that the decline in the youth share of the UK labour force can explain approximately 55 basis points of the fall in the aggregate unemployment rate between 1984 and 1998. We also assess whether shifts in the composition of the labour force have had any effect on the youth and adult unemployment rates (for example, through generational crowding effects). We find little robust evidence for this.

A number of factors, other than changes in birth and death rates, may affect the composition of the labour force. The proportion of the population in each age group that is economically active (either employed or actively searching for work) can and does vary over time, and this will lead to changes in the composition of the labour force. Section 5 discusses two alternative approaches that seek to control for these changes in the labour force participation rates of each age group, in order to isolate the effect of demographic change on the unemployment rate. Qualitatively, the results are the same as before. Demographic change appears to be the principal determinant of the changes in the composition of the labour force and explains a small but significant fraction of the overall change in the unemployment rate between 1984 and 1998.

Finally, in Section 6, we use current projections of the future size and composition of the labour force (based on data on fertility rates, and forecasts of future patterns of migration, mortality and activity rates) to project the implications for the unemployment rate in the near future. We conclude that shifts in the composition of the labour force are unlikely to have a significant impact on the unemployment rate over the next decade.

2 Stylised facts

2.1 Demographic change

The United Kingdom, like most of the developed world, has experienced a sustained period of significant demographic change in the post-war period. The crude birth rate[(2)] increased rapidly through the late 1950s and early 1960s, from 15 in 1955 to 18.5 in 1964, then collapsed to a low of 11.5 in 1977. It has since stabilised (see Chart 2.1). These changes were echoed 16 years later in the size of the youth cohort entering the labour market (see Chart 2.2): the proportion of 16–19 year olds in the labour force peaked at 9.9% in 1981, but by 1994 had fallen back to 5.8%.

Chart 2.1
Crude birth rate

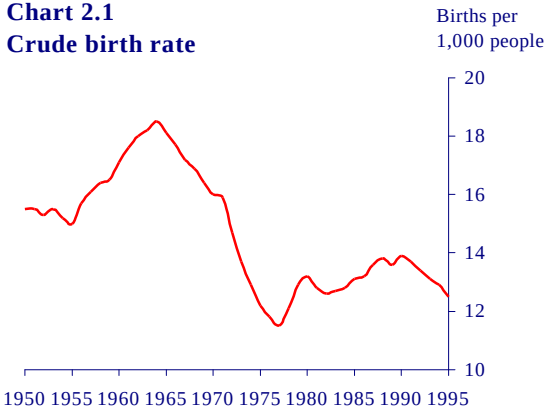
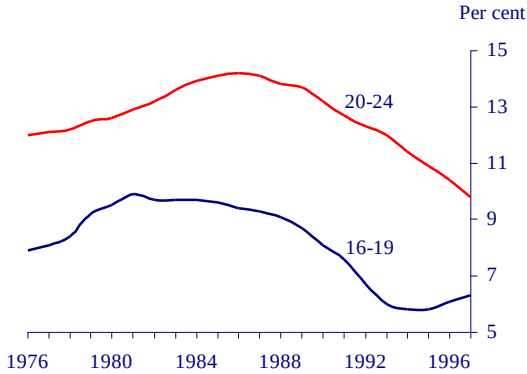


Chart 2.2 illustrates the dramatic fall in the youth share of the labour force between the late 1970s and the mid-1990s. Although the huge fall in the birth rate that occurred once the baby boom had ended will certainly have reduced the number of youths in the working-age population, there are a number of other factors that might have affected the *youth share of the labour force*. Principal among these is the proportion of each youth cohort that remains within the education system. Over the past two decades the United Kingdom has experienced a period of sustained expansion in the post-compulsory education system, with the number of youths attending

(2) The total number of births each year, multiplied by a thousand and divided by the population.

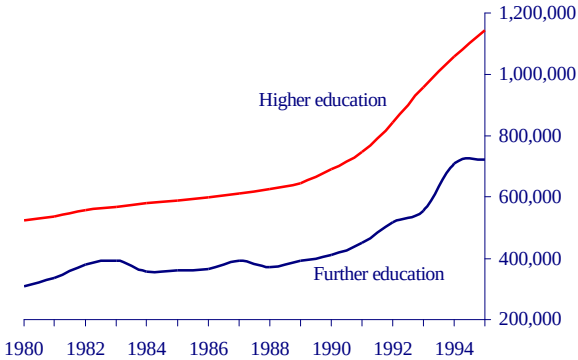
Chart 2.2
The youth share of the labour force



further and higher education colleges more than doubling between 1980 and 1995 (see Chart 2.3). Although a large number of these students will also seek part-time employment to supplement their income, increased participation in the education system is certain to have reduced the proportion of youths in the population either employed or actively searching for work. This reduction in the youth share of the labour force (over and above the demographic change in the population discussed above) can be illustrated by focusing on the proportion of economically active youths in the working-age population. For those aged 16 to 17 the activity rate fell by more than 4 percentage points, and for those aged between 18 and 24 it fell by 7 percentage points. This had a significant impact on the number of youths in the labour force—if activity rates had remained at their 1984 levels there would have been approximately 400,000 more youths in the labour force (approximately half the increase in the number of youths entering further and higher education, reflecting the fact that a number of students are also classified as economically active). To put this in context, in 1984 there were 6¼ million youths aged between 16 and 24 in the labour force, but by 1998 there were less than 4½ million. In other words, approximately a quarter of the total fall in the number of youths in the labour force over the period was a result purely of changes in the proportion of the youth population either employed or actively searching for work. However, changes in youth activity rates will not necessarily have affected the composition of the labour force over the period to the same extent as they have the number of youths in the labour force. For men at least, the incidence of economic inactivity has increased across all age groups in the

labour force since the mid-1970s[3] and so the labour force may have declined at a similar rate to the proportion of youths entering the labour force. Changes in the participation rate of a specific age group will matter only to the extent that it diverges from that of other age groups.

Chart 2.3
Numbers of students in further and higher education



2.2 The youth unemployment gap

Youths always have a higher unemployment rate than adults (see Chart 2.4). This differential is persistent, but varies across the cycle. The unemployment rate is identically equal to the product of the *inflow rate* into unemployment and the average *duration* of unemployment. So if U is the stock of unemployment, S is the inflow into unemployment, and N is the size of the labour force, then:

$$\frac{U}{N} = \frac{S}{N} \times \frac{U}{S} \qquad \textbf{(2.1)}$$

In steady state, the number of people entering unemployment must equal the number leaving it. Letting H denote the total outflow from unemployment, we get:

(3) Activity rates have risen for women. See Gregg and Wadsworth (1999).

$$\frac{U}{N} = \frac{S}{N} \times \frac{U}{H} \qquad \textbf{(2.2)}$$

The final term of this expression is the reciprocal of the outflow rate, so the unemployment rate in steady state can be expressed as the inflow rate into unemployment rate divided by the outflow rate from it:

$$\frac{U}{N} = \frac{S/N}{H/U} \qquad \textbf{(2.3)}$$

The UK data show that youths have higher unemployment rates because they have a higher propensity to become unemployed. Once unemployed, however, their outflow rates from unemployment appear, if anything, to be marginally higher than those of adults; as a result, at any given point in time, a far smaller proportion of unemployed youths have been unemployed for an extended period (see Chart 2.5).[4] Put another way, although large numbers of young people flow into unemployment each period, very few end up becoming long-term unemployed.

Chart 2.4 also reveals that, relative to all other age groups in the labour force, youths have had increasingly higher unemployment rates over the period. When the labour market began to recover in the mid-1990s, the unemployment rate of the youngest members of the labour force was the most sluggish to react—between 1993 and 1996 the unemployment rate of 16–17 year olds actually increased, while the rates of all other groups fell. By 1998, while the unemployment rate of most other age groups had fallen by about a third, the unemployment rate of 16–17 year olds was still at its 1993 level. This may well be a consequence of increased participation in post-compulsory education—if, as seems likely, those members of each cohort with the best employment prospects enter further and higher education, then over time the average employability of those youths who enter the labour force aged 16 will fall.

(4) For further details see Appendix Table A.2.2.

Chart 2.4
Unemployment by age group

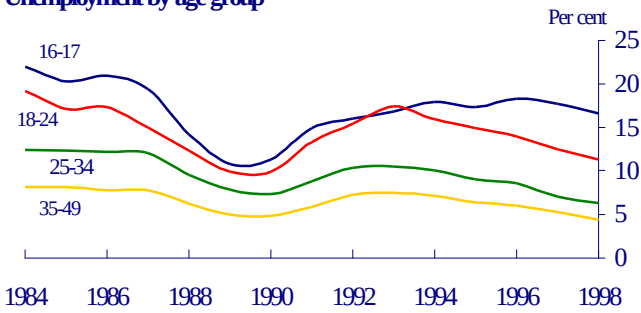
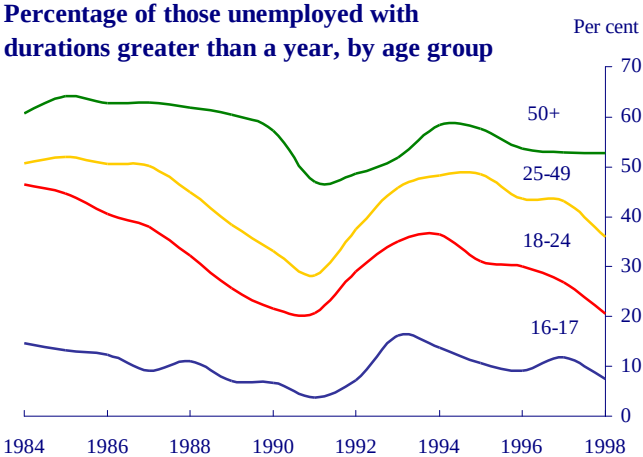


Chart 2.5
Percentage of those unemployed with durations greater than a year, by age group



So our two stylised facts are:

- the proportion of youths in the labour force has fallen substantially over the past 15 years; and

- youths always have higher rates of unemployment than adults because they have higher inflow rates into unemployment.

