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TAXES, BENEFITS
AND LABOUR
MARKET
RESPONSES:
NEW EVIDENCE
FOR IRELAND

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SUMMARY

Individuals' decisions about the nature and extent of labour market participation can be significantly affected by the structure of welfare payments and taxes on income. Other things being equal, a person is usually more willing to devote an hour of his or her time to paid work the greater is the net financial return. This return can be significantly affected by taxes and/or the withdrawal or reduction of welfare benefits. From a public policy perspective, a key question is how aggregate labour supply – the sum of the individual labour supply decisions – responds to changes in tax rates and bands, allowances or credits and welfare payment rates. This is a key element in determining how sharp are the trade-offs between the level of welfare payments, total employment and hours worked, and tax rates. It also determines the extent to which tax and welfare policy changes can be expected to contribute to policy goals such as increasing labour supply and/or specifically female labour supply, as set out in the National Employment Action Plan (Department of Enterprise and Employment, 2002).

Questions about the impact of policy changes on labour market behaviour have been of concern in many countries, and have motivated a great deal of highly focused research on the topic. As a result, methods for analysing the impact of tax and transfer policy changes on labour market behaviour have continued to advance rapidly in recent years. Irish research in this area has been more limited. This study, therefore, has three main aims:

- To provide new estimates of the responsiveness of the labour supply of married men and women in Ireland to financial incentives, including those shaped by tax and welfare policies, based on best practice techniques from the international literature.
- Building on these estimates, the study shows how the labour supply implications of tax and welfare policy changes can be assessed in much greater depth than has been possible heretofore.
- To provide empirical estimates, again based on best practice techniques, of the extent to which replacement rates influence the durations of spells of unemployment.

The findings in each of these areas are summarised below.

Labour Supply Estimates

A model which is able to capture important features of household labour supply behaviour from a policy point of view is set out in Chapter 2. It accounts for the full structure of the basic tax rules and the key feature that the social welfare system provides a floor to income. It models decisions about participation in the paid labour market and hours of work choices in a unified framework, while allowing for fixed costs associated with

employment (e.g., travel to work or childcare costs). It takes appropriate account of the fact that wage rate information is not directly available for those who are not in employment. The model was estimated using data from the 1994 Living in Ireland Survey, which had the key advantage of having information on *desired* hours of work as well as actual hours of work. This is of considerable benefit in clearly identifying individuals' preferences regarding hours of work. (While observed labour market outcomes have changed markedly since 1994, the indications are that underlying preferences are more stable, so that the findings reported later on responsiveness to tax changes are still highly relevant).

We found that, in line with other findings for Ireland and internationally, the labour supply of married women is significantly more responsive to an increase in their wage rate than married men's labour supply with respect to the male wage rate. The elasticity of women's labour supply (measured in terms of average desired hours of work) with respect to the female wage rate is almost 0.9 i.e., a 1 per cent rise in the female wage rate would give rise to a 0.9 per cent increase in average desired hours of work. For men the corresponding elasticity is 0.25. Taking into account cross elasticities, a 1 per cent rise in all wages would give rise to an increase of almost 0.2 per cent in the labour supply of married men and an increase of almost 0.5 per cent in the labour supply of married women. For both men and women, increased participation accounts for the major part of the response, with increases in hours of work playing a lesser role.

Assessing the Labour Supply Impact of Tax/Transfer Policy Changes

Labour supply responses to a number of policy changes are examined in Chapter 3. These included equal valued tax cuts through four different channels: cuts in the standard and top rates of tax, widening of the standard rate tax band and increasing the basic personal allowance. A structural change in the tax treatment of couples, introducing greater independence between the taxation of husband and wife, was also examined: this approximated the full individualisation of the standard rate tax band announced in Budget 2000. Alternative uses of the incipient rise in tax revenue – including a proportionate cut in income tax rates, or an increase in child benefit – were also analysed.

Looking at the results on equal-valued tax cuts, we found that both men's and women's desired hours responded positively to a standard rate tax cut (of 2.8 percentage points) and to an increase (of about 20 per cent) in the basic personal allowance. An increase in band width (of about 30 per cent) or a cut in the top rate of tax (of 6.3 percentage points) led to a positive response in married men's desired hours similar to that for a standard rate tax cut or personal allowance increase. But the response of married women to a top rate tax cut or to band-widening was more than twice as strong as that of men, and more than twice as big as their response to a standard rate tax cut or allowance increase. Most of the change in desired hours appeared to be driven by changes in labour force participation.

Turning to the results on increased independence in the taxation of married couples, we find that full individualisation of the standard rate tax band could have quite different impacts on labour supply depending on the use made of the rise in tax revenue that would result. If the revenue were

used to fund a general tax cut (through proportionate cuts in standard and top rates of tax) then men's participation would remain roughly constant, while married women's participation would rise by about 2½ percentage points. Average desired hours of work would rise by 0.4 hours per week. While this is a large change on a "one-off" basis, it is small compared to the trend rise in married women's participation (about 30 percentage points over the past 20 years). If the revenue were used to finance an increase in child benefit, married women's participation would rise by more than the fall in married men's participation; but there would be a net fall in average desired hours of 0.2 hours per week.

Unemployment Payments and the Duration of Unemployment

Although much has been written about the relationship between unemployment durations and unemployment payments in the last two decades, the nature of the relationship remains problematic. Although disincentive effects associated with payments have been regularly found in research in the US and UK, the UK research is disputed and disincentive effects have been notable by their absence in studies from Continental Europe. However much research in this area has failed to adequately take into account the structure of unemployment payments and the fact that these may have a limited duration. Measurement problems when modelling disincentive effects also rear their head in the use of poor estimates of benefit levels and of in-work incomes. In Chapter 4 we used detailed information from the Living in Ireland Panel Survey on actual benefit levels in the household and estimates of in-work income from the *SWITCH* tax/benefit model to examine the effects of various disincentive measures on the duration of unemployment spells between 1994-5 and 1997-8. Moreover, we also accounted for the structure of benefit payments by examining the effect of limited benefit duration. Our findings suggest that controlling for other factors, the hazard of exit from unemployment is negatively related to unemployment payments. However, the type and structure of payments is important. Disincentive effects appear to influence only those receiving Unemployment Benefits (UB) and among this group the exit rate increases as exhaustion approaches at 15 months duration. We find no significant disincentive effects amongst those receiving Unemployment Assistance (UA). The disincentive effects among UB recipients in Ireland are also of a much smaller size than those found in other studies in the UK, the US and Continental Europe.

Conclusion

Many key decisions on income tax and social welfare policy must take account of the likely labour market consequences. For example, concerns about the adequacy of welfare payment rates must be balanced against the potential labour market implications of increased payments. Studies of the impact of tax and welfare policy changes on individuals' labour supply decisions are vital if these labour market implications are to be assessed accurately. The findings in this report represent significant advances on what is known about these topics in an Irish context.

