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Entering Work and the British Tax and Benefit System

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Preface

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Material from the Quarterly Labour Force Survey is Crown Copyright, has been made available by the Office for National Statistics (ONS) through the ESRC Data Archive and has been used by permission. Neither the ONS nor the Data Archive bears any responsibility for the analysis or interpretation of the data reported here. Data from the Family Resources Survey and the Family Expenditure Survey were kindly supplied by the Department of Social Security.

The views expressed in this report are those of the authors concerned and not those of the Institute for Fiscal Studies or the Centre for Economic Performance (which have no corporate views), nor those of the Joseph Rowntree Foundation, the Treasury or the Financial Services Authority.

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Executive Summary

This report is concerned with entry or re-entry into work by men and women who are unemployed or inactive in the labour market. It examines how individual attributes and characteristics, labour market conditions and the tax and benefit system affect individual decisions about whether or not to enter work. The extent to which reforms to the tax and benefit system can help people move into work and 'make work pay' is an important policy question at this time. This study breaks new ground by using data from the Quarterly Labour Force Survey (QLFS), which follows around 12,000 people each quarter for five quarters on a rolling-panel basis. The benefits of this survey are twofold. First, we can look at the wages of individuals who actually move into work and use these to estimate the wages that people who are currently unemployed or economically inactive would earn if they moved into work. Second, we can look at individual people who start off out of work and then move into work over the length of the QLFS panel. This is an advance over existing British studies which use data where each person is observed only once.

Moving into Work in the QLFS

The analysis uses data from four consecutive QLFS panels, which end in the quarters Summer 1994 to Spring 1995. All men and women aged between 18 and 59 who were not in work in the first quarter of the QLFS panel except students, the severely disabled and those who moved into self-employment were used, a

sample size of 10,453. We included non-participants as well as unemployed work-seekers.

Analysis of the flow into work of the men and women in the QLFS showed that, over the year between the start and end of the sample, around 19 per cent of men moved into work compared with 15 per cent of women. Around 5 per cent of the total sample made more than one transition between unemployment or economic inactivity and work over the period.

A comparison between people who moved from non-employment into work over the length of their stay in the QLFS panel and people who were still out of work at the end of the panel showed that, for men, the movers into work were younger on average, had better educational qualifications, were more likely to have children and were more likely to be homeowners as opposed to renters. If married, they were also more likely to have a working partner. For women, the patterns were similar.

'Entry Wages' and the Overall Wage Distribution

We compared the distribution of wages for new entrants into work in the QLFS with the distribution of wages for employees as a whole. The entry wage distribution has a lower mean and is more compressed than the overall wage distribution. Table 1 gives some summary statistics for both wage distributions. It shows that the median entry wage is around 69 per cent of the median for the whole wage distribution. However, the gaps between male and female earnings and between the earnings of better- and less-educated workers are smaller for entry wages than they are for wages overall.

TABLE 1

Summary statistics: entry wages and overall wages

Summary statistic	*QLFS entry wage distribution (£ per hour)*	*QLFS overall wage distribution (£ per hour)*
Median, all wages	4.00	5.80
Median, men	4.53	6.92
Median, women	3.66	4.97
Median, education past minimum school-leaving age	4.33	6.94
Median, minimum school-leaving age only	3.67	5.00

Minimum Wages and Entrants into Work

The national minimum wage that will be introduced in April 1999 sets minimum hourly rates of pay for employees aged 18 or over in the UK economy. We find that a minimum wage set in 1995 at a level equivalent in real terms to the government's proposals of £3.60 per hour for employees over the age of 21 and £3.20 per hour for under-21s would affect around 10 per cent of QLFS employees overall, but almost 30 per cent of labour market entrants. Minimum wages at higher levels have proportionately greater effects: a minimum wage of £5.00 per hour for over-21s and £4.20 per hour for under-21s affects 60 per cent of new entrants. The minimum wage is likely to have a greater impact on 'entry jobs' than on the labour market as a whole.

Entry Wages and Work Incentives

The assumptions we make about the wages that people who are currently out of work would be able to earn if they were to go into work can affect our estimates of the financial gains that are available from working. Using IFS's tax and benefit microsimulation model, TAXBEN, running on data from the Family Resources Survey

(FRS), we computed two measures of the gain from working:

- the *replacement rate (RR)*, defined as the ratio of income net of taxes and benefits when out of work to net income in work;
- the *average tax rate (ATR)*, defined as the proportion of gross earnings from work that is taken by the government in taxes and reduced benefit income.

We used four different assumptions about the wages at which people moved into work:

- *average wage for employees:* the assumption that each person moves into work earning the average hourly wage in the FRS for a person of their characteristics;
- *selectivity-adjusted average wage:* the assumption that each person moves into work earning the wage predicted from an FRS wage equation that allows for self-selection into the work-force;
- *mean entry wage:* the assumption that each person moves into work earning the mean wage predicted from a QLFS entry wage regression;
- *median entry wage:* the assumption that each person moves into work earning the QLFS entry wage estimate based on the median rather than the mean wage for a person of given characteristics.

Table 2 summarises the results of this analysis. The columns show the effect of using the different wage assumptions. The first row shows the average (mean) wage for the FRS unemployed and economically inactive sample under different wage assumptions. This is followed by the mean replacement rate and average tax rate under the different wage assumptions, assuming 37 hours' work per week.

TABLE 2

Wages, replacement rates and average tax rates under different wage assumptions

Measure	*Average wage for employees*	*Selectivity-adjusted average wage*	*Mean entry wage*	*Median entry wage*
Mean wage	£6.34	£5.28	£4.39	£4.03
Mean RR	0.60	0.65	0.69	0.70
Mean ATR	0.51	0.53	0.54	0.54

Table 2 shows that predicting wages for unemployed and economically inactive people based on entry wage assumptions results in lower wage estimates than if overall wages from the FRS are used, even if a selectivity adjustment is made. The entry wage distribution is leftward-skewed, and hence the median-based entry wage estimate is lower than the mean-based one. The differences in the wage assumptions make a substantial difference to average replacement rates: the mean RR is around 10 percentage points higher under entry wage assumptions than under FRS average wage assumptions. Meanwhile, ATRs differ a lot less depending on the wage assumption used — they are slightly higher on average if we assume that out-of-work people would earn average entry wages rather than average overall wages, but not by much.

The report also analyses differences in replacement rates and average tax rates by family type, looking at single and married men and women separately, splitting married people according to whether they have a working partner or not, and considering young single people still living with their parents and lone mothers separately. This analysis finds that:

- RRs for women of a given family type are substantially higher than those for men of the same family type;

- RRs are high for married men and women with partners who are *not* in work;
- lone mothers have comparatively high RRs and ATRs;
- single childless men and women and single people who live with their parents face low RRs compared with other groups, and these differences are more pronounced when hours of work are high.

Hence both the family status of an unemployed or economically inactive person and the assumptions we make about the wage he or she would be able to earn in the labour market can make a substantial difference to how large the financial rewards to working might be for that person.

How the Empirical Model Works

Our model relates the information from the QLFS on who moves into work to the increases in disposable income that people expect to receive from moving into work. To get an accurate assessment of how the tax and benefit system affects the financial gains from working, we use IFS's tax and benefit microsimulation model, TAXBEN, to evaluate post-tax incomes in and out of work for unemployed and economically inactive people in the Family Resources Survey (FRS) in the same time period as the QLFS data. The QLFS entry wage information is used to predict earnings for the unemployed and inactive people. We also predict, using an hours equation for job entrants in the QLFS, the number of hours each unemployed person would work if he or she moved into work. The data from each dataset are averaged into '*cells*' (where a cell is comprised of all individuals of a given sex, age, educational attainment, region and family status). This

means that, although the individuals in the QLFS and the FRS are different people, we can combine the information on gains from working from the FRS and the wage information and the data on who moves into work from the QLFS.

Regression Results

We estimated moving-into-work regressions that relate the proportions of men and women moving into work in the QLFS to the net out-of-work incomes and the average gains from work that were calculated from the TAXBEN model. A number of specifications were estimated, most of which contained additional control variables. The results are summarised in Table 3. Where the effects of the out-of-work-income and gain-from-work variables were statistically significant at the 5 per cent level, this is indicated by two asterisks.

The main results were that:

- there is a positive relationship between what our model predicts is the financial reward from working for men and women who are unemployed or economically inactive and their propensity to move into work, controlling for age, redundancy and the level of unemployment;
- the relationship appears to be stronger for women than for men;
- the relationship is *not* robust to controlling for family type in the model;
- there is evidence that the effect of increases in financial incentives is strongest for men and women who gain little financially from working in the first place.

TABLE 3

Summary of moving-into-work regression results

	Specification number (as in Chapter 5)			
	(1)	*(2)*	*(4)*	*(8)*
Impact of £10 increase in predicted out-of-work income on probability of moving into work (% points):				
Men	–0.1	0.9 **	0.7 **	0.0
Women	–0.3 **	–0.2 **	–0.1	–0.3 **
Impact of £10 increase in expected gains from working on probability of moving into work (% points):				
Men	1.2 **	1.3 **	0.9 **	0.0
Women	2.5 **	2.5 **	1.9 **	0.6
CONTROLS:				
Male/Female	Yes	Yes	Yes	Yes
Age	No	Yes	Yes	Yes
Redundancy in last three months	No	No	Yes	Yes
Level of unemployment (by education and region)	No	No	Yes	Yes
Age of youngest child (women only)	No	No	Yes	Yes
Sick and disabled people	No	No	No	Yes
Homeownership	No	No	No	Yes
Family status (single, living with parents, married, working partner)	No	No	No	Yes

** denotes that the result is statistically significant at the 5 per cent level.

Policy Simulation

We can use the relationship between the net financial rewards from entering work and the information on who moves into work to simulate the effect on the numbers of people entering work in Britain of a number of labour market reforms that the present government has introduced or is planning to introduce. This is done by using TAXBEN to simulate the changes in the gains from working that each reform would cause. We consider the following reforms:

- the national minimum wage;
- the working families' tax credit;
- two reforms to employee National Insurance contributions (the abolition of the entry fee into NICs and the raising of the lower earnings limit for NICs to the threshold for income tax);
- a 10p starting rate of income tax (on the first £2,000 of taxable income).

Table 4 summarises the results of each of the policy simulations. The main results are as follows:

- WFTC is predicted to increase the probability of entering work for men with children. For women, WFTC increases work entry for lone mothers and married women with husbands who are not in work, but *decreases* the probability of entering work for married women with working partners.
- The NI reforms produce increases in the probability of entering work for all family types, especially for single people living with their parents and married people with working partners.
- The predicted impact of the 10p tax rate on the likelihood of entering work follows a similar pattern to the NI reforms, although the effects are smaller.
- The NI reforms are predicted to achieve the largest reduction in the stock of unemployed and economically inactive men and women of working age in Britain, reducing the stock by around 115,000 in the long run. For the WFTC, the stock reduction is around 92,000, and for the10p tax rate, it is around 76,000.
- The cost of each reform to the government arising from lower tax receipts and/or increased benefit payments is offset to some extent by extra people

TABLE 4

Summary of results from policy simulations

Result from policy simulation	*Minimum wage*	*WFTC*	*Reform: National Insurance*	*10p tax rate*	*Combined*[a]
Average change in income out of work (£):					
Men	0.00	0.58	0.28	0.80	1.66
Women	0.00	2.26	0.93	1.37	4.49
. Average change in gain from work (£):					
Men	2.54	2.67	2.65	1.65	7.05
Women	3.82	0.88	1.95	1.20	4.19
Average change in probability of entering work (% points):					
Men	0.21	0.26	0.22	0.17	0.66
Women	0.52	0.09	0.28	0.17	0.55
Long-run reduction in stock of unemployed or inactive people	N/A	91,720	115,280	75,970	287,020
Above as a percentage of total	N/A	−1.23	−1.54	−1.02	−3.84
Exchequer cost of reform (ignoring employment effects) (£m)	N/A	1,300	2,490	3,300	6,750
Change in exchequer cost (from employment effects) (£m)	N/A	−540	−448	−308	−1,311
'Cost of reform per job' (£)	N/A	8,300	17,700	39,400	18,900

[a]Combined figures do not include the effects of the minimum wage.

moving into work as a result of the reform. We predict that this will mean that the net annual cost is around £760 million for WFTC, around £2,040 million for the NI reforms and around £2,990 million for the 10p tax rate.

- The cost of each reform per additional job generated by the reform is lowest for WFTC and highest for the 10p tax rate.

CHAPTER 1
Introduction

This report is concerned with the process of entering or re-entering work after a period of unemployment or economic inactivity. It examines how personal characteristics, features of the labour market and, in particular, features of the tax and benefit system affect the decisions that individuals make about whether or not to enter work. By using a novel combination of datasets and modelling techniques, we hope to be able to answer some important questions about the way in which tax and benefit policy can influence people's labour market choices and, in particular, how large or small the effects of taxes and benefits are.

Our decision to concentrate on the move into work is motivated by two considerations. One is that this area of research is extremely policy-relevant at the present time in the UK. The Labour government elected in 1997 has promoted policy initiatives in the labour market as one of the key themes of economic policy. Initiated or planned reforms include the 'New Deal' for unemployed young people and its extensions to other parts of the labour force, the working families' tax credit for working families with children, reforms to National Insurance contributions, a national minimum wage and a 10p starting rate of income tax. These reforms have been presented as part of a unified strategy under the two headline slogans 'welfare to work' and 'making work pay'. While one part of this strategy depends on improved training opportunities, job subsidies and, indeed, a degree of compulsion into work, the other relates to financial incentives. It is on

the impact of designing the tax and benefit system to improve these financial incentives that we concentrate here.

It is worth stressing that enthusiasm on the part of policymakers for schemes designed to promote employment and help the long-term unemployed is nothing new in itself — after all, the previous Conservative government introduced several innovative measures in this area (for example, family credit, training for work, and Restart interviews for the long-term unemployed). However, despite an enormous empirical literature, there is still widespread debate on how effective particular changes to the tax and benefit system might be in promoting the transition from welfare into work in the UK.

The second reason for concentrating on movements into work is that the particular nature of the data that we are using for this study allows us to perform an analysis that was not previously possible using UK data. As we show below, policy simulation of the effects of taxes and benefits on participation is not new in itself. However, the present study is intended to break new ground by using a dataset — the Quarterly Labour Force Survey (QLFS) — that follows around 12,000 people each quarter for five quarters on a rolling panel basis. The use of detailed panel data allows us to make two major advances in modelling movements into work:

- We can look at the wages of those individuals who actually move into work. We show how this can be useful for arriving at an estimate of the wages people who are currently out of work would earn if they moved into work — something that it is essential to have if we are going to estimate the possible 'returns to work' for people who are currently not working.

- Because we have a panel dataset (with more than one observation for each individual over time), we can look at people who start off out of work and then move into work. Hence we can look at various features of the transition into work. This is impossible to do using a purely cross-sectional dataset.

1.1. Aims of the Report

Our aim in this report is to estimate the impact of changes in in-work and out-of-work incomes on the probability of moving into work, where out-of-work income is evaluated through modelling entitlements using a model of the UK tax and benefit system (TAXBEN) and in-work income is estimated using the distribution of wages actually earned by people who move into work in the survey. Hence the novel features of our analysis are:

- that we observe who actually moves into work and use this information to estimate a model of moving into work;
- that we see the range of wages they actually command and take this as an exogenously given available distribution; and
- that we estimate in-work and out-of-work incomes, given personal characteristics and wage information, using the TAXBEN program.

Once we have a working model of the probability of moving into work, it is a straightforward matter to apply the predictions of the model to estimate what the effect would be of changes to the tax and benefit system on the probability of non-working people moving into work. In other words, we attempt to simulate the effect of policy changes on the extent and rate of transitions

into work. These simulated reforms will include some changes that the government is actually planning to introduce, such as the national minimum wage, the working families' tax credit and a 10p starting rate of income tax. It should be emphasised that, as the reforms in question have not actually happened yet but are scheduled to happen over the course of the present parliament, there will be scope for further research to examine the *actual* response of the labour market to these reforms in a few years' time, when the data have been collected. However, at the present time, a simulation-based approach is the best we can do, given the data available.

1.2. Structure of the Report

Chapter 2 gives the background to the economic analysis of labour supply and how the tax and benefit system affects moving into work. This consists of a discussion of the economic theory underlying the empirical work on the topic, and then an analysis of the two strands of empirical literature that we intend to bring together — work on transitions from unemployment into employment, and work on how the tax and benefit system affects labour supply and employment. The chapter ends with a brief outline of our exact aims in this project and what we hope the significance of the results will be. Chapter 3 describes the data that we use, which come from two British datasets — the Quarterly Labour Force Survey and the Family Resources Survey. Chapter 4 gives a detailed explanation of the model that we estimate and what we hope to achieve with this modelling strategy. Chapters 5 and 6 summarise and analyse the results that the model produces. Specifically, Chapter 5 looks at the estimates from the statistical model that we use to relate the data

on non-working people who move into work during the course of the Quarterly Labour Force Survey panel to their attributes and circumstances. Chapter 6 builds on this by conducting and analysing some simulations of policies that the government has implemented or is about to implement, using the results from Chapter 5 as raw material. We attempt to predict the effects of policies such as the working families' tax credit and the 10p starting rate of income tax on the durations of unemployment and/or economic inactivity that people face and on the numbers of people moving into work as a result of such policies. Chapter 7 offers our conclusions.

CHAPTER 2
Background

In this chapter, we describe the framework that economists normally use to look at labour supply issues, and then examine some previous work by applied economists that relates to our aims in this report.

2.1. Economic Theory and Moving into Work

2.1.1. 'Static' labour supply theory and the budget constraint

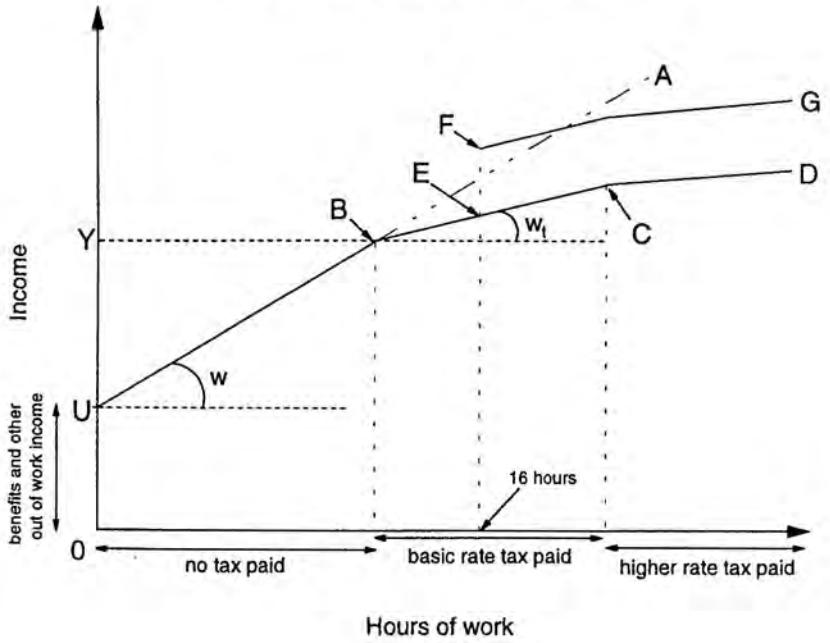
A simple 'static' model of labour supply is the starting-point traditionally used by economists for the analysis of people's labour market decisions, and it can illustrate many of the features we are interested in for the present analysis. Consider the case of an individual deciding whether to enter work or not. Assume, for the moment, that the individual knows how much income he or she receives when not in work (from benefits, investment income and so on) and how much he or she can earn from working (i.e. the hourly wage rate). In this case, the financial aspects of the choice between working and not working can easily be illustrated using a *budget constraint*, such as the hypothetical example in Figure 2.1.

The budget constraint is a straightforward concept: it relates the individual's *hours of work* (on the horizontal axis) to his or her *net income* (on the vertical axis), where net income includes income from all sources, taking into account taxes and benefits. In the example case in Figure 2.1, we see that at point *U* on the vertical axis, the individual is not working and has income of

0U (which may be from benefits, investments and so on). If the person moves into work, they are paid at the wage rate *w* per hour. In the absence of taxes or benefits, this would result in the budget constraint being a straight line, *UA*. Thus it is clear that the higher the hourly wage rate a person can earn in work, the steeper his or her budget constraint will be. Taxes complicate the situation. We show here a tax on earnings above the level *Y* on the vertical axis. This lowers the portion of the budget constraint above *Y* from *BA* to *BC*. w_t is the after-tax wage rate. Higher rates of tax (such as on the portion *CD* in the diagram) lower the slope of the budget constraint even more. Other taxes (such as National Insurance contributions) create further 'kinks' and move the budget constraint further away from being a simple straight line.

FIGURE 2.1

An example budget constraint



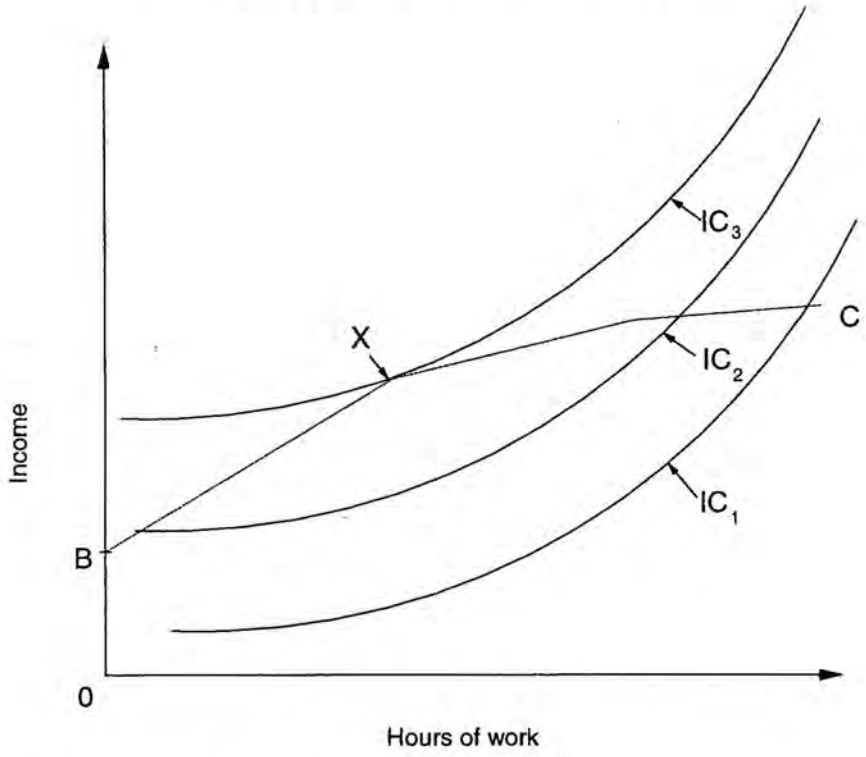
Whilst taxes lower the budget constraint, benefits raise it. Out-of-work benefits (such as income support and housing benefit) will raise the point *U* where the budget constraint begins on the vertical axis. If a person moves into work, there comes a point at which benefit starts to be withdrawn — the benefit 'taper', where additional earnings lead to reductions in benefit. Again, this will make the slope of the budget constraint shallower. On the other hand, in-work benefits (such as family credit (FC)) provide a boost to income as soon as a person works the specified number of hours (16 in the case of FC under current rules), and this creates a 'step' or discontinuity illustrated by the vertical jump from E to F in Figure 2.1.

The main point to draw out from this discussion is that the budget constraint has a complex and non-linear shape, and economists have to take this into account when examining people's labour supply responses to work incentives. This is why we use the IFS tax and benefit 'micro-simulation' model, TAXBEN, which is capable of evaluating budget constraints along the lines of Figure 2.1 for each individual in the dataset.

Given the shape of a particular individual's budget constraint, the assumption made in simple labour supply models is that the person makes a decision about whether to work at all, and, if so, about how many hours to work, which will place them at a point on the budget constraint. What determines this choice? The usual assumption is that a trade-off exists: on one hand, people prefer more income to less (i.e. they want to maximise their net earnings from work) but, on the other hand, they dislike work itself. Given this trade-off, we can illustrate the basic theory behind the hours choices an individual makes with Figure 2.2. This shows a simplified budget constraint and a set of curves

FIGURE 2.2

Indifference curves and the budget constraint



IC_1, IC_2, IC_3 and so on that economists label *indifference curves*. Suppose a person was working h_1 hours for a net income of y_1. If hours of work were increased to h_2, there would be an income level, y_2, at which the individual would be 'indifferent' (i.e. not have a preference one way or the other) between working h_1 hours for a net income of y_1 and working h_2 hours for a net income of y_2. y_2 must, of course, be a higher income level than y_1 because the individual dislikes work and so requires compensation in the form of higher income for working longer hours. By this method, it is possible to draw up a collection of income and hours points between which the individual is indifferent; these make up the indifference curve IC_1 in

Figure 2.2. We can imagine a whole family of indifference curves at different levels of welfare or 'utility'; in Figure 2.2, curves that are above IC_1 (such as IC_2) are preferable to IC_1 because, by moving up to a higher curve, it is possible to work the same number of hours for higher earnings or, alternatively, fewer hours for the same earnings, both of which are preferred by the individual under our assumptions.

We now have the two sets of information we need to determine the individual's hours of work under the basic model — the budget constraint, which shows the possibilities open to the individual, and the 'map' of indifference curves, which shows us what choices the individual would ideally like to make. The solution to the labour supply decision occurs at the point where the individual's highest attainable indifference curve is just touching the budget constraint. In Figure 2.2, this occurs at point X, where IC_3 touches the budget constraint.

This concludes our discussion of the basic static labour supply model. Below, we discuss some issues relating to potential problems with this model and using it in applied research, but, first, we need to put the labour supply decision in a more dynamic context.

2.1.2. Dynamic labour supply: the search framework

Whilst the simple static labour supply model is a useful theoretical tool and helps us view the issues involved graphically through the budget constraint and indifference curves, what we are most interested in is the transition between unemployment and work, which requires a more dynamic modelling approach. The economic theory of *search* is well equipped to address these needs.

In search theory, the process that an unemployed person has to go through to find work is analysed

explicitly. The crucial assumption is that information about jobs is *costly*; that is, the person looking for work does not automatically know the characteristics and wage rates of every job for which there is a vacancy. Hence he or she has to search to find this information, which is a costly activity. The theory assumes that the job offers that appear to the individual are drawn randomly from a wage distribution $F(w)$ at a given rate; both the wage offer distribution and the rate of offers may change over time in response to changing economic conditions or individual circumstances. Faced with a given job offer, the job-seeker has to decide between accepting the job and continuing to search. In doing this, he or she is assumed to weigh up the value of the job (the wage plus other characteristics), on one hand, against the expected value of future offers (some of which might be better) minus the costs of remaining unemployed and continuing to search, on the other hand, and make a 'utility-maximising' choice.

An important concept to introduce here is the *reservation wage*, which is defined as the wage that would need to be offered to the unemployed person which would be just enough to induce him or her to accept the offer rather than continue searching. Offers of work at wages below the reservation wage are turned down; an offer at the reservation wage or above is accepted.[1] (Note that the reservation wage concept is implicit in the simple static analysis that we looked at in the last section as well. Given that the indifference curves in Figure 2.2 slope upward, if the wage w is

[1]Of course, this characterisation of a 'job offer' does not necessarily correspond to what we would describe as a 'job offer' in everyday parlance; it is more of an implicit notion, in the sense that the job would be offered if the searching individual applied. In reality, it is likely that an individual would not even apply for jobs offering wages below his or her reservation wage.

sufficiently low, it is likely that a person's highest achievable indifference curve would be reached at the vertical axis at zero hours of work — a 'corner solution'. If we were to increase the wage, the budget constraint would get steeper and at some point it would be the case that the person could reach a higher indifference curve at a positive number of hours — that is, he or she would choose to enter work. The wage at which this would occur is the reservation wage.)

There are difficulties involved in using the search framework as a basis for empirical work on transitions into work. One is that the distribution of wage offers is crucial to the theory, and yet only the actual accepted offer resulting in the move into work is recorded in actual data. Similarly, we do not know the reservation wages of people in the data — only whether they move into work or not (if they do, we assume that the wage offer was at or above the reservation wage). In practice, economists are forced to estimate these missing variables from the data available.

Here, we try to model the wage offer distribution by relating the observable attributes (age, education level, etc.) of individuals in the Quarterly Labour Force Survey to the wages received by those individuals who move into work. We then divide the entry wage distribution into segments and estimate the probability of moving into work at each segment for everyone in the dataset. We do not explicitly model the reservation wage but it is implicit in our final equations where we model the relationship between transitions into work and the observable attributes of the sample. If it is these observable attributes that are the determinants of people's reservation wages, then our approach is sound from a search-theoretic perspective.

2.2. Problems and Issues Arising from Labour Supply Models

Although the discussion of the budget constraint and search theory given above makes the economist's task in modelling labour supply seem relatively straightforward, there are several potential problems and issues that need to be raised concerning whether the approaches outlined above are valid. It is worth devoting some time to these issues.

First, there may be problems modelling the budget constraint. Remember that the budget constraint should (ideally) take into account all the costs and benefits of working in order to be an accurate depiction of the trade-offs that people take into account when making labour supply decisions. We have so far concentrated on the purely financial aspects of the work decision — the net earnings from work after taxes and benefits are accounted for. Now, although these financial incentives may be an important determinant of labour supply, they are probably far from being the only determinants. For one thing, there may be many costs and benefits of working that are harder to measure. Some of these are implicit but difficult to determine from the data available to researchers, including childcare costs for parents out at work, travelling and mobility costs, and non-wage rewards at work, such as company cars. Others present more profound conceptual difficulties — for example, any psychological costs or benefits that might be derived from working or from non-employment. Additionally, the notion that unemployed or economically inactive individuals have good information about the wage offers available to them in the labour market, and about the features of the benefit system that affect their net returns, is frequently questioned by some researchers (as, indeed, is the

notion that individuals are even capable of making rational and 'utility-maximising' choices).[2] These issues certainly need to be mentioned in any discussion of labour supply theory; incorporating them directly in an empirical model of labour supply decisions is more difficult. However, economists are certainly aware of these problems, and promising efforts have been made to address some of them (see, for example, Duncan and Giles (1998) on childcare costs).