Given the orders of magnitude of the relevant variables, demographic change in the labour force could have been large enough to have had a significant effect on aggregate unemployment.

3 The youth unemployment rate differential

Turnover in the labour market appears to be greatest for younger workers. Gregg and Wadsworth (1995) estimate that more than half of all the job changes during the course of a working lifetime occur before the age of 30, and a quarter before the age of 20. In the following section we outline the existing explanations of why youths suffer higher unemployment rates than adults. It appears that these higher job separation rates can be explained either by discrimination against youths when firms are forced to lay-off staff, or by the greater propensity of young workers to quit their jobs. Of course, it is plausible that as the composition of the labour force changes the differential between the youth and adult unemployment rates may vary; however, irrespective of the shifts in the composition of the labour force we have discussed, theory and evidence suggest that our stylised fact—that youths have higher unemployment rates than adults—will always be true (Topel (1998)).

3.1 Firms' lay-off policies

Firms are periodically forced to lay-off some of their employees, both in response to transitory and permanent shifts in demand, and as a result of periodic restructuring of the workplace to increase efficiency or profitability. If firms disproportionately concentrate lay-offs among their youngest employees, this might help to explain the higher youth inflows into unemployment. There are two main reasons why lay-offs may be concentrated among younger workers. First, that firms are constrained—by prior agreement to 'last in, first out' (LIFO) rules, which disproportionately target younger workers—in who will be laid off; and second, that firms choose to lay off their youngest employees.

3.1.1 Negotiated LIFO rules

In their survey of 'Pay and employment determination in Britain', Oswald and Turnbull (1985) find that LIFO is the most widely used method for choosing who will be made compulsorily redundant in a slump. The LIFO

rule, which will typically be introduced at the behest of unions,[5] discriminates against those most recent entrants to the workforce, when the firm is forced to lay off staff. Youths are, almost by definition, recent entrants to any firm. Of the 350 establishments surveyed by Oswald and Turnbull, 64% used LIFO as their criterion to decide enforced redundancies. Although the recent decline in the coverage of trade union bargaining may well have reduced the use of LIFO rules in deciding who is laid off, it is likely to remain important wherever unions have retained significant bargaining strength.

3.1.2 Firms choosing to lay off younger workers

Firms may choose to lay off their younger employees in the face of a negative demand shock. Older workers will have acquired a considerable amount of valuable workplace-relevant human capital during their time in the labour market. These skills will be costly for the firm to replace, both in terms of the financial cost of hiring and training replacements, but also because it will take a new entrant a certain amount of time to acquire familiarity with the workplace. If the firm chooses to lay off skilled incumbents it may be difficult to replace them when demand recovers. Conversely, young new entrants have little general or firm-specific workplace human capital and will still be in plentiful supply when demand recovers. For this reason, the firm may decide to preserve the skilled core members of its workforce and to concentrate lay-offs where possible amongst the least-skilled new entrants.

The incentive to lay off younger less-skilled workers may be counterbalanced by the fact that they will almost certainly be paid substantially less than older members of the workforce, so the simplest way to cut labour costs significantly would be to lay off the more expensive older workers. However, there are sunk costs in hiring and/or training staff to replace skilled employees, and firms may not be able to continue to operate effectively without their skilled core workers. So lay-offs might still be concentrated amongst the least skilled, despite the fact that they are cheaper to employ. In the Oswald-Turnbull survey, 47% of firms reported deciding enforced redundancies according to the criterion of those who were ‘least skilled or competent’. In addition, if firms believe that youths are more likely to quit than adults they may delay training younger employees, which will prolong

(5) Public choice arguments suggest that LIFO rules, which give increased job security to the majority of employees, are likely to be adopted by union representatives.

the period for which young entrants to the firm will be viewed as low-skill workers (Farber (1994)).

3.2 Youths' higher propensity to quit

Young people quit their jobs more frequently. There are two main reasons why they may do so: they may be employed in types of jobs that encourage them to quit more often, or they may behave differently from adults in the labour market.

3.2.1 Low-wage/secondary sector jobs

The probability that an individual will quit a job is generally taken to be inversely proportional to the wage offered, so low-wage industries are generally high-turnover industries. The labour market is often characterised as comprising two sectors: a primary sector of high-wage jobs, for which there are job queues and for which voluntary quits (into unemployment) are rare; and a secondary sector of low-skill jobs, characterised by low pay, poor working conditions and limited prospects for training or future wage growth.

Low pay is in fact remarkably concentrated in a very small number of industries—half of all the low paid work in just six occupations (see Metcalf (1999a)). As younger workers are concentrated in the secondary sector (two fifths of those aged 18–20 and more than half of those aged 16–17 work in the retailing and hospitality industries, both of which are classic low-pay employers (see Metcalf (1999b)), they will be more likely to quit their jobs than older workers. This might also explain their higher inflow rates into unemployment. So, on this explanation, it is not that young people necessarily have an intrinsically higher probability of quitting their jobs than adults, but simply that they happen to work in the high-turnover secondary sector in disproportionate numbers.

But why are youths more likely to be employed in the secondary sector? If youths have lower reservation wages, they will be willing to accept low-wage jobs that adults will reject; and their reservation wages may be lower either because their benefit entitlements when unemployed are lower,[6] or because their wages may be supplemented by contributions from their parents.

(6) Those aged 18 to 24 receive £40.70 Jobseeker's Allowance per week while those aged 25 and above receive £51.40, under both the contribution-based and income-based schemes (Benefits Agency (1999)).

Adult workers may also be at a distinct advantage when applying for vacancies in the primary sector—they will be more productive (having acquired work-related human capital through 'on the job' training programmes), and can provide references from previous employers that signal their ability and work ethic (ie that they don't shirk). With insufficient experience in the labour market to have obtained such workplace training or to have developed a reputation for good working attitudes, youths will be at a distinct disadvantage to an adult with otherwise identical observable productivity characteristics. So young workers are likely to be forced initially to accept vacancies in the secondary sector.

3.2.2 'Job shopping'

An individual may be unable to assess how productive, and hence how well paid, he will be in a particular job until he accepts it.(7) So individuals may sample a number of jobs, many of which they will quit when the match is revealed as unproductive—a process known as 'job shopping'.

Manning (1998) argues that the earnings-experience profile of both men and women can largely be explained by this model of job search. In particular, he argues that the fact that displaced workers suffer a loss in earnings when they re-enter employment, even after controlling for tenure (and hence acquired firm-specific capital in their former jobs) is indicative of the fact that search capital has been destroyed, and the individual will have to resume shopping for a lifetime job. The employment hazard (the conditional probability that a job match will end, given that it has survived to that date) actually appears to increase in the first few months of a job's life—a finding that is consistent with workers disregarding any initial information about the quality of the match, instead waiting for sufficient information to make an informed decision about the prospects of the current job (Farber (1994)). However, after about three months, the employment hazard begins to decline—the job has been revealed as either of high or low quality and the majority of unproductive matches will have been destroyed.

In effect, high job mobility is the mechanism by which the young progress towards a 'lifetime' job. Youths do not have higher inflows because they have less work experience *per se*, but the fact that they have been searching in the labour market for such a short time makes it more likely that they are

(7) Following Nelson (1970), jobs are then said to be 'experience goods'; conversely, if an individual's productivity in a vacancy can be observed on inspection, without actually accepting and sampling the match then jobs are said to be 'pure search goods'.

still employed in a relatively low-quality, low-wage job, and are therefore more likely to quit. It may also be that, because of their inexperience in the labour market, youths are more reliant on sampling jobs in order to discover their productivity; adults, on the other hand, may be better able to assess a vacancy's worth on inspection. So youths may accept, and then rapidly quit, jobs that adults would not have accepted in the first place.

This theory of 'job shopping' implies that new entrants to the labour market suffer a temporary unemployment penalty since they have to search for a productive job match—and so a fall in the number of youths in the labour market may reduce the unemployment rate because there are less of these new entrants to the labour market. However, in Section 2.1 we discussed how part of the fall in the youth share of the labour force can be explained by increased participation in post-compulsory education, which involves no real fall in the number of new entrants to the labour market, only an increase in their average age upon arrival. If graduate entrants into the labour force also suffer an unemployment penalty due to job shopping, then a fall in the youth share of the labour force caused by increased participation in the education system might be expected to have no effect on the aggregate unemployment rate.