1. INTRODUCTION

1.1 Context

The balance between the level and structure of social welfare payments and the financial incentive to work is a key issue in public policy. It is central to the achievement of the objectives of the National Anti-Poverty Strategy, which include both income adequacy and reductions in unemployment. However a key gap in our knowledge is how responsive labour market behaviour actually is to changes in financial work incentives. This study helps to fill that gap via detailed microeconomic research linked to *SWITCH*, the ESRI tax-benefit model.

Indeed, the issue of the responsiveness of labour supply to effective tax rates¹ is a critical one for the wider trade-off between equitable distribution of the fruits of economic growth and maximisation of output growth. This is “the big trade-off” at the heart of many policy dilemmas, as emphasised by Okun (1975). Much depends on how sharp this trade-off is, and in particular on how strong is the response of labour supply to financial incentives including those shaped by tax and welfare policies. Another perspective on this issue is that it is necessary to identify the responsiveness of different groups and individuals with different characteristics if income taxes are to be structured in a way which will minimise the “excess burden” of taxation. High taxes on responsive groups (or, in another context, goods for which demand is highly responsive or “elastic”) lead to greater departures from economic efficiency than taxes raising the same revenue which fall to a greater extent on less responsive groups (or goods for which demand is relatively inelastic).

There are, of course, other reasons why it is desirable to identify the impact of tax and welfare policies on labour supply. Policy objectives may include increasing labour supply in general, or specifically an increase in the female labour supply. Indeed, each of these forms part of the EU Employment Strategy (European Commission, 2001) and the National Employment Action Plan (Department of Employment and Enterprise, 2002) for Ireland. If changes in income tax and welfare policy are to be used to help reach policy targets in this domain, then it is essential that we should have clear results on the responsiveness of labour supply to tax and welfare policies.

How can the responsiveness of labour supply to changes in tax and welfare policies be estimated? This has been an active area of research internationally, with new methods and approaches being developed to deal with the statistical and econometric problems encountered. Sophisticated econometric techniques are needed to derive results which

¹ By effective tax rate we mean the combined effect of income taxes, social insurance contributions and reduction or withdrawal of social welfare payments.

are unbiased – simpler methods are not sufficient, as they can produce biased estimates of key parameters.² The international research effort has built on the availability of large-scale datasets with detailed information on the wages, hours and employment relevant characteristics of representative samples of the population. In the Irish context, there have been few counterparts to the very specialised econometric modelling of this topic found in a number of other countries.³ The main aims of this study are

- to estimate the responsiveness of Irish labour supply to changes in wages, taxes and transfers in a manner consistent with international “best practice” and
- to simulate the response of labour supply to a variety of changes in Irish tax and welfare policies.

In order to achieve these aims, we build on the foundation provided by *SWITCH*, the ESRI tax-benefit model, and by international work on the modelling of labour supply in ways which allow the impact of taxes and transfers to be identified and simulated. Section 1.2 outlines the role of *SWITCH*, and the contribution which it makes – in the form of routines to calculate tax liabilities and welfare entitlements – to the labour supply modelling undertaken in later chapters. Section 1.3 looks at international experience with labour supply modelling, and Section 1.4 looks more closely at models which are geared towards identifying and simulating tax/transfer effects. Section 1.5 draws out the lessons in an Irish context and Section 1.6 outlines the material covered in later chapters.

1.2 Role of “Static” Tax-Benefit Models

Selected hypothetical households are often used as a guide to the impact of tax and welfare policy changes – for example in tables produced as part of the documentation for the annual Budget. Such analysis, based on supposedly typical cases, has severe limitations. The most fundamental limitation is that it cannot provide an overall picture of the gains and losses associated with reform package. Furthermore, it may miss some important effects because small number of selected households cannot adequately deal with the diversity of circumstances relevant to the tax and welfare situation of real households. Static tax-benefit models, which simulate the impact of policy changes on a large-scale nationally representative sample, are needed to provide a more comprehensive assessment of the effects of changes to tax and social welfare policy. These models are called “static” because they do not allow for any behavioural response to the policy change. The effects identified by these static models are often termed “impact”, “first-round” or “cash” effects. They depend essentially on the “arithmetic” of the tax and benefit systems – rates of welfare payment, means tests, tax bands and so on. *SWITCH*, the ESRI tax-benefit model (the acronym stands for *Simulating Welfare and Income Tax CHanges*) was developed to allow such analysis

² Most of the technical material is in the Appendices to Chapters 2 and 4, with the body of each chapter concentrating on a more informal account of how the results are derived and their interpretation.

³ An exception is Callan and van Soest (1996).

to be carried out for Ireland. At the time of writing, it is based on the Living in Ireland Survey for 1994, a large-scale, nationally representative sample of actual households.⁴ As a result it automatically takes account of the wide diversity of circumstances in the real population.

SWITCH uses detailed information on individual and family circumstances (including information on wages and hours of work for those in paid employment, and on labour force status and receipt of social welfare benefits for those not in paid employment) to assess the social welfare entitlements and tax liabilities of each family in the database. The model can therefore simulate for each family the disposable income they would receive under actual policy, or under alternative policies of interest. Using these detailed calculations it is possible to summarise the impact of policy changes in many different ways – how the average gain or loss varies depending on the income or composition of the family, for example. The model has been used to assess the static or first-round impact of various policy options and of policy changes actually implemented in recent years.

SWITCH can also be used to analyse changes in marginal tax rates, or in replacement rates. This is a significant advance on what is possible without a microsimulation model. However, such analysis cannot, unless supplemented by a suitable labour supply model, provide a quantitative estimate of labour supply responses.⁵ To move beyond first-round effects to simulation of the dynamic impact of policy changes, allowing for behavioural responses, one needs evidence about the scale and nature of these responses.

Behavioural response to the policy change can be seen as taking place in a second round, as adjustments in hours of work are not, typically, instantaneous. As we shall see, identification of behavioural response to tax/benefit policy changes requires quite different and sophisticated techniques, but a working static tax benefit model is a prerequisite. In order to analyse labour supply decisions one must know what disposable income is associated with different labour supply choices for each individual. The routines contained in the tax-benefit model for calculating taxes and benefit entitlements can be adapted to provide this essential input. We now turn to international experience in modelling labour supply, particularly as it relates to tax/transfer policies.

1.3 Labour Supply Modelling: Overview of International Research

The basic intuition behind economic modelling of labour market participation decisions has been well expressed by Blundell and Walker (1988):

Individuals decide on how long they are going to work on the basis of their after-tax wage rate and the household's other after-tax income.... The argument is that an individual will want to work up to the point where the

⁴ Work on a model using data from the 2000 wave of the Living in Ireland Survey is at an advanced stage.

⁵ Given that the direction of response for different sub-groups often varies, it can be difficult even to arrive at an indication of the likely direction of change in response to some policy changes.

*value of extra income from further work is just offset by the value of the ...
time sacrificed to earn it*

(Blundell and Walker, 1986, p.8)

Economic theory predicts that, for a given level of net household income, the willingness of an individual to devote an hour of his or her time to paid work will increase the greater is the financial return to that hour of paid work i.e., the higher is the after-tax wage rate. Similarly, the greater is a household's need for income (the lower is its non-work income) the more valuable extra earnings will be and the more likely the individual will be to forego leisure time for paid work.