Another set of issues has to do with the economist's notion that, in making a labour supply decision, a presently unemployed or economically inactive individual has a free choice over (a) whether to work or not, and (b) how many hours to work. Whether the first of these choices is available is a much-debated topic in economics dating right back to Keynes (1936), who introduced the concept of 'involuntary unemployment' to describe the situation facing an unemployed individual who would like to work but cannot secure a job at the 'prevailing real wage'. Whether this concept is fully coherent as it stands is open to debate, as there is a distribution of wages rather than a single real wage, and a person who does not receive any offers at a certain wage level might be able to secure a job at a lower wage. None the less, many modern economists would accept that, in some circumstances, the labour market

[2]See, for example, England, Ford and Kempson (1996), who argue that, for most people, the tax and benefit system is *not* an important factor in determining their labour market status. In defence of the economist's focus on the tax and benefit system, it should be stressed that the budget constraint is a model of people's labour market behaviour as opposed to their thought processes. It is quite possible that people do behave in the manner predicted by economic theory, despite not working through the costs and benefits of the labour supply decision with the academic rigour of the economist, instead relying on 'rules of thumb' or rough calculations. See Dilnot and Duncan (1992) for a survey of different criticisms of labour supply theory in economics and the economist's response.

may not 'clear' fully (i.e. there may be more unemployment than there would be in a fully flexible labour market in an equilibrium state) and hence individuals looking for work may experience more difficulty than would be intimated by the simple labour supply model. (Indeed, search theory itself is designed to account for some unemployment that arises because information — and therefore looking for jobs — is costly.)

As for hours choices, there is a continuing debate over whether the full range of hours choices is available to employees, or whether firms demand certain patterns of hours worked in order to fit in with their production requirements. It should be stressed that, even if every job had completely inflexible hours provisions, an unemployed person might still receive a range of different job offers with different hours attached and so there would effectively be a choice of hours available and the continuous budget constraint would be a defensible model. In practice, it is difficult to identify from the available data on the hours people actually work whether individuals do face constraints on the hours they can work or whether the observed hours are the result of an unconstrained choice by the employees involved.[3]

The debate over the issues can best be summed up with the observation that researchers looking at labour supply should be constantly aware that the standard model of work decisions is a simplification — and possibly an oversimplification — of the true picture. With this in mind, we turn to look at some actual studies that are related to the approach taken in the present report.

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[3]Although there have certainly been attempts to tackle this question in the literature — for example, Stewart and Swaffield (1997).

2.3. Previous Empirical Work

One strand of the applied literature on labour supply is the 'hazard' literature, which looks at the time it takes unemployed people to move back into work. This literature draws heavily on the dynamic aspect of labour supply theory (i.e. search theory) that was looked at in the last section. Early examples of these types of models in the UK include work by Nickell (1979), Lancaster (1979) and Atkinson et al. (1984), who made detailed studies of movements into work using data on the unemployed. More recent work includes a paper by Narendrenathan and Stewart (1990), who look at the robustness of various specifications for these hazard models. The papers estimate *hazard functions*, which give the probability of leaving unemployment conditional on having been unemployed for a given amount of time.

We shall start with Nickell's paper as a focus for slightly more in-depth discussion as it illustrates the main empirical issues in a straightforward manner. Using search theory, it is assumed that each unemployed individual faces a known distribution of possible wage offers that is specific to his or her last occupation, educational attainment and labour market experience. This is important for estimation purposes because the wage that an unemployed individual would earn in work is estimated using these occupational, educational and experience variables, and this is then used to compute the replacement rate (the ratio of net income out of work to net income in work) which is used as a regressor in the main hazard model. The hazard model also controls for the time spent in unemployment, family status, age, ill health and local labour demand. Nickell finds that the hazard rate falls over time (that is, people who have been unemployed for longer seem to have a lower

probability of finding work in the next period than people who have been unemployed for a short period of time). A higher replacement rate (that is, a higher ratio of out-of-work income to in-work income, caused by higher benefits or lower income in work) appears to lower the hazard for the first 20 weeks of unemployment but has little effect on the long-term unemployed.

Whilst Nickell's analysis was a ground-breaking piece of work for the UK, there are several areas that subsequent work has seen as in need of improvement. One of these is that, whilst it is tempting to interpret the results as meaning that the longer that someone stays in unemployment, the less likely they are to leave it (i.e. the probability of leaving unemployment is *duration-dependent*), there is another possible explanation. The decline in the hazard rate over time may be an artefact resulting from *unobserved heterogeneity*; that is, it might be the case that the people who fail to leave unemployment quickly are, in some unobservable way, not as productive as the people who return to work quickly, and failure to control for this yields misleading results. This is a crucial topic which we return to in Chapter 4 when discussing our own modelling strategy.

Another problem is that, in Nickell's paper and other papers from the late 1970s and early 1980s, the 'unemployed' are defined as 'actively seeking work', so that non-participants (i.e. people who are not in work but not engaged in seeking work) are not part of the study. Whilst this was a reasonable simplification to make using data from the 1970s, later in this report we show that the proportion of non-participating males in the labour market has increased sharply since the 1970s; hence it is vital that today's studies do not ignore the phenomenon of non-participation. More recent work by Narendrenathan and Stewart (1990) takes account of the

possibility of *exit* from unemployment into non-participation (rather than into employment) by estimating a 'competing-risks' model, where there is more than one possible labour market state into which to make a transition. However, even this study still starts off with just the unemployed, rather than the unemployed and economically inactive.

A third problem, as identified by Atkinson et al. (1984), is that Nickell's measure of unemployment benefits was fairly crude, due to the fact that the data he was using did not allow him to determine (for example) what rate of benefit the unemployed were entitled to. In addition, he made no attempt to model the impact of taxes and benefits on net wages; tax and benefit modelling was in its infancy at the time, and gross wages were normally used to derive the distribution of wage offers.

Another strand of the labour supply literature attempts to model transitions between employment, unemployment and non-participation ('multinomial' modelling) using detailed micro-data on the incomes and benefit eligibility of people in the sample. This type of literature normally uses data over a period of years (either panel data or repeated cross-sections) so as to look at how changes in benefit eligibility and incomes in and out of work for different people affect work incentives and moves into and out of work. Examples of this type of analysis include Blundell, Duncan and Meghir (1998), looking at the labour supply responses of married women to income tax changes in the UK over the 1980s and 1990s, Eissa and Liebman (1996), looking at similar data for the US, and Duncan and Giles (1998), who simulate the effects of the introduction of the working families' tax credit in the UK. We shall focus on an example paper by Bingley and Walker (1997), which looks more closely at the

choice between work and non-participation, as it is most relevant to our present purposes.

Bingley and Walker take a sample of lone mothers and look, in particular, at the effect of changes to in-work benefits (such as family credit (FC)) on movements into and out of work. The data used come from the Family Expenditure Survey between 1978 and 1992, with a sample of just under 5,000 lone mothers. Lone parents are assumed to choose between four possible labour market states: non-participation, participation at part-time hours with take-up of FC, participation at part-time hours without taking up FC, and participation at full-time hours. The assumption that there are only a number of discrete 'hours points' at which individuals can choose to work is necessary in order to make the model computationally viable, given the fact that the budget constraint is very non-linear. In the first stage of modelling, wage equations are estimated on the whole sample to obtain predictions of in-work wages for non-workers. These predictions include a 'selectivity adjustment' which is estimated from a labour-force participation equation and is designed to take account of the fact that, as the only people we observe in work are those whose wages are high enough to make it worth while for them to work, people not in work are likely to command lower wages in the labour market than those in work. A multinomial probit equation is then used to relate the probability of choosing each labour market 'regime' to standard control variables (for example, age, age of youngest child in household and region) and the predicted in-work wages from the first-stage equation. The paper shares some of the features of the modelling strategy used in the present report, as the wages for lone mothers are run through a tax–benefit simulation model (which is, in many ways, a simplified version of TAXBEN) in

order to evaluate the post-tax and post-FC incomes at 0, 24 and 40 hours of work. The results suggest that the provision of family credit has a large impact on the probability of working part-time relative to the probability of non-participation.

2.4. How Our Approach Fits in with Previous Literature

As shown in the last section, there are two main strands to the existing literature on labour supply and transitions from unemployment to employment. One is based largely on hazard models in a dynamic context (using panel data where the same individuals are observed more than once) and the other is based largely on modelling the budget constraint in a much more detailed manner, in a more static setting (or comparing a series of 'snapshots' of individual budget constraints across time). Our model aims to combine the strengths of both these approaches, although inevitably we are forced into some compromises by the limitations of the data we are using. In common with Bingley and Walker's work based on repeated cross-sections, we place a special emphasis on calculating the budget constraint as accurately as possible, and the IFS TAXBEN model helps us do this. In addition, we are looking at both men and women and at all the different family types, rather than just, for example, lone mothers. At the same time, in common with the literature on unemployment hazards, we are concerned with movement into work (although we are looking at entry into work from labour market inactivity as well as from unemployment). However, whilst we are estimating the probability of moving into work, we are not estimating a full hazard model because we are not fully conditioning on the time people in the Quarterly Labour Force Survey have been

out of work. This is partly because our data on unemployment durations are not fully reliable, but more because we have a greater interest in the overall movements into work resulting from a change in the tax and benefit system than in analysing the hazard function *per se*. So this report aims at a dynamic model of the transition between non-employment and employment that also accurately models the financial incentives faced by individuals deciding whether to work or not.

Previous empirical estimates of the impact of the tax and benefit system on participation in the labour market

In this section, we present a brief summary of some recent results on the impact of the tax and benefit system (or, at least, specific aspects of it) on labour market participation in the UK, the US and Canada. This is shown in Table 2.1, where we list the authors of each study, the sample on which the study is carried out and the main results found.

The results from previous work shown in the table raise several important points regarding empirical research on the effects of reforms to the tax and benefit system on employment rates and entering work from unemployment. One is that the empirical data that are used to evaluate the effects of these reforms can differ widely in their nature. For example, the Self-Sufficiency Project (SSP) data used in the Card and Robins study were taken from an experiment that was built into the programme, whereby some of the people who were eligible for SSP were randomly assigned into a control group who did *not* enter the programme. Experimental data of this kind are often viewed as ideal for the purposes of programme evaluation as they, hopefully,

TABLE 2.1

A summary of main results from previous studies of the effect of taxes and benefits on participation and/or work entry

Study	*Sample*	*Main results*
Bingley and Walker (1997)	UK: lone mothers, Family Expenditure Survey, 1978–92 (repeated cross-sections)	Doubling the maximum amount of family credit eligibility increases participation by 10 percentage points (from a base of 34 per cent working). The maximum FC eligibility is conditional on family size but averages around £75 (in 1992 prices).
Card and Robins (1996)	Canada: single mothers, 1992–95 (experimental evaluation with random assignment)	The Self-Sufficiency Project (SSP) — an earnings supplement programme for single parents on welfare for at least 12 of the last 13 months — provides a supplement equal to one-half the difference between gross labour income and a target earnings level. Full-time work (30 hours or more) is required to qualify. A year after the introduction of the SSP, programme members were around 13 percentage points more likely to be in work than eligible lone parents who had been randomly assigned out of the programme as a control group.
Duncan and Giles (1996)	UK: mothers of pre-school-age children, Family Expenditure Survey, 1992	£10 childcare voucher, costing £330 million to implement, increases participation of this group by 30,000 (around 4 percentage points).
Duncan and Giles (1998)	UK: lone mothers, Family Resources Survey, 1994–96 (repeated cross-sections)	Simulating the introduction of the working families' tax credit (a more generous system planned to replace family credit in 1999) increases the participation of single mothers by around 2 percentage points (from 34 per cent to 36 per cent), moving into work at between 20 and 40 hours of work per week.
Eissa and Liebman (1996)	US: single mothers, 1984–90 (repeated cross-sections)	The Tax Reform Act of 1986 increased the generosity of the Earned Income Tax Credit (the main US welfare programme for families with children), increasing the maximum EITC from $550 to $851. This is predicted to have increased participation for single women with children from 73 per cent to 75.8 per cent.

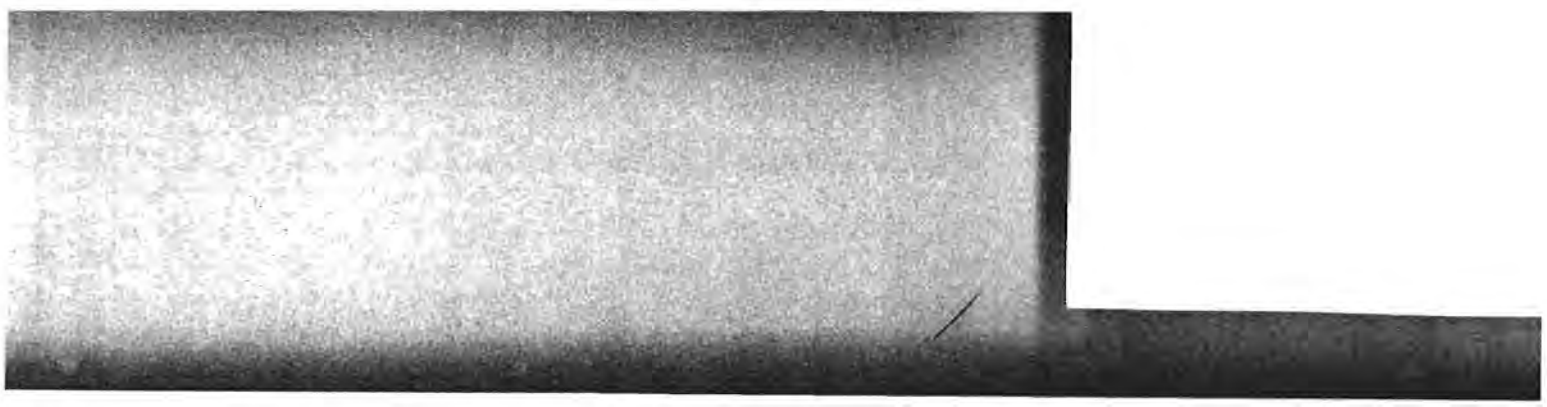
make it easier for researchers to control for other factors when evaluating programme effects. In the UK, such data have not so far been available and so researchers have used data from non-experimental studies such as repeated cross-section or panel datasets instead.

Another issue in looking at previous results is that the programmes that are being examined are often quite complex in design (for example, the family credit programme looked at by Bingley and Walker in the UK, and the US Earned Income Tax Credit). Whilst a full examination of the quirks of individual programmes would be beyond the scope of this brief survey, the implication of this complexity is that a reform can have quite different effects on different individuals according to whether they are eligible, exactly how the means-testing for a benefit works (if any) and whether everyone who is eligible for the benefit actually takes up their entitlement.[4] The upshot of this is that attempts to sum up the effects of a reform in terms of a single number — for example, by saying something along the lines of 'this reform increased participation by 2.1 percentage points' — can often be rather misleading. We have highlighted some individual estimated figures in Table 2.1 to give a flavour of the sorts of estimates that previous empirical work has come up with, but they should be taken as suggestive measures only.

In our results in Chapter 5, we derive a measure known as the *elasticity* of work entry to changes in the financial gains from working which we use our model to estimate. Elasticity is a concept used by economists

[4]Possible reasons for a person who is eligible to receive a benefit that would increase their income none the less failing to take up the benefit include possible social 'stigma' associated with being on benefits and the possibility that individuals are not very well informed about the benefits to which they are actually entitled. See Fry and Stark (1993) for an empirical analysis of the extent of benefit take-up in the UK in the 1980s.

to measure the responsiveness of the quantity of a commodity that is demanded or supplied to a change in its price. In this case, the 'commodity' is labour supply by entrants (or re-entrants) to the work-force over a fixed period of time and the 'price' is the financial gain that these entrants expect to receive when they move into work. While our estimates of this elasticity are interesting, they are by no means the whole picture of the effect of the labour market reforms that we analyse because, as we show in the other parts of Chapters 5 and 6, the different reforms affect different groups of the people we are looking at in different ways. So we also take a more detailed look at how our results compare with previous research in Chapter 6.



CHAPTER 3
Data

This project makes use of two different British datasets. Below, we describe both datasets and the precise use we make of them.

3.1. The Quarterly Labour Force Survey (QLFS)

The Quarterly Labour Force Survey is a dataset which has operated in its present format since 1992. It is a 'short panel' survey based around household interviews; around 60,000 households are interviewed per quarter. Individuals come into the survey in their 'starting quarter', are interviewed each quarter up to a year after the initial contact, and are then dropped. Thus the QLFS is a five-quarter 'rolling' panel. Crucially for our purposes, in the fifth and final quarter, survey respondents in work are asked about the wages they earn. This allows us to get a measure of entry wages for those people who start their time in the panel out of work and end the period in work.

In this report, we use four consecutive quarters of QLFS data, the four panels ending in the quarters Summer 1994 to Spring 1995. The data that we decided were suitable for use in this project comprise 10,453 observations. In Section 3.3, we give precise details of how our final sample was selected. Numerical details of how the selections we made affected the usable sample size can be found in Appendix A.

3.2. The Family Resources Survey (FRS)

The Family Resources Survey is a cross-sectional dataset of around 26,000 households which has been collected annually in the UK since 1994. Our reason for using the FRS as well as the QLFS in this project is so that we can arrive at an accurate measure of the budget constraint facing individuals both in and out of work, given assumptions about their gross in-work wages. We are able to compute the budget constraint and hence post-tax-and-benefit incomes using IFS's tax and benefit micro-simulation model, TAXBEN, which runs on FRS data.[5]

Of course, the people surveyed in the FRS are not the same people as are sampled in the QLFS, so there is a compatibility issue: how do we 'link' data from both sources so that they can be used in a single analysis? Our solution is to aggregate data from both sources into a large number of 'cells', where the cells are groups of people defined by various characteristics, i.e. people of a certain sex, age, family type, region and so on. The details of this grouping procedure will be covered in the next chapter, but the salient point to note here is that it is important to select our FRS sample so that it is as consistent as possible with the QLFS. Obviously, as the FRS is a cross-section rather than a panel, it is not possible to look at transitions into work; nor is there any information on how long individuals have been in their present job. However, the FRS does contain information on employment status; so we are able to set up the FRS

[5]An interesting extension of the modelling methodology presented here would be to attempt to modify the TAXBEN model to run directly on QLFS data, thus circumventing the need to use the FRS. Whilst the investment of time and effort that would be needed to assess the feasibility of this extension of TAXBEN and to implement it were beyond the scope of this project, it remains an interesting avenue for future research.

data according to the same criteria as those used for the first quarter of the QLFS panel. Again, the details of these criteria can be found in Section 3.3. Numerical details of how the sample selections affect the sample size can be found in Appendix A.

3.3. Data Selection

This section explains the rationale behind the way we select the data for use in our empirical work. We make use of all men and women in the QLFS and FRS samples who:

- are aged between 18 and 59;
- are not in work in the FRS or in the first quarter of the QLFS (note that we are including not just those unemployed people seeking work but also 'non-participants' who are not currently searching for paid work);
- are not full-time students;
- are not unlikely to enter work in any circumstances due to *severe* disability; we define the severely disabled as those who are in receipt of one or more of the following benefits: severe disablement allowance, disability living allowance and attendance allowance;[6]
- do not have missing information on employment status, educational attainment or housing tenure;

[6]Note that we do *not* exclude people who are in receipt of invalidity benefit from the sample. This is because there is some evidence that individuals who are on invalidity benefit at one time may move back into work at a later point. This may be because their incapacity for work is a short-term condition or because, whilst not fully fit, they are able to do some types of work. See Disney and Webb (1990) and Meghir and Whitehouse (1997) for some evidence on this point.

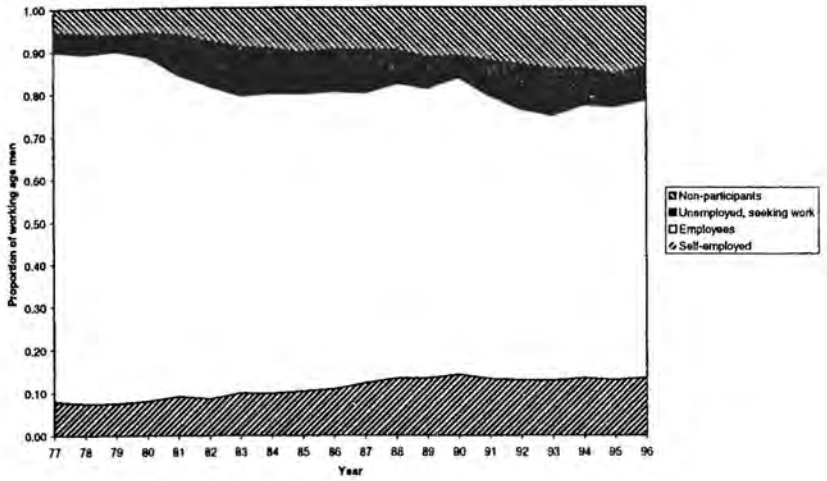
- do not move into *self-employment* (as opposed to a job as an employee) by the final quarter of the QLFS.

We exclude full-time students from the analysis as this group face a more complex set of incentives — they are neither working full-time[7] nor unemployed or economically inactive, and hence it is difficult to accommodate them in the empirical analysis without introducing a more complex model that includes full-time education as a state into which people can move. However, we do include people who are not in work but are also not actively seeking work, i.e. those men and women normally classified as 'non-participants' in the labour force. This inclusion is potentially important for a number of reasons. As shown by Figures 3.1 and 3.2, the main shifts in the UK labour market in recent years have been in the balance between employment and non-participation, rather than between employment and unemployment. (See Box 3.1 for more details on this point.) The benefit system potentially plays an important role in this, for it is particularly with regard to increases in the numbers receiving disability benefits and benefits for lone parents that the number of benefit-dependent individuals has risen. To exclude all these groups from the analysis would potentially miss the most important aspects of non-employment in the UK. The men and women who move into self-employment

[7]It is important to note, however, that many students do undertake temporary and part-time jobs to help finance their studies, either during term-time or in vacations. We exclude these working students from the analysis because, in a sense, they already have a full-time occupation (i.e. being a student), regardless of whether they are working additionally or not. However, an examination of employment patterns amongst students would be an extremely interesting topic in its own right.

FIGURE 3.1

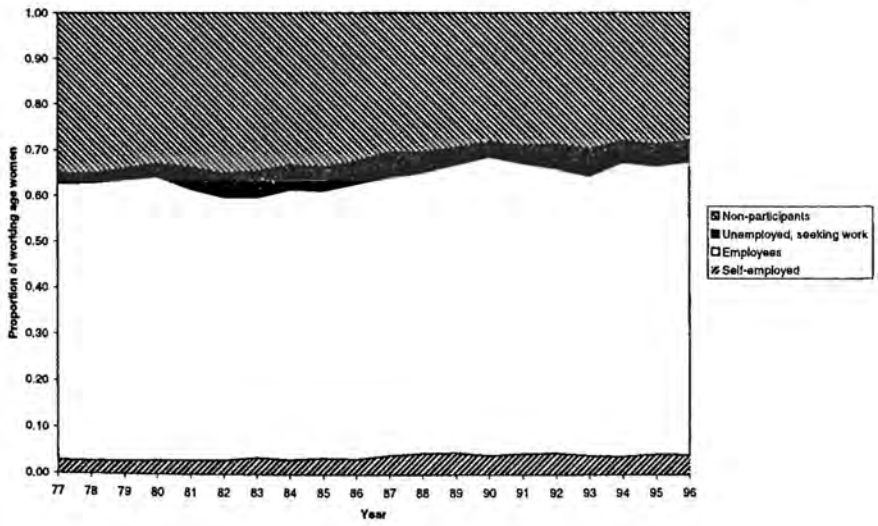
Employment composition of working-age men in the UK, 1977–96



Source: Family Expenditure Survey.

FIGURE 3.2

Employment composition of working-age women in the UK, 1977–96



Source: Family Expenditure Survey.

are excluded because the information in the QLFS on the incomes that self-employed people receive is poor, and hence it would be extremely difficult to derive a measure of 'entry wages' for individuals choosing to enter self-employment.[8]

BOX 3.1

Changes in the employment composition of working-age men and women in the UK, 1977–96

Figures 3.1 and 3.2 show the changes in the proportions of men and women of working age who were employees, self-employed people, unemployed work-seekers or non-participants in the labour market over the 20-year period ending in 1996. Figure 3.1 shows that around 90 per cent of males of working age were either employees or self-employed in 1977. By the early 1990s, this proportion had shrunk to around 80 per cent. The increase in non-work was partially due to an increase in the numbers of unemployed work-seekers (the numbers of unemployed men were especially high during the recessions of the early 1980s and early 1990s), but the bulk of the increase was due to a substantial increase in the numbers of males who are neither employed nor searching for work — the non-participants. This proportion grows from around 5 per cent of men in the late 1970s to around 15 per cent in the 1990s, with no discernible cyclical variation. For women (Figure 3.2), there are large changes in the opposite direction; the employees and self-employed grow from just over 60 per cent of the population in 1977 to around 70 per cent in 1996. Although the proportion of unemployed work-seekers grows over the period as a whole, this is more than compensated for by the decline in the numbers of non-participants, from around 35 per cent to below 30 per cent. What this shows is that, although changes in the numbers of work-seeking unemployed individuals are important over this 20-year period, the changes in the numbers of non-participants are also an important part of the picture, and it is vital to account for moves between non-participation and work in an exercise such as the present report.

[8]Also, it is conceptually difficult to separate wages (i.e. the returns to labour) from profits (the returns to capital) for self-employed people. Hence they are customarily excluded from labour supply analysis.

3.4. Data Analysis and Descriptive Statistics

This section takes a look at the data in the QLFS on the people who move into work and those who stay out of work.

3.4.1. Moving into work in the QLFS

Although the wages that people earn in work are only recorded at the end of their stay in the QLFS panel in the fifth quarter of the survey, employment status is recorded in every quarter. We can therefore look at the transitions into and out of work that take place *between* the start and end of the five-quarter period. For our chosen QLFS sample who are unemployed or economically inactive at the start of the survey, Table 3.1 shows the number of people in employment, the number out of employment, and the flows between the two states, quarter by quarter. Tables 3.2 and 3.3 repeat this exercise for men and women respectively.

Table 3.1 shows that, of the 10,453 individuals not in work in the first quarter of the QLFS data, approximately 8 per cent move into work in the second quarter. After that, there is a progressively smaller outflow from unemployment into employment; at the same time, a small number of people return to unemployment from the jobs they found in the second quarter or afterwards. Examination of individual transitions shows that, while 1,610 people (around 15 per cent of the sample) make just one transition from unemployment to employment in the period, 537 individuals (around 5 per cent of the total sample) make more than one transition, i.e. they are moving into work, out of work and perhaps even back in again! What this shows is that our model of moving into work is a simplification of the transitions going on in the QLFS

TABLE 3.1

QLFS labour market state flows over five quarters: overall

Quarter	*Number not in work (%)*	*Number employed (%)*	*Flow into work (%)*	*Flow out of work (%)*
1st	10,453	0	—	—
	(100.0)	(0.0)		
2nd	9,596	857	857	—
	(91.8)	(8.2)	(8.2)	
3rd	9,172	1,281	567	143
	(87.7)	(12.3)	(5.4)	(1.4)
4th	8,939	1,514	419	186
	(85.5)	(14.5)	(4.0)	(1.8)
5th	8,762	1,691	392	215
	(83.8)	(16.2)	(3.8)	(2.1)

TABLE 3.2

QLFS labour market state flows over five quarters: men

Quarter	*Number not in work (%)*	*Number employed (%)*	*Flow into work (%)*	*Flow out of work (%)*
1st	3,364	0	—	—
	(100.0)	(0.0)		
2nd	2,993	371	371	—
	(89.0)	(11.0)	(11.0)	
3rd	2,820	544	226	53
	(83.8)	(16.2)	(6.7)	(1.6)
4th	2,756	608	152	88
	(81.9)	(18.1)	(4.5)	(2.6)
5th	2,710	654	148	102
	(80.5)	(19.4)	(4.4)	(3.0)

TABLE 3.3

QLFS labour market state flows over five quarters: women

Quarter	*Number not in work (%)*	*Number employed (%)*	*Flow into work (%)*	*Flow out of work (%)*
1st	7,089	0	—	—
	(100.0)	(0.0)		
2nd	6,603	486	486	—
	(93.1)	(6.9)	(6.9)	
3rd	6,352	737	341	90
	(89.6)	(10.4)	(4.8)	(1.3)
4th	6,183	906	267	98
	(87.2)	(12.8)	(3.8)	(1.4)
5th	6,052	1,037	244	113
	(85.4)	(14.6)	(3.4)	(1.6)

rather than the whole story. None the less, because the numbers of people making multiple transitions are small relative to the overall sample, and because a model that took into account multiple transitions from unemployment to employment would be much more complex, we have chosen to remain committed to a model that just looks at labour market status at the start and end of the panel in our empirical work.

Tables 3.2 and 3.3 show that men seem to be more mobile into work than women over the sample period; by the fifth quarter, around 19 per cent of men had moved into work compared with only 15 per cent of women. This may be linked to the fact that the proportion of the out-of-work sample who claim to be seeking work in the first quarter is higher for men than it is for women. In any case, some women with children may prefer to stay at home looking after them rather than go out to work, and, if this group is sizeable, it will tend to mean that there is a lower proportion of working-age women moving into work than men.

3.4.2. The characteristics of people moving into and out of work

An interesting question that the QLFS allows us to address is: what are the characteristics of people who move from non-employment into work over the 12 months between their first and last interviews compared with individuals who leave the survey still not in work? Below, we compare a number of attributes (for example, age, educational attainment and housing tenure) for the QLFS where the sample has been split into four groups:

(a) those who start and end the sample period in work;
(b) those who move from being out of work into work over the survey period;

(c) those who move from being in work to being out of work by the end of the sample period;
(d) those who start and end the survey period out of work.

We define being in work as state 'E' and being out of work as state 'N' in Tables 3.4 and 3.5. These tables present various descriptive statistics on age, educational attainment, children, housing tenure and family status for the different groups. Table 3.4 gives the results for men and Table 3.5 the results for women.[9]

Examining Table 3.4, it is clear that there are a number of systematic differences between the characteristics of men who stay out of work over the sample period, those who move into work or out of work, and those who stay employed over the sample period. Men moving into work in group (b) are more likely to be aged under 25 than either the employees in group (a) or those who stay out of work in group (d). Meanwhile, groups (c) and (d) (the movers out of work and those who stay out of work respectively) contain the highest proportions of males aged over 50. There are also clear differences in educational attainment amongst the different sub-samples. Men who were in work at both points are more likely to have stayed on after the minimum statutory school-leaving age than men who changed employment status over the period, who were

[9]It is not completely accurate to say that Tables 3.4 and 3.5 present a comparison between 'movers' in groups (b) and (c) and 'non-movers' in groups (a) and (d) because, as the previous section shows, some people make more than one transition into and out of work in the five-quarter period. None the less, we just look at employment status at the start and end of the panel here, partly to keep the analysis simple and partly because these categories are the definitions of moving and non-moving that we use for our empirical work below (although we do perform checks to make sure that the results are robust to including the within-panel transitions).