However, there could be a number of reasons why, when graduates enter the labour market, they may be at less of a disadvantage than non-graduates. They may, for example, have a clearer idea of the sort of industry and firm in which they want to work, based on the specialisation of their education and the availability of free college careers advisory services. So they will require a shorter period of job shopping. They may be inherently more attractive to employers, either because they will have acquired more human capital (or at least are able to more effectively signal their innate productivity) or because employers believe that they are more mature and less likely to shirk; so they may be better able to apply directly for primary sector jobs. Finally, older entrants to the labour market may have higher reservation wages, either because they enjoy less parental financial support or because they have increased access to adult levels of government benefit. If any of these factors applies, then although all individuals must temporarily suffer high inflow rates into unemployment when they enter the labour market, the size and duration of this 'unemployment penalty' will fall with the age (or amount of human capital) of the entrant.

Over time the unemployment rate of those aged 18 to 24, an increasing proportion of whom will have recently entered the labour market, has fallen

relative to other age groups in the labour force (see Chart 2.4). So it appears that any 'inflow penalty' incurred by graduates entering the labour force is more than offset by the increase in human capital that they acquired by staying longer in the education system. So changes in the composition of the labour force caused by increased participation in further and higher education can still affect the aggregate unemployment rate—since by increasing the duration of education and the age at which they arrive in the labour market, new entrants can reduce the unemployment penalty that they suffer on entry.

3.3 Generational crowding and the youth unemployment rate

The youth unemployment rate cannot necessarily be taken as being independent of demography, as it is possible that the youth unemployment rate itself might be sensitive to the proportion of youths in the labour force. The empirical evidence (Freeman and Bloom (1986)) suggests that the unemployment rate of a group, and in particular of youths, may be increasing in its share of the labour force. A number of factors will affect the size of these 'generational crowding' effects: the existence, level and coverage of any youth minimum wage legislation; the degree of substitutability and/or complementarity with other groups in the labour force; and the elasticity of demand for youth labour (Freeman and Bloom (1986)).

So the shift in the composition of the labour force away from the young may have led to a fall in the youth unemployment rate, irrespective of any cyclical effects. However, as long as youth unemployment rates remain above those of adults (which they always do) then shifts in the labour force away from youths will still reduce the aggregate unemployment rate. In Section 4.5 below we investigate whether youths are any more likely to become unemployed given the huge fall in the youth share of the labour force, and find no robust evidence of these generational crowding effects.

4 The quantitative importance of demographic change

So youths have (significantly) higher unemployment rates than prime-age adults, and since the early 1980s the demographic composition of the labour force has undergone significant change. In order to quantify the importance of these facts for measured unemployment, we can decompose changes in the aggregate unemployment over time into two parts: the part accounted for by changes in the unemployment rates of the separate age groups in the labour force; and that accounted for by changes in the composition of the labour force itself. This so-called 'shift-share' approach has its origins in the work

of Perry (1970), but can also be found in Summers (1986), Shimer (1998), Katz and Krueger (1999) and Horn and Heap (1999), among others.

4.1 Accounting for changes in the aggregate unemployment rate

The aggregate unemployment rate at time *t* can be defined as the weighted average of the unemployment rates of all the separate age groups in the labour force, where the weights are simply the respective group's share of the labour force:

$$U_t = \sum_i w_t(i) \times u_t(i) \qquad \textbf{(4.1)}$$

where $w_t(i)$ defines the share of the labour force who are members of group *(i)* and $u_t(i)$ captures the group-specific unemployment rate at time *t*. So a fall in aggregate unemployment must by definition originate from either a change in the composition of the labour force towards groups with lower unemployment rates, a fall in the unemployment rates of some or all groups, or some combination of the two.

Following the terminology used by Katz and Krueger (1999), we define the *age-constant unemployment rate*[8] as the weighted average of the age-specific unemployment rates, where the weights are now the shares of the labour force of each group in a certain base year t_0:

$$U^{AC}_{t_1,t_0} = \sum_i w_{t_0}(i) \times u_{t_1}(i) \qquad \textbf{(4.2)}$$

where $w_{t_0}(i)$ is the benchmark share of group *(i)* in the labour force at time t_0. It captures what would have happened to aggregate unemployment, given the observed changes in group unemployment rates, if there had been no age-related demographic change (ie if the labour force shares had remained at their levels in t_0).

Katz and Krueger suggest the use of the *difference* between the aggregate unemployment rate and this age-constant unemployment rate at time *t*—or the age adjustment to the unemployment rate (AAU)—as a measure of the impact of demographic change, which will take the form:

(8) In Shimer's terminology this is the *genuine* unemployment rate.

$$U_{t_1} - U^{AC}_{t_1,t_0} = \sum_i \left(w_{t_1}(i) - w_{t_0}(i)\right) \times u_{t_1}(i) \qquad \textbf{(4.3)}$$

This residual captures the part of the evolution of aggregate unemployment that cannot be explained by shifts in the age-specific unemployment rates alone, and which must therefore be caused by shifts in the composition of the labour force.

The other extreme is to measure what would have happened to the unemployment rate had all the age-specific unemployment rates remained constant (ie abstracting from all the economic factors determining unemployment), and instead only the composition of the labour force had changed. The unemployment rate as it would have been if driven purely by demographic change, or as Katz and Krueger term it the *age-driven unemployment rate*,[(9)] is thus:

$$U^{AD}_{t_1,t_0} = \sum_i w_{t_1}(i) \times u_{t_0}(i) \qquad \textbf{(4.4)}$$

where: $u_{t_0}(i)$ is the benchmark unemployment rate of group *(i)* at time t_0. The numerical level of this rate is (by construction) dependent on the levels of unemployment in the base year, and so it does not in any sense measure the unemployment 'caused' by demographic factors. But we can interpret the difference between the age-driven rate at time t_1 and unemployment in the base year t_0 as the implied change in the aggregate unemployment rate due to demographic pressures—which we call the age-driven change in the unemployment rate (ADCU):

$$U^{AD}_{t_1,t_0} - U_{t_0} = \sum_i \left(w_{t_1}(i) - w_{t_0}(i)\right) \times u_{t_0}(i) \qquad \textbf{(4.5)}$$

Shimer also suggests using a chain-weighted measure (CWM) to identify the change in unemployment attributable to demographics (Shimer (1998)), defined as:

$$\Delta_{t_1,\,t_0} = \sum_{t=t_0}^{t_1-1} \sum_i \left(w_{t+1}(i) - w_t(i)\right)\left(\frac{u_{t+1}(i) + u_t(i)}{2}\right) \qquad \textbf{(4.6)}$$

(9) In Shimer's terminology this is the *demographic* unemployment rate.

Since by definition, $\Delta_{t_0,t_0} = 0$, we can decompose our chain-weighted measure as follows:

$$\Delta_{t_1,t_0} = \Delta_{t_1,\,t_0} - \Delta_{t_0,\,t_0} = \Delta_{t_1,\,t_0} - \Delta_{t_1-1,\,t_0} + \Delta_{t_1-1,\,t_0} - \Delta_{t_1-2,\,t_0} + \text{etc}$$

$$= \left(\Delta_{t_1\,,\,t_0} - \Delta_{t_1-1\,,\,t_0}\right) + .. + \left(\Delta_{t_0+1\,,\,t_0} - \Delta_{t_0\,,\,t_0}\right) \qquad \textbf{(4.7)}$$

So if each individual term—the change in his chain-weighted measure between years *t* and *t*+1—is thought of as capturing the demographic change between these two years, then the overall measure describes the cumulative effect of demographic change over the period, which is not as sensitive to the choice of base year, because of the implicit averaging involved in the calculation of the chain-weighted measure. However, this measure of demographic change is itself still sensitive to economic factors—if youth activity rates vary more than those of adults over the cycle, for example, any demographic shift towards the young will be exaggerated during a boom as more youths are drawn into the labour force (Shimer (1998)).

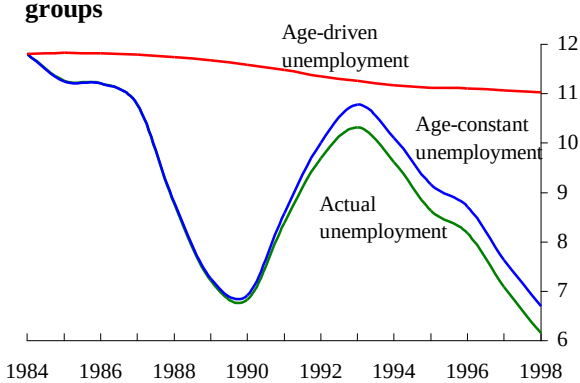
4.2 Empirical evidence

Consistent data on unemployment rates by age group are available only from 1984, so we cannot examine the direct effect of the entry of the baby boomers into the labour market (the majority of those born at the peak of the baby boom, in 1964, would have entered the labour market some four years before the data start). We can, however, explore the impact of the large fall in the birth rate between 1964 and 1977. Using data from the Labour Force Survey, we initially divide the labour force into two groups—youths (aged less than 25) and adults—but for comparison we also repeat the calculations for a finer disaggregation of the labour force into five different age groups. An examination of how sensitive our results are to changing the base year of our calculations is deferred to Section 4.4.

Using a simple two-part decomposition into youths and adults, the age-constant unemployment rate (shown in Chart 4.1) tracks the actual unemployment rate quite closely for most of the period, and the two series are virtually indistinguishable up until 1989. However, the shift in the youth composition of the labour force is not captured by the age-constant rate and for this reason the actual unemployment rate declines further than the age-constant rate. The path of the age-driven unemployment rate captures this shift away from the young in the labour force and therefore also falls over the

period. However, because it is benchmarked on 1984 unemployment rates, it is unaffected by the large fall in all the age-specific unemployment rates as the economy recovered from the severe slump in the early 1980s.