The widespread increase in women's labour force participation stimulated a great deal of research on labour supply and participation decisions. Killingsworth's (1983) survey indicates that "first generation" studies in the 1960s and early 1970s revealed the need for improved theoretical and statistical techniques to cope with the fact that the outcomes of participation decisions directly influenced the data available. For example, information on wage rates was rarely, if ever, available for those not in paid employment. One early response to this problem was to estimate the relationship, for those currently in employment, between wages and personal characteristics relevant to the labour market (level of education, age and so on). Potential earnings for those not in employment was then predicted on the basis of this estimated relationship.

Later work has emphasised that such procedures, used in "first generation" work, may be inherently biased. If an individual has a wage which is higher than would be expected on the basis of the true relationship between personal characteristics and wages, s/he is more likely to decide to work, and be included in observations used to estimate the relationship. Conversely, if an individual has a wage lower than expected on the basis of the true relationship, s/he is more likely not to be in paid employment, and therefore not to contribute an observation to the sample used to estimate the relationship. This "selection bias" may distort the estimated relationship between wages and characteristics. The bias thus introduced then contaminates the predictions of potential earnings, and thereby the relationship between potential earnings and the participation decision.

Models and estimation methods to deal with these issues were developed by what Killingsworth (1983) terms "second generation research". These models and methods were specifically designed to analyse the participation decision, recognising the data limitations inherently associated with this, in particular the absence of information on wages for non-participants. While this research represented a substantial advance on earlier work, most of it did not deal explicitly with the way in which pre-tax or gross income is transformed by the tax and transfer system into after-tax income.

The technical challenges of dealing with the income tax system, and the even greater challenges posed by the discontinuities, jumps, kinks and non-convexities in the gross-to-net income schedule induced by the welfare system were tackled in a series of ground-breaking papers by Hausman and others (Hausman, 1980 and 1981). The method involved constructing complete budget constraints for each individual. A number of studies were undertaken in different countries using this approach (see

for example, the special edition of the *Journal of Human Resources* edited by Moffitt (1990b)). Some problems and limitations only emerged with repeated use of the model. MaCurdy, Green and Paarsch (1990) argued that the most serious difficulty was that the restrictions necessary to estimate the Hausman model tended to limit the estimated parameters and elasticities to rather narrow ranges.

Blundell and MaCurdy (1999), reviewing a range of approaches to labour supply modelling, note that there has been a steady expansion in the use of sophisticated statistical models which deal with non-participation and non-linear budget constraints. Their review includes 10 papers dealing with female labour supply and 11 papers dealing with male labour supply. In the next section, we examine a selection from this work, in order to guide the strategic choices needed in constructing such a model for Ireland.

1.4 Modelling the Impact of Policy Changes on Labour Market Behaviour

Tax and transfer policies are an important part of the context in which individuals and families make decisions about the nature and extent of their participation in the labour market. Decisions about whether one or both individuals in a couple will seek paid employment, hours of work, or the balance of advantage between acceptance of a job offer and continued search for a better job, can be significantly affected by taxes and transfers. Changes in labour market behaviour are sometimes the primary aim of a particular tax or welfare reform; in other cases, the main aim may be a different one, but the consequences for labour market behaviour may be central to an overall evaluation of the impact of a proposed reform. Questions about the impact of policy changes on labour market behaviour have been of concern in many countries, and have motivated a great deal of highly focused research on the topic. As a result, methods for analysing the impact of tax and transfer policy changes on labour market behaviour have continued to advance rapidly in recent years.

At the outset of the present project, a conference was convened at The Economic and Social Research Institute (ESRI) to gain insights from the current work and accumulated experience of leading modellers of labour supply in the US, the UK and the Netherlands.⁶

Moffitt (2000) stressed the key role of microsimulation models, operating at the level at which actual decisions are taken rather than some more aggregate level. He showed clearly the steps involved in designing and estimating a model which is capable of analysing the impact of possible changes to US policies towards lone mothers. One element of the model is that it simplifies the labour market choices facing lone mothers into three possibilities: full-time work, part-time work and remaining outside the paid labour force. A key factor which is taken into account is that benefits such as Aid for Dependent Children (AFDC), Food Stamps and subsidised housing are not always taken up by those who are entitled to them.

⁶ The papers from the conference were published in Callan (2000).

Creedy and Duncan (2000) surveyed recent developments in behavioural microsimulation. They discuss the criteria by which models of labour supply may be chosen in this context. They conclude that an approach based on estimation of what is termed a structural discrete choice model of labour supply offers the greatest potential. Such models attempt to identify the underlying preferences guiding individual or family choices in the labour market, but simplify these choices to a limited set of hours points. The recent change in the UK to a Working Families Tax Credit (WFTC), replacing Family Credit, was examined in order to illustrate the value of such an approach. The change can be summarised as a more generous version of Family Credit (with increased payments and a reduction in the “benefit withdrawal rate” or taper), coupled with a change in the payment mechanism. The results show that higher participation in employment is likely for one parent families, but finds that a significant number of women married to low earning men would be likely to withdraw from the labour force. The net financial gain from their continued employment would be reduced because of the more generous income support available under WFTC if they were to withdraw from employment.

Van Soest and Das (2000) adopted just such a structural discrete choice approach to the modelling of labour supply in their paper, building on earlier work such as van Soest (1995). Their model takes into account fixed costs of working, and variation in preferences across households. The model is designed to examine the potential impact of proposed tax reforms in the Netherlands on the labour supply of married or cohabiting couples. Simulation of one structural reform revealed that while the macroeconomic objective of stimulating increased labour supply would be met, there could be negative labour supply consequences for a significant sub-group. Women with low earnings working part-time might find the net reward from employment reduced to such an extent that they would withdraw from the paid labour market. This could have undesired consequences for sectors of the labour market (e.g., home care work in the health sector) in which such workers are strongly represented.

1.5 Lessons for Labour Supply Modelling in Ireland

Callan, Doris and Nolan (2000) set out the context for estimation and simulation of labour supply responses to tax and welfare changes in Ireland. In the not-so-distant past, the predominant concerns were about high levels of unemployment and outward migration. More recently new concerns have emerged about meeting labour shortages through increased labour supply and/or immigration. But an understanding of the nature of labour market responses to tax and welfare policy changes remains a pressing issue. Building a framework in which labour supply responses to tax and welfare changes can be simulated is a complex task, as shown by Moffitt (2000), Creedy and Duncan (2000) and van Soest and Das (2000) among others. Strategic simplifications are essential to make the task a feasible one: the most central of these is to estimate preferences over a limited set of hours options. Essential building blocks include an ability to model the consequences of alternative labour market choices for the disposable incomes of individuals and families. The experience gained in building *SWITCH*, the ESRI tax-benefit model,

which examines the “cash” or “first-round” effect on incomes of changes in tax and welfare policy, provides a key building block for a broader model.