TABLE 3.4

Comparison of characteristics for movers and non-movers: men

Characteristic	*Status*							
	(a)		*(b)*		*(c)*		*(d)*	
	q1 E	*q5* E	*q1* N	*q5* E	*q1* E	*q5* N	*q1* N	*q5* N
Sample size	14,967		654		689		2,710	
Age: % of sample in age-group								
18–24	10.9		26.9		15.8		12.5	
25–35	31.2		28.4		21.6		20.5	
36–49	40.3		29.4		28.5		28.8	
50+	17.5		15.3		34.1		38.2	
Education: % staying on after minimum school-leaving age	50.3		39.6		44.6		30.0	
Highest qualifications:								
% with degree	24.2		11.9		17.3		8.5	
% with A-levels	32.2		29.7		31.5		26.0	
% with GCSEs	20.3		26.5		18.9		17.4	
% with other/missing quals	8.7		11.5		9.4		9.6	
% unqualified	14.6		20.5		22.9		38.6	
% in families with children	42.7		33.5		31.6		27.2	
Housing tenure:								
% owning homes	78.5		47.9		60.8		44.2	
% renting	13.8		30.4		27.3		46.7	
% living with parents	7.7		21.7		11.9		9.1	
Marital status:								
% single	23.9		40.7		31.9		41.7	
% married	76.1		59.3		68.1		58.3	
Amongst married:								
% working partner	76.0		55.2		60.6		34.6	
% non-working partner	24.0		44.8		39.4		65.4	

in turn more likely to have stayed on than those who had no job at either point. The same pattern holds true for the distribution of degree and A-level qualifications; the corollary of this is that those who end the sample period out of work are more likely to have no qualifications whatsoever. Looking at the proportions of men who have families with children, it is clear that men who are employed over the sample period are around 16 percentage points more likely to have

children than those who are out of work over the period, with those who change employment state falling somewhere in between. One of the most dramatic differences between the employed and non-employed sample, as one might expect, is the pattern of housing tenure — almost 80 per cent of men in group (a) are homeowners, compared with only 44 per cent of group (d) (again, groups (b) and (c) are between these two extremes). There seems to be a larger proportion of men who move into or out of work living with their parents than for the groups where labour market status is unchanged, although this may be tied up with the fact that men living with their parents are younger on average. Finally, men in work at both the start- and end-points of the QLFS are around 18 percentage points more likely to be married than those who stay out of work over the period, and, amongst the married sample, those who are in work at both points are much more likely to have working partners than those who are out of work at both points. Once again, the groups who move between work and non-work are intermediate cases.

Comparing the results for women in Table 3.5, the age patterns are similar to those found for men, although women moving into work are not substantially more likely to be found in the lowest age-group than for any of the other groups. The relative abundance of stayers-on at school and educational qualifications amongst the employed sample and the 'movers' relative to those who were unemployed at both ends of the panel is once again a feature of the data, although, in this case, there are more stayers-on overall than for men but also fewer A-level qualifications and more GCSEs. The statistics for the proportions of women with children show a very different pattern from those for men; here, women who

TABLE 3.5

Comparison of characteristics for movers and non-movers: women

Characteristic	*Status*							
	(a)		*(b)*		*(c)*		*(d)*	
	q1 *E*	*q5* *E*	*q1* *N*	*q5* *E*	*q1* *E*	*q5* *N*	*q1* *N*	*q5* *N*
Sample size	14,426		1,037		1,012		6,052	
Age: % of sample in age-group								
18–24	11.5		15.2		12.9		10.4	
25–35	29.3		43.2		35.5		32.7	
36–49	41.8		33.1		31.3		31.3	
50+	17.5		8.5		20.3		25.5	
Education: % staying on after minimum school-leaving age	54.1		46.1		44.3		36.6	
Highest qualifications:								
% with degree	21.2		12.6		13.8		7.9	
% with A-levels	15.1		14.3		13.3		10.2	
% with GCSEs	34.7		41.8		33.9		30.9	
% with other/missing quals	6.9		5.5		7.0		8.2	
% unqualified	22.1		25.8		31.9		42.9	
% in families with children	40.4		69.6		51.4		60.6	
Housing tenure:								
% owning homes	78.9		58.9		67.9		56.2	
% renting	14.7		34.6		26.8		41.9	
% living with parents	6.4		6.5		5.3		1.9	
Marital status:								
% single	25.5		30.1		23.5		28.4	
% married	74.5		69.9		76.5		71.6	
Amongst married:								
% working partner	90.4		83.6		85.8		64.8	
% non-working partner	9.6		16.4		14.2		35.2	

are in employment over the sample period are around 20 percentage points *less* likely to have children in the family than those women who are not in work at the start or the end of the panel. Interestingly, however, women who move from non-employment into employment are more likely to have children than those who stay in one labour market state. It is possible that this phenomenon may reflect increased use of childcare by mothers who are then able to go out to work; on the

other hand, it may just be that mothers with children who are growing up may be more likely to make a transition back into work once their children reach a certain age (for example, when they start going to school). Further investigation would be necessary to shed light on this question.

The housing tenure breakdown is also rather different from that for men in that women appear to be more likely to be homeowners, particularly amongst groups (b), (c) and (d). Also, the proportions living with their parents in groups (b), (c) and (d) are much lower for women than for men. Finally, looking at marital status, there is no clear association between labour market states or transitions and the proportions of married or single women in the data; however, married women are much more likely to have working partners if they are themselves in work over the QLFS panel period.

To summarise this section, then, we find that for most of the characteristics we look at, the sample who are employed at both the start and the end of the QLFS panel have rather different characteristics from the group who are out of work in both periods. The people who move into or out of work have characteristics that are somewhere in between the in-work and out-of-work groups in most cases (with the exception of age, where movers tend to be younger than non-movers in most cases).

3.4.3. Comparison of the QLFS and the FRS data

The fact that we are using two different data sources in this report — the QLFS and the FRS — makes it important to compare the two. If there are large discrepancies between what the two surveys tell us about the labour market and the behaviour of the individuals in each sample over the same time period,

and those differences cannot be explained by any observable characteristics of the people included in the surveys, it could adversely affect our analysis. In Appendix B, we use econometric techniques to assess how compatible the two surveys are, and the reader is referred there for a fuller (and more technical) discussion. The results of the comparison, in brief, were that, despite some slight anomalies between the datasets, there was a good degree of correspondence between the pictures of the labour market that the sources presented.

3.4.4. The distribution of 'entry wages'

We now move from analysis of the characteristics of those who move into employment to analysis of the characteristics of the jobs into which they move. First, we examine the distribution of hourly entry wages in the QLFS and compare it with the overall distribution of wages in the QLFS amongst all employees. Figure 3.3 gives a histogram of the QLFS entry wage distribution, with the overall QLFS distribution plotted in Figure 3.4 for comparison. The median point in each distribution is shown as a vertical line on the diagram. We see that, whilst the overall QLFS distribution has the characteristic normal (bell-shaped) profile when plotted on a logarithmic scale, the hourly entry wage distribution has a lower mean, is leftward-skewed and has more of a 'spike' at its modal point (the point on the horizontal axis where the most individuals are clustered). As an additional check, we plot a histogram of the FRS overall wage distribution in Figure 3.5; this looks very similar to the QLFS overall wage distribution.

FIGURE 3.3

Histogram of QLFS entry wages, 1994–95

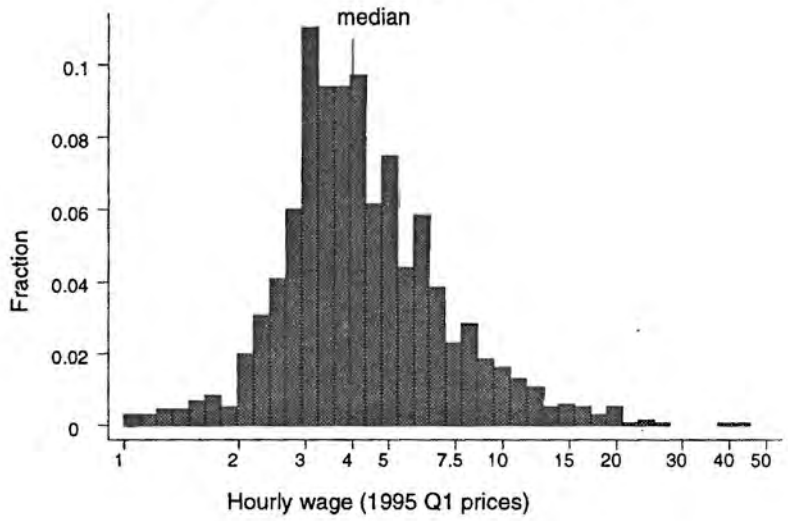


FIGURE 3.4

Histogram of QLFS overall wages, 1994–95

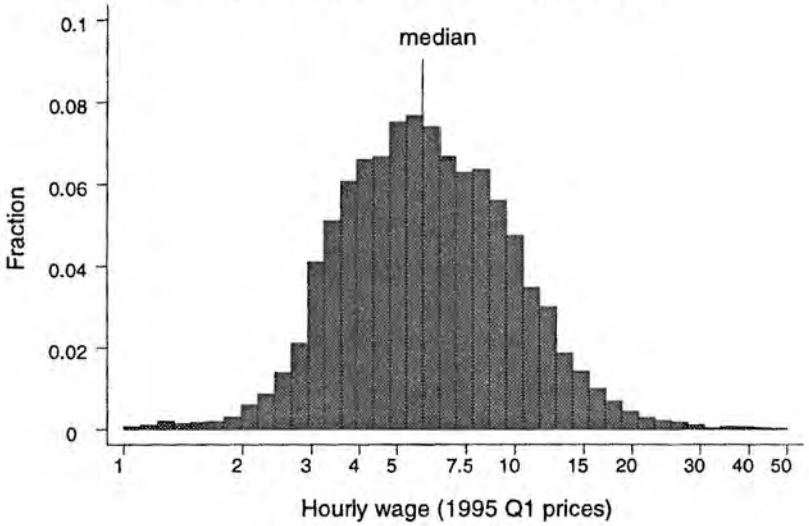
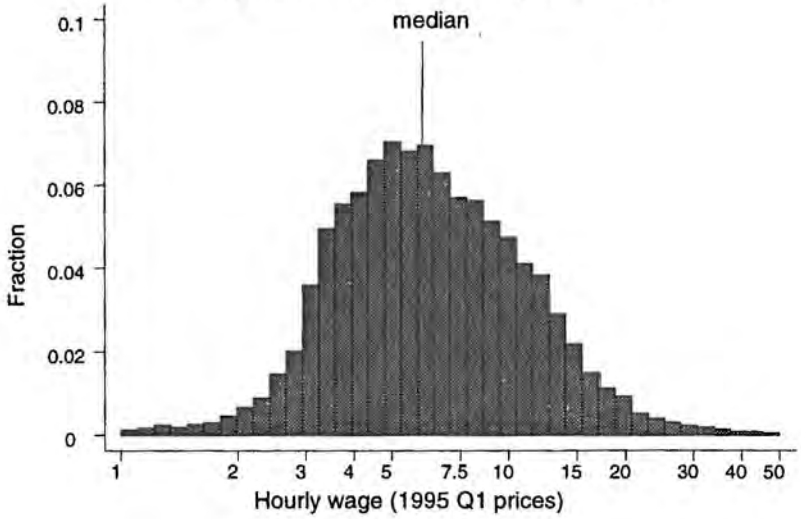


FIGURE 3.5

Histogram of FRS overall wages, 1994–95



It is possible to get a clearer view of the differences between entry wages and overall wages for different groups by looking at the averages for different types of people within each distribution. This is done in Table 3.6, which shows a number of interesting points regarding the differences between entry wages and the overall wage distributions in the QLFS and in the FRS. The median hourly entry wage is only just over two-thirds of the average QLFS wage and exactly two-thirds of the average FRS wage. In the overall wage distributions, there are large gaps between the median wage level for men and the level for women; in the case of entry wages, this gap still exists but it is smaller: the median female entry wage is 81 per cent of the male median, whereas the median overall female wage in the QLFS is only 72 per cent of the male median and for the FRS the figure is 68 per cent. Examination of the differential between wages of people who stayed on in education past the statutory minimum school-leaving

TABLE 3.6

Summary statistics for FRS and QLFS wage distributions

Summary statistic	*QLFS entry wage distribution (£ per hour)*	*QLFS overall wage distribution (£ per hour)*	*FRS overall wage distribution (£ per hour)*
Median, all wages	4.00	5.80	6.00
Median, men	4.53	6.92	7.29
Median, women	3.66	4.97	4.96
Median, education past minimum leaving age	4.33	6.94	7.35
Median, minimum leaving age only	3.67	5.00	5.03

age and those who left at the minimum age reveals a similar picture: the differentials between the medians of the two groups are much greater for the overall wage distributions than for the QLFS entry wage distribution. In summary, then, the entry wage distribution has a lower mean than the overall wage distribution, and there is less differentiation between the wages of different groups on entry into the labour market than we would see if we were to look at the whole distribution of existing jobs.

It is interesting to ask why these differences exist between the entry distribution and the overall distribution. One possible explanation is that there are returns to job tenure in the form of higher wages;[10] entry jobs are, by definition, short-tenure at the time at which we observe them, so we would expect to find a difference between the two distributions if this were the case. Another possibility is that longer-lasting jobs are

[10]For example, there may be an accumulation of firm-specific skills (i.e. firm-specific human capital) on the job which increases the wages individuals can earn as job tenure increases. Seniority pay, where pay is closely linked to tenure, appears to be a feature of many job markets, although it is difficult to distinguish between returns to tenure and returns to experience.

'better' jobs in the sense of being more productive, and, if wages are linked to productivity, we would again expect to see this relationship in the data, even in the absence of returns to tenure; better-paying jobs last longer, and hence the entry wage distribution has a lower average wage as it contains a lot of worse-paying jobs which will be destroyed relatively quickly. Whether either of these explanations could account for the differentials between men and women and between education groups is another matter. It may be that jobs that men and higher-educated groups tend to go into have higher growth paths than other jobs and so the differentials are exacerbated as time goes on. These issues are fascinating but the short-run nature of the QLFS panel gives us little scope for investigating them. In any case, they are incidental to our main objectives in this report.

The important point to take away from this discussion is that the mean and shape of the entry wage distribution are very different from those of the overall wage distribution, which has a higher mean. In the next section, we focus on how these differences in the wage distributions for those moving into work and those already in work might affect the impact of a specific policy — the proposed national minimum wage.

3.5. The Impact of Minimum Wages on Entrants into Work

In Summer 1998, the government issued proposals for a national minimum wage to be implemented in April 1999, which would set a minimum hourly rate of pay for virtually all employees in the UK economy. The rate of the minimum wage is to be dependent on the employee's age:

- for employees aged 21 and over: £3.60 per hour;
- for employees aged 18–20: £3.20 per hour;
- for employees aged 16 or 17: no minimum.

Given the profile of the wage distributions examined in the last section, it is instructive to look at how many employees in the QLFS data are in jobs paying wages that are lower than the proposed minimum wage floors. We look at this below as regime (1). In addition, given that there was considerable discussion and debate from various sources about what the appropriate level for a minimum wage should be, it is interesting to compare what the effects might be of imposing wages at levels different from the government's proposals. With this in mind, we also examine two other hypothetical minimum wage regimes which are at proportionally higher levels than the government's proposals:

Regime (2): £4.30 per hour for over-21s, £3.60 per hour for 18–20-year-olds.
Regime (3): £5.00 per hour for over-21s, £4.20 per hour for 18–20-year-olds.

Of course, as our data are from the 1994–95 tax year and we are expressing all wages in April 1995 prices, it is necessary to deflate the minimum wage levels in regimes (1) to (3) by the increase in the retail price index over the period April 1995 to April 1998 — around 11 per cent — to allow for inflation and produce a consistent analysis. The minimum wage levels that we use in the analysis below are outlined in Table 3.7.

TABLE 3.7

Minimum wage levels used in analysis (April 1995 prices)

Regime	*Age 18–20*	*Age 21+*
(1) (government's proposals)	2.88	3.25
(2)	3.25	3.88
(3)	3.79	4.51

Given these levels of the minimum wage, our analysis is very simple. We look at how many employees in the QLFS have hourly wages that are below these minimum wage levels, and compare this with how many new entrants would be affected. Because the minimum wage levels are different for young people and for the rest of the population, we also produce separate figures for the under-21 age-group. The results presented in Table 3.8 show that a minimum wage set in 1995 at a level equivalent in real terms to the government's proposals would affect around 10 per cent of QLFS employees overall, but almost 30 per cent of new entrants. For the under-21 sub-sample, there is a much higher impact on the total in-work population — around 17 per cent — but only a slightly higher impact on new entrants. Higher levels of the minimum wage have proportionately greater effects: setting a minimum wage at current prices of £5.00 an hour for the over-21s and £4.20 for under-21s, as in regime (3), affects 60 per cent of new entrants overall and over two-thirds of the young entrants.

This analysis is very simplistic in that we have made no attempt to evaluate what the employment effects of a minimum wage would be — whether low-paying jobs

TABLE 3.8

Direct effects of the minimum wage for employees and new entrants in the QLFS

Group affected		*% affected under regime:*		
		(1)	*(2)*	*(3)*
Overall sample:	All employees	10.2	20.4	30.5
	New entrants	29.6	46.3	60.3
Under-21 sample:	All employees	17.3	34.6	53.4
	New entrants	32.3	47.4	67.0
Over-21 sample:	All employees	9.9	19.9	29.7
	New entrants	29.3	46.3	59.8

would be lost, whether low-paid younger workers would be substituted for older members of the work-force and so on. What we do show, however, is that the minimum wage will potentially have a much greater impact on people moving into entry jobs than it will on the work-force as a whole, primarily because the entry job wage distribution has a lower mean than the overall wage distribution. This in itself is an interesting finding. In the next step of our descriptive analysis, we start to exploit IFS's tax–benefit model, TAXBEN, to look at how the different levels of wages for new entrants and for employees overall might affect our estimates of the potential gains from working for those not in work at present.

3.6. Estimating the Gains from Work for Unemployed and Economically Inactive People: The Effect of Different Wage Assumptions

As our approach to estimating the probability of moving into work relies on using information about entry wages to predict the gains from working for people who are currently out of work (and about whom, consequently, we have no wage information), it is useful to look at how our predictions of the gains from working are affected by what measure of wages we decide to use. Our method for doing this is to use the TAXBEN model to compute two measures of the gain from working for those people in the FRS sample who are not in work. The two measures are:

(1) The *replacement rate (RR)*, defined as the ratio of post-tax-and-benefit income out of work to net income in work. Clearly, the RR at 'zero hours' (i.e. out of work) is 1. If working positive hours

produces a net income gain, the RR will drop below 1.

(2) The *average tax rate (ATR)*, defined as the proportion of tax paid (and benefit income lost) on gross earnings from work. It is calculated as one minus the ratio of the increase in net income from taking up a job to the gross earnings that the job provides. If the gain from work for an individual is less than his or her gross earnings, either because benefits are lost when work is taken or because the gross earnings are taxed, the ATR will be a positive fraction, rising to 1 if there is no net gain from work whatsoever. If the income gain after tax and benefits actually *exceeds* gross earnings (for example, in the presence of in-work benefits), the ATR will be negative.

To calculate the ATR for a person currently out of work, we need to know the increase in net income from taking up a job and the gross earnings that the job provides. To know the increase in net income, we need to know net income in work and net income out of work. The out-of-work income we can observe or calculate. To assess in-work income, we need to make assumptions about a person's *hours* of work and what hourly *wage* he or she is working at. From these, we can make an estimate of his or her *gross earnings*. We then use TAXBEN to evaluate the amount of *taxes paid and benefits received*, given this amount of earnings. In this section, we are interested in how RRs and ATRs for the FRS out-of-work sample change, given different assumptions about the hourly wages that would be earned by these individuals if they were to move into work.

RRs and ATRs are each interesting in their own right and each tells us something rather different. An RR can

be very high if out-of-work income is high, even if none of it is withdrawn when work is entered — say because it is income from investment or from a working spouse. Here, then, the income gain is large but it is a small proportion of household income. Under these circumstances, the ATR would be low. On the other hand, one could have a high ATR where effective tax rates are high, but a low RR if the final net income is nevertheless high relative to out-of-work income.

We investigate the variation in RRs and ATRs under four sets of wage assumptions:

(1) *The 'cell average' assumption:* Assume that each person moves into work earning the average hourly wage in the FRS[11] for a person of their characteristics (where we define 'characteristics' as sex, age-group, educational attainment, region of residence and the presence or absence of children in the household).[12] This approach does not allow the workless to have lower wages than those in work except in so far as they differ with respect to this limited range of observed characteristics.

(2) *The 'FRS wage prediction' assumption:* Assume that each person moves into work at a wage that is predicted from a *selectivity-adjusted* wage regression run on the FRS data with the (log) wage as the dependent variable and observable characteristics (for example, age, educational attainment and region of residence) as explanatory variables. This selectivity adjustment means that

[11]Note that, as a check, we also calculated these cell average figures for the QLFS. They correspond very closely between the two datasets, but to economise on space we do not present the results here.

[12]See Chapter 4 for further details about the definitions of the characteristics involved in constructing these cells.

the FRS predicted wages from the equation are, in most cases, lower than the cell averages.[13]

(3) *The 'QLFS entry wage prediction' assumption:* Assume that each person moves into work at a wage predicted from a wage regression run on the QLFS entry wage data. The regression specification is similar to that of the regression we run on the FRS data above, although this time we do not include a selectivity correction. As is shown below, for the most part the predicted wages for this sample from the QLFS are substantially lower than both the FRS cell average wages and the predictions from the FRS wage equation. In the remaining tables in this chapter, this prediction is referred to as the 'mean-based' estimate.

(4) *The QLFS entry wage prediction based on the median wage rather than the average.* This is produced by converting each wage into a percentile[14] of the distribution and running a regression on the person's place in the wage distribution. This predictive position is then mapped to the relevant wage for that percentile. As the entry wage distribution is skewed to the left, this predicts lower wages over most of the distribution. In the remaining tables in this chapter, this prediction is referred to as the 'percentile-based' estimate, for want of a better term.

Comparing results from these four different wage assumptions can tell us important things about the uses

[13] See Appendix C for full details of the specification and results of the wage equation and the selectivity adjustment used.

[14] The *n^{th} percentile* of a distribution is defined as that point in the distribution below which n per cent of the observations in the distribution fall and above which $(100-n)$ per cent fall. So the median of a distribution is equal to the 50th percentile, for example.

of different methodologies in estimating returns to work, and helps to show why using the entry wage information can make quite a difference.

The cell average method simply assumes that an out-of-work person would earn the same wage as an employed person with similar attributes (on average) if he or she were to enter work. The key assumption of this approach is that there are no other characteristics, unobserved in the data available to researchers, that would tend to affect the non-working person's potential wage. This assumption is, of course, questionable; if non-working people have poor past labour market experience, or if they are less productive[15] in some other way than an employee, or indeed if they can only get the lower-quality job matches, it seems reasonable to assume that this could lead to them being paid less than someone who was observationally similar but more productive in terms of these unobservable attributes. This is what is found to be true when looking at the wages that entrants actually get (see Gregg and Wadsworth (1997)).

The method of predicting wages from a selectivity-adjusted FRS wage equation attempts to get around this problem of unobservables by assuming that there is some additional variable — an 'instrumental' variable — that does not exert any influence on wage levels but helps explain whether someone is actually observed in work or not, i.e. whether they participate. The instrumental variable that we use here is the income that the TAXBEN model predicts each individual would receive when out of work, which is related to the

[15]'Less productive' in this case might mean that the non-working people have less motivation or worse social skills than the employed. There may, of course, be a link between being less motivated and having poor past labour market experience, although the root causes of this kind of poor labour market performance are often hard to determine.

probability of participation but not to wage level. This additional information on the determinants of employment is used to adjust our predictions of wages for individuals not in work to take account of the fact that selection into work is a choice variable, i.e. for a set of people with given observable characteristics, those whom we observe in work are not a random sub-sample, but predominantly those who have *chosen* to be in work rather than not. If the decision to work is related to the expected earnings in work, it is quite possible that the in-work sample have higher earnings than the out-of-work sample would have in work. The selectivity adjustment is an attempt to estimate how large the difference between in-work wages and the potential wages for the out-of-work might be, controlling for other characteristics.

The QLFS wage equation uses data on the wages of those moving into work, rather than of all those in work, to predict the potential wages of those who do not take work. This third approach, then, assumes that an individual in the out-of-work sample would earn a wage similar to that of another previously non-working person of similar characteristics who has recently entered work. This is the assumption we make for our empirical model below.[16] Hence it will be interesting to compare the wages, RRs and ATRs predicted under the QLFS entry wage equation with the analogous statistics produced by the prediction methods that use the FRS wage data.

[16]Although there we expand the 'similar characteristics' to include some employment history information and controls for previous redundancy, in an attempt to proxy some of the unobservable characteristics mentioned earlier. In this case, we are unable to include redundancy information as it is not present for the FRS sample and so cannot be used to predict wages for them.

TABLE 3.9

Average hourly wages of the non-working under different assumptions

	Mean	*Median*
Cell average wage	£6.34	£6.48
Selectivity-adjusted wage	£5.28	£5.08
Entry wage (mean-based)	£4.39	£4.15
Entry wage (percentile-based)	£4.03	£3.96

The final variant shown is also based on entry wages but is centred on the median rather the mean. Entry wages are leftward-skewed, with a few jobs paying high wages (above the median of all wages) but the bulk paying substantially less.

An indication of the difference that these methods make is given in Table 3.9, which shows the mean and median wage derived from each. As expected, the wage from the cell averages is the highest. The selectivity-adjusted average wages are substantially lower — the mean is 17 per cent lower — while the average entry wages are lower still, the mean-based measure being 17 per cent lower than the selectivity-adjusted mean. The difference between using mean or median entry wages is not large compared with using the whole wage distribution versus the entry wage distribution, but predicting the entry wages around the median of the distribution rather than around the mean lowers the mean wage prediction by about 8 per cent.

What really matters about the differently estimated wages is the difference they make to estimates of the returns to work. Using TAXBEN, we calculate the RRs and ATRs assuming that people would work at 12, 20 or 37 hours a week. This is, of course, purely illustrative. The definition of out-of-work income we use here is full income for the tax unit. This comprises income from benefits, other unearned income (such as income from

investments) and any earnings or other income accruing to the individual's spouse or partner (if he or she has one). It should be noted that the calculation of the RR is particularly sensitive to whether spouse's earnings and other income are included in the definition of out-of-work income, whereas the ATR is less affected by this matter of definition.

Table 3.10 shows in its three parts the distribution of RRs by quintile of predicted average entry wage at 12, 20 and 37 hours of work respectively.[17] Table 3.11 does the same thing for the distribution of ATRs.

Looking at Table 3.10, we see that the combination of other family income and the tax and benefit system means that RRs have no consistent pattern across the wage distribution for a fixed hours choice, but that the rates fall with more hours worked. Using QLFS entry wages rather than the FRS wage predictions tends to raise RRs for all quintiles but not by much.

There is the same limited variation in ATRs in Table 3.11. In the presence of a direct tax system with a progressive structure, a lower wage could actually reduce the ATR for some groups, such as non-working wives of working husbands, who are not entitled to benefits when out of work. Over the entire wage distribution, lower wages do result in higher ATRs, but for those out of work the variation in wages is small. Raising wages by a small amount — say from £4 to £5 an hour — at all hours choices in itself changes work incentives very little.

[17]It may sound odd to display everything according to the quintile defined by one particular distribution, but it is, in fact, important to do this in order that the people in each quintile are the same in each case so that comparisons can be more easily made.

TABLE 3.10

Distributions of calculated replacement rates for FRS out-of-work sample under different wage assumptions, at three different hours points

(a) 12 hours

Quintile	*Cell average wage*	*Selectivity-adjusted wage*	*QLFS entry wage (mean-based)*	*QLFS entry wage (percentile-based)*
1	0.85	0.87	0.90	0.89
2	0.86	0.88	0.90	0.90
3	0.86	0.88	0.90	0.91
4	0.85	0.88	0.90	0.91
5	0.81	0.85	0.88	0.92
All	0.85	0.87	0.90	0.90

(b) 20 hours

Quintile	*Cell average wage*	*Selectivity-adjusted wage*	*QLFS entry wage (mean-based)*	*QLFS entry wage (percentile-based)*
1	0.75	0.78	0.82	0.80
2	0.76	0.79	0.82	0.82
3	0.76	0.79	0.83	0.84
4	0.74	0.79	0.81	0.84
5	0.70	0.75	0.79	0.85
All	0.74	0.78	0.81	0.83

(c) 37 hours

Quintile	*Cell average wage*	*Selectivity-adjusted wage*	*QLFS entry wage (mean-based)*	*QLFS entry wage (percentile-based)*
1	0.62	0.66	0.70	0.67
2	0.63	0.67	0.70	0.70
3	0.62	0.66	0.72	0.72
4	0.59	0.65	0.68	0.72
5	0.52	0.58	0.64	0.70
All	0.60	0.65	0.69	0.70

TABLE 3.11

Distributions of calculated average tax rates for FRS out-of-work sample under different wage assumptions, at three different hours points

(a) 12 hours

Quintile	*Cell average wage*	*Selectivity-adjusted wage*	*QLFS entry wage (mean-based)*	*QLFS entry wage (percentile-based)*
1	0.60	0.60	0.60	0.60
2	0.60	0.60	0.60	0.59
3	0.57	0.58	0.57	0.57
4	0.60	0.60	0.60	0.60
5	0.59	0.60	0.62	0.63
All	0.59	0.60	0.60	0.60

(b) 20 hours

Quintile	*Cell average wage*	*Selectivity-adjusted wage*	*QLFS entry wage (mean-based)*	*QLFS entry wage (percentile-based)*
1	0.54	0.55	0.56	0.55
2	0.53	0.54	0.55	0.54
3	0.53	0.54	0.54	0.54
4	0.55	0.56	0.57	0.57
5	0.54	0.56	0.58	0.60
All	0.54	0.55	0.56	0.56

(c) 37 hours

Quintile	*Cell average wage*	*Selectivity-adjusted wage*	*QLFS entry wage (mean-based)*	*QLFS entry wage (percentile-based)*
1	0.53	0.54	0.54	0.54
2	0.53	0.54	0.55	0.54
3	0.51	0.52	0.54	0.54
4	0.51	0.53	0.55	0.55
5	0.48	0.50	0.53	0.55
All	0.51	0.53	0.54	0.54

Comparing RRs and ATRs by family type

An interesting extension to the results we have just seen (looking at how the distribution of replacement rates and average tax rates varies according to the assumptions we use on wages) is to break the statistics down by family type. We split people up by sex and marital status. We also consider married people with and without a working spouse separately because they face such different effects from the benefit system: a married person with a working spouse is likely to be entirely unaffected by the benefit system; where both members of a couple are not working, the effects of the benefit system are potentially quite dramatic. Another group that is likely to be affected very much by the benefit system is single parents, and we consider lone mothers as a group in their own right.[18] Additionally, we have divided single people into separate categories depending on whether they are still living in the parental home or live in a home of their own away from their parents, as the treatments of the two groups under housing benefit regulations are very different.

As a prelude to discussion of the differences in RRs and ATRs by family type, it is useful to look at the difference between the levels of income for unemployed and economically inactive individuals and our prediction of their net financial gains from moving into work. This is shown in Table 3.12, which pre-empts the discussion in the later chapters of this report by presenting the following information for people of each family type:

[18]Although there are a few lone fathers in the FRS data, the numbers are so small that it is impossible to do a meaningful analysis on them as a separate group. Hence we have amalgamated them with other single men.