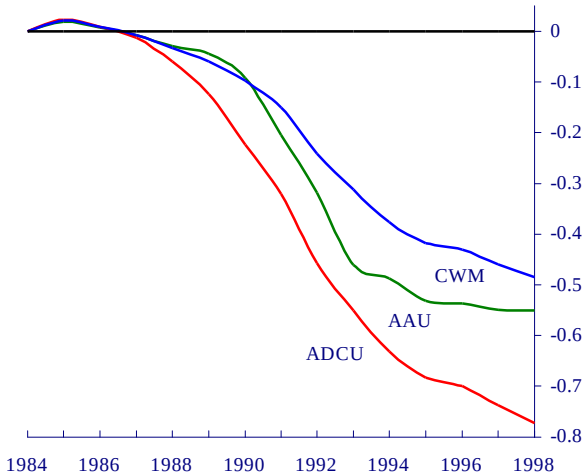
Chart 4.1
Time path of actual, age-driven and age-constant unemployment (%); two groups



Our interest for present purposes is in the changes in these series. In quantitative terms, the age-driven unemployment rate fell by almost 77 basis points over the period, while the aggregate unemployment rate declined by 566 basis points; so demographic change explains approximately 14% of the fall in the unemployment rate on this measure. On the other hand, the age-constant unemployment rate fell by some 511 basis points, and so explains 90% of the fall in the aggregate rate; so the age adjustment to the unemployment rate implies that demographic change explains about 10% of the fall in the aggregate rate. The chain-weighted measure (not shown in Chart 4.1) fell by about 50 basis points, and so accounts for about 9% of the fall in aggregate unemployment over the period. It would appear, then, that demographic change in the labour force explains about 50 to 75 basis points, or 9% to 14%, of the fall in the aggregate unemployment rate between 1984 and 1998 (see Chart 4.2).

Chart 4.2
Measures of demographic pressure (percentage points); two groups

CWM - chain-weighted measure
AAU - age adjustment to the unemployment rate
ADCU - age-driven change in the unemployment rate



These results may of course be sensitive to the way in which we have divided the labour force. So we repeat the analysis, sub-dividing the labour force further into five separate age groups: 16–17, 18–24, 25–34, 35–49, and 50 and over. The pattern that emerges is qualitatively very similar to that obtained by dividing the labour force into just youths and adults. In quantitative terms, the age-driven unemployment rate now falls by some 69 basis points between 1984 and 1998, explaining almost an eighth of the fall in aggregate unemployment over that period. The age-constant unemployment rate falls by some 514 basis points, explaining 91% of the fall in the aggregate unemployment rate (therefore the age adjustment to unemployment explains the remaining 9% of the fall in the aggregate rate). Finally, the chain-weighted measure falls by about 40 basis points, explaining about 7% of the decline in the aggregate rate. So on this disaggregated basis, the percentage of the fall in aggregate unemployment that can be explained by demographic change lies between 7% and 12%, or about 40 to 70 basis

points (see Chart 4.3). The role of demographic change is in fact marginally reduced compared with the simple youths/adults decomposition.

4.3 Changing the base year

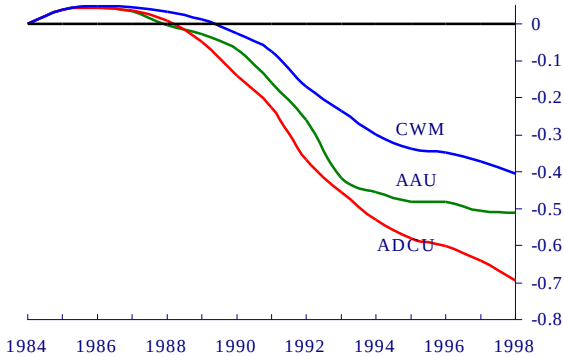
These results take unemployment rates and labour force composition in 1984 as the base for calculating the age-constant and age-driven unemployment rates over the period. But this is arbitrary and we can test whether the results are qualitatively or quantitatively sensitive to this choice, repeating the analysis using each year in the sample in turn as the anchor. Of course, our calculations of the age-constant and age-driven unemployment rates are now in part retrospective, and we must amend our definitions of the age adjustment to the unemployment rate and the age-driven change in the unemployment rate accordingly. The age adjustment to unemployment, given age-constant unemployment calculated using base year *(x)*, is now defined as the difference between the change in the unemployment rate and the change in the age-constant unemployment rate over the period:

$$\left(U_{98} - U_{84}\right) - \sum_i w_x(i)\left(u_{98}(i) - u_{84}(i)\right) \qquad \textbf{(4.8)}$$

The age-driven change in the unemployment rate is now defined as the difference between what the unemployment rate would have been in 1998 and 1984, had group-specific unemployment rates remained at their values in the base year *(x)*:

$$\sum_i u_x(i)\left(w_{98}(i) - w_{84}(i)\right) \qquad \textbf{(4.9)}$$

Chart 4.3
Measures of demographic pressure (percentage points); five groups



The chain-weighted measure of demographic unemployment is of course unaffected, as it is based on the actual composition of the labour force and group unemployment rates in each year.

It turns out that the choice of base year has a significant effect on the estimate of the impact of demographics on the unemployment rate (see Charts 4.4 and 4.5). The mean estimates of the change in actual unemployment explained by each of our measures across all available base years (1984 to 1998) are shown in Table 4.A.

Chart 4.4
Variation in measures of impact of demographic change by base year (basis points)

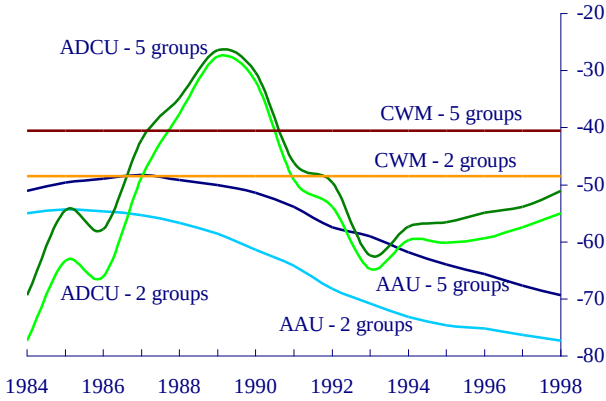


Chart 4.5
Variation in measures of impact of demographic change by base year (percentage of change in unemployment explained)

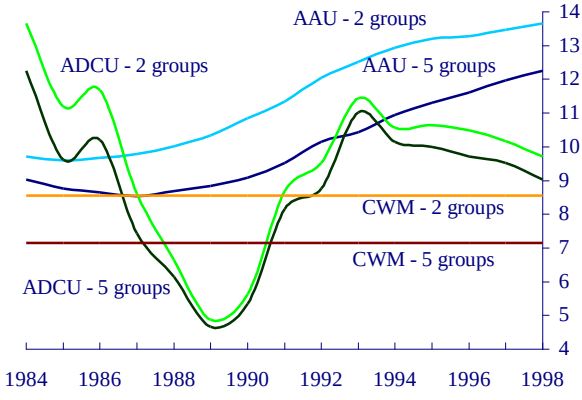


Table 4.A
Summary of estimates of the impact of demographic change on the unemployment rate

	Basis points		Percentage explained	
Index of demographic pressure:	2 groups	5 groups	2 groups	5 groups
Average age adjustment to unemployment	-65.0	-56.5	11.5	10.0
Average age-driven change in unemployment	-54.1	-49.8	9.6	8.8
Average chain-weighted measure	-48.5	-40.5	8.6	7.2

Note: A comprehensive set of our results can be found in Appendix Tables A.4.1.1 and A.4.1.2.

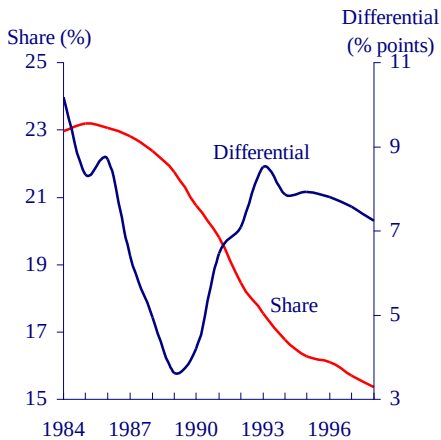
The fact that our results are sensitive to the base year is no surprise, as each base represents a different set of values of the composition of the labour force and group unemployment rates.

For example, while the actual composition of the labour force in each period used to calculate the age-driven unemployment rate is common to all base years, the group-specific unemployment rates that they modify are not. If all the group-specific unemployment rates were higher in 1984 than 1998, then the age-driven unemployment rate will be higher across the period if we use 1984 as a base year rather than 1998. The age-driven *change* in the unemployment rate over the period will be unaffected by such differences, but will still be sensitive to differences in the *dispersion* of the unemployment rates between base years: the greater the difference between

the unemployment rates, the more that changes in the composition of the labour force will matter. The variation in the change in the age-driven unemployment rate by base year can in fact be explained by base year variations in the age-related unemployment rate differentials (Chart 4.6 shows the time path of this differential for the youth/adult decomposition).