Callan *et al.* (2000) highlight in particular the following lessons which can be learned from international experience:

- It is not possible to simply take a simulation model developed elsewhere from “off the peg”, as it were, and apply it in Ireland. Such a model has to be custom-built to a significant extent, to fit with the data available and the policy context in which one is operating.
- It is not sensible to aim at one catch-all model taking into account all the complexities of tax and welfare systems, consistency across the life-cycle, family labour supply issues, involuntary unemployment, take-up of welfare programmes, and so on.
- As is so often the case, strategic simplifications have to be made if the research strategy is to prove fruitful, reflecting both the key questions on which the research decides to focus and the available data

Chapter 2 will set out in detail the specific simplifications chosen in this study, and Chapter 3 will show how they allow the model to be used to analyse policy issues in a productive manner. Here we outline some of the main strategic choices made in the light of the international experience.

The first choice was whether to model budget constraints as discrete or continuous: does one seek to model labour supply choices along the entire spectrum of hours, or in discrete ranges? The international experience pointed firmly in the direction of a discrete choice framework. There is, of course, some loss of accuracy in characterising the budget constraint and hours options in terms of discrete packages, but this approach allows much greater flexibility in a number of other key areas and is the one adopted in Chapters 2 and 3.

A second choice which has to be made is how best to approach the individual versus familial nature of labour supply decisions. One option is to focus on individual labour supply decisions, with the income and hours worked of the spouse or partner taken as fixed. Another is to treat decisions about the labour supply of both partners as jointly produced by a unitary decision-making entity. Finally, one can explore what bargaining/collective choice approaches have to say about how such decisions are actually reached. Given that some of the key tax and welfare issues concern the treatment of couples, a family labour supply framework may represent the best compromise here. This does not make the restrictive assumption that husbands make decisions taking their wife’s labour supply as fixed and vice versa, but assumes the couple as a unit decide how to adjust their individual labour supplies.

The treatment of unemployment in labour supply models also raises complex choices. Some econometric approaches treat all unemployment as similar to non-participation; others adopt a more nuanced approach, treating those classified under ILO guidelines as “seeking work” as involuntarily unemployed. The best approach may depend in part on the available data. The ESRI’s 1994 Living in Ireland Survey contains

information on desired hours of work for those currently in employment, as well as information on whether individuals who are currently not in employment are seeking work. This allows for modelling of labour supply in terms of desired hours of work, which overcomes the problems which arise when an individual wishes to work, but cannot find a job.

1.6 Outline of the Study

The remainder of the paper is structured as follows. In Chapter 2 we set out a model, adapted from the work of van Soest (1995), which is well suited to the investigation of labour supply responsiveness. It allows us to examine the two key dimensions of labour supply response – hours of work and the participation/non-participation decision,⁷ and its structure takes account of the central technical difficulties in the investigation.⁸ The model is estimated using data from the 1994 Living in Ireland Survey, and tax-benefit routines (which calculate the disposable income associated with various labour supply choices) adapted from *SWITCH*, the ESRI tax-benefit model. This allows estimation of the responsiveness of different dimensions of male and female labour supply – participation and hours of work – to changes in gross wages. Wage elasticities of labour supply (the percentage change in desired hours of labour supply for a 1 per cent increase in gross wages) are calculated by simulating the labour supply response of each individual in the sample, rather than simply evaluating the elasticity at the mean, in order to arrive at a more representative summary statistic for responsiveness.

In Chapter 3 we use these labour supply estimates to predict the likely response of husbands' and wives' labour supply to tax and welfare policy changes of interest. Thus, Chapter 3 reports on the nature and extent of husbands' and wives' labour supply responses to a range of equal-valued policy options, including cuts in taxes via increased allowances, wider bands, and reduced tax rates; and to a structural change in the tax treatment of couples approximating the full "individualisation" of the standard rate tax band (similar to the policy announced in Budget 2000).

Chapter 4 examines a different aspect of labour supply: the responsiveness of unemployment durations to the balance between in-work and out-of-work incomes, often summarised by the "replacement rate". In order to isolate any such effect, a detailed microeconomic study of the determinants of unemployment durations is needed. The work reported in Chapter 4 again draws on the international literature in this field to establish a model which deals with the measurement issues involved, and provide estimates of the impact of higher replacement rates

⁷ Thus, the model allows for choices between non-participation in the labour market, and participation on a part-time or full-time basis.

⁸ There are, of course, other technically valid approaches: the point is that the one used here is among those which meet the criterion of conforming to "best practice" internationally.

on the duration of unemployment spells. Chapter 5 draws together the main findings and conclusions from the study.

2. TAXES, BENEFITS AND LABOUR SUPPLY

2.1 Introduction

The goal of this chapter is to provide estimates of labour supply responsiveness which can be used to analyse the impact of changes in tax and benefit policy. The broad framework within which this is done is along the lines described in the previous chapter. Individuals are observed as having chosen certain hours of work. The net family incomes they would obtain at these and other hours of work can be simulated using routines for the calculation of taxes and benefits adapted from a tax-benefit model (in this case, *SWITCH*). The fact that each individual has chosen the observed package of income and hours of work is taken as indicating that this is the one which is preferred to all other choices open to him or her, and maximises the family's overall welfare or "utility".⁹ Information of this type on a large sample of families can be used to identify the underlying influences on family welfare which guide labour supply choices. Once these have been identified, it becomes possible to predict how individuals may behave if tax or welfare policy is changed in certain ways – a topic which will be explored in more detail in the next chapter.

This chapter outlines and applies a specific method of estimating the underlying influences on individual's labour market choices, including the influence of financial incentives which can be affected by tax and welfare policy. The following chapter builds on this model to derive simulation-based estimates of the likely behavioural responses to certain tax and welfare policy changes.¹⁰

The remainder of the chapter is structured as follows. The characteristics of the dataset used are described in Section 2.2. Section 2.3 outlines a discrete choice model of family labour supply based on van Soest (1995); further detail on the model used is contained in the Appendix to this chapter. In Section 2.4 we discuss the parameter estimates and the labour supply elasticities. Section 2.5 draws together the main findings.

⁹ The distinction between observed hours and preferred hours of work is discussed in Section 3.2 below.

¹⁰ These estimated behavioural responses do not take account of wider repercussions in the labour market of the changes in labour supply. The method does not aim at a full analysis of equilibrium effects, although the results obtained could be used as input for a computational general equilibrium model in which such effects can be investigated. See Chapter 3, Section 1 for more details.

2.2 Data

Survey respondents are quite commonly asked about their actual hours of work in the paid labour market. But actual hours worked do not always represent the individual's *preferred* hours of work. For example, an individual may wish to work fewer hours, but cannot obtain part-time work with similar conditions to the full-time job. On the other hand, an individual may find himself or herself unemployed, but may wish to obtain a full-time job and be actively searching for one. Labour supply models which ignore this fact, and treat actual hours as identical with desired hours, are likely to be imperfect guides to labour market behaviour. In attempting to identify the impact of taxes and net wages on labour supply decisions, there are considerable advantages to be gained from working with information on individual's preferred hours of work. In the Irish context, such information is available from the 1994 wave of the Living in Ireland survey (LII), which for this reason is the dataset employed here. There have, of course, been considerable changes in the Irish labour market since then, most notably a rise in female participation rates, a fall in unemployment and a substantial increase in total employment. It seems likely, however, that these changes are associated more with changes in the opportunities facing individuals than with a sharp change in preferences. This suggests that results such as those obtained here – identifying preferences and examining the likely response to alternative policy experiments – have a strong continuing relevance. We will return to the issue of the implications of recent changes in the Irish labour market for the conclusions drawn from the analysis at the end of Section 2.4.