- the average levels of out-of-work income that TAXBEN predicts they would receive in the April 1997 tax system;[19]
- how much better off people of that family type would be if they were to move into work, on average, according to the calculations that we make in the model presented later in the report.

It is useful to discuss Table 3.12 in conjunction with Tables 3.13 and 3.14, which present the statistics on RRs and ATRs broken down by family type, as Table 3.12 helps to explain what we find in the latter tables. Although the model that is estimated in Chapter 5 uses the QLFS entry wage measure to calculate the returns from work, we have included estimates of the RRs and ATRs under all four of the wage measures that were looked at earlier, for the purposes of comparison.

Table 3.12 shows that the mean income out of work is substantially lower for men than it is for women (a level of around £151 as opposed to £246). Also, the financial returns that our model predicts will be received on entering work (i.e. income in work minus income out of work) are higher for men than for women of the same family type.[20] Given that our model includes earnings of the spouse in the income that an individual receives when out of work, this inevitably means that the out-of-

[19]It should be borne in mind that the figures in Table 3.12 are calculated on the basis of the April 1997 tax system, whereas the replacement rate and average tax rate calculations in this chapter are based on the April 1994 tax system. We use the April 1997 system for Table 3.12 as this is the benchmark for the policy simulations in Chapter 6 and it is useful to be able to refer back to it. However, the qualitative differences between family types are similar, regardless of whether we are looking at the 1997–98 tax system or the 1994–95 tax system.

[20]The wage differences arise partly because male average hourly wages are higher than female average hourly wages, but also because male average hours amongst employees are higher than female average hours.

work income of married women is higher than that of married men, on average.

TABLE 3.12

Weekly incomes and expected gains from work under April 1997 tax and benefit regime

Group	*Mean income out of work (£)*	*Mean expected gain from work (£)*
Men, overall	150.95	91.70
Women, overall	246.25	63.99
Men		
Single, not living with parents	94.29	94.40
Single, living with parents	42.67	91.38
Married, partner working	232.85	130.61
Married, partner not working	183.50	64.75
Women		
Single, no children	93.52	52.77
Lone mother	153.44	47.65
Single, living with parents	47.12	83.37
Married, partner working	344.71	85.33
Married, partner not working	190.49	32.86

TABLE 3.13

Replacement rates by family type under different wage assumptions, at three different hours points

(a) 12 hours

Family type	*Cell average wage*	*Selectivity-adjusted wage*	*QLFS entry wage (mean-based)*	*QLFS entry wage (percentile-based)*
Men				
Single, not living with parents	0.78	0.83	0.89	0.92
Single, living with parents	0.61	0.70	0.75	0.75
Married, partner working	0.83	0.88	0.91	0.93
Married, partner not working	0.95	0.97	0.98	0.99
Women				
Single, no children	0.83	0.88	0.91	0.92
Lone mother	0.89	0.89	0.89	0.90
Single, living with parents	0.65	0.74	0.77	0.77
Married, partner working	0.83	0.86	0.87	0.88
Married, partner not working	0.92	0.92	0.93	0.93

Continues opposite.

TABLE 3.13 continued

(b) 20 hours

Family type	*Cell average wage*	*Selectivity-adjusted wage*	*QLFS entry wage (mean-based)*	*QLFS entry wage (percentile-based)*
Men				
Single, not living with parents	0.61	0.67	0.76	0.80
Single, living with parents	0.44	0.50	0.55	0.54
Married, partner working	0.72	0.77	0.83	0.85
Married, partner not working	0.84	0.89	0.93	0.95
Women				
Single, no children	0.70	0.77	0.81	0.82
Lone mother	0.76	0.77	0.78	0.78
Single, living with parents	0.45	0.50	0.53	0.52
Married, partner working	0.77	0.79	0.81	0.82
Married, partner not working	0.86	0.90	0.92	0.93

(c) 37 hours

Family type	*Cell average wage*	*Selectivity-adjusted wage*	*QLFS entry wage (mean-based)*	*QLFS entry wage (percentile-based)*
Men				
Single, not living with parents	0.40	0.45	0.55	0.58
Single, living with parents	0.27	0.31	0.34	0.34
Married, partner working	0.55	0.61	0.68	0.71
Married, partner not working	0.64	0.73	0.81	0.84
Women				
Single, no children	0.48	0.56	0.61	0.62
Lone mother	0.70	0.72	0.74	0.74
Single, living with parents	0.30	0.34	0.36	0.35
Married, partner working	0.66	0.69	0.71	0.73
Married, partner not working	0.74	0.78	0.81	0.82

The implications of the weekly incomes and gains from work shown in Table 3.12 for the estimated replacement rates for men and for women vary according to which hours levels we look at. At 37 hours (part (c) of Table 3.13), RRs for women of a given family type are higher than those for men of the same family type in most cases. At lower hours levels (parts (a) and (b) of Table 3.13), there is no clear pattern.

There are, however, large differences in RRs at all hours levels *within* both sexes by family type. Replacement rates are high for married men and women with partners who are *not* in work. The explanation for this again stems from Table 3.12. A non-working married couple is entitled to higher overall levels of benefit through income support or job-seeker's allowance than is a single unemployed person, and this makes the numerator of the replacement rate high. Meanwhile, the expected gains from working for married women without a working partner are much lower than the gains for married women whose partners work, and the same is true for men. This is mainly due to the fact that, in a couple where just one person decides to go into work, the effective marginal rates of tax are high because means-tested benefits such as income support and housing benefit are 'clawed back' as income rises.[21] By contrast, if someone's partner is already in work, then unless the partner's wages are very low, the marginal rate of tax for the second earner is likely to be relatively low. These differences by family type also manifest themselves in the average tax rate calculations in Table 3.14. ATRs for married men and women in two-earner households are much lower than those for sole earners.

Another group with high RRs and ATRs is lone mothers. The high RRs are linked to the fact that lone mothers have higher average levels of out-of-work income than other single people (because families with children attract higher levels of benefit payments). The expected gains from work for single mothers are low

[21]This is counterbalanced, to some extent, if the family has children and the sole earner works 16 hours or more a week because he or she may then be entitled to family credit. However, 'clawback' takes place on family credit as well once net earnings from work reach a certain level.

TABLE 3.14

Average tax rates by family type under different wage assumptions, at three different hours points

(a) 12 hours

Family type	*Cell average wage*	*Selectivity-adjusted wage*	*QLFS entry wage (mean-based)*	*QLFS entry wage (percentile-based)*
Men				
Single, not living with parents	0.76	0.79	0.83	0.84
Single, living with parents	0.54	0.60	0.64	0.64
Married, partner working	0.57	0.62	0.63	0.65
Married, partner not working	0.89	0.91	0.93	0.93
Women				
Single, no children	0.76	0.80	0.82	0.82
Lone mother	0.71	0.68	0.65	0.65
Single, living with parents	0.56	0.63	0.65	0.65
Married, partner working	0.21	0.20	0.19	0.18
Married, partner not working	0.77	0.73	0.72	0.71

(b) 20 hours

Family type	*Cell average wage*	*Selectivity-adjusted wage*	*QLFS entry wage (mean-based)*	*QLFS entry wage (percentile-based)*
Men				
Single, not living with parents	0.65	0.68	0.74	0.76
Single, living with parents	0.47	0.50	0.53	0.52
Married, partner working	0.50	0.53	0.57	0.57
Married, partner not working	0.80	0.83	0.86	0.87
Women				
Single, no children	0.67	0.72	0.75	0.75
Lone mother	0.57	0.53	0.50	0.49
Single, living with parents	0.40	0.43	0.45	0.44
Married, partner working	0.26	0.25	0.24	0.22
Married, partner not working	0.72	0.75	0.77	0.77

Continues overleaf.

TABLE 3.14 continued

(c) 37 hours

Family type	*Cell average wage*	*Selectivity-adjusted wage*	*QLFS entry wage (mean-based)*	*QLFS entry wage (percentile-based)*
Men				
Single, not living with parents	0.54	0.56	0.62	0.63
Single, living with parents	0.41	0.42	0.43	0.43
Married, partner working	0.44	0.46	0.49	0.49
Married, partner not working	0.68	0.73	0.78	0.80
Women				
Single, no children	0.55	0.60	0.62	0.63
Lone mother	0.68	0.67	0.65	0.65
Single, living with parents	0.40	0.40	0.40	0.40
Married, partner working	0.31	0.30	0.29	0.28
Married, partner not working	0.67	0.69	0.70	0.70

compared with those for most other groups, which is due partly to the clawback of means-tested benefits but also to the fact that lone mothers are a group with relatively low average wages. Single childless men and women and single people who live with their parents face low RRs compared with the other groups, and these differences are more pronounced when hours of work are high.

This section, then, has provided some idea of the levels of replacement rates and average tax rates faced by the unemployed in the UK under different assumptions about the wages they could command. In many cases, such as for lone parents, the figures are very high. The average RR is around 70 per cent, higher for part-time jobs. RRs and ATRs vary to some extent according to what wage measure is used, but are more dramatically different between family types.

CHAPTER 4
Methodology

In this chapter, we outline the model that we use to estimate the probability of moving into work from the QLFS and FRS data. The description given here focuses on how the various parts of the model fit together rather than on the technical details of the econometric methods we use. We do, however, include a detailed technical description of the model in Appendix D for interested readers. As outlined in Chapter 1, our aim is to construct a model that relates the information from the QLFS on who moves into work to the increases in overall net income that they expect to achieve from moving into work (which are estimated by combining the data on entry wages in the QLFS with a budget constraint evaluated by the TAXBEN model running on the FRS data).

4.1. The Modelling Procedure

Modelling proceeds in several stages, which can be summarised as follows:

(1) A *QLFS wage equation* is run. This estimates a relationship between the wages earned by the individuals who move into work in the QLFS and a set of characteristics observed in the data.
(2) A *QLFS hours equation* is estimated. This gives a relationship between the likelihood of individuals who move into work in the QLFS working 'full-time' or 'part-time' and a set of individual characteristics.

(3) The relationships estimated in the wage and hours equations are used to *predict* the probability of working at different wage levels and at part-time or full-time hours for everybody in our QLFS sample.

(4) For each dataset, we take the data on individuals and aggregate it (by taking averages) into groups or *cells*, where each cell comprises all individuals of a given sex, age, educational attainment, region and family type. The advantage of aggregating the data into cells is that we then have FRS and QLFS datasets based on identically defined cells, making it easy to 'pass' data across from one to the other.

(5) The probabilities of working at different wages and hours points from step 3, which have been averaged by cell in the QLFS in step 4, are passed across to the FRS.

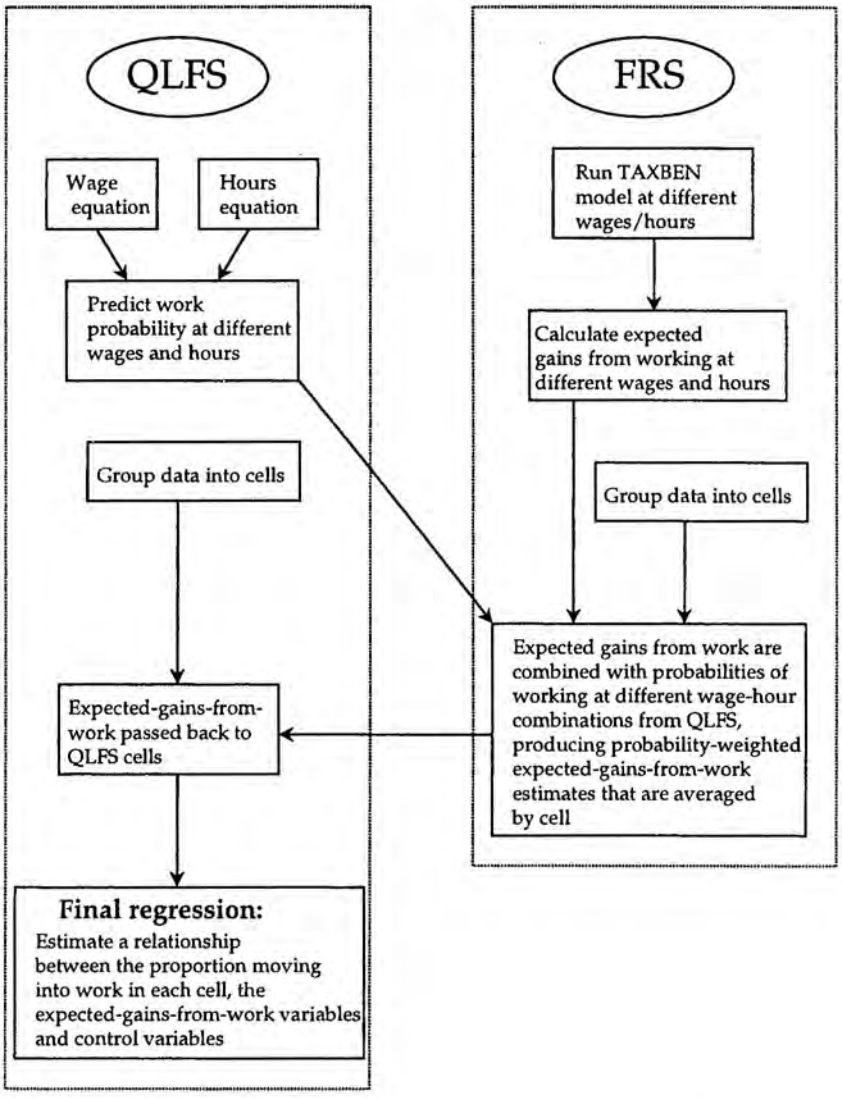
(6) For each individual in the FRS, the *TAXBEN* model is run several times at a range of different wage and hours levels. This produces figures for the expected gains from working at each of these wages and hours points.

(7) The statistics for gains from work are combined with the probabilities of working at different wages and hours combinations that were carried over from the QLFS. For each individual in the FRS, this produces a probability-weighted *expected-gains-from-work* estimate. These estimates are averaged by cell and passed back to the QLFS (along with the average unearned income in each cell).

(8) In the final stage of the model, we use a *moving-into-work equation* to estimate a relationship between the proportion of people moving into work in each cell, the expected-gains-from-work variables and a number of control variables.

FIGURE 4.1

Flow chart showing modelling procedure



Because the modelling procedure is quite complicated, we have included a flow chart of the process in Figure 4.1. The left-hand column shows the steps of the model that use QLFS data and the right-hand column shows the steps that use FRS data. The arrows show links between the different steps and, in

particular, where results are 'carried across' from one dataset to the other.

4.2. Important Modelling Issues

In the rest of this chapter, we explain the important details of the model in a little more depth in order to examine and explain some crucial issues that arise.

4.2.1. Calculating the 'expected gains from work'

Our final estimation procedure will relate the probability of moving into work during the year following the first wave of the QLFS panel to an estimated measure of 'gains from working' plus some other characteristics that we need to control for as described below. The calculation of the gain from working is the most complex part of the model and requires some explanation. We are interested in the financial gain that a person currently not in work might receive if he or she were to enter work. This depends on several main factors:

- the gross wage that he or she would earn on (re-) entry into the labour market;
- the number of hours worked;
- the effects of the tax and benefit system on net income (through income tax, National Insurance, in-work benefits and the withdrawal of out-of-work benefits).

The IFS tax and benefit model, TAXBEN, makes the effects of the tax system relatively easy to gauge. For any given hourly wage and number of hours worked, TAXBEN can calculate the post-tax gains from work for a person in the FRS dataset using pre-existing information on benefit levels and benefit eligibility.

However, we still need to make an assumption about the hourly wage and the number of hours worked. In this report, we use the distribution of entry wages in the QLFS to estimate the wage that an out-of-work person might get if he or she is in work. This is done as follows:

- The distribution of QLFS hourly entry wages is divided up into 10 equal-sized segments (known as *deciles*).
- A regression is run on the sample of people moving into work in the QLFS, relating the position of the person's entry wage in the distribution to the following variables:
  - whether the person is in the age-group 18–24 years old, 25–35, 36–49 or 50 and over;
  - the person's level of educational qualifications: degree level, GCSE level or other qualification; the effect of education is allowed to vary by age-group;
  - the person's region of residence (London, West Midlands, Scotland etc.);
  - some 'work history' variables:
    - whether the person was made redundant from their previous job within the quarter prior to the start of their QLFS panel;
    - the length of time that the person has been out of work prior to entering the QLFS panel (this includes all the redundancies plus anybody who left work for any other reason in the period).

  We allow for differential effects of all the above variables by gender (to capture the possibility that the entry wage structure is different for men and women).

The aim in estimating this equation is to include as much information as possible that might be directly relevant for wage levels and that we have for both employed and non-working people. We are using the regression to 'match' the in-work and out-of-work sample in terms of observable and wage-relevant characteristics. For each individual in the sample of job entrants, we can make a prediction of their probability of entering a job at a certain point in the wage distribution, which is our 'best guess' at their position in the wage distribution given the observable data. Since we know the age, educational attainment, region, etc. for people in the out-of-work sample in the QLFS, we can also predict wage levels for the out-of-work sample. This gives us a set of 10 predicted probabilities for the out-of-work sample which are the probabilities of entering work at different deciles in the wage distribution. At the same time, we take a summary measure of the hourly wage rate within each decile (we use the mean within each decile) to produce 10 hourly wage measures to pass on to the TAXBEN model. These are the wage points that we use to calculate the gains from work for each individual in the out-of-work FRS dataset.

4.2.2. Defining 'gains from work'

The 'gains-from-work' variable is made up from two variables produced by TAXBEN — the *out-of-work* income that TAXBEN evaluates a member of the FRS dataset as being entitled to, and total income *at a specified number of hours of work.*

Out-of-work income comprises income from the following sources:

- TAXBEN's estimate of the income from benefits that the individual is entitled to if not in work. If the individual is married or cohabiting, then we include all benefits for the couple (rather than just for the individual).[22]
- Other personal unearned income (from investments, maintenance payments and so on) as given in the FRS data.
- For married men and women, there is another income source — the partner's after-tax earnings from work (if any).

Income for an individual working a specified number of hours is made up of net income from the two (or three) sources noted above, plus net earnings from work. TAXBEN takes into account any reduction (or increase) in benefits arising from entry into work and thus replicates the budget constraint (examined in Chapter 2) as closely as possible, given the tax system in force in the tax year 1994–95.

The gains-from-work variable is the difference between in-work income and out-of-work income.

4.2.3. Using wages and hours predictions from the QLFS

At this point, several important issues arise. First, we need to make use of the predicted probabilities of entering work at different points in the wage distribution that were calculated for the QLFS sample, to arrive at a probability-weighted estimate of gains from work. But the gains from working have been calculated from TAXBEN for the *FRS* sample, so we need to combine these with the probabilities from the QLFS somehow.

[22]See Giles and McCrae (1995) for precise details of how the TAXBEN model calculates benefit income and the FRS information used.

How do we do this, given that there are different people in each sample? Our solution to this problem involves aggregating the data in the QLFS and FRS separately into groups or 'cells', where each cell comprises individuals with a certain set of attributes and characteristics. These characteristics are:

- sex (male, female);
- age-group (18–24, 25–35, 36–49, 50+);
- family status (single living away from parental home, single living with parents (in the 18–24 age-group), married with working partner, married with non-working partner);
- region (London and South-East, other);
- education group (left school at minimum leaving age, other);
- children in household (yes, no).

So, for example, a particular cell might consist of men aged 25–35 who are married with working partners, left school after the minimum leaving age, and live in London or the South-East.

The combination of characteristics by which we group people was chosen because groups that differ on the basis of these characteristics are likely to have different levels of wages and/or benefits and hence different gains from work, and it is this variation that we exploit to identify the model of moving into work. Forming every cross-wise combination of these characteristics gives a maximum of 188 groups (on the assumptions that we combine single men with children and single men without children into the same groups, and that we do not have groups comprising people aged 25 or over who are living with their parents). In fact, some of the groups are either empty or too small to use to derive reliable estimates of the probability of moving

into work, so we end up with 160 groups, of which 90 are female and 70 are male.

Once the groups are defined, we take the average of the probabilities of moving into work at each wage decile point for each cell in the QLFS and pass these probabilities across to the FRS. For each individual in the FRS, the cell-based wage decile probabilities are used to obtain a probability-weighted average gain from work averaging across the different wages.

4.2.4. Hours choices

We have looked at the wages at which people enter work, but it is also important to take account of the number of hours individuals may be working when they move into work. Obviously, the number of hours that a person chooses (or is able) to work will affect their gains from work. As seen in Section 3.4, the distribution of hours of work varies a lot according to whether we are looking at male or female entry jobs. We are particularly interested in the choice between 'part-time' and 'full-time' work. The choice of cut-off point for the boundary between part-time and full-time work is inevitably somewhat arbitrary; we choose to define any job of less than 30 hours per week as 'part-time' and any job of 30 hours or more as 'full-time'.

Given this, a regression is estimated on the sample of entrants into work in the QLFS. The dependent variable is full-time or part-time work, and we regress this on the grouping characteristics listed above. A set of predictions are obtained from this regression, averaged and passed across to the FRS. These predictions are the probability (for each group) that work will be 'full-time', conditional on job entry. On the FRS side, TAXBEN is run at two hours points — a part-time one and a full-time one — as well as at 10 wage levels. (We

initially assume that 'part-time' work takes place at 20 hours and 'full-time' at 37 hours.) Hence TAXBEN is run 20 times for each out-of-work individual in the FRS. Each TAXBEN run has a cell-based probability attached, and these probabilities will sum to unity (100 per cent) for each individual.

Once the probability-weighted gain from work for each person in the FRS sample has been calculated, these gains from working are again averaged by cell and passed back across to the QLFS dataset, along with the average out-of-work income for each cell.

4.2.5. The 'moving-into-work' equation

The final equation estimated is run on the QLFS and is a regression of the probability of moving into work on a number of explanatory variables. We always include the income-out-of-work and gains-from-working measures derived in the last section. Additionally, we control for other factors in most of the results we present. However, the question of what control variables to use requires some thought and will be discussed further in Chapter 5 where the results are presented.

4.2.6. Policy simulation

The final moving-into-work equation outlined in the last section is designed to show the impact of a specially constructed measure of expected gains from work on the probability that out-of-work people in the QLFS will move into work over the 12-month period after starting the panel. Whilst the concept of an expected gain from work relates strongly to the economic theory of labour supply and job search, it is of less use from a policy perspective. If the government wishes to evaluate the possible effects of a reform to the tax or benefit system (for example, the planned introduction of the working

families' tax credit to replace family credit in 1999), it would be very useful to have a direct estimate of the impact that the change would have on the numbers of individuals moving into work from a state of unemployment or economic inactivity. This is given in Chapter 6 and the methodology we use is explained there.

4.2.7. Advantages and problems of the grouping procedure

Before we move to the next chapter and a detailed examination of the results that emerge from our modelling framework, it is important to discuss the strengths and the limitations of the modelling approach that we chose to take in this report, as they will directly affect the conclusions that we are able to draw from the results presented.

As explained in some detail earlier, the data in this analysis come from two different sources — the QLFS panel, which enables us to examine transitions into work, and the FRS, from which (via the TAXBEN model) we are able to derive the gains from work over the entry wage distribution under a given regime of taxes and benefits. The implications of using different datasets to provide different parts of the data that we use are serious: one cannot simply run regressions on the sample at the individual level because each dataset contains different people. We overcome this problem by averaging the data for each dataset into cells defined by various characteristics (sex, age, family type, education and region) and treating the cells as our unit of observation. This has the advantage that cell-level data from both datasets can be freely combined and included in the same regression. However, a potential disadvantage is that the only variation in the dependent

(left-hand-side) variable and the regressors (right-hand-side variables) that remains to use as a basis for estimating the regression model is the variation *across* groups. All *within*-group variation is eliminated by averaging within cells. So, in our model, we are using the differences in the *average* out-of-work incomes and gains from working for people of given sexes, ages, regions, family types and education groups to look at the effect of gains from working on the probability of moving into work.

The averaging process may have some additional benefits in terms of model robustness. It could be argued that a lot of the variation in incomes that arises within cells (i.e. the extent to which one person of given observable characteristics earns more than another person of similar observable characteristics) is due to personal attributes that cannot be observed by the researcher in most datasets (for example, individual motivation). An attempt to estimate a model without controlling for these unobserved factors might lead to 'omitted variable bias', whereby some of the impact of the unobserved attributes is mistakenly attributed to the observable attributes, thus producing false results. In other words, the model may be more robust against *unobserved heterogeneity* than a model estimated at the individual level. However, the averaging process certainly makes it more difficult to identify a model. In the light of this, it is important to explain what effects we are able to identify in our results.

The moving-into-work equations that are the final stage of our model relate the proportion of people in each cell moving into work to a vector of predicted out-of-work incomes and gains from work from the tax and benefit model. A key question in arriving at these results is 'what other factors should we control for in this final regression?'. The answer to this depends on what

factors we think might have an influence on people's propensities to move into work *independently* of their effect on people's incomes out of work and potential gains from work. The effects on incomes out of work and gains from work operate principally through two channels — attributes that affect wage levels and attributes that affect the level and form of benefit entitlement. Both of these channels are already being controlled for by the time we reach the final moving-into-work equation: the differences in wage levels manifest themselves in the wage equation estimated earlier in the process and affect the estimated probabilities of a cell member entering work at different wage levels, and the differences in benefit entitlement are taken into account by TAXBEN in the calculation of net income and gains from work.

The central problem is this: as the grouping variables that we use were initially chosen with the intention of being those observable attributes that matter most in determining wages and benefit entitlement, we may run into an identification problem if we attempt to insert these variables into the moving-into-work equation at this later stage (for example, by including age, family type, region or child variables in the equation). These variables are likely to be highly collinear with either wages (in the case of educational attainment and region) or benefit levels (family type and the presence of children) or both (age). Hence including dummies for these attributes in the final equation may well swamp any incentive effects that TAXBEN and the previous wage equations might have uncovered. Worse still, as we are estimating on a dataset of averages of cells defined by these attributes themselves, including a full set of attribute dummies leaves very little systematic variation from which to estimate the model. So, on one hand, there is a case for leaving out of the regressor set

some or all of the attributes that define the cells themselves.

On the other hand, it is quite possible that at least some of the grouping variables do have a direct influence on people's propensities to move into work over and above their effect on the financial incentives involved. For example, age could be important just because people of different ages have different attitudes towards work, either because they are at different stages in the life cycle or because they are from different generations or 'cohorts'. Family type as we have defined it may have an important impact on work decisions because the work decisions of both partners in a marriage may be interrelated, and it is not obvious that this is a purely financial matter. And, for women especially, the presence of children in the household may affect their attitudes towards work and their availability for work. Ignoring these possible effects whilst estimating a model of labour supply would seem unwise, at the very least.

The implications of this discussion for the identification of our model seem to be that a dilemma exists: if we include the grouping variables as regressors in the final equation, we run the risk that their presence may prevent the identification of effects of gains from work on moves into work; but if we leave them out, we may be attributing too much to financial incentives and not enough to demographics and personal attributes. Our solution is to present several different specifications. Some omit all the grouping variables, others include some but not all of them, whilst others include all of them. It is hoped that, by doing this, it will be possible to set some bounds within which the actual effects of the tax and benefit system will be located.

CHAPTER 5
Results

In this chapter, we discuss the results obtained from the moving-into-work regressions that we ran on the QLFS data. These form the basis of the policy simulations that are conducted in Chapter 6. As discussed in the last chapter, in the course of estimating the model it is necessary to run a wage equation and an hours equation on the individuals who move into work in the QLFS. These are not discussed in the main text of the report but full details are included in Appendix E.

5.1. Control Variables and Regression Specifications

The moving-into-work regressions that we estimate relate the proportions of men and women moving into work in each 'cell' of the QLFS data to the out-of-work-income and expected-gains-from-work variables that we calculate using the TAXBEN model.

In addition, most of the specifications estimated contain some of the grouping variables themselves (particularly age) as controls, although, as discussed at the end of the last chapter, there are potential problems with doing this. At the same time, we also include in most of the specifications some additional control variables from the QLFS cell-level data. These are as follows:

- The proportion of individuals in each cell who were made redundant from their previous job in the three-month period prior to the start of the QLFS panel. This is designed to capture (as far as is possible,

given the data) the effect of involuntary displacement from work, i.e. people in a state of non-work pretty much 'by accident'.

- The level of ILO-defined unemployment[23] from the QLFS statistics, measured at the start of the panel, broken down by gender, region and educational qualification group (the groups defined are degree-holders, A level or equivalent, GCSE or equivalent and no qualifications). A weighted average of these statistics according to the proportions of individuals in a given cell with the respective qualifications and living in the respective region is used as a regressor. This unemployment indicator is meant to capture macroeconomic and regional conditions in the labour market.
- The proportion of people in each cell who are homeowners rather than renters. This affects the level of benefits available to non-working people, as renters with low incomes are entitled to housing benefit, whereas mortgagers on low incomes are entitled to extra income support to help meet mortgage payments.[24] Also, there is a lot of evidence to support the hypothesis that homeowners and renters are very different types of people on average (see, for example, Giles et al. (1996)).
- The proportion of women in the cell whose youngest child is aged under five, and the proportion whose

[23]The International Labour Organisation (ILO) uses an internationally consistent definition of unemployment based on the number of people who are not in work but are actively seeking work at a given time. This definition is the one given in the QLFS data.

[24]Although from 1996 onwards mortgage payments as a part of income support were restricted to those who had been out of work for 39 weeks or more, in the period we are examining, 50 per cent assistance with mortgage interest payments was available for the first 16 weeks of an unemployment spell and full support was available thereafter.

youngest child is aged between five and 18. These controls are included to take account of the fact that the presence of young children in the household may influence the mother's decision about whether to work because of factors such as the mother wishing to spend time with the child, the availability and cost of childcare facilities if both parents do go out to work, and so on.