The age adjustment to the unemployment rate, on the other hand, holds the labour force composition constant at its base year level. Between 1984 and 1998, the youth unemployment rate fell further than the adult rate in absolute terms (see Chart 2.4) and the youth share of the labour force was almost monotone decreasing over the period, only increasing (marginally) between 1984 and 1985. So the later our base year, the lower the weight we will place on the group unemployment rate which changes the most, and the smaller our estimate of the change in the age-constant unemployment rate will be. As a result, demographic change as measured by the age adjustment to the unemployment rate will explain more of the change in unemployment, the later our choice of base year. The increase in the age adjustment to the unemployment rate over this period can therefore be explained by the near-monotone fall in the youth share of the labour force (see Chart 4.6).

Chart 4.6
Youth share of the labour force and the youth adult unemployment differential



4.4 'Generational crowding': cohort size and unemployment rate interactions

The above analysis implicitly assumes that group unemployment rates are unaffected by the size of each group as a proportion of the labour force. Any interactions between group size and group unemployment rate will not, on the measures we have used, be attributed to demographic change, which will reflect only the direct compositional effect. If, for example, the increase in the youth unemployment rate in the late 1970s and early 1980s, as the baby boomers entered the labour force, was partly caused by the rapid expansion of that cohort (so-called 'generational crowding'), then the reverse effect would be seen as the proportion of young people in the labour force declined. The unemployment rate of the young might have fallen back again, even without any cyclical effects, and both the youth share of the labour force and the youth unemployment rate would have declined. This should correctly be regarded as a direct consequence of demographic change. Shimer (1998) finds that these generational crowding effects have a significant role in explaining changes in the aggregate unemployment rate. By themselves, the changes in the age-specific unemployment rates caused by shifts in the composition of the labour force implied about a 1 percentage point increase in the US aggregate unemployment rate between 1954 and 1980 (almost exactly a half of the total impact that he estimates demographic change had over the period). However, other factors might also lead to a relative improvement in youth unemployment rates, coincidental with the fall in the youth share of the labour force. For example, there could be a change in firms' preferences towards youth labour, or a shift in demand by consumers towards companies that disproportionately employ youths (Freeman and Bloom (1986)).

Shimer offers a useful illustrative measure of these generational crowding effects, normalising them by the size of the changes in the group unemployment rates and labour force shares. He defines the measure:

$$r = \frac{\left(\tilde{w}_{t_1} - \tilde{w}_{t_0}\right)\left(\tilde{u}_{t_1} - \tilde{u}_{t_0}\right)}{\left|\tilde{w}_{t_1} - \tilde{w}_{t_0}\right|\left|\tilde{u}_{t_1} - \tilde{u}_{t_0}\right|} \in [-1,1] \qquad \textbf{(4.10)}$$

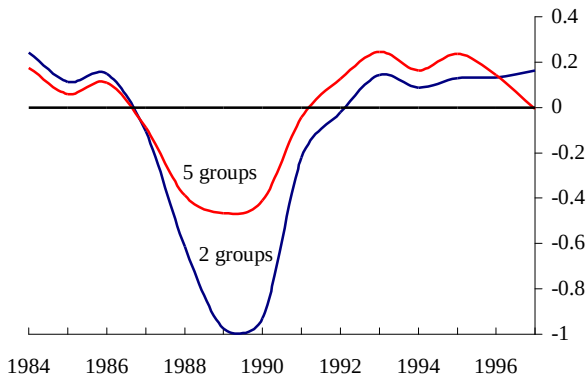
where $\tilde{w}_{t_i}, \tilde{u}_{t_i}$ are the vectors of labour market shares and unemployment rates respectively in each time period. The numerator of Shimer's measure is the scalar product of the change in the vector of labour market shares, and the

change in the vector of the unemployment rates—which effectively captures the degree of correlation between them. This correlation coefficient is then normalised by the absolute size of the change in the two vectors captured by the denominator. If the measure is positive then in a period of demographic change, those groups whose share of the labour force changes will experience relative changes in their unemployment rates in the same direction, which would support the notion of generational crowding. Conversely, if the measure is negative, then those groups whose share of the labour force increases would enjoy a relative fall in their unemployment rates.

Taking the whole sample, if we divide the labour force into youths and adults, r takes the value 0.24; if we divide it into five separate groups, the measure falls to 0.17. The underlying message remains the same: there appears to be clear evidence of generational crowding of the kind that, when the youth share of the labour force declined, the youth unemployment rate also fell relative to other groups in the labour force.

But this result is not robust. Choosing any year between 1987 and 1991 as the starting point, the evidence is of *perverse* generational crowding effects (ie a negative correlation coefficient), with youths experiencing relatively higher unemployment rates as their share of the labour force fell (see Chart 4.7).

Chart 4.7
Variation in Shimer's correlation coefficient by base year

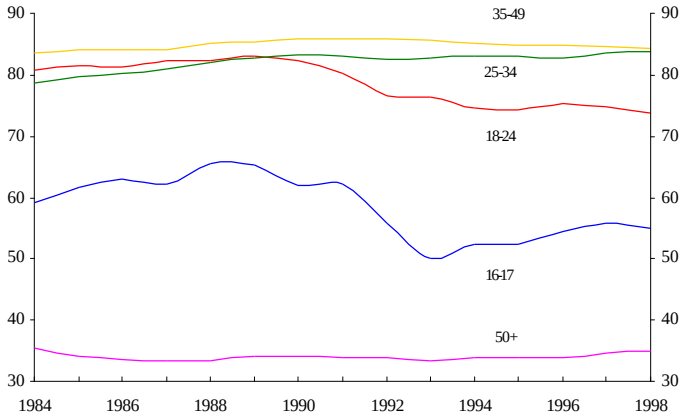


Given that the youth share of the labour force was steadily decreasing across the entire period, the sign of the correlation coefficient will depend crucially on the direction of change of the youth/adult unemployment differential. We know that this gap increased after 1989, despite the falling youth share of the labour force, which is why the Shimer statistic suggests perverse generational crowding effects. A neutral assumption, on the available evidence, is probably that the UK group-specific unemployment rates have been independent of the composition of the labour force, and that the statistics computed earlier are indeed appropriate measures of the effect of demographic change on unemployment.

5 Controlling for changes in activity by age group

In the previous section we estimated how much of the change in the aggregate unemployment rate can be accounted for by changes in the composition of the labour force. However, as we discussed in Section 2.1, changes in the composition of the labour force are not driven exclusively by demographic forces, but also by changes in the proportion of the population actively engaged in the labour force, and so our results should not be interpreted as capturing only the impact of the change in the composition of the population on the unemployment rate, which is the motivation of this paper. As Chart 5.1 illustrates, the most striking change in the rate of activity in the population over the period occurred among the young—between 1984 and 1998 the activity rate of 16 to 24 year olds fell by more than 6½ percentage points—which was almost certainly due to the growth in participation in post-compulsory education. However, changes in activity have not been confined to youths—in 1998, approximately 5% more of the 25 to 34 year olds in the population were either employed or actively searching for work than in 1984. Clearly, changes of this magnitude have the capacity to affect the size and composition of the labour force, and so they also have the potential to affect the unemployment rate. If we wish to measure accurately the proportion of the total change in the unemployment rate that can be explained purely by demographic change in the population then we need to control for these changes in labour force participation by age group.

Chart 5.1
Activity rates by age (%)



In order to isolate the effect of demographic change on the unemployment rate we pursue two separate modifications of the shift-share methodology outlined in the previous section. The first essentially holds activity rates constant and calculates the hypothetical impact on the unemployment rate of changes in the composition of the labour force consistent with changes in the composition of the underlying population, given the observed behaviour of the group-specific unemployment rates. The second focuses instead on the impact of changes in the composition of the working-age population on the fraction of the population that is unemployed.

5.1 The impact of changes in the population shares on the unemployment rate

We have argued that the shift-share decomposition employed in the previous section will not measure precisely the impact of demographic change on the unemployment rate, because our estimates will also incorporate the effect of changes in the group-specific activity rates on the composition of the labour force. Given information on the proportion of each age group in the population that is economically active in a given year, $h_t(i)$, and the aggregate activity rate in that year, $\bar{h}_t$, it is straightforward to calculate what the composition of the labour force would have been in that year given the changes in the composition of the population, had activity rates remained at

their levels in year t_0 throughout the period. If for each year t we define $\bar{h}_t^{t_0}$ as the (hypothetical) aggregate activity rate, given the actual composition of the population in that year, but assuming that the age-specific activity rates remained at their levels in year (t_0), then the labour force share of group (i) of whom there were $P_t(i)$ individuals out of a total population $\bar{P}_t$ in year t, would have been:

$$w_t^{t_0}(i) = \frac{h_{t_0}(i) \times P_t(i)}{\bar{h}_t^{t_0} \times \bar{P}_t} = \frac{h_{t_0}(i)}{h_t(i)} \times \frac{\bar{h}_t}{\bar{h}_t^{t_0}} \times \frac{h_t(i) \times P_t(i)}{\bar{h}_t \times \bar{P}_t} = \frac{h_{t_0}(i)}{h_t(i)} \times \frac{\bar{h}_t}{\bar{h}_t^{t_0}} \times w_t(i) \qquad \textbf{(5.1)}$$

where $w_t(i)$ is group (i)'s actual share of the labour force in year t. However, our modification is not trivial. In Section 3.3 we discussed the possibility that the unemployment rate of a specific group may depend upon the relative size of that group in the labour force—generational crowding effects. So whenever the hypothetical labour force shares diverge from those we observe, there is the possibility that the group unemployment rates will also differ from those we observe, which will affect the accuracy of our shift-share decomposition. However, given the lack of any robust evidence to support the existence of significant generational crowding effects (see Section 4.5), we assume that the group-specific unemployment rates are entirely independent of the composition of the labour force, and so use the observed pattern of unemployment for our alternative shift-share decomposition. There is one further complication with this approach. Had the composition of the labour force and the group unemployment rates followed the hypothetical path we have assumed, then the time path of aggregate unemployment would also have differed from what we observe. So, when calculating the importance of demographic change in explaining changes in the aggregate unemployment rate, we need to modify our estimate of the change in the unemployment rate accordingly:

$$\Delta U^{t_0} = \sum_i \left(w_{98}^{t_0}(i) \times u_{98}(i) - w_{84}^{t_0}(i) \times u_{84}(i) \right) \qquad \textbf{(5.2)}$$

We can repeat this approach for each year in the sample, in each case holding activity rates constant and using the observed composition of the labour force and pattern of unemployment rates in that year to calculate our standard

estimates of the impact of demographic change on the unemployment rate. Our results are shown in Table 5.A.