The basic information used to construct the preferred hours variable comes from a number of questions, depending on the labour market status of the individual concerned. For those who are in employment, and working in a paid job for more than 15 hours per week (a cut-off imposed by the design requirements of Eurostat), the information comes from the answer to the question:

Suppose that you could continue to work in your present job, and could choose exactly how many hours to work. Your hourly rate of pay would not change, but your total weekly pay would vary depending on how many hours you worked. How many hours per week would you like to work?

(Living in Ireland, 1994 Questionnaire, question A.39)

For those who are either unemployed, or seeking other work to replace or in addition to a job of less than 15 hours per week, preferred hours are taken as the answer to the question:

If you could find a suitable job, how many hours per week would you prefer to work in this new job?

(Living in Ireland, 1994 Questionnaire, question D.2)

If, however, the individual is not seeking work – for reasons which could include study, training, housework, caring for children or others, retirement, personal illness or injury – then preferred hours are taken as being zero.

For those working less than 15 hours per week, and not seeking additional work, there are two other possibilities, based on the response to the question:

What is your MAIN reason for working less than full-time?

(Living in Ireland, 1994 Questionnaire, q. C.5)

If such a worker states that the main reason is that “I want but cannot find a full-time job” then preferred hours are set equal to 40 (the modal value for full-time workers). But other reasons (such as being in education/training, caring for children or others, personal illness or disability, not wanting a full-time job) lead to actual hours being taken as the best indication of preferred hours.

The distributions of preferred hours for men and women are considered later, but first we must define the sample on which the analysis is to take place.

Table 2.1: Criteria Defining the Sample used for Labour Supply Analysis

Criterion	No. of cases excluded	No. of cases remaining
Married couple, both aged 65, not in full-time education, with responses to individual questionnaire		2,260
Exclude: Self-employed, farmer	696	1,564
Exclude: Cases with missing values	165	1,399
Exclude: Ill or disabled	87	1,312
Exclude: Persons exiting a job	16	1,296
Final sample		1,296

Table 2.1 sets out the criteria used to identify the sample on which the model was to be estimated. The survey contained responses from 2,260 married couples where both partners were aged under 65 and neither partner was in full-time education.¹¹ Almost 700 couples were excluded from the analysis because at least one spouse was engaged in farming or other self-employment. This is because the labour supply choices facing the self-employed are rather different, and even the measurement of hours of work and the financial return from work become more difficult. While this is a very common exclusion in the international literature on labour supply, it affects proportionately more cases in the Irish context – particularly because of the higher rate of participation in farming. The remaining exclusions – of cases with missing information on variables needed for the

Table 2.2: Variable definitions and sample statistics

Variable and unit of measurement	Minimum	Maximum	Mean	Standard
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¹¹ In principle, cohabiting couples could also have been included in the analysis, provided that the rules governing their tax liabilities and welfare entitlements could also have been modelled. The small potential increase in sample size did not warrant the considerable additional time and effort which would have been required at this stage. The issues involved could be revisited with a dataset incorporating a larger number of cohabiting couples.

				Deviation
Preferred hours per week				
husband	0.0	80.0	35.8	14.1
wife	0.0	65.0	11.1	14.7
Usual hours in all jobs per week				
husband	0.0	100.0	31.8	20.2
wife	0.0	84.0	10.0	15.6
Gross wage (Ir£ per hour)				
husband	0.0	54.8	6.82	5.99
wife	0.0	26.7	2.41	4.22
Potential experience (years)				
husband	3.9	52.1	28.1	11.0
wife	0.4	52.6	26.2	10.8
*Husband's highest educational qualification:				
None beyond primary	0.0	1.0	36.4%	0.481
Group Certificate	0.0	1.0	10.6%	0.309
Intermediate/Junior Certificate	0.0	1.0	14.1%	0.348
Leaving Certificate	0.0	1.0	21.2%	0.409
Diploma	0.0	1.0	5.2%	0.223
University degree/higher degree	0.0	1.0	12.3%	0.329
*Wife's highest educational qualification				
None beyond primary	0.0	1.0	36.0%	0.480
Group Certificate	0.0	1.0	5.2%	0.223
Intermediate/Junior Certificate	0.0	1.0	18.6%	0.389
Leaving Certificate	0.0	1.0	29.1%	0.454
Diploma	0.0	1.0	4.6%	0.209
University degree/higher degree	0.0	1.0	6.5%	0.246
*Big town	0.0	1.0	5.2%	0.500
*City	0.0	1.0	40.7%	0.491
*Dublin	0.0	1.0	30.9%	0.462
Age of husband (years)	23.3	65.0	44.7	10.4
Age of wife (years)	19.1	65.0	42.7	10.1
*Illness/disability hampering daily activity				
husband	0.0	1.0	12.2%	0.327
wife	0.0	1.0	13.8%	0.345
*Child in 0-4 Age Bracket? (0=no, 1=yes)	0.0	1.0	27.9%	0.449
*Child in 5-12 Age Bracket? (0=no, 1=yes)	0.0	1.0	47.1%	0.499
Number of children aged under 18	0.0	9.0	1.74	1.50
Occupational pension (Ir£/week)				
husband	0.0	759.0	8.5	44.6
wife	0.0	161.0	0.4	6.6
Mortgage interest (Ir£/week)	0.0	163.8	20.5	25.6
Investment income (Ir£/week)				
husband	0.0	143.8	2.2	9.9
wife	0.0	126.2	0.5	4.3
No. of children eligible for Child Benefit	0.0	8.0	1.62	1.45

Memorandum item. Number of cases 1,296 drawn from Living in Ireland Survey 1994.

Note: *These variables have a value of unity when the individual or couple has the characteristic shown and zero otherwise. As a result, the mean shows the percentage of cases with the given characteristic.

analysis, of couples including a person classifying his or her labour force status as "ill or disabled",¹² and of persons who at the time of interview were leaving a job – amount to about 270 cases. The final sample for analysis includes information on 1,296 couples.

Table 2.2 sets out basic descriptive statistics on the variables used in the analysis. We note some key features of the hours and wages variables below. On average, husbands are in paid employment for almost 32 hours

¹² Other persons with an illness or disability hampering daily activity are included, and this information on their illness/disability status is used in the analysis.

per week, as against 10 hours per week for wives. This gap is only partly accounted for by a lower rate of labour market participation among women. For those in paid employment, there is still a substantial gap (42 hours per week for men and 28 for women). On average men's preferred hours of work were greater than their actual hours (36 hours as against 32 hours per week), but women's preferred hours of work were slightly lower than their actual hours (10 hours as against 11 hours per week).