We estimate a number of different specifications of the moving-into-work equations in order to illustrate the impact of introducing different sets of control variables on the estimated effects of the tax and benefit system. Box 5.1 gives the details of the specifications we use. The first of these — specification (1) — just shows the raw correlation between the proportions in each cell moving into work and our predicted data from TAXBEN on the average levels of out-of-work income and expected gains from working in each cell. The first additional control variable we add, in specification (2), is dummies for age-group; although age-group is itself a grouping variable and so its inclusion lays us open to the sort of identification problems discussed in the last chapter, it seems none the less important to include separate controls for age to allow for different propensities to participate across age-groups due to cohort or life-cycle effects. The next controls we add, in specification (3), are the labour market variables: the proportion of the cell made redundant in the last quarter and the level of unemployment (specific to region and education group). Specification (4) introduces variables for the proportion of women whose youngest child is aged under five, and for the proportion of women whose youngest child is aged between five and 18. Although the child variable is itself a grouping variable and so this approach means that we lose some explanatory variation

BOX 5.1

Equation specifications

(1): TAXBEN predicted income out of work and predicted gains from work only
(2): (1) + age-group dummies
(3): (2) + controls for the proportion of the group made redundant in the last three months and for the level of unemployment over education groups and regions
(4): (3) + controls for the proportion of women in the group whose youngest child is aged under five and for the proportion of women whose youngest child is aged between five and 18
(5): (4) with the gains-from-work variable split into a two-part spline at £100 per week (see Section 5.3)
(6): (4) + an extra control for working partner (no other family-type variables)
(7): (4) with the extensions from (5) and (6) combined
(8): (4) + controls for the proportion of owner-occupiers in the cell, for the proportion of sick or disabled people and for family type

in the model, it seems important to control for the effects of children, as their presence or absence may be a major determinant of women's labour market behaviour.[25]

Specifications (5), (6) and (7) extend the model in two different ways. Specification (5) is designed to test whether the effects of expected gains from working are more pronounced for people whose initial expected financial return to work is low. Specification (6) specifically controls for the presence of a working partner in married couples, and specification (7)

[25]We do not include child variables for men because it seems less obvious that the presence of children should be a determinant of men's labour market behaviour. As an experiment, we did try using child dummies for men in the regressions and the result was that the effects of children were not very robust to the different specifications used. Hence we decided to leave them out.

combines the extensions of (5) and (6). Finally, specification (8) adds the family-type dummies as control variables; whilst this may leave us with very little meaningful variation with which to estimate the effects of the tax and benefit system, it is useful to include this 'kitchen-sink' specification for a comparison with the more parsimonious sets of controls.

A priori, we might expect the earlier specifications to feature stronger estimated effects of gains from work, whereas the later specifications, which control for much of the variation in wages and benefits that we are using to help identify these incentive effects, would be expected to show weaker effects. Below, we see whether this is the case.

5.2. Results from Initial Specifications

Table 5.1 at the end of this section (on pages 87 and 88) shows the results from the initial set of specifications that we ran (specifications (1)–(4) and (8)). The regressions were run on the whole sample of men and women jointly;[26] however, as it is possible that men and women might have quite different patterns of moving into work with regard to the financial incentives available, and indeed certain other characteristics (for example, age), the regressions were initially run with the estimated coefficients on all the right-hand-side variables *allowed to vary by gender.* Because we wanted

[26]Note, however, that the number of men and women used in the QLFS regressions is 10,311, rather than the 10,453 men and women used in the descriptive statistics in Chapter 3. This is because we lost 142 observations from the QLFS due to the fact that the 'cells' that these men and women were in were so small that there was no one entering work in them over the period, hence we were unable to use them in the grouped probit (which requires that the probability of entering work for each group is somewhere *between* 0 and 1). Full details of the cells that were lost because of this are obtainable from the authors on request.

as parsimonious a specification as possible without distorting the regression results by imposing too restrictive a specification, the initial regression in specification (4) with all the coefficients allowed to vary by gender was tested against models where some coefficients in the regressions were bundled together for men and women. The results of this testing procedure (likelihood-ratio testing) are documented in Appendix E. In the end, the accepted specification was to interact the out-of-work-income and expected-gain parameters and the youngest age-group parameter (age 18–24) with sex but to group the other age parameters and all the other coefficients together. A gender dummy is also always included.

The regressions shown in Table 5.1 are grouped probits[27] where the coefficients have been transformed into *marginal effects*; hence they show the predicted impact of a unit change in the variable in question on the probability of working. For example, in the column under specification (1) in Table 5.1, the number 0.0012 in the 'Expected gains from work, men (£)' row means that it is estimated that a £1 increase in predicted in-work income relative to out-of-work income increases the probability of working (measured between 0 and 1) by 0.0012, or 0.12 percentage points. Some of the regressor variables are dummy variables (i.e. they only take the value zero or one); this is the case with the age-group variables, the working-partner variable in specifications (6) and (7), and the family-type controls in specification (8). For these, the marginal effect is the increase in the probability of moving into work that results from being in that state relative to the 'base' group (for example, being in the 50+ age-group in specification (2) in Table 5.1 is estimated to reduce the

[27]Estimated by maximum likelihood techniques.

probability of working by around 17.3 percentage points relative to the base group, who are those aged 25–35). Not all the estimated coefficients are statistically significant; where an estimate is significantly different from zero at the 5 per cent level, this is indicated by two asterisks, and significance at the 10 per cent level is indicated by one asterisk.

With this information in mind, we turn to Table 5.1 to analyse the results for the overall sample. The simplest specification — specification (1) — shows that, for men, the raw correlation between moving into work and the out-of-work-income measure is not statistically significant. For women, however, out-of-work income is significant, and the coefficient is negative, so that a £1 increase in women's out-of-work income is associated with a 0.03 percentage point decrease in women's probability of moving into work. The measure of expected gains from work used in the regression is significant for both men and women, although the magnitude of the effect seems to be larger for women: a £1 increase in expected gains from work for men is estimated to increase the probability of moving into work by around 0.12 percentage points, whereas for women the estimate is around 0.25 percentage points. The female marginal effect in specification (1) is negative and significant, implying that women are around 5 percentage points less likely to enter work than men on average. It should be borne in mind, however, that, as there are no other controls in the regression, these results should really only be used for comparison with the more complex specifications shown in the other columns of Table 5.1.

We move on to the first of these more complex specifications in column (2), where controls for age-group are added to the regression. The pattern of results by age-group suggests that, in comparison with the base

group of men and women aged between 25 and 35, younger men (in the 18–24 age-group) are significantly more likely to move into work, whereas older age-groups are significantly less likely to do so. The inclusion of age variables does little to alter the estimated effects of the income and gains-from-work variables with one important exception — the effect of income out of work for men is now positive and statistically significant. It is important to remember that this implies a positive effect of an increase in income out of work *whilst holding the gains from work constant*. In other words, the coefficient actually gives the effect of shifting the entire budget constraint up rather than increasing out-of-work income relative to in-work income. To get the effect of an increase in out-of-work income whilst holding in-work income constant, we have to subtract the gain coefficient from the out-of-work-income coefficient. This implies, for men, that a £1 increase in out-of-work income relative to in-work income *reduces* entry into work by 0.04 percentage points. This accords with the economic intuition that increasing the income a person can receive out of work, whilst holding other things equal, would, if anything, make a person less likely to enter work rather than more likely. However, it is important to remember that out-of-work income as defined in our analysis is not just the individual's own income; it also includes his or her spouse's income, which will include spouse's earnings if the married person has a working spouse. We saw in the descriptive analysis of the QLFS data in Tables 3.4 and 3.5 that married men and women who are employed are more likely to have working spouses than those who are unemployed or economically inactive.[28] In

[28]The 'added-worker effect', whereby a married person with a working spouse is himself (or herself) more likely to be in work, is an established

specification (6), which is discussed in the next section, we introduce controls for the presence of a working partner to see whether the coefficient on out-of-work income is affected by the way we define out-of-work income in this model.

In specification (2), the female marginal effect is positive. This shows that, once we control for the higher male entry rate amongst the youngest age-group, women are more likely to enter work in the older age-groups. However, when extra controls are put in in the later specifications, the female effect is no longer significant (apart from in specification (8)).

In specification (3), variables for the proportion of the group laid off in the last three months and the level of unemployment by region and education group are introduced into the analysis. The redundancy variable is strongly positive, implying that the higher the proportion of recent redundancies in a cell, the more likely it is that members of that cell will move back into work. If people who have recently been made redundant have not had adequate time to search for a new job but can find new work easily in the medium term, this is the result we would expect. At the same time, the unemployment effect appears to be negative, implying that a 1 percentage point increase in the unemployment rate is associated with a decrease of around 1 percentage point in the probability of moving into work. Again, if

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feature of the labour market in many countries (see, for example, Lundberg (1985)). Several possible explanations for this phenomenon have been advanced in the literature and there is not enough space to discuss them here. However, the analysis of replacement rates and average tax rates in Chapter 3 showed that RRs and ATRs were much lower for married people with working partners than for those with non-working partners. Thus, given that one member of a couple is in work, there is more financial incentive for the other member to enter work than if both partners were unemployed or economically inactive.

high regional unemployment rates are associated with low availability of vacancies, then we would expect to see this result. The inclusion of these variables reduces the size of the coefficients on the income and gains variables in specification (3) slightly, although all remain statistically significant.

Specification (4) adds controls for the proportions of women in each cell with a youngest child aged under five years and with a youngest child aged between five and 18 years. The results of adding these variables are interesting: the variable for youngest child under five is significantly negative (implying that women with younger children are less likely to move into work), whereas for youngest child aged between five and 18, the opposite is the case — women with all children over five years of age are *more* likely to move into work than childless women. It is possible that this result reflects the fact that some women will be returning to the labour market after a period of time spent child-rearing, and these would tend to be the women whose children are over five years of age. The inclusion of the child variables has only slight effects on the other coefficients in the regression, although the out-of-work-income measure for women is no longer significant and the dummy variable for the 18–24 age-group of women is now positive and marginally significant.

In specification (8), a full set of controls for family type are included. This reduces the size of the coefficients on the gains-from-work variables drastically and they are no longer significant for men or women (although the female out-of-work-income variable becomes significant again). This underlines the fact that much of the variation in calculated incomes out of work and gains from work in our model is across different family types, and the removal of this variation makes it difficult to estimate any effects. The marginal effects of

the family-type variables indicate that single women living with their parents are around 16 per cent more likely to move into work than the base group (married men and women with non-working partners), and that

TABLE 5.1(i)

Estimated coefficients from moving-into-work regressions (specifications 1–4)

	Specification (1)	(2)	(3)	(4)
Predicted out-of-work income, men (£)	−.0001	.0009 **	.0006 **	.0007 **
Predicted out-of-work income, women (£)	−.0003 **	−.0002 **	−.0002 **	−.0001
Expected gains from work, men (£)	.0012 **	.0013 **	.0006 **	.0009 **
Expected gains from work, women (£)	.0025 **	.0025 **	.0020 **	.0019 **
Age-group				
18–24, men		.1892 **	.1659 **	.1424 **
18–24, women		−.0038	.0004	.0370 *
36–49		−.0555 **	−.0475 **	−.0924 **
50+		−.1733 **	−.1638 **	−.1876 **
Proportion of cell redundant less than three months ago			.6622 **	.5651 **
Level of unemployment (by education and region)			−.0103 **	−.0090 **
Female	−.0530 **	.0878 **	−.0127	.0067
Female, youngest child 0–4 years				−.0884 **
Female, youngest child 5–18 years				.0849 **
Proportion of sick or disabled in cell				
Proportion of homeowners in cell				
Family type				
Single men				
Single men living with parents				
Married men (partner works)				
Single women				
Single women living with parents				
Married women (partner works)				
Constant	−1.149 **	−1.530 **	−.8137 **	−.8816 **
Number of cells used	160	160	160	160
Average cell size	64.4	64.4	64.4	64.4
Log likelihood	-4508.3	-4293.6	-4280.3	-4268.7
Pseudo R^2	.0195	.0662	.0691	.0716

**Significant at 5 per cent level. *Significant at 10 per cent level.

TABLE 5.1(ii)

Estimated coefficients from moving-into-work regressions (specifications 5–8)

	Specification			
	(5)[a]	*(6)*	*(7)*[a]	*(8)*
Predicted out-of-work income, men (£)	.0008 **	.0003 **	.0005 **	.0000
Predicted out-of-work income, women (£)	−.0000	−.0003 **	−.0003 **	−.0003 **
Expected gains from work, men (£)	a	.0001	a	.0000
	.0016 **		.0005	
	b		b	
	−.0035		−.0013	
Expected gains from work, women (£)	a	.0014 **	a	.0006
	.0020 **		.0016 **	
	b		b	
	−.0040 **		−.0021 **	
Age-group				
18–24, men	.1397 **	.1282 **	.1280 **	.0246
18–24, women	.0358 *	.0291	.0289	.0100
36–49	.0991 **	−.0830 **	−.0890 **	−.0656 **
50+	−.1959 **	−.1763 **	−.1826 **	−.1609 **
Proportion of cell redundant less than three months ago	.6227 **	.4520 **	.4996 **	.4251 **
Level of unemployment (by education and region)	−.0072 **	−.0149 **	−.0130 **	−.0127 **
Female	.0808	−.0673	−.0202	−.1424 **
Female, youngest child 0–4 years	−.1082 **	−.0923 **	−.1056 **	−.0799 **
Female, youngest child 5–18 years	.0763 **	.0920 **	.0860 **	.0571 **
Proportion of sick or disabled in cell				−.1300 **
Proportion of homeowners in cell				.0625
Family type				
Single men				−.0532 *
Single men living with parents				.0665
Married men (partner works)		.1094 **	.0885 **	.0965 **
Single women				.0481 *
Single women living with parents				.1561 **
Married women (partner works)		.0937 **	.0830 **	.1164 **
Constant	−1.208 **	−.2532	−.4996	−.0839
Number of cells used	160	160	160	160
Average cell size	64.4	64.4	64.4	64.4
Log likelihood	-4261.0	-4256.0	-4252.7	-4244.9
Pseudo R^2	.0733	.0744	.0751	.0768

[a]In 'Expected gains from work' rows under specifications (5) and (7), a is the coefficient on gains of up to and including £100 p.w. and b is the coefficient on gains of over £100 p.w.

**Significant at 5 per cent level. *Significant at 10 per cent level.

married men and women with working partners are also significantly more likely to move into work.

5.3. Extension: Allowing for Different Incentive Effects when Gains are Small

One possible criticism of the way we have incorporated the gains-from-working variable into the model so far is that our measure of expected gains is assumed to affect work incentives in a completely linear way. That is, an extra £1 of income in work as opposed to out of work is assumed to have the same marginal impact on someone whose current potential gain from working is, say, £5 per week as it does on someone whose expected gain is, say, £500 per week. Thinking intuitively, this may not be realistic; it seems at least plausible that increasing someone's gains from work by a set amount makes a larger difference to his or her work incentives if this represents a large proportion of the gains from work that they currently expect than if it is a tiny percentage of the difference between their in-work and out-of-work incomes.

One way of testing whether these effects are important is to allow different coefficients on the gains-from-work variables in the moving-into-work regression depending on whether the average expected gain from work is large or small. In specification (5) in Table 5.1, we allow the effect of gains from work to vary according to whether the average expected gain from work in an individual cell is up to or greater than £100 per week.[29] This is why, in column (5), there are *two* numbers reported for the marginal effects of expected gains from work for men and for women: the first number (labelled 'a') gives the marginal effect of £1 of

[29]Technically, this is known as a two-part linear spline with the knot at £100 per week.

additional financial gains from working when the total gain level is less than or equal to £100 per week; the second number ('b') gives the marginal effect when the total gain is more than £100 per week. In all other respects, this specification is identical to specification (4).

The results show that increases in the gains to be had from working seem to have a positive effect on movements into work only when the initial level of gains is less than or equal to £100 per week. For men, an increase of £1 in the gain from work is associated with an increase of 0.16 per cent in movements into work where gains are less than or equal to £100, but there is no significant effect on movements into work where the initial gain is higher than this. For women, the contrast is even more striking: here, there appears to be a *negative* relation between increases in gains from work and movements into work for those who could expect to gain more than £100 per week to start off with. Meanwhile, for women with lower gains, the marginal effects are virtually unchanged from the overall effects in specification (4).

Of course, splitting up the gains from working into two groups with the cut-off at £100 per week is a relatively crude and arbitrary way of extending the model. However, even with this simple split, there does appear to be evidence that when a person initially expects only a small financial return from work (either due to low wages, or because of high marginal tax rates resulting from the impact of the tax and benefit system, or both), the impact of a given increase in financial incentives is likely to be greater than the impact on someone who can achieve large returns from working. This is an interesting finding, given that some of the labour market reforms that we discuss in the next chapter (for example, the working families' tax credit

and the national minimum wage) are aimed, in particular, at individuals whose returns to work are low to begin with.

5.4. Extension: Controlling for the Presence of a Working Partner

When looking at specification (2), we raised the question of whether the way in which out-of-work income has been defined in this model could affect the results because of a correlation between the level of household income and the likelihood of moving into work associated with being married with a working partner. One way of attempting to control for the working-partner effect is to include in the regressions a dummy variable for cells composed of married people with working partners. With this in mind, specification (6) in Table 5.1 is identical to specification (4) except that it includes working-partner dummy variables for men and women.

The first thing to note is that the working-partner dummy variables are positive and significant for both sexes. The estimated increase in the probability of moving back into work associated with being married with a working partner, compared with having a non-working partner, is about 11 percentage points for men and about 9 percentage points for women. Meanwhile, the income and gain variables in the regressions are somewhat altered from their counterparts in specification (4). For men, the out-of-work income variable is still positive, but the gains-from-work variable is no longer significant. Hence, for men, including a direct control for a working partner eliminates the main effects of financial incentives that we found earlier. For women, on the other hand, the results are different. The negative effect of out-of-work

income is larger and the positive effect of expected gains from working smaller in specification (6) than in specification (4). The differences are not huge, but they do suggest that the way in which working partners are treated in the model can affect the results to some extent.

In specification (7), we combine the two extensions to our model by estimating a regression that contains controls for working partner and separates the effect of gains from work lower than or equal to £100 per week from the effects of gains from work higher than £100 per week. The effects of having a working partner seem to be reasonably similar to those in specification (6). As for the split in the gains-from-work variable, the coefficient on gains from work over £100 per week is not as negative for women when a working partner is controlled for as it was in specification (5). However, the effect is still significantly negative. The coefficient on gains from work at or under £100 for women is lowered slightly compared with specification (5). Meanwhile, as with specification (6), the gain-from-work effects for men are not significant.

5.5. Calculating a Basic Elasticity of 'Work Entry'

Given the results that we have obtained from the model of moving into work, it is useful to calculate a measure called the *elasticity*, which shows how responsive the process of entry into work is to changes in the financial gain from working as opposed to remaining out of work. The elasticity is defined by the following formula:

$$\frac{\textit{Percentage change in number of people entering work after reform}}{\textit{Percentage change in expected gain from work arising from reform}}.$$

If this elasticity is high, then tax and benefit reforms that increase the financial incentives to work may have

TABLE 5.2

Estimated elasticities of work entry (over 12-month period) from QLFS data

Group	*Percentage change in work entry*	*Mean expected gain from work (£)*	*Percentage change in gains from work*	*Elasticity*
Men	0.09	91.70	1.09	0.083
Women	0.19	63.99	1.56	0.122

a large effect on work entry (or re-entry). Conversely, if the elasticity of work entry is low, then rates of work entry are likely to be quite unresponsive to the tax and benefit system. The elasticity can be easily derived from the results in Table 5.1 since the coefficient on 'expected gains from work' can be multiplied by 100 to give the percentage change in work entry arising from a £1 increase in gains from working. We can find out how large a £1 increase in gains from work is in percentage terms by looking at the mean expected gains from work for men and women back in Table 3.16. We use the coefficients in specification (4) to do this calculation as this is the specification that we use in the policy simulations in the next chapter.

The results of the calculation are shown in Table 5.2 and suggest that the elasticities are somewhere in the region of 0.1 for both men and women, although the estimate for women is higher than that for men. An estimated elasticity of 0.1 implies that a reform that increased the potential gains from working for the presently unemployed and economically inactive group of men and women by 10 per cent would have been expected to increase the percentage of men and women entering work *over the QLFS panel* by 1 point. However, as we show in the next chapter, this is probably an underestimate of the elasticity in the long

run, as the 'stock' of unemployed and economically inactive men and women in the economy will decrease over time if the entry rate into work increases but the exit rate from work to unemployment (or economic inactivity) remains unchanged. The figures in Table 5.2 are a relatively short-run estimate of the responsiveness of the labour market to changes in the net returns from working. Also, it is important to remember that, in our model, entry into work is sensitive to changes in income received when *out of work,* and hence reforms to the tax and benefit system that change individuals' predicted out-of-work incomes may have effects that are not captured by the elasticity measures shown in Table 5.2.

We do not directly compare our estimates of the elasticity of work entry with previous work because, to our knowledge, no previous paper has produced an elasticity measure that is defined in exactly the same way as ours. However, in the next chapter, when we simulate the effect of various policy reforms on the rate of entry into work and the stock of unemployed and economically inactive people in the labour market, we do compare our results with some previous work as the definitions that we use there are more comparable with those used by previous authors.

5.6. Summary of Results

The overall picture that emerges from these regressions is that there is a positive relationship between the expected-gains-from-working variable that we have constructed and the likelihood of people in the QLFS moving into work, which appears to be stronger for women than for men. For women, this relationship is statistically robust to all the specifications we use apart from specification (8), where we control for family type. For men, the relationship is robust to including controls

for age, redundancy and the level of unemployment, but not to including controls for the presence of a working partner. There is also evidence that the positive relationship is driven by the groups where the initial level of gains from working is less than or equal to £100 per week. If we can interpret our results as a causal relationship between gains from work and the probability of moving into work, they suggest that a £100 increase in the gains from working to individuals in the sample would increase the flow into work over a 12-month period by around 6 to 9 percentage points for men and around 18 to 20 percentage points for women. An additional finding was that the relationship between gains from work and movement into work seems to be strongest where the initial sizes of the financial returns are low. In the next chapter, we assess what the magnitudes of labour supply responses estimated here mean for the possible effects of labour market reforms on movements into work.

CHAPTER 6
Policy Simulation

The results in the previous chapter showed the relationship between the measure of 'expected gains from work' (i.e. the average net financial gain that an out-of-work person might achieve by moving into work) and individuals' actual propensities to move into work. Whilst this is certainly useful, the importance of these results from a policy perspective depends, to a large extent, on how changes in the tax and benefit system change the returns to work. In this chapter, we explore the impact of some basic reforms that the present government is planning to introduce on the gains from work and the likelihood of people entering work.

Our methodology can be summarised as follows (a full technical description can be found in Appendix F). Remember that the gains-from-work variables used in the regressions in Chapter 5 are calculated using the TAXBEN model running on the actual tax and benefit rules that were in operation at the time when the QLFS and FRS data were collected (the 1994–95 tax year). However, TAXBEN is equally capable of evaluating the post-tax incomes for people in the FRS data using a *simulated* tax and benefit system that has been changed in some way — for example, the system following a cut in income tax or a change to the structure of family credit. We make use of this feature by running the same individuals through TAXBEN under a reformed tax and benefit system. This generates a new set of gains from working for the FRS sample. After averaging the gains from work by cell and passing them back to the QLFS, as shown in Chapter 4, we can predict the probability of

moving into work for each cell under the reformed tax and benefit regime. We can then compare the probability of moving into work under the real tax and benefit system with the simulated probabilities produced by the reform; this gives us some idea of how the reform might affect work incentives and what the magnitude of those effects might be.

6.1. The Choice of Regression Specification for the Policy Simulation

Since the results in Chapter 5 used a number of different regression specifications, it is important to decide on which specification we want to take the coefficients from to apply to the new set of gains from work arising from our policy simulation. In the simulations below, we use specification (4) as outlined in Box 5.1 (the specification that includes out-of-work income, the gains from working, age-group dummies, labour market controls for redundancy and the level of unemployment, and the child variables for women). This seems a sensible specification to use, as when we moved to specification (8), where there were full controls for family type, the impact of the gain variables disappeared.[30] It would also be interesting to experiment with specifications (5) and (6), which provided some extensions to the basic model that produced some differences in the results; however, lack of space

[30]In preparing this report, we also estimated a specification that was intermediate between (4) and (8) in that sickness and homeownership controls were included but family-type dummies were not. The coefficients on income out of work and gains from working for this specification were very similar to those for specification (4) and so, to save space, we have not reported it.

prevents us from duplicating the policy simulations for these other specifications here.[31]

The structure of this chapter is as follows. Section 6.2 describes each of the simulated reforms in some detail. Section 6.3 describes exactly how and to what extent we are able to implement these changes using the TAXBEN model. Section 6.4 presents tables showing the predicted effects that each reform has on the number of people moving into work over the period, calculated using our model. We are able to use these predicted effects to calculate the impact of the reforms on the average length of time that unemployed or economically inactive people spend outside the labour market, and the effects that the reforms might have on the size of the 'stock' of unemployed and economically inactive people of different family types, both in the short run and the long run. We are also able to calculate how these changes in stocks might affect the cost to the government of implementing each reform, analysing whether the extra people who move into work will mean that the reforms 'pay for themselves'. We compare the cost-effectiveness of different reforms. Finally, in Section 6.5, we are able to compare our findings with those of previous work in the UK that has made comparable estimates of the impact of reforms such as the working families' tax credit.

6.2. The Reforms Considered

All the reforms we consider are reforms that, at the time of writing (Spring 1999), the government is intending to implement by the end of the present parliament. One of the reforms — the proposed national minimum wage — is not a reform to the tax or benefit system *per se* but

[31]The results of the policy simulations when specifications (5) and (6) are used are available from the authors on request.

will have an impact on the distribution of entry wages (as shown in Chapter 3). The other reforms are tax and benefit reforms. We give details of each reform below.

A: National minimum wage

As discussed in Chapter 3, the national minimum wage sets a minimum hourly rate of pay for all employees aged over 18 in Britain.

B: Working families' tax credit

The working families' tax credit (WFTC), planned to come into operation in Autumn 1999, is a reform of the system of in-work support for working families with children. It will replace the previous system, family credit (FC), which has operated since 1988. Although FC operates through the benefit system and WFTC is planned to operate as a tax credit through the wage packet, the principle behind the operation of both schemes is the same: families with at least one child and an adult working 16 hours or more per week whose net income falls below a certain 'eligible amount' are entitled to a certain amount of benefit which helps top up their earnings. The principal changes that the introduction of WFTC is expected to make to this system of in-work support are the following:

- The credit for each child aged under 11 in the family is to be increased by £2.50 per week.
- The taper threshold is to be raised. The threshold (or 'applicable amount') is the amount of net income families can earn before their entitlement to FC or WFTC starts to be reduced. Currently, the FC threshold is £79; for WFTC, it will be raised to £90.
- The taper rate is to be lowered from 70 per cent to 55 per cent. This means that, for families whose

income is above the threshold level, with each extra pound of net income received, the amount of credit paid will fall by 55p rather than by 70p, i.e. it will be taken away more slowly.

- Whereas FC is normally paid to the female partner in a couple with children, under WFTC rules the credit will normally be paid to the principal earner in the household (although couples will be able to nominate the other member of the household to receive the credit if they so desire).
- A childcare credit of up to £150 is expected to be included in the final version of WFTC. Credit will be available to families with two or more children spending £150 or more on childcare per week.

The amount that WFTC will cost the government in increased benefit payments is estimated by the Treasury to be around £1.3 billion (excluding the childcare credit, the costs of which are difficult to calculate).[32,33]

C: National Insurance reforms

National Insurance contributions (NICs) are a form of tax on earnings paid by all employees in the UK earning more than the lower earnings limit (currently £64) in a week. In the March 1998 Budget, the Chancellor announced the reform of the National Insurance system in two stages. We focus here on the reforms to *employee* NICs.[34] These were scheduled in two stages:

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[32]See HM Treasury (1998).

[33]The initial Treasury estimate of the cost of the childcare credit was in the region of £100 million, but if families change their childcare expenditure in the light of the credit being available, then the final cost could be many times this.

[34]Employer NICs were also reformed in the 1998 Budget but the TAXBEN model does not presently have the facility to model the effects on wages of

- Stage 1: the abolition of the 'entry fee' whereby anyone who is paid at or above the lower earnings limit (LEL) has to pay a tax of 2 per cent of their earnings below the LEL. This reform removes a small 'spike' in the budget constraint which many commentators thought distorted the structure of earnings (see Dilnot and Giles (1998)). It will be implemented in April 1999 and is expected to cost the government just over £1 billion in lower tax receipts.[35]
- Stage 2: the raising of the LEL to the point where a single person begins to pay income tax on their earnings (currently £81). The aim of this reform is to integrate the National Insurance system with the income tax system more closely. It is expected to be implemented before the end of the present government's term of office and is also expected to cost the exchequer just over £1 billion.

D: 10p starting rate of income tax

The government has a long-standing commitment to lower the starting rate of income tax from its present level of 20p in the pound to 10p in the pound. The details of how this will be done are not clear yet but we consider one possibility. Our version of the 10p-rate reform lowers the rate of tax on the first £2,000 of taxable income (i.e. the first £2,000 of income currently taxed at 20 per cent) to 10 per cent. The tax rate on the remainder of the current 20p band is raised to the standard rate (currently 23 per cent). The time-scale for the 10p-rate reform has not been announced yet but it is

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payroll taxes levied on employers. Hence we do not present results on the effects of changes to employer NICs in this report.

[35]Costings for the NI reforms and the 10p tax rate in this report are calculated using IFS's TAXBEN model.

thought that the government intends to implement it before the end of this parliament (2002 at the latest). Our version of the reform is expected to cost around £3.3 billion to implement at current prices.

E: Combined tax and benefit reforms

As the introduction of WFTC, a 10p starting rate of income tax and the reforms to NICs are reforms that are designed as part of a package of welfare-to-work measures and may well all interact with each other, it seems sensible to look at the *combined* predicted effect on entry into work. We do this by comparing the starting tax and benefit system with a system where all the tax and benefit changes have been implemented.[36] The cost of implementing this combined reform is expected to be around £6.8 billion at current prices.

6.3. Implementing the Reforms in TAXBEN

The implementation in TAXBEN of the reforms we are considering is complicated somewhat by the fact that TAXBEN has certain limitations in how it can model some of the reforms. This is explained in more detail below. It should be noted at the same time that, although the initial tax and benefit system that we used to produce the gains-from-working variables for the regressions in Chapter 5 was the actual tax system as of April 1994, for the policy simulations we start with the April 1997 system (as this was the system that the Labour government inherited from the previous administration in May 1997). So we compare the initial April 1997 system with the system reformed in a

[36]Note that the minimum wage is *not* included in this combined assessment. This is because, as explained below, the effects on work entry arising from the minimum wage are not meant to be taken as indicators of the likely employment effects of a minimum wage.

number of ways.[37] This does not change the basic methodology, however. Specific issues to do with each individual reform are discussed below.

- **Minimum wage:** Our approach towards simulating the effects of this policy was to set to £3.60 per hour (in April 1997 prices) all the wages that were less than £3.60 to begin with in the QLFS entry wage distribution for men and women aged 21 or over. This changes the shape of the entry wage distribution radically, as around 30 per cent of the entry wages are now fixed at £3.60. Clearly this should increase the gains from work before (and probably after) taxes and benefits for those individuals who are more likely to move into work near the bottom of the entry wage distribution. Likewise, the wage distribution for the under-21s was fixed so that £3.20 was the minimum.
- **Working families' tax credit:** In Section 6.2, it was shown that WFTC makes five important changes to the tax and benefit system compared with its predecessor, family credit. The first three of these (the increased child credit, the taper threshold change and the taper rate change) are all easy to model in TAXBEN. We side-step the issue of the change in which partner will receive the credit because our income definitions incorporate all household benefits for both partners in married households; therefore the issue of who receives the benefit is not important for our modelling strategy.[38]

[37]The wage rates of the individuals in the 1994–95 FRS who are used in the TAXBEN simulation are uprated by the retail price index to April 1997 prices in order to ensure that the wages going through the model are the same in real terms as those in the previous chapter.