It appears that once we control for changes in the activity rates of each group over the period, demographic change caused a smaller fall in the aggregate unemployment rate than that estimated in the previous section. This result is not that surprising since we have excluded from our analysis the impact of the shift in the composition of the labour force caused by increased participation in post-compulsory education, which would otherwise have reduced the unemployment rate. Furthermore, falling inactivity among those aged between 25 and 34, *ceteris paribus*, increased the size of the labour force, which further exacerbated the observed fall in the youth share of the labour force, and so further exaggerated previous estimates of the impact of demographic change on the unemployment rate. However, shifts in the composition of the labour force driven purely by demographic change in the population still explain about a 45 basis point fall in the unemployment rate over the period.

Table 5.A
Summary of the impact of demographic change on the unemployment rate, controlling for changes in activity rates by age group

	Basis points		Percentage explained	
Index of demographic pressure:	2 groups	5 groups	2 groups	5 groups
Average age adjustment to unemployment	-51.9	-46.7	9.4	8.5
Average age-driven change in unemployment	-42.8	-41.2	7.8	7.5
Average chain-weighted measure	-39.8	-36.9	7.2	6.7

Note: A comprehensive set of our results can be found in Appendix Tables A.5.1.1 and A.5.1.2.

5.2 The impact of demographic change on the fraction of the population that is unemployed

An alternative estimate of the impact of demographic change on the proportion of individuals of working age who are unemployed can be obtained by repeating our shift-share analysis using working-age population shares and the ratio of each age group who are unemployed. The advantage of this approach is of course that we can abstract from all changes in labour force participation by focusing on changes in the composition of the working-age population—which is affected solely by demographic forces. However, the drawback is that we will not be estimating the impact of demographic change on the unemployment rate itself.

We can repeat the analysis, as before using each year in turn as a base for our calculations, and the results from this alternative shift-share decomposition are given in Table 5.B.

Table 5.B
Summary of the impact of demographic change on the fraction of the working-age population who are unemployed

	Basis points		Percentage explained	
Index of demographic pressure:	2 groups	5 groups	2 groups	5 groups
Average age adjustment to unemployment	-37.6	-32.2	8.5	7.4
Average age-driven change in unemployment	-31.0	-28.9	7.0	6.6
Average chain-weighted measure	-27.8	-24.6	6.3	5.6

Note: A comprehensive set of our results can be found in Appendix Tables A.5.2.1 and A.5.2.2.

Over all three approaches, the results above indicate the smallest role for demographic change in explaining the absolute and proportional fall in the fraction of individuals who are unemployed. However, this is largely due to the fact that the gap between the proportion of the youth and adult populations who are unemployed is significantly smaller than the differential between the youth and adult unemployment rates.[10] So shifts in the composition of the working-age population can be expected to have a more marginal role in explaining changes in the fraction of the whole population that is unemployed.

(10) See Appendix Table A.5.3.

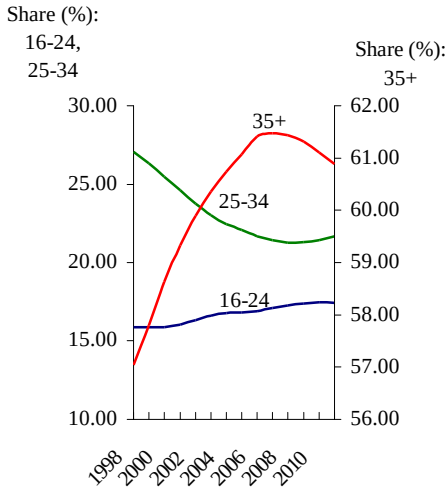
We have outlined two alternative approaches here to that presented in the previous section, each of which seeks to isolate the effect of demographic change on the unemployment rate. Unsurprisingly, both show that once we control for changes in labour force participation rates by age, shifts in the composition of the labour force explain less of the change in the aggregate unemployment rate over the period. However, it still appears that demographic change in the population was the predominant cause of the change in the composition of the labour force, and hence of the estimated change in the unemployment rate that it produced.

6 The effect of demography on future unemployment

The focus of this paper has so far been retrospective, investigating how much of the change in the aggregate unemployment rate can be explained by demographic pressures. However, shifts in the composition of the population will doubtless continue, and we now attempt to predict the likely implications of demographic change on the unemployment rate in the near future. Given reasonable assumptions on the pattern of fertility and mortality rates, and the size and direction of cross-border migration, we can project the resident population into the future. In order to estimate the composition and size of the labour force, we also need to forecast the percentage of each of the separate groups in the labour force that will be either employed or actively searching for work.(11) The following is based on projections of the composition of the labour force given in the June 1998 edition of *Labour Market Trends.*

(11) These projections of the group-specific activity rates typically rely on four separate sets of explanatory variables: the level or change in the level of the unemployment rate, the number of dependent children aged under 5 per woman, lagged activity rates, and time trends to capture other structural factors (see Armitage and Scott (1998), page 291).

Chart 6.1
Projection of the composition of the labour force: 1998-2011



We can identify three broad trends in the projections of the labour force:

- The youth share of the labour force begins to recover from the baby bust and slightly increases over the period.

- The number of people aged between 25 and 34 declines quite sharply (quite unsurprisingly—this is the generation of youngsters in the baby bust, ten years into the future when they reach maturity).

- The relative share of the older section of the labour force—aged 35 years and over—increases (as the bulge in fertility rates in the early 1960s passes through the age distribution).

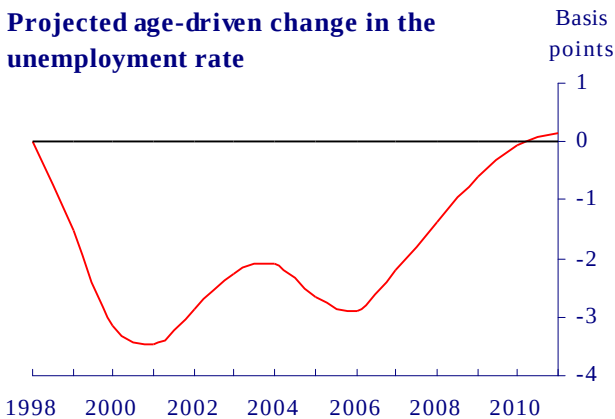
Since youths have higher unemployment rates than adults, the slight shift towards the young is likely marginally to drive up the unemployment rate (an effect which might be amplified by any generational crowding effects), as will a decrease in the numbers of 25–34 year olds with lower unemployment rates than younger workers. However those above 35 years of age have unemployment rates lower still than those in early adulthood (in 1998 the unemployment rate for those aged 25–34 was 6.3%, while for those 35 years and older it was 4.4%), and therefore an increase in the proportion of those

aged 35 and over in the labour force should drive the unemployment rate down.

Given these projections of the composition of the labour force, we can make a tentative forecast of the implied change in the aggregate unemployment rate due to demographic pressures. Taking 1998 as the base year, we divide the labour force into the three broad groups described above and calculate the age-driven change in the unemployment rate based on the observed unemployment rates of each of these groups in our base year (see equation (**3.5**)):

$$\sum_i \left(w_t(i) - w_{1998}(i)\right) \times u_{1998}(i) \qquad \textbf{(6.1)}$$

Chart 6.2
Projected age-driven change in the unemployment rate



Given the projected increases in the labour force shares of both the high and low-unemployment groups, the impact of demographic change is relatively weak throughout the period—at most, demographic pressures will be responsible for a fall of about 3½ basis points in the aggregate unemployment rate. However, the potential for these benign demographic forces to reduce the unemployment rate has already been almost exhausted. The age-driven unemployment rate is projected to fall until 2001, and thereafter, following a short period of turbulence, to be at its level in 1998. Of course, in the interim, any generational crowding effects from changes in the composition of the labour force might amplify these results. But, on the basis of these results, it is difficult to draw any conclusion other than that,

however important demographic change might have been in the evolution of the unemployment rate in the past 20 years, there is little evidence that it will have much effect for the foreseeable future.

However, as we have emphasised previously, shifts in the composition of the labour force can arise not only through demographic change in the population, but also through changes in the proportion of each age group that is economically active.[12] Nevertheless, controlling for any projected changes in the age-specific activity rates over the period has a negligible effect on our estimates of the reduction in the unemployment rate implied by future shifts in the composition of labour force. Finally, when we turn to the impact of demographic change on the proportion of the working-age population that is unemployed we find results that are quantitatively similar to our original projections.