Figure 2.1: Distribution of Preferred Hours of Work for Husbands and Wives in Paid Employment, 1994

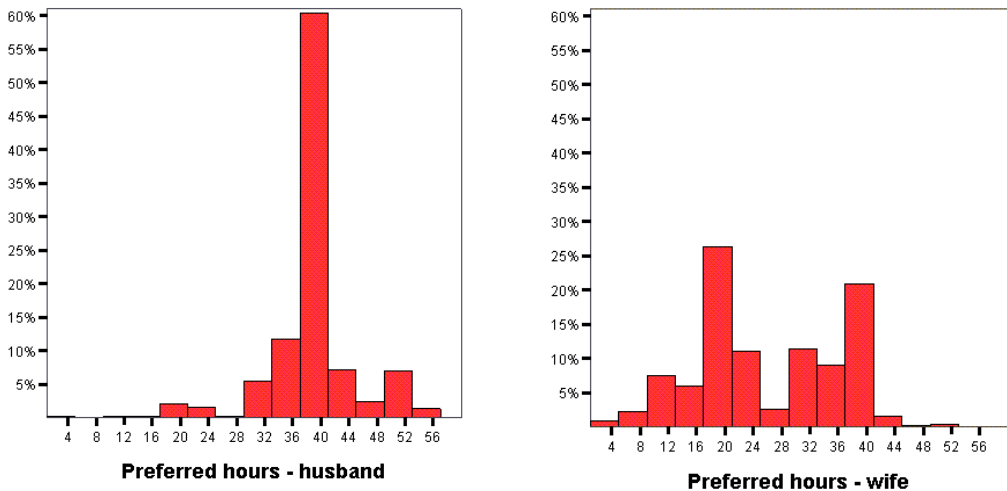
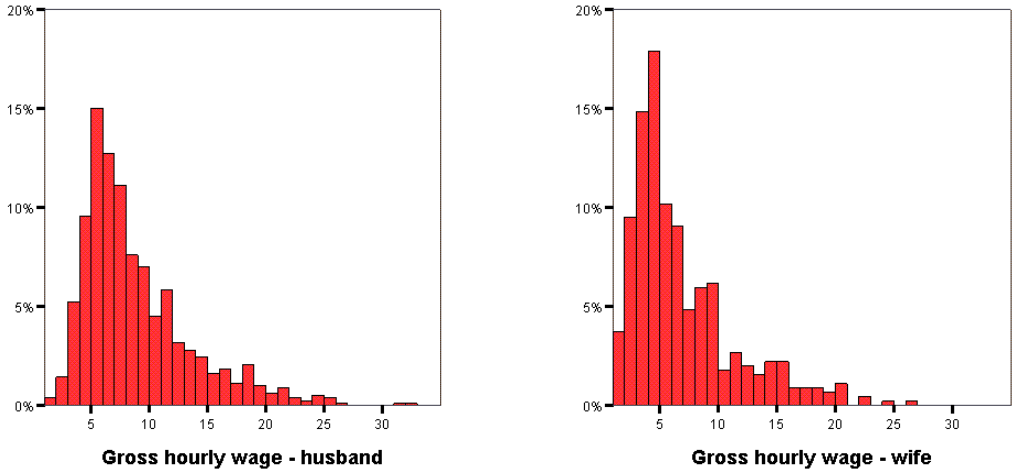


Figure 2.1 shows the distribution of preferred hours of work for husbands and wives in paid employment. There is a sharp “spike” in preferred hours for men at about 40 hours per week, with almost 60 per cent of all those with positive preferred hours indicating that this is their preferred situation. By contrast, the distribution of preferred hours for married women is bi-modal, with less sharp peaks at both 20 and 40 hours. Almost 80 per cent of women with positive preferred hours wish to work for less than 40 hours, with a considerable spread over the different hours categories. Just under half of married men, and just over 70 per cent of married women have actual hours of work which are approximately equal to their preferred hours of work.

Gross hourly wages are constructed by dividing the usual gross wage per week or per month by the usual number of hours worked during the relevant pay period. The gross wage of employed married women in the 1994 sample was £6.90, or about three-quarters of the average wage for married men (£9.04). Figure 2.2 illustrates the distribution of gross hourly wages for men and women in paid employment. Around 44 per cent of married women had an hourly gross wage of less than £5 in 1994, as against only 15 per cent of married men.

Figure 2.2: Distribution of Gross Hourly Wage (IR£ per hour) for Husbands and Wives in Paid Employment, 1994



2.3 Aspects of the Model

A full description of the econometric model used to estimate labour supply responsiveness is given in the Appendix to this chapter (Appendix 2.1). Here we give a more informal account of the model and the choices made in its specification.

The model assumes that husband and wife co-operate fully in maximising their joint welfare. The couple's joint utility takes into account the family's total disposable income, and the "leisure" or non-work time of each partner.¹³ Thus, the utility function expresses how the family values an extra hour's non-work time by each partner as against the cost (in terms of disposable income foregone) from a extra hour of work by that partner.¹⁴ Economic theory tells us that utility is increasing in income and in the leisure or non-work time of each partner. In our work this is guaranteed not by restricting the flexibility of the utility function, but by combining a flexible utility function with an estimation procedure that ensures that the restrictions are upheld.¹⁵ We allow for variation in couple's preferences depending on observed characteristics such as age, health status and the number of children. We also allow for unobserved differences in preferences ("unobserved heterogeneity", see A.2.1)

In principle, each partner could choose from a very fine grid of hours options e.g., from 0 hours up to 60 hours in steps of one hour.¹⁶ This would mean evaluating the welfare or utility function for the couple in

¹³ In labour supply modelling the term "leisure" is widely used to include all activities outside of paid employment ("labour"). Thus activities such as child and elder care, shopping, cooking and so on are included as well as leisure in its more everyday sense.

¹⁴ Note that this is not simply the gross hourly wage. The change in disposable income depends also on tax rate applicable over this margin.

¹⁵ See Appendix 2, Section 1 for details.

¹⁶ Finer grids are of course possible but this is sufficient to illustrate the point.

respect of 3,721 choices (= 61 times 61). In practice, however, van Soest (1995) has shown that the main features of labour supply choices can be captured by a more limited number of options. Here we examine choices for multiples of 8 hours (0, 8, 16,...40, 48) or 49 possible options for the couple's hours choices (=7 times 7). Sensitivity analysis undertaken for a finer grid of hours choices (multiples of 4 hours) suggest that the main results are not much affected.

There are two ways to interpret the answer to the preferred hours question (see Section A.2.2). The first is that each spouse answers in terms of the hours they would work if, as a couple, they were to agree on the hours combination which best suited them; the second is that each spouse answers the preferred hours question taking the partner's hours as given at their current level. The results reported here are for the model estimated under the first interpretation, but elasticities of labour supply with respect to wages were similar when estimated with respect to the second interpretation. (For more detail see Appendix 2, Section 2.)

The model is estimated using the method of simulated maximum likelihood. The results reported here are for 20 replications, but similar results are obtained for higher numbers of replications (up to a maximum of 100 in our sensitivity tests).