[38]Of course, this approach is *not* a solution to the extremely difficult question of how to model intra-household income distribution (i.e. the

Of course, this is not to say that changing the recipient of the benefit within the household may not have important effects — just that in the present analysis we cannot identify these effects. Additionally, we do not model the effects of the childcare credit as it requires information on the availability of childcare which is difficult to derive from the FRS data. In the light of these limitations, the analysis that follows should be treated as, at best, a partial evaluation of the effects of introducing WFTC, with the emphasis on the actual changes in the generosity of WFTC compared with FC.

- **National Insurance changes:** The abolition of the 2 per cent entry fee and the raising of the LEL to £81 per week can both be accurately modelled.
- **10p tax rate:** This can be modelled accurately.

Subject to the reservations described for WFTC, we can be confident that TAXBEN models the simulated reforms to the tax and benefit system accurately. The next section shows the results that emerge from running these simulations.

6.4. Results

First in this section, we discuss the predicted changes in the number of people entering work arising from each of the simulated reforms. After this, we look at the

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division of income received by household members among those members) and, in particular, it is inadequate for looking at labour supply substitution within the household (i.e. the possibility that the wife's labour supply decision may be influenced by what the husband does and vice versa). However, in the absence of a fully formulated and empirically tractable model for modelling the labour supply of both partners in a married household simultaneously, we have chosen to persist with a model where household benefit income is treated as a single 'block' whilst acknowledging the limitations of this approach.

impact that the reforms might have on the average length of time that men and women of different ages and family types spend unemployed and/or not participating in the labour market. We also attempt to derive some elasticities from the results; the elasticities measure the sensitivity of the flow of men and women into work to changes in the tax and benefit system, and hence the potential effectiveness of these policies. Finally, we compare the 'cost-effectiveness' of the different policies — how many people are predicted to move into work as a result of them, and at what cost.

6.4.1. Policy simulation A: the national minimum wage

In this section, we consider the effect on gains from work of implementing a national minimum wage in the UK along the lines recently proposed by the government. It should be noted, before looking at these results, that the assumptions underlying this approach to simulating the effect of the minimum wage are quite extreme as they imply that, following the implementation of a minimum wage, jobs that were paying rates below the minimum wage would continue to exist with wages raised to the new minimum wage level. For this to be so, there would have to be imperfections in the labour market in the form of imperfect competition or monopsony which had resulted in exploitation (a situation where employees in the low-wage jobs are being paid less than the value of what they produce in these jobs). Otherwise, in a situation where the labour market was perfectly competitive, the jobs paying rates below the minimum wage would disappear when the minimum wage was implemented because it would no longer be profitable to employers to maintain these jobs. There is fierce debate within the

economics profession about the extent to which imperfect competition and exploitation exist in the labour market, but suffice to say that it seems unlikely that a minimum wage would have *no effect whatsoever* on the distribution of available jobs throughout the economy. Hence it is important to bear in mind that the results presented here are *not* intended to show the likely employment effects of a minimum wage! However, the results are instructive from the perspective of wanting to know how higher wages in low-paid jobs might affect people's willingness to move into work, i.e. the effects on how much labour individuals might wish to supply.

Table 6.1 shows five columns of results. The first two contain the average *changes* in income out of work and the expected gains from work arising from the reform. The next column shows our estimate of the change in the proportion of men, women or individuals of a certain family type moving into work as a result of the reform, expressed in percentage points. For example, if the actual proportion entering work was 25 per cent and our model predicted that the reform would increase this proportion to 25.1 per cent, the figure here would be 0.1. In the final two columns, we show the 95 per cent confidence interval for the change in the proportion entering work.[39] The change in the proportion is a statistical estimate and as such is estimated with some error. The confidence interval gives the range of plausible values for our estimate: it shows the bounds within which there is a 95 per cent probability that the true population statistic is located. It is included so that we can assess whether our estimates are significantly different from zero. If the estimate is

[39]Technical note: these confidence intervals are estimated by bootstrapping the grouping procedure and the regression model (with 500 repetitions).

TABLE 6.1

Simulated effects of national minimum wage

Group	*Average change in:*			*Confidence intervals (95%)*	
	income out of work (£)	*expected gain from work (£)*	*work entry prob. (% points)*	*Lower*	*Upper*
Men, overall	0.00	2.54	0.21	0.10	0.38
Women, overall	0.00	3.82	0.52	0.32	0.77
Men					
Single, not living with parents	0.00	2.62	0.18	0.08	0.33
Single, living with parents	0.00	6.53	0.69	0.31	1.28
Married, partner working	0.00	2.61	0.18	0.08	0.35
Married, partner not working	0.00	1.39	0.09	0.04	0.15
Women					
Single, no children	0.00	4.13	0.41	0.24	0.62
Lone mother	0.00	1.94	0.30	0.18	0.44
Single, living with parents	0.00	6.14	1.38	0.83	1.96
Married, partner working	0.00	4.60	0.68	0.43	1.03
Married, partner not working	0.00	3.11	0.27	0.18	0.38
Men and women					
Aged 18–24	0.00	4.84	0.70	0.43	0.99

positive and the lower confidence interval is also above zero, then we can be reasonably confident that our estimate is statistically significant.

Table 6.1 shows that the minimum wage produces increases in the expected gains from work for both sexes and all family types in the sample.[40] This is not

[40]It should be noted that the minimum wage is predicted to have no impact on out-of-work income for *any* of the groups. This will not be accurate for some married people with working partners because, if their partner earns an hourly wage below the minimum wage rate, then the partner's earnings would increase under the minimum wage and this would be an increase in

surprising, as, under our assumptions, the reform is increasing wages for a large proportion of the sample of people entering work and hence increasing the gains from work. The simulated impacts on the numbers of people entering work in the QLFS are positive for both men and women. The effects are of the order of 0.2 of a percentage point for men and 0.5 of a percentage point for women.

Looking at how the estimated changes break down by family type, the minimum wage effects for men are strongest for single men living with their parents and weakest for married men with non-working partners. For women, the effects seem to be largest for single women living with their parents and for married women with working partners, and smallest for lone mothers. The minimum wage effects are statistically significant across all family types.

We also include a separate row in the table looking at how the minimum wage affects men and women in the youngest age-group used in our analysis (18- to 24-year-olds), as some of these will be subject to the lower minimum wage rate of £3.20 per hour rather than the £3.60 rate. The results here show that labour supply responses are stronger for the younger age-group with a predicted increase in work entry of 0.7 of a percentage point. However, as a greater proportion of 18- to 24-year-olds are entering work in the first place than for the population as a whole (around 25 per cent), the *elasticity* of work entry (as defined in Chapter 5) may not be that different for this group.

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their own out-of-work income under our assumptions. However, the TAXBEN model is not capable of evaluating this increase at the moment.

6.4.2. Policy simulation B: working families' tax credit

The simulated effects of introducing WFTC are shown in Table 6.2. The first interesting thing to note is that changes arise not only in the expected gains from work but also in the incomes out of work for some groups. The reason WFTC can change the out-of-work incomes for a person in the sample, even though it is a benefit that is only received by those in work, is that, for a married couple, one partner's in-work income is treated in our model as the other partner's out-of-work income. As we are applying the tax and benefit changes to both members of the couple simultaneously, when a man or

TABLE 6.2

Simulated effects of working families' tax credit

Group	*Average change in:*			*Confidence intervals (95%)*	
	income out of work (£)	*expected gain from work (£)*	*work entry prob. (% points)*	*Lower*	*Upper*
Men, overall	0.58	2.67	0.26	0.14	0.40
Women, overall	2.26	0.88	0.09	0.06	0.14
Men					
Single, not living with parents	0.00	0.88	0.05	0.02	0.11
Single, living with parents	0.00	0.00	0.00	0.00	0.00
Married, partner working	2.60	–0.23	0.18	0.08	0.35
Married, partner not working	0.00	6.94	0.56	0.28	0.95
Women					
Single, no children	0.00	0.00	0.00	0.00	0.00
Lone mother	0.00	6.90	1.07	0.64	1.62
Single, living with parents	0.00	1.01	0.19	0.09	0.32
Married, partner working	4.65	–2.35	–0.41	–0.63	–0.17
Married, partner not working	0.00	4.02	0.48	0.31	0.67

woman with a working partner is out of work, any increase in his or her partner's income resulting from the introduction of WFTC will show up as an increase in his or her own out-of-work income. This explains why we see changes in average income out of work for men and women with working partners.

The changes in expected gains from work arising from WFTC are positive for all except four groups. There is no change for women without children or for men living with their parents because these groups have no children and hence are not eligible for WFTC.[41] For married men and (especially) married women with working partners, where the expected gains from working are *negative*, the reason is somewhat more subtle. Recall that WFTC, like family credit, is effectively a means-tested in-work benefit, entitlement to which is assessed on total family net income, so a couple with high enough income would lose entitlement to benefit. If the family is past the cut-off point at the end of the taper (i.e. is receiving no FC or WFTC) under both the old FC rules and the new WFTC rules when both partners are working, then total household income in work is unchanged. However, income out of work (i.e. family income when the husband was working but the wife was not working) may have increased under WFTC. In these circumstances, gains from work would have decreased. This is effectively what happens for some of the married men and women with working partners in the sample, which accounts for the change in gains from work being negative for this group.

Turning to the simulated changes in entry to work arising from the reform, we find that the effects are

[41]There is a small positive predicted effect for the larger group of single men not living with their parents. This is because there are a few single fathers in this group who are eligible for WFTC.

larger for men overall than for women. Obviously there are no effects for single men because incomes are unchanged,[42] but for married men the effects are larger for those with non-working partners than for those with working partners. This is what we might expect, given that the increase in gains from work is positive and relatively large for men with non-working partners, whereas it is negative for men with working partners.[43] For women, there are significant positive changes in work entry for lone mothers and married women with non-working partners, but for married women with working partners, the prediction is that the proportion entering work will *decrease* by 0.41 of a percentage point. Thus we see that, for women with working partners, WFTC may actually produce 'perverse' effects, due to the impact it has on the budget constraint of the couple in our model — increasing out-of-work income and reducing the wife's own gains from work due to the interaction with the husband's income.

6.4.3. Policy simulation C: changes to employee NICs

The simulated effects of the two reforms to the structure of employee National Insurance contributions are shown in Table 6.3. We see that, as with WFTC, the reductions in NICs can show up as an increase in out-of-work income for men and women with working partners. This time, however, it is not possible for an increase in a husband's or wife's income to have a perverse effect on their partner's gains from work, because NICs are

[42]Except for some single fathers. See note 41.

[43]It may seem surprising that we get positive changes in work entry for married men with working partners, given that their gains from work are predicted to decrease, but recall that the coefficient on out-of-work income for men in specification (4) in Table 5.1 was positive, and we can see that the increase in out-of-work income is actually driving the result.

TABLE 6.3

Simulated effects of National Insurance reforms

Group	*Average change in:*			*Confidence intervals (95%)*	
	income out of work (£)	*expected gain from work (£)*	*work entry prob. (% points)*	*Lower*	*Upper*
Men, overall	0.28	2.65	0.22	0.11	0.39
Women, overall	0.93	1.95	0.28	0.18	0.39
Men					
Single, not living with parents	0.00	2.70	0.17	0.08	0.32
Single, living with parents	0.00	3.69	0.39	0.18	0.71
Married, partner working	1.23	3.29	0.37	0.20	0.62
Married, partner not working	0.00	1.87	0.11	0.05	0.19
Women					
Single, no children	0.00	2.18	0.25	0.15	0.37
Lone mother	0.00	0.70	0.11	0.06	0.16
Single, living with parents	0.00	2.76	0.63	0.37	0.92
Married, partner working	1.91	2.58	0.39	0.26	0.57
Married, partner not working	0.00	1.31	0.11	0.07	0.16

assessed on an individual basis: the level of NICs paid by one partner does not affect the level of the other partner's NICs.[44] Hence the change in expected gains from work is positive for all family types under this reform.

Turning to the predicted effects on the probability of work entry, we find statistically significant increases in all cases. The effects are of similar magnitude for men and for women overall. Amongst men, the group living with their parents and married men with working

[44]Also, NICs are levied on *gross* earnings, so there is no possibility of an interaction with the other elements of the benefit system (such as family credit).

partners experience the largest predicted increases in work entry. For women, the story is similar.

6.4.4. Policy simulation D: 10p starting rate of income tax

The effects of introducing a 10p starting rate of income tax are summarised in Table 6.4. Again, the reform causes increases in out-of-work income for men and women with working partners. This time, there are also small increases for some single people and people with non-working partners, which are caused by the fact that some of these groups have unearned income which is also taxed at the lower rate. Once again, there are small

TABLE 6.4

Simulated effects of 10p tax rate

Group	*Average change in:*			*Confidence intervals (95%)*	
	income out of work (£)	*expected gain from work (£)*	*work entry prob. (% points)*	*Lower*	*Upper*
Men, overall	0.80	1.65	0.17	0.10	0.28
Women, overall	1.37	1.20	0.17	0.12	0.24
Men					
Single, not living with parents	0.28	1.96	0.14	0.07	0.25
Single, living with parents	0.03	2.28	0.24	0.12	0.45
Married, partner working	2.12	2.00	0.32	0.19	0.48
Married, partner not working	0.68	0.96	0.09	0.05	0.13
Women					
Single, no children	0.47	1.35	0.16	0.10	0.23
Lone mother	0.04	0.37	0.06	0.03	0.08
Single, living with parents	0.00	1.84	0.42	0.25	0.60
Married, partner working	2.30	1.70	0.26	0.18	0.37
Married, partner not working	0.86	0.59	0.05	0.04	0.07

increases in the expected gains from work across the board, although these are not as large as the increases resulting from the National Insurance reforms.

The simulated changes in the probability of work entry are similar across men and women taken as a whole and are of the order of 0.17 of a percentage point. Looking across family types, as with the NICs reform, the increases appear to be largest for men and women living with their parents and for married men and women with working spouses.

6.4.5. Combined effects of tax and benefit reforms

Table 6.5 shows the predicted effects of the tax and benefit reforms on work entry when the reforms are combined into one 'package'. In the final column, we calculate the sum of the individual effects for each family type from Tables 6.2 to 6.4. It is by no means a foregone conclusion that the whole is equal to the sum of the parts as far as the effects of the reforms go, as different reforms may interact with one another and hence a reform that has good effects when considered in isolation may have quite different effects when considered as part of a package of measures.[45] Looking at the figures for men and women overall in Table 6.5, we find that, in fact, the overall measure is broadly similar to the sum of the individual effects of the reforms. However, breaking the predicted effects down by family type, some differences emerge. For married men with non-working partners, the sum of the increases in probability from the individual reforms is greater than the overall prediction from Table 6.5. For

[45]For example, as eligibility for family credit is assessed on after-tax income, changes in the income tax or National Insurance system can affect the amount of FC a working person might receive and hence the likely impact of a family credit reform.

TABLE 6.5

Combined effects of tax and benefit reforms

Group	*Average change in:*			*Confidence intervals (95%)*		*Sum of indiv. effects*
	income out of work (£)	*expected gain from work (£)*	*work entry prob. (% pts)*	*Lower*	*Upper*	
Men, overall	1.66	7.05	0.66	0.36	1.08	0.65
Women, overall	4.49	4.19	0.55	0.39	0.79	0.54
Men						
Single, not living with parents	0.28	5.60	0.37	0.17	0.68	0.36
Single, living with parents	0.04	6.05	0.64	0.30	1.18	0.63
Married, partner working	5.92	4.90	0.85	0.52	1.24	0.87
Married, partner not working	0.70	10.05	0.79	0.40	1.33	0.76
Women						
Single, no children	0.48	3.72	0.44	0.27	0.65	0.41
Lone mother	0.04	8.43	1.31	0.78	1.99	1.24
Single, living with parents	0.00	5.72	1.27	0.78	1.86	1.24
Married, partner working	8.71	1.87	0.23	0.13	0.35	0.24
Married, partner not working	0.86	6.11	0.67	0.70	1.44	0.64

most women, the reverse is the case. However, the difference between the two sets of estimates is never very large. In general, the overall effect of the package of reforms on the probability of work entry is both positive and statistically significant.

6.4.6. Combining the reforms with the effects of a minimum wage

Table 6.6 combines the effects of the minimum wage on expected gains from work, which were shown in Table 6.1, with the effects of the combined set of reforms, shown in Table 6.5. In other words, it gives an estimate of how the putative gains from working would be affected if the minimum wage were implemented at the same time as the tax and benefit reforms, and how the two sets of reforms interact. It should, once again, be stressed that this is in no way an assessment of the likely employment effects of a minimum wage. Comparing the results in Table 6.6 with the figures in

TABLE 6.6

Combined effects of tax and benefit reforms and minimum wage

Group	*Average change in:*			*Confidence intervals (95%)*	
	income out of work (£)	*expected gain from work (£)*	*work entry prob. (% points)*	*Lower*	*Upper*
Men, overall	1.66	9.86	0.89	0.47	1.52
Women, overall	4.49	8.65	1.17	0.78	1.68
Men					
Single, not living with parents	0.28	8.38	0.56	0.26	1.05
Single, living with parents	0.04	12.61	1.34	0.62	2.45
Married, partner working	5.92	7.04	1.04	0.62	1.55
Married, partner not working	0.70	12.00	0.92	0.46	1.58
Women					
Single, no children	0.48	8.43	0.91	0.54	1.35
Lone mother	0.04	11.26	1.77	1.06	2.67
Single, living with parents	0.00	12.52	2.82	1.70	4.06
Married, partner working	8.72	7.04	1.00	0.70	1.44
Married, partner not working	0.87	9.88	1.02	0.67	1.45

Table 6.5, it is clear that raising the bottom of the wage distribution to minimum wage levels results in large increases in the estimated gains from working for most groups, and particularly for women and for single men living with their parents. This has a corresponding impact on the predicted change in the probability of work entry. So the minimum wage reinforces the increases in the potential gains from work (conditional, of course, on the entry jobs still being available at the higher wage rates).

6.4.7. Time spent out of the labour market

An alternative way of presenting the results of the policy simulations is to ask what effect a higher proportion of people entering work would have on the average duration of spells of unemployment and/or economic inactivity that men and women of different ages and family types undergo. This can be calculated fairly easily if we make an assumption about how the numbers of people entering work after a period of unemployment or labour-force inactivity relate to the average length of time that a particular spell of unemployment or inactivity lasts.

The assumption we make here is that the probability of a given person entering work (i.e. leaving unemployment or economic inactivity) is constant (i.e. does not vary with time). This assumption is possibly unrealistic,[46] but it does have a very useful property for

[46]The probability of exit from unemployment or economic inactivity is known technically as the *hazard rate*. A constant hazard rate may be an unrealistic assumption because it is quite possible that a given person's probability of entering work might change over time, either increasing (for example, because the intensity with which they search for work increases) or decreasing (because they lose labour market skills or become demoralised over time).

our purposes: the expected duration of unemployment or economic inactivity is calculated as

$$\text{Average duration in years} = \frac{1}{\text{Entry rate into work (over 1 year).}}$$

Hence it is a straightforward process to calculate the average durations of spells of unemployment or economic inactivity in the QLFS data, and also to show how they may be affected by the increase in entry rates arising from the policy reforms.

It should be noted that, to do these calculations, we need to make the additional assumption that *exit* rates from work (i.e. entry rates into unemployment or economic inactivity) are not affected when entry rates into work change. In addition, because we do not distinguish between unemployment and labour market inactivity in our model, it is not possible to look specifically at the impact of policy reforms on unemployment durations as opposed to spells of inactivity. This is an important consideration as unemployment might be considered a transitional state (in so far as the unemployed are actively searching for work), whereas inactive people may, in many cases, have no intention of moving into work, at least in the short or medium term. Hence spells of economic inactivity are likely to be longer, on average, than spells of unemployment and, by averaging across these two groups of people who are not working, it may be difficult to see this. None the less, we present in Table 6.7 the results from the QLFS for the average durations of non-working spells for individuals of different family types and the impact that the combined policy reforms (excluding the introduction of a national minimum wage) are estimated to have on them.

TABLE 6.7

Estimates of the impact of the combined policy reforms on the average length of spells spent out of the labour market for different groups

Group	*Entry rate into work (%)*	*Average spell length*		*Entry rate change from reform (%)*	*Change in average spell length*	
		Yrs	*Dys*		*Dys*	*%*
Men, overall	19.4	5	53	0.66	−62	−3.3
Women, overall	14.6	6	305	0.55	−90	−3.6
Men						
Single, not living with parents	12.3	8	50	0.37	−87	−2.9
Single, living with parents	36.6	2	267	0.64	−17	−1.7
Married, partner working	28.2	3	201	0.85	−38	−2.9
Married, partner not working	14.4	6	341	0.79	−131	−5.2
Women						
Single, no children	11.8	8	181	0.44	−112	−3.6
Lone mother	14.1	7	26	1.31	−218	−8.2
Single, living with parents	36.4	2	272	1.27	−34	−3.5
Married, partner working	17.8	5	230	0.23	−26	−1.3
Married, partner not working	7.2	13	296	0.67	−427	−8.5

The table shows that men have a higher overall entry rate into work than women over the year between the first and last quarters of the QLFS panel. Correspondingly, the average durations of spells of unemployment or economic inactivity are higher for women (almost seven years) than they are for men (just over five years). Looking by family type, for men, those living with their parents and married men with working partners have the highest job entry rates. The story for women is similar. The next column shows the estimated increase in the work entry rate arising from the combined set of reforms. The penultimate column shows the reduction (measured in days) in the average length of non-work spells predicted to arise from the set of policy reforms, and the final column expresses this as a percentage of the original duration. The size of the reduction depends on two factors: the policy effect will

obviously be greater, the larger the change in the entry rate arising from the reform, but a given change in the entry rate will also produce larger reductions in average duration if the initial entry rate into work is low. So, for example, although the changes in entry rate for men living with their parents and for married women with non-working partners are of similar magnitudes, they translate into a reduction of about 14 months or 8.5 per cent of the total duration for the women, but only 17 days or 1.7 per cent for the men, because the entry rate is much lower for the women than for the men. Overall, the reductions in spell lengths are larger for women than for men. They are especially large (at over 8 per cent) for married women with non-working partners and for lone mothers. Women with working partners and single men living with their parents have their average unemployment and economic inactivity durations reduced by less than 2 per cent under the combined reforms.

6.4.8. Unemployed and economically inactive stock

As well as looking at how the policy reforms affect the average durations of unemployment and economic inactivity for various groups of working-age people, it is possible to present the results in a different way by asking how many extra people would move into work as a result of a reform. In other words, to what extent would reforms reduce the *stock* of unemployed and economically inactive people in Britain?

Of course, the unemployed and inactive men and women in the QLFS are only a small sample of the population. Fortunately, both the QLFS and the FRS data contain 'grossing factors', which relate the number of people of given characteristics — sex, age, family

TABLE 6.8

FRS estimates of the stock of unemployed and economically inactive men and women in Britain, 1994–95

Group	*FRS unemployed or economically inactive stock estimate*
Men	
Single, not living with parents	1,186,220
Single, living with parents	416,930
Married, partner working	479,060
Married, partner not working	818,120
Total, men	2,900,330
Women	
Single, no children	540,000
Lone mothers	816,350
Single, living with parents	203,770
Married, partner working	2,034,380
Married, partner not working	986,710
Total, women	4,581,210
TOTAL	7,481,540

type and so on — to the number of people in the British population as a whole at the time.[47] By multiplying the number of men and women in each dataset by the grossing factors they are assigned in the data, it is possible to come up with an estimate of the total stock of unemployed and economically inactive people aged 18–59 in Great Britain who are not in full-time education and are not severely disabled (as defined in Chapter 3).[48] Table 6.8 shows that we estimate there to be almost 7.5 million unemployed and economically inactive people in Britain corresponding to the sample

[47]The estimates of the number of people in the British population used in the QLFS are derived from the 1991 census.

[48]We use the FRS to derive the estimates here because our QLFS sample is not a single quarter's data but an agglomeration of four consecutive quarters, which makes it more difficult to interpret the grossing factors in the QLFS as corresponding to population totals. However, rough calculations using QLFS grossing weights and correcting for the nature of our QLFS sample showed a high degree of correspondence between the two samples.

of the FRS that we use. Just over 60 per cent of the stock of unemployed and economically inactive people are female.

We calculate two measures of how the policy reforms are predicted to reduce the stock of unemployed or inactive people. Full technical descriptions of the way these are worked out are given in Appendix G. Here, we give a more intuitive description of the measures.

- The *short-run* measure of the stock reduction can be predicted by the increase in the entry rate into work over a period of 12 months for those who started the QLFS panel unemployed or economically inactive. This was shown in Tables 6.1 through 6.6. For each 'cell' from the FRS used in the model, we can take this predicted increase in the entry rate and multiply it through by the grossing factors in the FRS data. This gives the estimated increase in the number of people entering work over the one-year period between the start and end of the QLFS panel.
- A *long-run* estimate of the stock reduction can also be derived if we make the extra assumption, used in Section 6.4.7, that the expected duration of a spell of unemployment or economic inactivity is the reciprocal of the entry rate. Assuming also that the rate of inflow into unemployment or inactivity (i.e. the rate of *exit* from work) is constant over time, the stock of unemployed or economically inactive people is easily calculated as

  Stock = Inflow × Expected duration.

  For a constant rate of inflow, it is clear that reductions in the stock will be *proportional* to reductions in the expected duration of unemployment or economic inactivity (which we can calculate as shown in Section 6.4.7). This is a long-run estimate because it shows the way the

stock adapts to a permanent change in the entry rate into work induced by a change in the tax and benefit system as predicted in our model, whereas the short-run measure only gives the predicted increase if the rate changes over the course of the first year that the reform is implemented.

Both these measures of the change in stock arising from the policy reforms rely on the important assumption that the *exit rate* from work is unchanged after the reform. If the entry rate into work were to increase, but this was matched by a proportionate increase in the exit rate out of work, then overall employment would not rise — it would just mean that movements between different labour market states had increased, and in effect the labour market would have become more volatile. If it is the case that the tax and benefit reforms that we are modelling increase the potential gains from working for some or all of the working-age population but do not *decrease* the gains from work for anyone, then there is no obvious reason for the exit rate to change. However, if the reforms decrease the gains from work for some groups of the population, then we might expect to see an increase in exit rate as some people decide that leaving work is preferable to staying in work. If this were to happen, then our estimate of the numbers moving into work would be an overestimate. This might be the case with WFTC and married women with working partners, for example.

6.4.9. Exchequer cost of the reforms

Predictions of the changes in the stock of unemployed and economically inactive people following the tax and benefit reforms are also interesting because they allow

us to evaluate the net 'exchequer cost' of the reforms, i.e. what the reforms will cost the government to implement in the form of lost tax revenue and/or increased benefit payments. We calculate the exchequer cost in two stages:

1. *The cost in the absence of employment effects:* This is calculated using the IFS TAXBEN model (except in the case of the working families' tax credit)[49] and has a simple interpretation — it measures the change in government revenue arising from the fact that, if the tax and benefit system changes, people will be paying different amounts of taxes and/or benefits from what they were paying prior to the reform. This simple calculation takes no account of the possibility that individuals might change their labour supply (for example, by moving into work) as a result of the reform. TAXBEN simply assumes that individual behaviour is unchanged and the changes in tax receipts and benefit payments by the government are calculated for everyone in the FRS and then 'grossed up' so that they are an estimate of what the reform would cost the government over the British economy as a whole. These cost estimates are shown in Table 6.9.

[49]We do not use the TAXBEN model to estimate the cost of implementing WFTC because TAXBEN tends to underestimate the extent of family credit and WFTC payments, and hence the cost of extending the generosity of WFTC (see Giles and McCrae (1995) for reasons why this is the case). Instead, we use the Treasury's estimate of £1.3 billion for the cost of the reform here. However, we are forced to use the TAXBEN model for estimates of the *combined* cost of the reforms as no comparable Treasury estimates are available.

TABLE 6.9

Estimated exchequer cost of different reforms assuming no employment effects

Reform	*Exchequer cost assuming no employment effects (£m)*
WFTC	1,300[a]
NI reforms	2,490
10p tax rate	3,300
Combined	6,750

[a]Estimate from HM Treasury (1998). Other costings are derived from the IFS TAXBEN model.

2. *Changes in the exchequer cost arising from movements into work as a result of the reform:* Because our policy simulation estimates imply that some people will move into work as a result of the reforms, it is possible that this will affect the cost to the government. If an individual previously on benefits moves into work and comes off benefits, perhaps paying tax on his or her earnings, this reduces the cost of the reform to the government. On the other hand, for some people, this may be offset by in-work benefits. We estimate the change in the exchequer cost arising from the movements into work through the stock reductions that we estimate in this section. We provide a detailed discussion in Appendix G, but essentially our methodology calculates an average reduction (or increase) in the exchequer cost that occurs when someone in a given cell moves into work, grosses this up and then multiplies it through by the change in stock for people in that cell. Adding the cell estimates together then gives the overall change in the cost to the exchequer arising from the fact that some people move into (or out of) work. Because we calculate short- and long-run measures of the stock reduction, we also have short- and long-run measures of the exchequer cost.

We have calculated the employment and exchequer cost effects for each of the tax and benefit reforms individually as well as for the combined set of reforms. We have, however, excluded the minimum wage from our calculations in this section. This is because the framework that we used to look at the impact of the minimum wage on the probability of work entry in Table 6.1 is too unrealistic to allow sensible measures of the employment effects of a minimum wage to be constructed — the calculations there were meant to show the possible impact on work *incentives* of job offers at the minimum wage rate being available, rather than the actual impact on employment.

The first reform we consider in this section is the introduction of working families' tax credit. The results in Table 6.10 are split into short-run and long-run predicted effects, and these are split in turn into three columns. The first column gives our estimates of the number of extra people moving into work (i.e. the stock reduction). The second column expresses this as a percentage of the initial stock. The final column gives our estimate of the *change* in the exchequer cost arising from these predicted stock reductions (i.e. the amount to which movements into work offset the cost of implementing the reform). Adding the overall change in cost to the costings shown in Table 6.9 gives the predicted net cost of WFTC.

Table 6.10 shows that, in the short run, WFTC is predicted to reduce unemployment and economic inactivity by just under 12,000 people, or about 0.16 per cent of the total stock. The long-run effects are about seven to eight times larger, at just under 92,000. The extra people moving into work are mainly lone mothers and married people whose spouses are not in work. Meanwhile, there is a substantial reduction in the numbers of married women *with* working partners

TABLE 6.10

The employment effects and costs of WFTC

Group	*Short-run effects*			*Long-run effects*		
	Number moving into work	*Stock change (%)*	*Change in cost (£m)*	*Number moving into work*	*Stock change (%)*	*Change in cost (£m)*
Men						
Single, not living with parents	640	–0.05	–5	4,680	–0.39	–31
Single, living with parents	0	0	0	0	0	0
Married, partner working	710	–0.15	–4	1,950	–0.40	–12
Married, partner not working	4,770	–0.58	–40	24,000	–2.93	–197
Women						
Single, no children	0	0	0	0	0	0
Lone mothers	8,920	–1.09	–30	56,850	–6.96	–187
Single, living with parents	360	–0.18	–1	2,820	–1.38	–4
Married, partner working	–7,830	+0.38	+14	–39,850	+1.96	+73
Married, partner not working	4,370	–0.44	–19	41,270	–4.18	–181
TOTAL	11,940	–0.16	–84	91,720	–1.23	–540

entering work. The largest percentage reductions in the stock in the short run are for lone mothers and for married men with non-working partners. In the long run, the largest percentage reductions are also for lone mothers — almost 7 per cent of non-working lone mothers are predicted to move into work as a result of WFTC.