Therefore, it appears that irrespective of the particular method used, demographic change in the population is likely to have a negligible effect on the aggregate unemployment rate over the next decade.

7 Conclusions

The proportion of youths in the UK labour force has almost halved over the past 15 years. Since youths have a higher unemployment rate than adults (although this differential varies across the cycle), and the aggregate unemployment rate is simply the weighted average of the age-specific unemployment rates, a shift of this kind in the composition of the labour force should have been reflected in a fall in the aggregate unemployment rate.

Quantitatively, demographic pressures do indeed appear to explain part of the change in actual unemployment. Although we have shown that this is sensitive to the precise measure we use and particularly the assumption made about the base year, our best estimate is that approximately 55 basis points[13] of the fall in the unemployment rate between 1984 and 1998 (or about 10% of the total change) can be explained by changes in the composition of the labour force. We also find no robust evidence that youths have become

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(12) For example, it is estimated that irrespective of any increase in the number of youths in the population, approximately 150,000 more youths will be economically active in 2011 than in 1998.

(13) This is approximately equal to the average (over all base years) of the age-driven change in the unemployment rate, the age adjustment to the unemployment rate and the chain-weighted index, when the labour force is divided into only youths and adults (actual figure = 55.67 basis points).

relatively more likely to become unemployed, through generational crowding effects, as their share of the labour force has declined.

However, demographic pressures were not the only forces that affected the composition of the labour force over the period. Changes in the fraction of each age group either employed or actively searching for work clearly affect the composition of the labour force and therefore will also affect the unemployment rate. Once we control for these shifts in labour force participation rates by age group we find that, unsurprisingly, demographic change explains less of the change in the unemployment rate over the period. However, it appears that the shift in the composition of the population caused by the baby boom and bust still explains about 45 basis points[(14)] of the fall in the unemployment rate over the period.

Finally, on the basis of current projections, it appears that future shifts in the composition of the labour force will have little effect on the unemployment rate over the next decade.

(14) As before, this is equal to the average (over all base years) of the age-driven change in the unemployment rate, the age adjustment to the unemployment rate and the chain-weighted index, when the labour force is divided into only youths and adults.

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Appendix

Table A.2.2: The duration structure of unemployment by age

	Age 16–17				Age 18–24			
	U_t rate (%)	Percentage unemployed			U_t rate (%)	Percentage unemployed		
Year		< 6 mths	6–12 mths	> 12 mths		< 6 mths	6–12 mths	> 12 mths
1984	22.0	62.9	22.5	14.6	19.2	33.5	19.9	46.5
1985	20.3	62.6	24.1	13.3	17.1	36.4	18.9	44.7
1986	20.9	66.2	21.4	12.4	17.3	37	22.4	40.6
1987	19.4	64	26.9	9.1	15.0	40.3	21.8	37.9
1988	14.2	69	20.0	11.0	12.3	44.8	23.0	32.2
1989	10.8	82	10.8	7.2	9.9	54.6	19.7	25.7
1990	11.3	80	13.3	6.7	9.9	62.8	15.6	21.6
1991	14.9	80.9	15.3	3.8	13.3	58.3	21.0	20.7
1992	16.0	70.7	22.0	7.3	15.4	45.9	25.0	29.1
1993	16.8	55.9	27.9	16.2	17.4	42.0	22.8	35.1
1994	17.9	65.9	20.3	13.8	15.9	41.0	22.5	36.5
1995	17.3	66.4	23	10.7	14.9	47.1	21.9	31.0
1996	18.3	68.3	22.5	9.2	14.0	50.2	19.9	30.0
1997	17.7	68.1	20.1	11.8	12.5	55.4	17.7	26.8
1998	16.6	74.4	18.0	7.5	11.3	62.6	16.9	20.5

Table A.2.2: The duration structure of unemployment by age (continued)

	Age: 25–49				Age: 50+			
	U_t rate (%)	Percentage unemployed			U_t rate (%)	Percentage unemployed		
Year		6 mths	6–12 mths	12 mths		6 mths	6–12 mths	12 mths
1984	9.9	32.6	16.7	50.7	8.5	21.8	17.5	60.7
1985	9.9	31.9	16.1	52.0	8.0	21.9	13.9	64.1
1986	9.7	34.5	14.9	50.6	8.0	23.8	13.5	62.7
1987	9.6	35.0	14.8	50.2	8.6	24.2	12.8	62.9
1988	7.6	39.9	15.2	44.9	7.9	26.3	11.8	61.9
1989	6.2	45.1	16.4	38.5	6.9	27.4	12.1	60.5
1990	5.9	49.8	17.1	33.1	6.1	30.1	12.7	57.2
1991	7.2	54.1	17.6	28.3	6.9	37.8	15.3	46.9
1992	8.6	41.7	20.8	37.5	7.7	30.4	21.0	48.6
1993	8.8	35.2	19.0	45.8	8.9	28.7	19.5	51.8
1994	8.3	35.5	16.3	48.2	8.2	25.9	15.7	58.4
1995	7.5	36	15.6	48.4	6.7	28.5	13.9	57.6
1996	7.1	39	17.4	43.6	6.3	31.1	15.3	53.6
1997	6.0	41.3	15.6	43.1	5.5	33.8	13.3	52.9
1998	5.2	49.3	14.7	36	4.6	35.8	11.5	52.7

Table A.4.1.1: Percentage point change in indices of demographic change, by base year

	Age adjustment to unemployment		Age-driven change in unemployment		Chain-weighted index	
Base year	2 groups	5 groups	2 groups	5 groups	2 groups	5 groups
1984	-0.55	-0.51	-0.77	-0.69	-0.48	-0.40
1985	-0.54	-0.50	-0.63	-0.54	-0.48	-0.40
1986	-0.55	-0.49	-0.66	-0.58	-0.48	-0.40
1987	-0.55	-0.48	-0.49	-0.42	-0.48	-0.40
1988	-0.57	-0.49	-0.38	-0.35	-0.48	-0.40
1989	-0.59	-0.50	-0.28	-0.26	-0.48	-0.40
1990	-0.61	-0.51	-0.32	-0.30	-0.48	-0.40
1991	-0.64	-0.54	-0.49	-0.46	-0.48	-0.40
1992	-0.68	-0.57	-0.54	-0.50	-0.48	-0.40
1993	-0.71	-0.59	-0.65	-0.62	-0.48	-0.40

Table A.4.1.1: Percentage point change in indices of demographic change, by base year (continued)

	Age adjustment to unemployment		Age-driven change in unemployment		Chain-weighted index	
1994	-0.73	-0.62	-0.60	-0.57	-0.48	-0.40
1995	-0.75	-0.64	-0.60	-0.57	-0.48	-0.40
1996	-0.75	-0.66	-0.59	-0.55	-0.48	-0.40
1997	-0.76	-0.68	-0.58	-0.54	-0.48	-0.40
1998	-0.77	-0.69	-0.55	-0.51	-0.48	-0.40
Mean	-0.65	-0.56	-0.54	-0.50		
Variance	0.01	0.01	0.02	0.01		

Table A.4.1.2: Percentage change in unemployment explained by indices of demographic change by base year

	Age adjustment to unemployment		Age-driven change in unemployment		Chain-weighted index	
Base year	2 groups	5 groups	2 groups	5 groups	2 groups	5 groups
1984	9.7	9.0	13.7	12.3	8.6	7.2
1985	9.6	8.8	11.2	9.6	8.6	7.2
1986	9.7	8.6	11.7	10.2	8.6	7.2
1987	9.8	8.5	8.6	7.4	8.6	7.2
1988	10.0	8.7	6.6	6.1	8.6	7.2
1989	10.3	8.8	4.9	4.7	8.6	7.2
1990	10.9	9.1	5.6	5.4	8.6	7.2
1991	11.4	9.5	8.7	8.1	8.6	7.2
1992	12.0	10.1	9.5	8.8	8.6	7.2
1993	12.5	10.4	11.4	11.0	8.6	7.2

Table A.4.1.2: Percentage change in unemployment explained by indices of demographic change by base year (continued)

	Age adjustment to unemployment		Age-driven change in unemployment		Chain-weighted index	
1994	12.9	10.9	10.6	10.1	8.6	7.2
1995	13.2	11.3	10.6	10.0	8.6	7.2
1996	13.3	11.6	10.5	9.7	8.6	7.2
1997	13.5	12.0	10.2	9.5	8.6	7.2
1998	13.7	12.3	9.7	9.0	8.6	7.2
Mean	11.5	10.0	9.6	8.8		
Variance	2.5	1.8	5.6	4.5		

Table A.5.1.1: Percentage point change in indices of demographic change, holding activity rates constant by base year

	Age adjustment to unemployment		Age-driven change in unemployment		Chain-weighted index	
Base year	2 groups	5 groups	2 groups	5 groups	2 groups	5 groups
1984	-0.44	-0.42	-0.62	-0.59	-0.41	-0.38
1985	-0.46	-0.43	-0.52	-0.48	-0.41	-0.38
1986	-0.46	-0.43	-0.54	-0.51	-0.41	-0.38
1987	-0.46	-0.43	-0.40	-0.38	-0.41	-0.38
1988	-0.48	-0.44	-0.31	-0.31	-0.41	-0.38
1989	-0.50	-0.45	-0.23	-0.23	-0.41	-0.38
1990	-0.51	-0.45	-0.26	-0.26	-0.41	-0.38
1991	-0.53	-0.46	-0.40	-0.39	-0.40	-0.37
1992	-0.53	-0.45	-0.42	-0.40	-0.39	-0.36
1993	-0.54	-0.46	-0.50	-0.50	-0.39	-0.36