2.4 Estimation Results and Labour Supply Elasticities

2.4.1 PARAMETER ESTIMATES

The parameter estimates are shown in Table 2.3. The upper panel refers to the terms in the utility function, in which it will be recalled the basic arguments are family income (which depends on the hours worked and wage rates facing both partners) and the non-work time ("leisure") of both husband and wife. As explained in Section 2.3 above, a flexible parameterisation of the utility function is used which allows for several forms of interaction between income and leisure and between individual and family characteristics (age, number of children) and leisure.

The index m denotes the husband and f denotes the wife. A positive coefficient on one of the interactions with leisure¹⁷ implies a positive effect on the marginal utility of leisure and thus a negative effect on labour supply. For both spouses, age is significant, and preferred hours tend to decrease with age, particularly for older individuals. The presence of children has a strong negative effect on the wife's labour supply. For the husband, however, preferred hours increase significantly with the number of children, other things being equal. The presence of young children (age 0-5) reduces the desired labour supply of women, but has no significant effect for men. Men who suffer from an illness hampering daily activity have significantly lower preferred hours than healthy men, *ceteris paribus*. For women, the health dummy has the same sign, but the effect is much smaller and is not statistically significant at the 5 per cent level.

¹⁷ i.e., one of the β coefficients in b_2 and b_3 , see Equation (2).

Fixed costs of working depend on the same individual and family characteristics as preferences. The estimates imply that average fixed costs amount to about Ir£47 (€59) per week for men and about Ir£126 (€160) for women. Particularly the latter amount seems quite large, and would imply negative family incomes if both spouses have part-time jobs. It should be kept in mind, however, that fixed costs are unobserved, and will include *any* incentive for not working, including non-monetary incentives. For example, the lack of attractive small part-time jobs and difficulties in finding one may induce people not to work and to indicate not working as their preferred labour market state. In our model, this will be picked up as fixed costs of working also. The estimated standard deviations on the error terms in the fixed costs equations (€47 for men, €123 for women)¹⁸ show that a substantial part of the fixed costs are not explained. They also imply that for many respondents, fixed costs do not play a role at all.

Table 2.3: Estimated Parameters for Direct Utility Function and Fixed Costs in Modelling Preferred Hours of Work

Variable	Coefficient	Standard error	t-statistic
Direct utility function			
(Income/100) ²	-0.253	0.032	-7.89
(Husband's leisure/10) ²	-0.364	0.045	-8.15
(Wife's leisure/10) ²	-0.358	0.040	-8.91
(Income*Husband's leisure)/1000	0.316	0.027	11.67
(Income*Wife's leisure)/1000	0.073	0.018	4.09
(Husband's leisure*Wife's leisure/100)	0.080	0.018	4.33
Income/100	1.468	0.560	2.62
Husband's leisure/10	46.10	11.14	4.14
(Husband's leisure/10)* ln(Husband's age)	-25.51	5.97	-4.27
(Husband's leisure/10)* ln(Husband's age ²)	3.646	0.798	4.57
(Husband's leisure/10)* Husband has illness?	0.514	0.119	4.32
(Husband's leisure/10)* No. of children	-0.123	0.031	-3.91
(Husband's leisure/10)* Child under 5?	0.084	0.115	0.73
Wife's leisure hours/10	23.97	10.39	2.31
(Wife's leisure/10)*ln(Wife's age)	-13.19	5.73	-2.30
(Wife's leisure/10)*ln(Wife's age ²)	2.080	0.787	2.64
(Wife's leisure/10)*Wife has illness?	0.199	0.134	1.48
(Wife's leisure/10)*No. of children	0.117	0.037	3.15
(Wife's leisure/10)*Child under 5?	0.391	0.109	3.58
Fixed costs – husband			
const_fc/100	28.86	10.54	2.74
ln (Husband's age)	-15.90	5.62	-2.83
ln (Husband's age ²)	2.214	0.747	2.96
Husband has illness hampering activity?	0.197	0.109	1.81
Number of children eligible for Child Benefit	-0.025	0.030	-0.84
Child aged under 5?	-0.060	0.121	-0.49
Fixed costs – wife			

¹⁸ Ir£37 for men, Ir£97 for women.

const_fc/100	19.77	12.20	1.62
ln (Wife's age)	-11.06	6.69	-1.65
ln (Wife's age ²)	1.610	0.913	1.76
Wife has illness hampering activity?	0.361	0.147	2.46
Number of children eligible for Child Benefit	0.093	0.044	2.12
Child aged under 5?	0.268	0.131	2.05

Error terms (See Appendix, Section A.2.4)

$\sigma_{\eta m}$	0.342	0.064	5.36
$\sigma_{\eta f}$	-1.007	0.102	-9.84
σ_{um}	0.164	0.083	1.96
σ_{uf}	-0.008	0.105	-0.08
λ_{wm}	0.399	0.048	8.33
λ_{wf}	0.279	0.047	5.95

Note: Variables involving a question (denoted by ?) are dummy variables, with values 1 for a “Yes” and 0 for a “No”.

For both spouses, the age pattern of fixed costs is U-shaped, with a minimum at about age 40. For women, the children variables have the expected sign. The number of children is significant at the 5 per cent level, while, the dummy for young children is significant at the 10 per cent level only. Still, the point estimates suggest that the extra fixed costs of working for women due to a young child are about three to four times larger than the additional fixed costs due to an older child. For the husbands' fixed costs of working, children do not play a role. The illness dummy has the expected positive sign for both spouses. Somewhat surprisingly, perhaps, its effect is larger and more significant for women than for men.

For both men and women, we find a significantly positive covariance between the error term in the wage equation and the random preference term in the marginal utility of leisure. For women in particular, the correlation is quite strong and the correlation coefficient is close to -1 . Since the marginal utility of leisure is negatively related to labour supply, this implies a negative correlation between errors in wage equation and labour supply equation. This is in line with the division bias¹⁹ explanation for the correlation between these error terms.

2.4.2 ELASTICITIES

With models of this type, the parameter estimates do not directly reveal the sensitivity of labour supply for financial incentives. In particular, elasticities of labour supply²⁰ for both spouses' wage rates will be the main driving force behind the tax policy effects. To compute these, we have carried out some simulations. The individual elasticities vary across the sample. Since we want to use the model for policy analysis, we are mainly interested in aggregate elasticities. We define the (own or cross) wage elasticity of labour supply of some given group of people (husbands or wives) as the percentage change in total desired hours of that group if all before tax wage rates (of husbands or wives) in that group rise by 1 per cent.

While this definition is a widely-used one in the analysis of labour supply, “labour supply elasticity” has a wide variety of other meanings.

¹⁹ See Section 2.5 above.

²⁰ Technically it is the uncompensated elasticities which are most directly related to the observed impact of a change in tax policy.