In terms of costings, we predict that the £1.3 billion per year estimate of the cost of WFTC in the absence of employment effects will be offset by about £85 million

in the short run but by as much as £540 million in the long run. Hence the employment effects could eventually offset around a third of the expected initial cost. However, it should be stressed that our simulation of WFTC does not include the extra childcare assistance in the package, which may turn out to be the most costly feature of WFTC if enough families take advantage of it.

Next, in Table 6.11, we look at the predicted employment and cost impacts of the reforms to employee National Insurance. The pattern of short- and

TABLE 6.11

The employment effects and costs of the NI reforms

Group	*Short-run effects*			*Long-run effects*		
	Number moving into work	*Stock change (%)*	*Change in cost (£m)*	*Number moving into work*	*Stock change (%)*	*Change in cost (£m)*
Men						
Single, not living with parents	2,300	–0.19	–15	15,810	–1.33	–99
Single, living with parents	1,640	–0.39	–6	4,480	–1.07	–17
Married, partner working	1,800	–0.38	–11	6,180	–1.29	–37
Married, partner not working	960	–0.12	–7	6,200	–0.76	–47
Women						
Single, no children	1,640	–0.30	–8	10,630	–1.97	–52
Lone mothers	890	–0.11	–3	5,970	–0.73	–20
Single, living with parents	1,290	–0.63	–4	3,690	–1.81	–12
Married, partner working	8,230	–0.40	–17	44,580	–2.19	–91
Married, partner not working	1,200	–0.12	–5	17,730	–1.80	–74
TOTAL	19,940	–0.27	–77	115,280	–1.54	–448

long-run effects by family type for the NI reforms is rather different from that for WFTC. Here, the stock reductions (as a percentage of the total stock) are much more similar between groups, as one might expect, given that the reform improves work incentives for everyone who is capable of earning a wage that would take them above the NI floor, rather than being targeted at a specific group of people. In the short run, the biggest reduction in the stock in percentage terms is for single women living with their parents, at just over 0.6 per cent, whereas in the long run it is for married women with working partners, at about 2.2 per cent. Overall, the reform is predicted to reduce the stocks of non-working people by just under 20,000 in the short run and by about 115,000 in the long run. The cost estimates for the NI reform in the absence of employment effects are in the region of £2.5 billion and, on our estimates, the extra people moving into work reduce this bill by about a fifth — £448 million — in the long run.

It is very instructive to compare the results for the NI reforms with the results for the 10p starting rate of income tax, as, in many ways, the reforms have similar aims. They both aim to encourage work incentives lower down the earnings distribution; the NI reforms will reduce contributions for everyone whose earnings take them above the NI threshold (currently £64 per week), whilst the 10p tax rate reduces tax payments for anyone whose earnings are above their personal allowance threshold (currently around £81 per week for a single person). However, the reforms also reduce tax payments for everyone higher up the earnings distribution, rather than being specifically targeted on the low-paid.

TABLE 6.12

The employment effects and costs of the 10p tax rate

Group	*Short-run effects*			*Long-run effects*		
	Number moving into work	*Stock change (%)*	*Change in cost (£m)*	*Number moving into work*	*Stock change (%)*	*Change in cost (£m)*
Men						
Single, not living with parents	1,810	–0.15	–12	12,410	–1.05	–78
Single, living with parents	1,010	–0.24	–4	2,780	–0.34	–11
Married, partner working	1,560	–0.33	–10	5,380	–1.12	–33
Married, partner not working	760	–0.09	–6	4,870	–0.60	–37
Women						
Single, no children	1,090	–0.20	–6	7,020	–1.30	–34
Lone mothers	470	–0.06	–2	3,100	–0.40	–11
Single, living with parents	870	–0.43	–3	2,350	–1.15	–8
Married, partner working	5,500	–0.27	–11	29,910	–1.47	–62
Married, partner not working	550	–0.06	–2	8,150	–0.83	–35
TOTAL	13,650	–0.18	–55	75,970	–1.02	–308

Table 6.12 shows that, on our predictions, the 10p tax rate delivers less of a stock reduction than the NI reforms in both the short run and the long run. Over both horizons, the overall predicted stock reduction is about 70 per cent of what is predicted for the NI reforms. Breaking the stock reductions down by family type shows a similar pattern to that found for the NI reforms: the largest percentage reduction in the short run is for single women living with their parents, whereas in the long run it is for married women with working partners. In the long run, the extra men and

women who move into work are predicted to offset the cost of the reform by just over £300 million. Given that the estimate of the cost of the reform excluding employment effects is £3.3 billion, this is a smaller offset against that initial cost than for either of the other two reforms.

The remaining results in this section, presented in Table 6.13, show the predicted stock reductions and offsets in the costs of implementation when the reforms

TABLE 6.13

The employment effects and costs of the combined set of reforms

Group	*Short-run effects*			*Long-run effects*		
	Number moving into work	*Stock change (%)*	*Change in cost (£m)*	*Number moving into work*	*Stock change (%)*	*Change in cost (£m)*
Men						
Single, not living with parents	4,830	–0.41	–31	32,850	–2.77	–208
Single, living with parents	2,700	–0.65	–10	7,320	–1.76	–28
Married, partner working	4,020	–0.84	–25	13,170	–2.75	–80
Married, partner not working	6,710	–0.82	–55	35,630	–4.36	–286
Women						
Single, no children	2,850	–0.53	–14	18,040	–3.34	–88
Lone mothers	10,920	–1.34	–37	68,420	–8.38	–226
Single, living with parents	2,570	–1.26	–8	8,880	–4.35	–24
Married, partner working	5,630	–0.28	–13	34,680	–1.70	–79
Married, partner not working	6,380	–0.65	–28	68,040	–6.90	–293
TOTAL	46,610	–0.62	–221	287,020	–3.84	–1,311

Note: The long-run percentage changes in the stock are not exactly the same as the expected duration changes in Table 6.7, even though they are proportional in theory, because the changes in expected duration are calculated over slightly different-sized 'cells'. This is explained in more detail in Appendix G.

are combined. As we found when looking at the combined effects of the reforms on the probability of moving into work in Table 6.5, the overall estimate of the numbers of people moving into work, and the consequent reduction in the amount that the reforms will cost the exchequer, are roughly equal to the sum of the individual stock and cost reduction estimates. Overall, in the short run, around 47,000 extra people are predicted to move into work and this saves the exchequer around £220 million on an overall implementation cost of £6.75 billion. In the long run, around 287,000 extra people move into work — just under 4 per cent of the total unemployed and economically inactive stock — and this offsets the cost of implementing the reforms by just over £1.3 billion, or about 20 per cent of the reform cost. These results show, first, that the combined package of reforms could have a moderately sized impact on the stock of unemployed and economically inactive people in Britain, and, second, that taking into account reductions in the estimated cost of reforming the tax and benefit system due to the prediction that extra people will move into work as a result of the reform makes an important difference to the cost of a reform.

6.4.10. Cost-effectiveness of different reforms

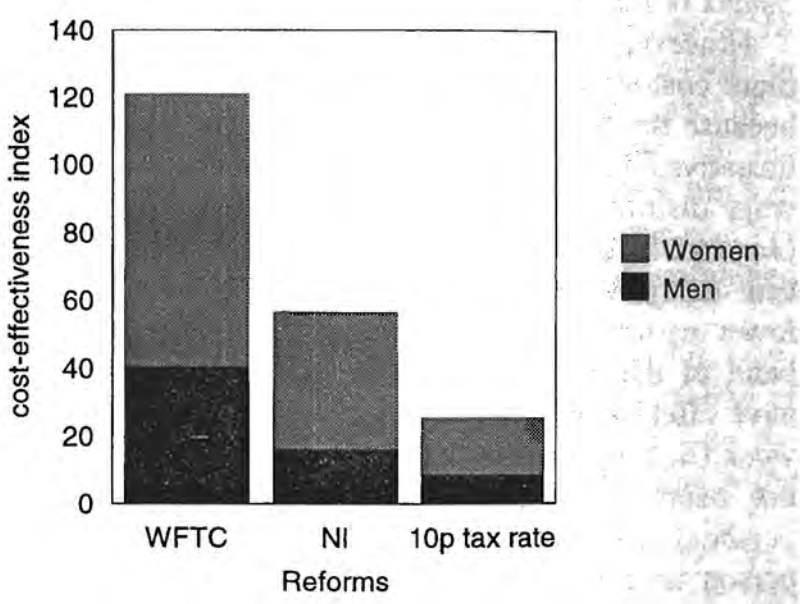
Continuing down the path of reform evaluation, we can do a simple comparison of how 'cost-effective' each reform is. In evaluating the cost-effectiveness of each reform, we ask the following question: 'how many people move into work as a result of the reform, and what is the cost to taxpayers of implementing the reform?'. By taking the ratio of the number of people moving into work as a result of the reform to its exchequer cost in millions of pounds, we can arrive at

an 'index of cost-effectiveness' which enables us to compare different reforms.[50]

Figure 6.1 plots the index of cost-effectiveness for each reform as a bar chart, showing men and women as separate contributors to the height of each bar. It shows that WFTC is more cost-effective than the National Insurance reform, which in turn is more cost-effective

FIGURE 6.1

The cost-effectiveness of different reforms



[50]We should be careful to stress that our definition of 'cost-effectiveness' — i.e. the number of people moving into work for a reform costing a given amount of taxpayer funds — is not the whole story as far as the effectiveness of a reform is concerned. For one thing, there are other dimensions of cost-effectiveness (for example, the extent to which reforms affect the hours of work and effort made by those already in work, or affect *exit from* work), which we do not consider. Additionally, many other issues, such as the distributional effects of reforms, how they affect the administration of the tax and benefit system, the level of public support for reforms and so on, are also important.

than the 10p tax rate. It is interesting to ask why this might be the case in terms of the way the policy operates.

One possible reason is that WFTC is better targeted on specific groups who are felt to be 'on the margin' of labour market participation (such as single mothers and married women with children); most empirical work shows that the labour supply of these groups tends to be more sensitive to financial incentives than that of other groups. Hence, for a given outlay, WFTC may be a more effective means of increasing entry into work than the tax or NI reforms.

However, it is also interesting that the NI reform is more cost-effective than the 10p tax rate. This may be because the NI reform does more to improve financial incentives for workers near the bottom of the entry wage distribution than the 10p tax rate does. There are two aspects to the NI reform: the removal of the 2 per cent entry fee into NI and the sychronisation of the lower earnings limit for contributions with the lower band of the income tax system. Both of these would have affected workers earning between £64 and £81 a week (in the 1997–98 tax system). By contrast, the 10p tax band only helps employees earning above the personal allowance threshold (£81 a week for a single person in 1997–98), so it has no effect on incentives where entry wages are very low. As we saw in specification (5) of the results in Chapter 5, changes in financial incentives appear to matter more when the gains to be had from work are low to start off with. This is precisely the case for individuals who would move into work at wages that paid above the NI entry fee threshold but below the income tax threshold. It may be that the NI reform is predicted to be more cost-effective than the 10p starting rate of income tax because it offers more to individuals moving into work at lower wages

(although it is still no help to those whose wages would fall below the NI entry fee threshold).

To sum up this section, then, our prediction is that WFTC would increase entry into work more than either the NI reform or the 10p starting rate of tax, and at less cost. Of course, this does not necessarily imply that WFTC is the 'best' reform, as this is only a very narrow criterion for comparison and, in any case, the reforms are intended to work as a package.

The 'cost per job'

Another way of expressing the cost-effectiveness of the different policy reforms which is used a lot in discussions in the media is the 'cost per job' of a reform. This basically measures the cost to the exchequer of getting one extra person into work through a reform. Table 6.14 shows our estimates of the cost per job of the individual reforms and of the combined package in the long run.

This is simply another way of looking at the cost-effectiveness of the reforms, so the ranking in terms of which reform is the most cost-effective should be the same as in Figure 6.1. Table 6.14 shows that this is the case. At around £39,400 per job, the 10p tax rate is almost five times as expensive per job as WFTC. The NI reform is somewhere in between, at around £17,700 per job.

TABLE 6.14

The cost per job of different reforms

Reform	*Cost per job (£ thousands)*
WFTC	8.3
NI reform	17.7
10p tax rate	39.4
Combined package	18.9

6.5. Comparing Our Results with Previous Work

To round off this chapter, it is useful to assess how our policy simulation results compare with previous research, both in the UK and elsewhere. It is difficult to make precise comparisons between countries because the details of the way the tax and benefit systems are run in each country are often very different. This means that, even if the underlying labour market conditions and the attitudes towards work of unemployed and economically inactive people in different countries were similar, studies in different countries are likely to look very different because of the particular quirks of each system. Even in the UK, it is difficult to compare our work with studies done in earlier periods because the reforms to the tax and benefit system conducted in the 1980s (for example) had different features from the reforms that the present government is implementing. In addition, the overall operation of the labour market and the macroeconomic circumstances may have been quite different. Hence, in this section, we start by comparing our results with the most recent work available that uses UK data, and then we follow this up with some more guarded comparisons with work from other countries.

The recent work that is most relevant for our purposes comes from Duncan and Giles (1998), who simulate the impact of the introduction of WFTC in the context of a discrete-choice model of labour supply using FRS data from 1994 to 1996. The budget constraints are calculated using TAXBEN and the model categorises individual labour supply into a number of 'regimes', including non-participation, unemployment and work at a variety of different hours levels. The analysis is restricted to lone mothers only. The results from the Duncan and Giles paper suggest that the introduction of WFTC will decrease the proportion of

unemployed and/or economically inactive lone mothers in the UK from about 76.9 per cent of the sample to 73.2 per cent. This translates to a stock reduction of around 4.8 per cent of the original stock. Because Duncan and Giles use cross-section data from the FRS rather than a panel dataset, they are essentially simulating how WFTC would change participation rates in a static equilibrium framework. Our estimate of the reduction in the stock of unemployed and economically inactive lone mothers resulting from WFTC is around 2 percentage points higher than the Duncan and Giles estimate, but it could be that this difference arises because we have not taken into account possible increases in the exit rate from work arising from the reform, and, if we were able to do this, our resulting prediction might be smaller. On the other hand, another important difference between the two papers is that we have used the QLFS entry wage information to predict the wages earned by unemployed and economically inactive people if they were to enter work, whereas Duncan and Giles use a standard selectivity-adjusted wage equation prediction. One might expect that this would tend to make our estimates *smaller* than theirs, because the predictions of wages for unemployed people using the entry wage assumptions appeared to be lower, in general, than the selectivity-adjusted wage predictions (at least on the selectivity adjustment we used), and hence the gains from work are smaller. Thus one might expect a study based on entry wages to predict smaller labour supply effects of reforms than a study based on selectivity-adjusted predictions from the overall wage distribution. But, in any case, the results of the two studies are not wildly different.

Another recent study that looks at the effect of a specific programme on entry into work is Card and Robins (1996), who evaluated the Canadian Self-

Sufficiency Project (SSP). This is an extremely generous in-work benefit which was designed for single parents who had been on Income Assistance (the Canadian equivalent of income support) for at least a year without finding work. For lone parents who moved into work in a job working 30 hours or more per week, the SSP provided an earnings supplement equal to half the difference between the claimant's gross earnings and a 'bench-mark' level of earnings. The bench-mark was set at around $37,000 per annum (around £15,000 per year at current exchange rates) in the province of British Columbia, meaning that a claimant working 35 hours per week in a job paying $7 per hour (around the average entry wage for people who moved into work in the programme) would earn $12,740 per year and receive an earnings supplement of $12,130 per year. Hence SSP provided a huge incentive to move into work, in some cases doubling the expected gains from working. The SSP experiment was conducted in a framework of *random assignment*, whereby some of the lone parents who were eligible were randomly selected and put in a control group who did *not* receive SSP. Theoretically, the impact of SSP can be deduced in this framework by simply comparing the 'treatment group' (who did receive SSP) with the control group. Card and Robins found that 15 months after the start of the programme, 41 per cent of the treatment group who started the panel unemployed had moved into work compared with only 28 per cent of the control group. Thus the programme appears to have had large effects.

It is difficult to do a side-by-side comparison of our results with those of Card and Robins, for several reasons: they were only looking at a subset of lone parents who had been unemployed and seeking work for at least a year, and it is difficult to know whether the labour market conditions in Canada in 1992–95 were

comparable with those existing in the UK in 1994–95. However, the fact that a programme that provides big work incentives does produce strong effects seems to be reasonably in line with what we have found for the UK. This is backed up by the evidence from Bingley and Walker (1997) for the UK and Eissa and Liebman (1996) in the US.

To sum up, as far as it is possible to compare our results with previous work, the findings from the policy simulations appear to be reasonably in line with the results of other recent studies we have looked at.

CHAPTER 7
Conclusions

This project was undertaken with the aim of finding out whether reforms to the tax and benefit system could have an important impact on the numbers of people entering or returning to work after a period of unemployment or labour force inactivity. We used data on labour force transitions and the wages people earned on entry into work in 1994–95 from the Quarterly Labour Force Survey and combined these with calculations of the effect of the tax and benefit system running on data from the Family Resources Survey to address this question. To our knowledge, this is the first piece of research in the UK that relates the labour supply decisions of unemployed and economically inactive people to the actual wages earned by those who move into work, as opposed to the wage distribution as a whole. The results in Chapter 5 suggest that the financial return to working does affect the probability of entering work for both men and women. The effects seem to be slightly larger for women than for men.

The policy simulations that were conducted in Chapter 6 compared the effectiveness of the working families' tax credit, reforms to employee National Insurance and the 10p starting rate of income tax which the Blair government has implemented or is planning to implement shortly in Britain. We found that, although all three reforms increase the numbers of people entering work, WFTC is predicted as having the largest positive effect at the lowest cost to the public purse. Overall, our model predicts that the reforms would increase the expected financial return to work by around

7.7 per cent for men and around 6.5 per cent for women. We estimate that, disregarding any changes in exit rates from work that might be induced by the reforms, this would increase employment in Britain by around 47,000 people over a one-year period due to increased rates of entry into work. Over the long run, the increase could be as much as 290,000, which corresponds to reducing the size of the 'stock' of unemployed and economically inactive working-age men and women by just under 4 per cent. Although this decrease is unlikely to be large enough to completely transform the labour market, the finding is potentially good news for those (including the present government) who see 'welfare-to-work' programmes as a means of reducing unemployment and economic inactivity rates amongst the working-age population. Our findings seem to fit in with the general pattern suggested by other recent research both in the UK and elsewhere.

In addition to this, the report has documented many interesting facts about the characteristics of people entering work compared with those who stay out of work for the duration of their time in the QLFS, and those who are in employment to begin with. At the same time, we examined the distribution of entry wages in the QLFS and compared it with the overall distribution of wages amongst all employees, finding that the former distribution had a lower mean and was more compressed than the latter. We made a detailed study of the effect of using different estimates of the wages that people not presently in work might receive if they were to enter work, and found that using actual entry wages in this procedure gave rise to very different calculations of the returns to work for the unemployed group from those using the complete distribution of wages for employees (even after making a correction for self-selection into the labour force). We also looked at the

implications of the distribution of entry wages for the effect that a minimum wage might have on new entrants into work and concluded that the minimum wage affects a much larger proportion of new entrants into work than of employees as a whole. This finding is potentially interesting from a policy perspective.

There are many ways in which it would be beneficial to extend the analysis in this report, and we have chosen to outline below what we think would be the three most important extensions.

Looking at Exit from Work as well as Entry

There is an important sense in which almost everything we have done in this report is only half the story, because we have only looked at transitions into work from unemployment or economic inactivity, rather than transitions into unemployment or inactivity from work as well. Although we have been able to provide estimates of the effect of the tax and benefit system on the numbers of people *entering* work, to get an overall estimate of the effect on employment rates in the population we would have to obtain an estimate of the effect of taxes and benefits on *exit from* work. This could perhaps be combined with an analysis of 'exit wages', i.e. the wages that individuals were earning just before they left work. The QLFS is a good survey for looking at the reasons for work exit because it includes information on the reasons each individual left their previous job (redundancy, dismissal, etc.). However, until 1997, there was no way of looking at exit wages in the QLFS because wage information was only taken in the fifth and final quarter. From Spring 1997 onwards, the QLFS has been redesigned so that wage information is asked for in the first quarter as well. Hence the most recent waves of the QLFS contain exit wage

information for people who left their job between the start and end of the panel, entry wage information for people who moved into work during the panel, and wage growth information for those who remained in employment throughout. With this additional information, it should be possible to do a much more complete and fully balanced analysis. However, this will have to wait until a sufficient quantity of the new data is available.

Ex-Post Evaluation of the Effects of the Reforms

As mentioned in Chapter 1, our attempt to predict the effects of the forthcoming tax and benefit reforms on the extent of entry into work is very much a first pass, and it should be possible to do a much more accurate analysis once the reforms are set in place. We would then be measuring the *actual* effects of the reforms rather than simulating the effects using data obtained from an earlier period where the tax and benefit system did not change. An *ex-post* evaluation of reforms such as the working families' tax credit and the 10p tax rate is an exciting project for future research, but of course we need to wait a few years for the necessary data.

More Complex Modelling of Labour Supply Decisions for Married Couples

As we saw in Chapters 4, 5 and 6, the issue of how to model labour supply responses for married or cohabiting couples, where both partners may have the opportunity and the desire to move into or out of employment in response to a reform, is a thorny one. For one thing, it is difficult to decide how to model the division of income within the household; does the fact that wages and benefits are paid to the husband or the wife specifically affect the relative incomes that each

partner ends up receiving, and if so, how does this affect the individual partner's calculation of his or her 'gains from working'? We side-stepped this issue in the report by using total household income as our measure of 'income out of work' for husband and wife alike; this is a simple way of approaching the problem but hardly a convincing solution. Moreover, if we wish to assess interactions between the labour supply *behaviour* of husbands and wives, and perhaps joint decision-making in this area, the problem increases in complexity by another order of magnitude. There have been some attempts to address these issues of intra-household decision-making in the literature (see, for example, Apps and Rees (1996)) but we are still a long way away from a fully acceptable model of labour supply choice for married people.

Subject to these caveats, we feel that the analysis in this report has managed to shed some light on the likely effects of the tax and benefit reforms that the government is planning to introduce. It is to be hoped that the next few years will allow researchers to build on the present foundations so that we can construct a more accurate picture of how the tax and benefit system affects labour market transitions.

APPENDIX A
Data Selection

A.1. Quarterly Labour Force Survey

The sample from this survey that we use is all individuals aged 18 or over and below compulsory retirement age (60 for women, 65 for men) who are not in work in the first quarter of the panel. From this initial sample of 12,033 observations, we remove full-time students, severely disabled people and people who move into self-employment over the QLFS panel (as explained in Section 3.3). We are also forced to drop observations where some of the information that we need to estimate our preferred model of moving into work was not properly recorded. Table A.1 shows the reductions in the available sample that occur due to these factors. In addition to this, there are a lot of missing data on entry wages for those people who entered work in the QLFS sample, as shown in the second part of Table A.1.

TABLE A.1

Sample selections and missing data, QLFS

Description of sample selection	*Reduction*	*Usable sample*
Initial sample, working age, not in work in 1st quarter of panel		12,033
Minus Missing information on employment status	–15	12,018
Minus People who move into self-employment in 5th quarter	–325	11,693
Minus Missing information on when left full-time education	–95	11,598
Minus Full-time students	–740	10,858
Minus Severely disabled	–405	10,453
Sample selection: entry wages		
Initial sample, people moving into work as employees		2,016
Minus Missing information on gross weekly wages	–331	1,685
Minus Missing information on hours worked	–375	1,310

A.2. Family Resources Survey

Table A.2 shows the sample selections that are made for the FRS due to missing data and in order to match the specifications of the QLFS exactly.

TABLE A.2

Sample selections and missing data, FRS

Description of sample selection	*Reduction*	*Usable sample*
Initial sample, working age, not in work in 1st quarter of panel		9,627
Minus Missing information on when left full-time education	–137	9,490
Minus Full-time students	–450	9,040
Minus Severely disabled	–771	8,269
Minus Missing information on homeownership	–2	8,267

APPENDIX B
Dataset Compatibility

Because we are using two different datasets — the Quarterly Labour Force Survey and the Family Resources Survey — in this analysis, there is a need to check that the two sources are 'compatible'. By this we mean that it is important that there are not systematic differences between the probability of working conditional on various characteristics in the FRS sample and the conditional probabilities in the QLFS sample when the individuals are first surveyed. This is crucial because our approach groups together individuals of similar characteristics in cells and then assumes that, at the cell level, data are freely transferable between both datasets. If the conditional probabilities of employment in QLFS cells with similar characteristics to their counterpart FRS cells are very different from those in FRS cells, then our approach is invalid. This could occur, for example, if there were different patterns of non-response to survey questionnaires in the surveys that could not be controlled for. A good way of checking for the compatibility of the two datasets is to run a regression of employment status on other characteristics in each survey and then to compare coefficients.[51] Obviously, we cannot compare the panel

[51]Note that it is the *conditional* probabilities of working that matter for dataset compatibility — i.e. the probability of working after controlling for other factors — and not the raw proportions of people in work in each dataset. The raw proportions might differ because different surveys systematically oversampled different subgroups of the population (for example, unemployed people), the survey designers being particularly interested in these groups. However, if this can be controlled for by observable characteristics, then it should not matter.

aspect of the QLFS with the FRS because the FRS is not a panel. But we can treat the first quarter of the QLFS panel as a cross-section and compare that with the FRS cross-section. This is done below, where participation probit equations are estimated for men and women in the QLFS and FRS.

The results are relatively reassuring. For men, there are some differences in the coefficients between the QLFS and FRS regressions (Tables B.1 and B.3), most importantly that men in the 18–24 age-group seem around 7 percentage points less likely to be in work in the FRS compared with the base group of men aged 25–35, whereas in the QLFS this is not the case. There are also some minor differences in the pattern of correlation between educational attainment by participation and age, although again these are only significantly different for the youngest age-group. Additionally, there is some variation in the regional pattern of participation between the two datasets for men, mainly attributable to lower participation by the base group (Scottish men) in the FRS. Whilst it might be thought that the difference between the conditional participation probabilities for the 18–24 age-group in the QLFS sample and those in the FRS sample is due to problems of non-response that are sample-specific, this is not backed up by the results for women in Tables B.2 and B.4, which are very similar across the board. Similarly, the regional patterns of participation are much more similar across the two female samples.

In summary, despite some anomalies between the datasets in the male sample, we are confident that our data sources are reasonably compatible.