Table A.5.1.1: Percentage point change in indices of demographic change, holding activity rates constant by base year (continued)

	Age adjustment to unemployment		Age-driven change in unemployment		Chain-weighted index	
1994	-0.55	-0.48	-0.46	-0.45	-0.38	-0.35
1995	-0.56	-0.50	-0.46	-0.44	-0.38	-0.35
1996	-0.58	-0.53	-0.46	-0.44	-0.39	-0.36
1997	-0.59	-0.54	-0.44	-0.42	-0.38	-0.35
1998	-0.59	-0.55	-0.42	-0.39	-0.38	-0.35
Mean	-0.52	-0.47	-0.43	-0.41	-0.40	-0.37
Variance	0.00	0.00	0.01	0.01	0.00	0.00

Table A.5.1.2: Percentage change in unemployment explained by indices of demographic change, holding activity rates constant by base year

	Age adjustment to unemployment		Age-driven change in unemployment		Chain-weighted index	
Base year	2 groups	5 groups	2 groups	5 groups	2 groups	5 groups
1984	8.0	7.6	11.2	10.6	7.3	6.8
1985	8.2	7.7	9.3	8.6	7.4	6.9
1986	8.3	7.7	9.7	9.1	7.4	6.9
1987	8.2	7.7	7.2	6.7	7.4	6.9
1988	8.7	7.9	5.5	5.5	7.4	6.9
1989	9.0	8.0	4.1	4.2	7.4	6.9
1990	9.2	8.1	4.7	4.7	7.3	6.8
1991	9.5	8.3	7.1	7.0	7.3	6.8
1992	9.5	8.2	7.6	7.4	7.1	6.6
1993	9.8	8.4	9.1	9.1	7.1	6.5

Table A.5.1.2: Percentage change in unemployment explained by indices of demographic change, holding activity rates constant by base year (continued)

	Age adjustment to unemployment		Age-driven change in unemployment		Chain-weighted index	
1994	10.1	8.7	8.3	8.3	7.0	6.4
1995	10.3	9.1	8.4	8.1	7.0	6.4
1996	10.6	9.6	8.3	8.0	7.1	6.5
1997	10.7	9.9	8.0	7.7	7.0	6.5
1998	10.7	10.0	7.6	7.2	7.0	6.4
Mean	9.4	8.5	7.7	7.5	7.2	6.7
Variance	0.9	0.7	3.6	2.9	0.0	0.0

Table A.5.2.1: Percentage point change in indices of demographi change, using unemployed to working population ratios, by base year

	Age adjustment to unemployment		Age-driven change in unemployment		Chain-weighted index	
Base year	2 groups	5 groups	2 groups	5 groups	2 groups	5 groups
1984	-0.28	-0.27	-0.48	-0.45	-0.28	-0.25
1985	-0.29	-0.26	-0.40	-0.36	-0.28	-0.25
1986	-0.30	-0.26	-0.42	-0.38	-0.28	-0.25
1987	-0.30	-0.26	-0.31	-0.28	-0.28	-0.25
1988	-0.31	-0.26	-0.24	-0.23	-0.28	-0.25
1989	-0.33	-0.27	-0.18	-0.17	-0.28	-0.25
1990	-0.35	-0.28	-0.20	-0.19	-0.28	-0.25
1991	-0.37	-0.30	-0.30	-0.28	-0.28	-0.25
1992	-0.39	-0.31	-0.28	-0.26	-0.28	-0.25
1993	-0.41	-0.33	-0.33	-0.32	-0.28	-0.25

Table A.5.2.1: Percentage point change in indices of demographic change, using unemployed to working population ratios, by base year (continued)

	Age adjustment to unemployment		Age-driven change in unemployment		Chain-weighted index	
1994	-0.43	-0.36	-0.29	-0.28	-0.28	-0.25
1995	-0.45	-0.38	-0.30	-0.28	-0.28	-0.25
1996	-0.46	-0.41	-0.31	-0.29	-0.28	-0.25
1997	-0.47	-0.43	-0.30	-0.28	-0.28	-0.25
1998	-0.48	-0.45	-0.28	-0.27	-0.28	-0.25
Mean	-0.38	-0.32	-0.31	-0.29		
Variance	0.01	0.00	0.01	0.00		

Table A.5.2.2: Percentage change in unemployed to working population ratios explained by indices of demographic change, by base year

	Age adjustment to unemployment		Age-driven change in unemployment		Chain-weighted index	
Base year	2 groups	5 groups	2 groups	5 groups	2 groups	5 groups
1984	6.47	6.07	10.92	10.25	6.34	5.60
1985	6.71	5.90	9.10	8.26	6.34	5.60
1986	6.81	5.85	9.58	8.78	6.34	5.60
1987	6.87	5.86	7.02	6.39	6.34	5.60
1988	7.12	6.03	5.46	5.20	6.34	5.60
1989	7.55	6.22	4.11	3.97	6.34	5.60
1990	8.03	6.46	4.53	4.33	6.34	5.60
1991	8.52	6.78	-0.28	-0.28	-0.25	5.60
1992	8.90	7.11	6.37	5.94	6.34	5.60
1993	9.42	7.61	7.51	7.22	6.34	5.60

Table A.5.2.2: Percentage change in unemployed to working population ratios explained by indices of demographic change, by base year (continued)

	Age adjustment to unemployment		Age-driven change in unemployment		Chain-weighted index	
1994	9.89	8.16	6.65	6.38	6.34	5.60
1995	10.24	8.73	6.76	6.42	6.34	5.60
1996	10.54	9.34	6.96	6.57	6.34	5.60
1997	10.77	9.87	6.83	6.49	6.34	5.60
1998	10.92	10.25	6.47	6.07	6.34	5.60
Mean	8.58	7.35	7.00	6.58		
Variance	2.64	2.41	3.18	2.59		

Table A.5.3: Unemployment to population ratios by age group: 1984-98

	16+	16-17	18-24	25-34	35-49	50+	16-59/64
1984	9.26	13.03	15.49	9.75	6.83	6.01	9.26
1985	8.89	12.49	13.95	9.80	6.87	5.61	8.89
1986	8.87	13.21	14.05	9.82	6.58	5.63	8.87
1987	8.57	12.04	12.31	9.77	6.57	6.13	8.57
1988	7.03	9.30	10.07	7.81	5.26	5.63	7.03
1989	5.80	7.00	8.23	6.54	4.28	4.88	5.80
1990	5.53	7.05	8.18	6.05	4.20	4.42	5.53
1991	6.76	9.22	10.69	7.32	5.07	4.99	6.76
1992	7.78	8.91	11.81	8.60	6.20	5.81	7.78
1993	8.24	8.45	13.29	8.72	6.42	6.59	8.24
1994	7.68	9.37	11.84	8.27	6.03	6.18	7.68

Table A.5.3: Unemployment to population ratios by age group: 1984-98 (continued)

	16+	16-17	18-24	25-34	35-49	50+	16-59/64
1995	6.88	9.04	11.07	7.45	5.48	5.09	6.88
1996	6.51	10.02	10.53	7.12	5.12	4.67	6.51
1997	5.64	9.89	9.37	5.82	4.50	4.06	5.64
1998	4.88	9.11	8.36	5.32	3.68	3.35	4.88

Table A.6.1: Projections of the labour force, activity rates and the working-age population by age: 1998-2011

	% of labour force			Activity rates			% of working-age population		
Year	16-24 yrs	25-34 yrs	35+ yrs	16-24 yrs	25-34 yrs	35+ yrs	16-24 yrs	25-34 yrs	35+ yrs
1998	15.40	26.24	58.35	71.18	84.06	55.22	17.54	25.30	57.16
1999	15.38	25.50	59.12	71.60	84.45	55.73	17.49	24.58	57.93
2000	15.37	24.68	59.95	71.66	84.65	56.18	17.50	23.78	58.71
2001	15.54	23.82	60.64	71.91	84.76	56.52	17.64	22.95	59.40
2002	15.81	22.99	61.21	72.13	84.83	56.64	17.88	22.11	60.00
2003	16.07	22.26	61.67	72.36	84.91	56.70	18.12	21.39	60.49
2004	16.22	21.71	62.08	72.47	85.01	56.74	18.26	20.84	60.90
2005	16.25	21.33	62.42	72.48	85.10	56.76	18.30	20.46	61.24
2006	16.31	20.92	62.78	72.56	85.20	56.81	18.35	20.04	61.60
2007	16.48	20.62	62.90	72.74	85.28	56.66	18.53	19.78	61.70

Table A.6.1: Projections of the labour force, activity rates and the working-age population by age: 1998-2011 (continued)

	% of labour force			Activity rates			% of working-age population		
2008	16.62	20.47	62.91	72.85	85.33	56.45	18.68	19.64	61.68
2009	16.72	20.46	62.82	72.95	85.40	56.20	18.78	19.63	61.59
2010	16.76	20.59	62.65	73.17	85.47	55.94	18.78	19.76	61.46
2011	16.73	20.82	62.45	73.32	85.51	55.67	18.72	19.98	61.30