TABLE B.1

Participation probit, QLFS 1994–95 sample: men

Dependent variable: In employment vs. Not in employment

Variable	*Marginal effect*	*Standard error*	*t-statistic*
Age 18–24	–0.0042181	0.0136499	–0.31
Age 36–49	–0.0357788	0.008132	–4.50
Age 50+	–0.1307996	0.0112659	–13.47
Education: post minimum age	0.0802141	0.0095009	8.30
Education × Age 18–24	–0.0899966	0.0218257	–4.85
Education × Age 36–49	–0.0208616	0.0130995	–1.64
Education × Age 50+	–0.0463437	0.158023	–3.22
Youngest child aged 0–4	0.0224112	0.0074667	2.85
Youngest child aged 5–18	0.0051783	0.0066912	0.77
Married, partner working	0.1428333	0.0069376	20.95
Married, partner not working	–0.0029316	0.0073987	–0.40
Living with parents	0.0790356	0.0073882	7.62
Homeowner	0.1905236	0.0073599	30.27
Region			
North	–0.0981995	0.0157914	–7.35
Yorkshire and Humberside	–0.0360414	0.011623	–3.34
North-West	–0.044532	0.0113025	–4.29
East Midlands	–0.0094457	0.0113801	–0.85
West Midlands	–0.0189979	0.0108097	–1.83
East Anglia	0.0014574	0.0134572	0.11
London	–0.0599466	0.0121681	–5.51
South-East	–0.000268	0.0089134	–0.03
South-West	0.0079204	0.0103173	0.75
Wales	–0.0710613	0.0150846	–5.40
Number of observations			22832
Log likelihood			–8205.0986
Pseudo R^2			0.1698

TABLE B.2

Participation probit, QLFS 1994–95 sample: women

Dependent variable: In employment vs. Not in employment

Variable	*Marginal effect*	*Standard error*	*t-statistic*
Age 18–24	−0.0289836	0.0172967	−1.71
Age 36–49	−0.0687034	0.0114801	−6.04
Age 50+	−0.2314482	0.014545	−16.61
Education: post minimum age	0.099557	0.0113165	8.74
Education × Age 18–24	−0.0513013	0.0250449	−2.12
Education × Age 36–49	−0.0148201	0.015516	−0.96
Education × Age 50+	−0.0651881	0.0189692	−3.57
Youngest child aged 0–4	−0.4502001	0.0103311	−41.51
Youngest child aged 5–18	−0.150463	0.0090827	−17.07
Married, partner working	0.1130747	0.0086094	13.34
Married, partner not working	−0.1610987	0.0123662	−13.80
Living with parents	0.1645433	0.0132545	9.51
Homeowner	0.2032604	0.0085877	24.56
Region			
North	−0.0417338	0.0168662	−2.54
Yorkshire and Humberside	−0.0130445	0.0144004	−0.91
North-West	−0.0203808	0.0137777	−1.50
East Midlands	−0.0266508	0.0157382	−1.72
West Midlands	−0.0186193	0.0143414	−1.31
East Anglia	−0.0273361	0.019522	−1.43
London	−0.0571672	0.0146598	−4.03
South-East	−0.0155964	0.0123893	−1.27
South-West	−0.0072766	0.0146912	−0.50
Wales	−0.0682496	0.0182164	−3.91
Number of observations			23964
Log likelihood			−12296.209
Pseudo R^2			0.1614

TABLE B.3

Participation probit, FRS 1994–95 sample: men

Dependent variable: In employment vs. Not in employment

Regressor	*Marginal effect*	*Standard error*	*t-statistic*
Age 18–24	–0.0720857	0.0187211	–4.25
Age 36–49	–0.0623636	0.011864	–5.45
Age 50+	–0.1650743	0.0152165	–12.40
Education: post minimum age	0.0389717	0.0118603	3.27
Education × Age 18–24	0.0004729	0.0189347	0.02
Education × Age 36–49	0.0234168	0.0149762	1.52
Education × Age 50+	–0.0332925	0.0189914	–1.85
Youngest child aged 0–4	0.0035892	0.0104694	0.34
Youngest child aged 5–18	–0.0044975	0.0093013	–0.49
Married, partner working	0.1902178	0.0085358	21.77
Married, partner not working	0.0275266	0.0088415	3.00
Living with parents	0.1093985	0.0074881	9.81
Homeowner	0.2286633	0.0090662	28.31
Region			
North	–0.0382237	0.016949	–2.41
Yorkshire and Humberside	–0.0143617	0.0142019	–1.04
North-West	–0.0032994	0.0130446	–0.25
East Midlands	0.0257603	0.0128868	1.89
West Midlands	0.0337783	0.0118418	2.64
East Anglia	0.059273	0.0131914	3.74
London	0.003824	0.0128162	0.30
South-East	0.0462963	0.0103022	4.16
South-West	0.0299848	0.0121375	2.31
Wales	–0.0474833	0.0186698	–2.76
Number of observations			15313
Log likelihood			–6031.1936
Pseudo R^2			0.1886

TABLE B.4

Participation probit, FRS 1994–95 sample: women

Dependent variable: In employment vs. Not in employment

Regressor	*Marginal effect*	*Standard error*	*t-statistic*
Age 18–24	–0.0219468	0.0197265	–1.12
Age 36–49	–0.0495298	0.0149802	–3.33
Age 50+	–0.2157711	0.0180341	–12.30
Education: post minimum age	0.0921854	0.0139727	6.58
Education × Age 18–24	–0.0625062	0.0281551	–2.28
Education × Age 36–49	–0.0203488	0.0198937	–1.03
Education × Age 50+	–0.0425449	0.0235468	–1.84
Youngest child aged 0–4	–0.4179516	0.0119211	–33.24
Youngest child aged 5–18	–0.1575026	0.0114031	–14.12
Married, partner working	0.1401707	0.0103574	13.57
Married, partner not working	–0.1329852	0.0146827	–9.41
Living with parents	0.1632004	0.0166764	8.03
Homeowner	0.2253291	0.010319	22.17
Region			
North	–0.0134864	0.0211818	–0.64
Yorkshire and Humberside	–0.0280854	0.0187151	–1.52
North-West	–0.0373033	0.0179099	–2.12
East Midlands	0.0020781	0.0193515	0.11
West Midlands	–0.0513543	0.0190742	–2.76
East Anglia	–0.0155273	0.0246151	–0.64
London	–0.0462877	0.0181415	–2.60
South-East	–0.0053436	0.0158942	–0.34
South-West	–0.0124513	0.0189745	–0.66
Wales	–0.0500814	0.0228092	–2.25
Number of observations			16076
Log likelihood			–8627.9421
Pseudo R^2			0.1572

APPENDIX C
Equations for Wage Assumptions in Chapter 3

TABLE C.1

Participation probit for selectivity correction to FRS wages

Dependent variable: In employment vs. Not in employment (FRS)

Regressor	*Marginal effect*	*Standard error*	*t-statistic*
Female	–0.2977508	0.0251144	–11.26
Male×Region:			
North	–0.0305617	0.0223846	–1.38
Yorkshire and Humberside	–0.0121697	0.0199224	–0.61
North-West	–0.0191935	0.0189363	–1.02
East Midlands	0.0472231	0.0194741	2.36
West Midlands	0.0534193	0.0184382	2.81
East Anglia	0.0622867	0.023556	2.54
London	0.0209781	0.018636	1.11
South-East	0.0655461	0.0158937	3.98
South-West	–0.0079218	0.0197494	–0.40
Wales	–0.0779415	0.0244396	–3.27
Female×Region:			
North	0.0036461	0.0201855	0.18
Yorkshire and Humberside	0.0073007	0.0177287	0.41
North-West	0.0011992	0.0169361	0.07
East Midlands	0.0514659	0.0178314	2.80
West Midlands	0.0035736	0.0177342	0.20
East Anglia	0.0333214	0.0226831	1.44
London	–0.0116652	0.0172898	–0.68
South-East	0.0490456	0.0147675	3.24
South-West	0.0010896	0.0181507	0.06
Wales	–0.0299662	0.0218034	–1.39
Male×Age:			
18–24	–0.1824179	0.0215646	–8.61
25–29	–0.0447322	0.0204151	–2.23
35–39	–0.048657	0.0249083	–1.99
40–44	–0.0872113	0.024653	–3.62
45–49	–0.1139714	0.0224554	–5.21
50–54	–0.1560434	0.0225042	–7.09
55–59	–0.2303625	0.0222453	–10.37

Continues overleaf.

TABLE C.1 continued

Regressor	*Marginal effect*	*Standard error*	*t-statistic*
Female×Age:			
18–24	–0.0079607	0.0191344	–0.42
25–29	–0.011816	0.0185826	–0.64
35–39	0.0553692	0.0209559	2.56
40–44	0.090351	0.0196215	4.33
45–49	0.0714128	0.0183865	3.72
50–54	0.0132364	0.0199731	0.66
55–59	–0.0851852	0.0227267	–3.84
Male×Education×Age:			
18–24	0.102776	0.0204458	4.63
25–29	0.1725138	0.0175705	8.14
30–34	0.1327028	0.0189267	6.22
35–39	0.11514	0.0206115	5.10
40–44	0.1625718	0.0185404	7.47
45–49	0.1770861	0.0168649	8.67
50–54	0.1405725	0.0201448	6.11
55–59	0.1062855	0.0229567	4.24
Female×Education×Age:			
18–24	0.128638	0.017533	6.55
25–29	0.165508	0.0150613	9.29
30–34	0.1051041	0.0167435	5.78
35–39	0.0702152	0.0204164	3.29
40–44	0.069514	0.0206642	3.21
45–49	0.1030304	0.0190259	5.00
50–54	0.0925108	0.0211939	4.07
55–59	0.0720783	0.0250191	2.74
Male×Single× Income out of work	–0.0043196	0.0001203	–36.20
Female×Single× Income out of work	–0.0019991	0.0000803	–24.97
Male×Married× Income out of work	–0.0013787	0.0000388	–35.84
Female×Married× Income out of work	–0.0003586	0.0000206	–17.43
Number of observations			31375
Log likelihood			–18416.832
Pseudo R^2			0.0980

TABLE C.2

Selectivity-adjusted FRS wage equation

Dependent variable: FRS log wage

Regressor	*Coefficient*	*Standard error*	*t-statistic*
Mills ratio	0.1295395	0.0194837	6.649
Female	–0.4041915	0.03593	–11.249
Male×Region:			
North	–0.0298721	0.0285538	–1.046
Yorkshire and Humberside	–0.0385195	0.0254046	–1.516
North-West	–0.0395583	0.0241884	–1.635
East Midlands	–0.0273539	0.0256844	–1.065
West Midlands	0.0125459	0.0243839	0.515
East Anglia	0.0385681	0.0312816	1.233
London	0.1491885	0.0243892	6.117
South-East	0.1655575	0.0214054	7.734
South-West	0.0124349	0.0253096	0.491
Wales	–0.0451897	0.0310486	–1.455
Female×Region:			
North	–0.0458895	0.0286918	–1.599
Yorkshire and Humberside	–0.0499713	0.0252081	–1.982
North-West	–0.0291952	0.0240305	–1.215
East Midlands	–0.0205452	0.0259778	–0.791
West Midlands	–0.0280581	0.0250968	–1.118
East Anglia	–0.0308435	0.0323977	–0.952
London	0.2127891	0.0244393	8.707
South-East	0.0585687	0.0215269	2.721
South-West	–0.0920074	0.0256001	–3.594
Wales	–0.0878551	0.0305798	–2.873
Male×Age:			
18–24	–0.4562516	0.0266439	–17.124
25–29	–0.1261882	0.0251194	–5.024
35–39	–0.0064161	0.0314602	–0.204
40–44	–0.0160803	0.0312069	–0.515
45–49	0.0145419	0.0281214	0.517
50–54	–0.0076711	0.028388	–0.270
55–59	–0.0991153	0.0301038	–3.292
Female×Age:			
18–24	–0.1103131	0.0289778	–3.807
25–29	0.0106517	0.0285538	0.373
35–39	0.0155236	0.0331592	0.468
40–44	0.0155699	0.0316064	0.493
45–49	–0.0068324	0.0290923	–0.235
50–54	–0.0193899	0.0302454	–0.641
55–59	–0.0820117	0.0342769	–2.393

Continues overleaf.

TABLE C.2 continued

Regressor	*Coefficient*	*Standard error*	*t-statistic*
Male×Education×Age:			
18–24	0.1161709	0.0312555	3.717
25–29	0.3320648	0.0279849	11.866
30–34	0.3603342	0.0267307	13.480
35–39	0.3307372	0.0311966	10.602
40–44	0.4362153	0.0315887	13.809
45–49	0.5123443	0.029602	17.308
50–54	0.4668293	0.0336325	13.880
55–59	0.4278321	0.0396753	10.783
Female×Education×Age:			
18–24	0.1440255	0.0299601	4.807
25–29	0.3718387	0.0285235	13.036
30–34	0.4113774	0.0282795	14.547
35–39	0.2872581	0.0316214	9.084
40–44	0.3652976	0.0301557	12.114
45–49	0.4166005	0.0289415	14.395
50–54	0.3949019	0.0336167	11.747
55–59	0.4137883	0.0431785	9.583
Constant	1.821043	0.0310821	58.588
Number of observations			20158
R^2			0.2625

TABLE C.3

QLFS entry wage equation

Dependent variable: QLFS log entry wage

Regressor	*Coefficient*	*Standard error*	*t-statistic*
Female	–0.0601676	0.1253407	–0.480
Male×Region:			
North	–0.0548824	0.1043222	–0.526
Yorkshire and Humberside	–0.0322238	0.1123191	–0.287
North-West	0.0068777	0.1035731	0.066
East Midlands	–0.1376181	0.1157873	–1.189
West Midlands	0.0363434	0.1058643	0.343
East Anglia	–0.0012999	0.1379402	–0.009
London	0.0414422	0.1011282	0.410
South-East	0.0639546	0.092277	0.693
South-West	–0.0659087	0.1166291	–0.565
Wales	–0.0785359	0.1281084	–0.613
Female×Region:			
North	–0.0913523	0.0920813	–0.992
Yorkshire and Humberside	–0.0692561	0.0836545	–0.828
North-West	–0.02496	0.0792299	–0.315
East Midlands	0.1055602	0.0940919	1.122
West Midlands	–0.0017203	0.086117	–0.020
East Anglia	–0.0012205	0.0951834	–0.013
London	0.1314627	0.082819	1.587
South-East	0.0088883	0.0735056	0.121
South-West	–0.173833	0.0833156	–2.086
Wales	–0.0441359	0.096098	–0.459
Male×Age:			
18–24	–0.1909195	0.098781	–1.933
25–29	–0.0091581	0.1071786	–0.085
35–39	0.0883949	0.1228251	0.720
40–44	0.1556559	0.1297211	1.200
45–49	0.1413802	0.1347743	1.049
50–54	0.2938116	0.1250467	2.350
55–59	0.1446315	0.1284341	1.126
Female×Age:			
18–24	–0.1616963	0.0803114	–2.013
25–29	–0.0471023	0.0694664	–0.678
35–39	–0.1424121	0.0827937	–1.720
40–44	–0.0214771	0.0998079	–0.215
45–49	–0.0226341	0.1010239	–0.224
50–54	–0.1832276	0.1094811	–1.674
55–59	–0.1207109	0.1405242	–0.859

Continues overleaf.

TABLE C.3 continued

Regressor	*Coefficient*	*Standard error*	*t-statistic*
Male×Education×Age:			
18–24	0.1102723	0.0950356	1.160
25–29	0.0966146	0.1304203	0.741
30–34	0.2933574	0.1486809	1.973
35–39	0.2738795	0.127922	2.141
40–44	0.3154285	0.1473563	2.141
45–49	0.1937148	0.1539272	1.258
50–54	0.2303702	0.1768491	1.303
55–59	0.1262264	0.1624261	0.777
Female×Education×Age:			
18–24	0.0771693	0.0959828	0.804
25–29	0.1579158	0.0778822	2.028
30–34	0.0990207	0.0842462	1.175
35–39	0.3410638	0.0862596	3.954
40–44	0.1429098	0.1143249	1.250
45–49	0.1153226	0.1214948	0.949
50–54	0.5111036	0.1578974	3.237
55–59	0.1467703	0.2453767	0.598
Constant	1.360233	0.1287716	10.563
Number of observations			1312
R^2			0.1370

APPENDIX D
Technical Details of the Model

D.1. Wage Equation

An **ordered probit** regression is estimated on the sample of people moving into work in the QLFS. The dependent variable in the ordered probit is the *decile* of the entry wage distribution that the individual moves into work at, denoted by Ω_i. The probit takes the form

(D.1) $\Omega_i^* = Z_i'\alpha + u_i$

where Ω_i^* is a normally distributed 'latent' wage variable such that $\Omega_i = d$ if $k_{d-1} < \Omega_i^* < k_d$, where the k_d are 'cut points' estimated from the model and d = 1,2,...,9; i = 1 to N_q are individuals in the QLFS; Z_i is a vector of individual characteristics that may affect the wage levels of new entrants:

- sex (male, female)
- age-group (18–24, 25–35, 36–49, 50+)
- region (11 standard regions)
- education (degree level, A level or equivalent, GCSE or O level or equivalent, other, none)
- interactions between age-groups and education (left full-time education at minimum school-leaving age, left full-time education later)
- the length of time (in years) that the individual was unemployed or economically inactive prior to the start of the QLFS panel

- previous redundancy within the quarter prior to the start of the QLFS panel

(all the variables in z_i are also interacted with gender); and u_i is a random error term.

D.2. Hours Equation

A **probit equation** is used to relate the probability of entering work at full-time as opposed to part-time hours levels (where 'full-time' is defined as 30 or more hours per week). For individual i, the equation takes the form

$$\text{(D.2)} \quad \Pr(FT_i = 1) = \Phi(H_i'\gamma + v_i)$$

where FT_i is the full-time work dummy variable; H_i is a vector of personal characteristics that may influence the hours that people work:

- family status (single, married with a working partner, married with a non-working partner, single and living with parents (18–24 age-group only))
- homeownership
- region (11 standard regions)
- age-group (18–24, 25–35, 36–49, 50 and over)
- education (degree level, A level or equivalent, GCSE or O level or equivalent, other, none)
- interactions between age-groups and education (left full-time education at minimum school-leaving age, left full-time education later)
- dummy variables for age of youngest child (under 2, 3–5, 6–10, 11–15, 16–18 years);

and v_i is a random error term.

The equation is estimated separately for men and women on the grounds that their observed hours patterns are very different.

D.3. Probability Weighting

For each individual i in the QLFS, there are two sets of predicted probabilities:

- the vector P_i^W of 10 probabilities of working at the different decile mean entry wages.
- the vector P_i^H of two probabilities of working at full-time and part-time hours, conditional on entering work.

P_i^H and P_i^W are cross-multiplied to give P_i^{WH} — the vector of 20 probabilities of working part-time hours and full-time hours at the 10 different decile wage points. There is an adding-up constraint that these probabilities must sum to 1, i.e.

$$\sum_{w=1}^{10} \sum_{h=1,2} P_i^{wh} = 1.$$

D.4. Grouping Procedure

These probabilities are then averaged for each of the groups $g = 1$ to G. The groups are defined by the following characteristics:

- sex (male, female)
- age-group (18–24, 25–35, 36–49, 50+)
- family status (single, married with a working partner, married with a non-working partner, single and living with parents (18–24 age-group only))
- children in family (yes, no)
- education (left full-time education at minimum school-leaving age, left full-time education later)
- region (London and the South-East, other).

The TAXBEN model is then run 20 times at each wage and hours combination to give the financial gains from working at these wage and hours points. For each individual j in group g, the vector of gains from work, Γ_j, is averaged over the group to give the group-level vector of gains from working

$$\Gamma_g = \frac{\sum_j \Gamma_j}{N_g}.$$

D.5. Moving-into-Work Equation

The final equation estimated on the QLFS is a grouped probit on the probability of moving into work:

(D.3) $$\Pr(M_g) = \Phi(\overline{X}_g'\beta + \overline{\Gamma}_g\delta + \varepsilon_g)$$

where M_g is the probability of moving into work for cell g; $\overline{\Gamma}_g$ is a vector of income and gains-from-work variables (defined as explained in Chapter 4); $\overline{X}_g$ is a vector of extra regressors that control for other factors affecting the probability of moving into work, as detailed in Chapter 5; and ε_g is a normally distributed error term.

APPENDIX E
Equations Used in Model of Moving into Work

TABLE E.1

Unrestricted specification for moving-into-work equation

Dependent variable: Proportion of people in cell moving into work over the length of the QLFS panel

Regressor	*Coefficient*	*Standard error*	*t-statistic*
Female	0.6983731	0.3688046	1.894
Predicted out-of-work income, men (£)	0.0027302	0.0005197	5.253
Predicted out-of-work income, women (£)	–0.0001699	0.0003513	–0.484
Expected gains from work, men (£)	0.0037298	0.0010963	3.402
Expected gains from work, women (£)	0.0059089	0.0013771	4.291
Age-group:			
18–24, men	0.4684724	0.0877571	5.338
18–24, women	0.1346199	0.0729217	1.846
36–49, men	–0.3581291	0.0773654	–4.629
36–49, women	–0.3732295	0.0835552	–4.467
50+, men	–0.896276	0.0909656	–9.853
50+, women	–0.8412712	0.0974014	–8.637
Proportion of cell redundant less than three months ago, men	1.992125	0.6712307	2.968
Proportion of cell redundant less than three months ago, women	1.937904	0.9973582	1.943
Level of unemployment (by education and region), men	–0.0165956	0.0148799	–1.115
Level of unemployment (by education and region), women	–0.0714153	0.0231158	–3.089
Youngest child 0–4, women	–0.3441389	0.1197959	–2.873
Youngest child 5–18, women	0.3208892	0.0876783	3.660
Constant	–1.166599	0.2782752	–4.192
Number of observations			10311
Log likelihood			–4266.521
$\chi^2(13)$			662.86
Pseudo R^2			0.0721

TABLE E.2

Restricted specification for moving-into-work equation and likelihood-ratio test

Dependent variable: Proportion of people in cell moving into work over the length of the QLFS panel

Regressor	*Coefficient*	*Standard error*	*t-statistic*
Female	0.0241559	0.1543133	0.157
Predicted out-of-work income, men (£)	0.0025195	0.0004815	5.232
Predicted out-of-work income, women (£)	–0.0001879	0.0003142	–0.598
Expected gains from work, men (£)	0.0031587	0.0009934	3.180
Expected gains from work, women (£)	0.006695	0.001213	5.519
Age-group			
18–24, men	0.4494973	0.0848391	5.298
18–24, women	0.1286229	0.0718884	1.789
36–49	–0.3589726	0.0565349	–6.350
50+	–0.8606712	0.0662065	–13.000
Proportion of cell redundant less than three months ago	2.036444	0.5530531	3.682
Level of unemployment (by education and region)	–0.0324785	0.0123507	–2.630
Youngest child 0–4, women	–0.3186866	0.0912338	–3.493
Youngest child 5–18, women	0.3058484	0.080247	3.811
Constant	–0.8816354	0.2360623	–3.735
Number of observations			10311
Log likelihood			–4268.7469
$\chi^2(17)$			658.41
Pseudo R^2			0.0716
Likelihood-ratio test vs. full interaction model			
$\chi^2(4)$			4.45
Prob. > χ^2			0.3484

TABLE E.3

Wage equation (ordered probit) for wage allocations in model, QLFS

Dependent variable: Decile in the QLFS entry wage distribution

Regressor	*Coefficient*	*Standard error*	*t-statistic*
Female	–0.1992954	0.2573881	–0.774
Male×Region:			
North	–0.0757059	0.2143398	–0.353
Yorkshire and Humberside	0.0299123	0.2270587	0.132
North-West	0.0287474	0.2093779	0.137
East Midlands	–0.1601093	0.2321882	–0.690
West Midlands	0.1520878	0.2154077	0.706
East Anglia	–0.0260155	0.2798565	–0.093
London	0.2553241	0.2054456	1.243
South-East	0.2705235	0.1894283	1.428
South-West	0.0465147	0.2365265	0.197
Wales	–0.0091474	0.2601265	–0.035
Female×Region:			
North	–0.1282859	0.1857264	–0.691
Yorkshire and Humberside	–0.0896877	0.1701214	–0.527
North-West	0.0152175	0.160107	0.095
East Midlands	0.1407607	0.1902976	0.740
West Midlands	0.0810152	0.1739278	0.466
East Anglia	0.0999434	0.1927301	0.519
London	0.4909774	0.1675522	2.930
South-East	0.1353925	0.1480328	0.915
South-West	–0.2923031	0.1695732	–1.724
Wales	0.0649341	0.1942177	0.334
Male×Age:			
18–24	–0.5076105	0.1521111	–3.337
36–49	0.2544934	0.1560348	1.631
50+	0.3380908	0.1686507	2.005
Female×Age:			
18–24	–0.2919884	0.1412778	–2.067
36–49	0.0442054	0.1232716	0.359
50+	–0.1846175	0.1793545	–1.029
Male×Education×Age:			
18–24	0.2099739	0.2026109	1.036
36–49	0.1928929	0.1828694	1.055
50+	–0.0816367	0.2503607	–0.326
Female×Education×Age:			
18–24	0.1202534	0.2013511	0.597
36–49	0.1539801	0.1410196	1.092
50+	0.6325642	0.273385	2.314
Male×Education:			
Degree level	1.063861	0.1864019	5.707
A level	0.4846855	0.1405682	3.448
O level or GCSE	0.2079309	0.1462403	1.422
Other	0.4158727	0.1776259	2.341

Continues overleaf.

TABLE E.3 continued

Regressor	*Coefficient*	*Standard error*	*t-statistic*
Female×Education:			
Degree level	0.9378885	0.1418594	6.611
A level	0.2633346	0.1279691	2.058
O level or GCSE	0.1560768	0.1021508	1.528
Other	−0.1351172	0.1709006	−0.791
Male×Time out of work	−0.1403309	0.0426218	−3.292
Female×Time out of work	−0.0432795	0.0193016	−2.242
Time out of work missing	−0.3153546	0.0893959	−3.528
Male×Recent redundancy	0.0784184	0.1463198	0.536
Female×Recent redundancy	0.2084698	0.2039315	1.022
Cut points:			
1	−1.315511	0.206238	−6.379
2	−0.8495825	0.2042633	−4.159
3	−0.5070402	0.2034854	−2.492
4	−0.2052009	0.2030634	−1.011
5	0.0810961	0.2028864	0.400
6	0.3684135	0.2029764	1.815
7	0.6818355	0.2034302	3.352
8	1.052984	0.204499	5.149
9	1.566476	0.2075058	7.549
Number of observations			1310
Log likelihood			−2871.4084
Pseudo R^2			0.0481

TABLE E.4

Hours equation (probit), men

Dependent variable: Hours of work more than 30 vs. Hours less than 30

Regressor	*Marginal effect*	*Standard error*	*t-statistic*
Single	0.0430319	0.2452155	0.175
Married, working wife	0.4228961	0.177539	2.382
Homeowner	0.1334637	0.160712	0.830
Living with parents	−0.4897521	0.4335676	−1.130
Region:			
North	−0.0702234	0.2896835	−0.242
Yorkshire and Humberside	0.0054512	0.3139159	0.017
North-West	0.1726288	0.306579	0.563
East Midlands	−0.4264342	0.3133518	−1.361
West Midlands	0.1107733	0.2969569	0.373
East Anglia	−0.0942988	0.3761586	−0.251
London	−0.1574243	0.2738645	−0.575
South-East	−0.078306	0.2584125	−0.303
South-West	−0.3117286	0.3073097	−1.014
Wales	−0.1488164	0.3547898	−0.419
Age-group:			
18–24	0.6230753	0.3973182	1.568
36–49	0.0535841	0.2359912	0.227
50+	−0.7633243	0.2501723	−3.051
Education×Age:			
18–24	−0.4502576	0.2509777	−1.794
36–49	0.0298025	0.2639882	0.113
50+	−0.0636973	0.2957428	−0.215
Youngest child aged:			
0–2	−0.008438	0.294055	−0.029
3–5	−0.6499262	0.2755932	−2.358
6–10	−0.1899201	0.2902373	−0.654
11–15	−0.0171508	0.3061298	−0.056
16–18	−0.7891323	0.5543991	−1.423
Education:			
Degree level	−0.0748688	0.2435839	−0.307
A level	0.0618198	0.1910726	0.324
O level or GCSE	0.0654425	0.1944017	0.337
Other	−0.1437294	0.2267611	−0.634
Constant	1.087488	0.3435034	3.166
Number of observations			654
Log likelihood			−263.7344
Pseudo R^2			0.0847

TABLE E.5

Hours equation (probit), women

Dependent variable: Hours of work more than 30 vs. Hours less than 30

Regressor	*Marginal effect*	*Standard error*	*t-statistic*
Single	0.0006328	0.1694698	0.004
Married, working husband	−0.2287529	0.1573323	−1.454
Homeowner	0.1246934	0.1209003	1.031
Living with parents	0.3940238	0.2938807	1.341
Region:			
North	−0.288867	0.2573635	−1.122
Yorkshire and Humberside	−0.1147051	0.2297482	−0.499
North-West	0.033179	0.2054431	0.161
East Midlands	0.0350593	0.2371953	0.148
West Midlands	0.3231793	0.2171698	1.488
East Anglia	0.1225753	0.2532382	0.484
London	0.3011183	0.2035887	1.479
South-East	0.1094741	0.1915262	0.572
South-West	−0.5244388	0.2569794	−2.041
Wales	−0.3975032	0.2733804	−1.454
Age-group:			
18–24	−0.0403035	0.2095862	−0.192
36–49	−0.6833417	0.1817121	−3.761
50+	−1.535272	0.2835797	−5.414
Education × Age:			
18–24	0.0872228	0.2560608	0.341
36–49	0.5336098	0.1835906	2.907
50+	0.6940139	0.3402639	2.040
Youngest child aged:			
0–2	−1.366098	0.156872	−8.708
3–5	−1.247479	0.1655262	−7.536
6–10	−1.134548	0.171515	−6.615
11–15	−0.3089853	0.1809168	−1.708
16–18	−1.081756	0.4002176	−2.703
Education:			
Degree level	0.0016237	0.178722	0.009
A level	−0.2678053	0.1768628	−1.514
O level or GCSE	−0.1579509	0.133374	−1.184
Other	0.0437833	0.2186967	0.200
Constant	0.3120133	0.2633149	1.185
Number of observations			1037
Log likelihood			−453.87475
Pseudo R^2			0.1978

APPENDIX F
Technical Details of Policy Simulation

The moving-into-work equations estimated in Chapter 5 are of the form

(F.1) $\Pr(M_g) = \Phi(\overline{X}_g'\beta + \overline{\Gamma}_g\delta + \varepsilon_g)$

where M_g is the probability of moving into work for group g, $\overline{\Gamma}_g$ is a vector of income and gains-from-working variables and $\overline{X}_g$ is a vector of extra regressors that control for other factors affecting the probability of moving into work. For the policy simulation results, $\overline{\Gamma}_g$ is replaced by $\overline{\Gamma}_g^R$, a new vector of gains from work calculated by TAXBEN using the reformed tax system to calculate individual budget constraints. This gives

(F.2) $\Pr_R(M_g) = \Phi(\overline{X}_g'\beta + \overline{\Gamma}_g^R\delta + \varepsilon_g)$,

i.e. a new set of probabilities of moving into work. The change in the probability of working for group g is just $\Delta p_g^W = \Pr_R(M_g) - \Pr(M_g)$.

APPENDIX G
Calculating the Number of People Moving into Work after Policy Reforms

G.1. The 'Short-Run' Calculation

This is an estimate of the number of people who will move into work within *one year* of a policy change. The estimate proceeds as follows:

- For each group g, $\Delta p_g^W = \Pr_R(M_g) - \Pr(M_g)$, the increase in the probability of moving into work arising from reform R, is calculated.
- This probability is multiplied by the sum of the grossing factors, q_j, in the FRS data for the group, $\sum_{j=1}^{n_g} q_j$, to give n_g^s, the number of extra people in the group moving into work.
- The within-group numbers are then summed over the groups to give N^s, the total short-run stock reduction.

The short-run calculation assumes that the reforms do not change the *exit rate* out of employment, i.e. that there is no displacement of the existing employees by new entrants.

G.2. The 'Long-Run' Calculation

This gives the total number of people moving into work once the changes in work entry rates arising from the reform have reduced the stock to a new equilibrium level. The estimate proceeds as follows:

- The expected duration of unemployment and/or economic inactivity is defined as the reciprocal of the entry rate into work for a group, or cell. However, some of the cells defined in the main modelling procedure have very low entry rates due to sampling error from small cell sizes, which leads to the expected duration being very long; this can bias the results. Hence we use larger cells for this procedure, grouping only by sex, family type, education and children in the family. These groups are referred to as $\gamma = 1$ to Γ.
- The change in the expected duration for a group γ is $\Delta l_\gamma = \frac{1}{\Pr_R(M_\gamma)} - \frac{1}{\Pr(M_\gamma)}$. The stock of unemployed and economically inactive people can be calculated by the formula Stock = Inflow × Expected duration. Holding the inflow into unemployment and economic inactivity (i.e. the exit rate from work) constant, the long-run stock reduction for group γ can be calculated by taking the numbers unemployed or economically inactive in group γ (by grossing up from the FRS) and multiplying through by $\Delta l_\gamma / l_\gamma$.
- The total long-term stock reduction is calculated by summing over groups as before.

The long-run calculation makes all the assumptions that the short-run calculation makes, *plus* the assumption that for each individual in the QLFS sample, the hazard of leaving unemployment or economic inactivity (i.e. of entering work) is constant over time. This is a sufficient condition for the expected duration of unemployment or economic inactivity to be equal to the reciprocal of the entry rate into work.

G.3. Changes in the Exchequer Cost in the Short Run and the Long Run

If extra people move into work as a result of the reforms, this changes our estimate of the cost that the government will incur as a result of increased benefit payments or decreased taxes arising from the reform. This is calculated as follows:

- Using TAXBEN, the household disposable income for each individual in the FRS when not in work, y_i^z, is calculated.
- Household disposable income for each individual at the expected hours and wage rate, y_i^w, is calculated.
- TAXBEN also calculates *gross earnings* for each individual at the expected hours and wage rate, w_i^w.
- The exchequer cost of individual i in the FRS moving into work is calculated as the change in disposable income minus the change in gross earnings, i.e. $c_i = y_i^w - (y_i^z + w_i^w)$. This cost is averaged within group g to give $\bar{c}_g^w$.
- The average group cost, $\bar{c}_g^w$, is multiplied through by the estimate of the stock reduction in group g. This is summed over all groups to give C_s, the change in exchequer cost in the short run, or C_l, the change in exchequer cost in the long run, depending on the stock-reduction measure used.

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