- Many studies only consider the elasticities for the average (“representative”) family. In a highly non-linear model like ours, these elasticities are not necessarily very informative for the consequences of wage changes for a heterogeneous population.
- Another approach is to consider average elasticities instead of elasticities of the average. The average elasticity can be seen as a weighted aggregate elasticity of hours worked, where more weight is given to people with lower desired hours.
- Other studies look at elasticities of hours worked conditional upon participation. For policy analysis, however, the effect on participation is at least as important as the effect on hours worked given participation, particularly for married women, whose participation rate is below 50 per cent. We compute elasticities taking full account of the (positive) impact of the wage rate on the participation decision (with desired hours equal to zero for non-participants). Actually, our results suggest that most of the sensitivity of labour supply for wage rates is driven by changes in the decision to participate.
- Elasticity calculations can also vary in the way in which the tax system is accounted for. We change all gross wage rates by 1 per cent and leave the tax system unaffected. The way in which net wage rates change is thus not fixed *a priori*, but driven by the existing tax system. On average, after tax wage rates will change by slightly less than 1 per cent, due to the progressive nature of the tax rules.
- In the case of family labour supply, elasticities vary with what is assumed about the spouse’s income and behavioural response. In line with the model introduced in Section 2.3, we assume that both spouses jointly adjust to the new family optimum; but similar results were found under the alternative assumption that each partner answered the question about desired hours on the assumption that their spouse’s hours would not change.

Table 2.4: Labour supply elasticities for married men and married women with respect to wage changes

Change in:	Elasticity of average preferred hours to change in wages	
	Husbands	Wives
Male wage	0.25	-0.35
Female wage	-0.07	0.88
Both wages	0.18	0.48

Note: A 1 per cent rise in the male wage leads to a 0.25 per cent rise in average preferred hours of married men, and a fall of 0.35 per cent in the average preferred hours of married women.

For men, we find an own wage elasticity of 0.25. That is, if all gross wage rates of the men in our sample increased by 1 per cent, with women’s wage rates remaining unchanged, the total desired hours of all men would increase by 0.25 per cent (with a 95 per cent confidence interval from 0.21 per cent to 0.30 per cent).²¹ Most of this effect is due to

²¹ Strictly speaking these are quasi-confidence intervals, derived from a simulation procedure.

increased participation: a rise in each husband's gross wage rate of 1 per cent would induce an increase of the number of men willing to participate of almost 0.2 percentage points, i.e., by 21 per cent of the actual participation rate of almost 90 per cent. For women, the estimated own-wage elasticity is 0.88 (confidence interval 0.71 per cent to 0.90 per cent). The elasticity of the participation rate is 0.49, which again explains the largest part of the total labour supply elasticity. These estimates are well in line with the broad range of empirical findings of labour supply elasticities for other countries (see Killingsworth and Heckman, 1986), even though, as explained above, a comparison is hampered by the fact that the large number of empirical studies are based on an almost as large number of elasticity concepts.

We find cross wage elasticities of -0.07 for men and -0.35 for women. If the wage rates of both men and women rose by 1 per cent, our model predicts that desired hours would rise by 0.18 per cent for men, and by 0.48 per cent for women.

The results of Doris (2001) help to give some indication of how the values of these elasticities might have changed in later years. Doris estimated elasticities of participation with respect to the gross hourly wage. While these estimates are not directly comparable with those reported here – they include single men and women as well as married couples – they suggest that the elasticity of participation has fallen sharply for men (from 0.46 to 0.19) but is roughly constant for women (0.92 to 0.93).²² Thus, if anything, the elasticity of participation, which is the major driving force behind labour supply responsiveness in our analysis, is likely to have fallen somewhat in the latter 1990s, as participation rates increased sharply.

2.5 Conclusions

In this chapter we have constructed a discrete choice structural labour supply model which is able to capture important features of household labour supply behaviour from a policy point of view. The model accounts for the full structure of the basic income tax and employee PRSI rules and the key feature that the social welfare system provides a floor to income; it simultaneously captures the participation decision and the decision on hours worked, by allowing for fixed costs of work; and it takes account of the fact that wage rate information is not directly available for those who are not in employment. From a technical point of view, it does not impose quasi-concavity of preferences and thus avoids the MaCurdy *et al.* (1990) critique that elasticities are largely determined *a priori*. We have estimated the model using Irish data and have obtained elasticities which are well in line with other recent findings, and are robust with respect to a number of changes in the specification.

We find that, in line with other findings for Ireland and internationally, the labour supply of married women is significantly more responsive to an increase in their wage rate than men (with respect to the male wage rate). The elasticity of women's labour supply (measured in terms of average desired hours of work) with respect to the female wage rate is almost 0.9

²² The constancy of the figure for women masks a fall for women with no second level qualifications and a rise for those with second- or third-level qualifications.

i.e., a 1 per cent rise in the female wage rate would give rise to a 0.9 per cent increase in average desired hours of work. For men the corresponding elasticity is 0.25. Taking into account cross-elasticities, a 1 per cent rise in all wages would give rise to an increase of almost 0.2 per cent in the labour supply of married men and an increase of almost 0.5 per cent in the labour supply of married women. For both men and women, increased participation accounts for the major part of the response, with increases in hours of work playing a lesser role.

In the next chapter, we apply the model set out and estimated here to analyse the possible labour supply effects of alternative tax reforms. These range from simple cuts in tax rates to more complex reforms of the type involved in the “individualisation” of the standard rate tax band undertaken in recent years. In interpreting these results, it should be borne in mind that Doris (2001) found the participation elasticity for women roughly constant, but that the participation elasticity for men fell sharply between 1994 and 1998.

APPENDIX 2.1: TECHNICAL SPECIFICATION OF THE ECONOMETRIC MODEL

We use a static neoclassical structural labour supply model for two joint decision makers (husband and wife). The basic framework is similar to that of van Soest (1995). Husband and wife are assumed to maximise a joint utility function for the couple, taking account of family income, and of their own and their spouse's "leisure" or non-work time. We follow the bulk of the labour supply literature, in which the difference between the time endowment and hours worked is called leisure time, but actually comprises an aggregate of all time use categories except for paid work (see Apps and Rees, 1996, for a critique on this).

A.2.1 Utility

The couple's joint utility depends on both spouses' leisure or non-work time (TE-hm for the husband, TE-hf for the wife, where TE is the time endowment and hm and hf represent the hours of work of the male and female partners) and on the total net income of the family (y). The main components of net income are the earnings of both spouses, asset income, and child benefit. The earnings of other household members are not included. The model would be consistent with utility maximisation in a life cycle framework with intertemporally additive preference if net income could be replaced by total expenditures (see Blundell and Walker, 1986). Since our data do not contain any information on consumption expenditures or savings, we cannot do this, and remain within a static framework.

We use a quadratic direct utility function:²³

$$U(v) = v'Av + b'v, \quad v=(y, (80-hm), (80-hf))' \quad (1)$$

The time endowment has been set to 80 hours per week, but there is no loss of generality: another choice of the time endowment or a specification in terms of hours worked instead of leisure, would give exactly the same model. The specification in terms of leisure is chosen to simplify the interpretation of the results. Without restrictions on the parameters, this utility function is locally second order flexible – the widely accepted standard for optimal flexibility in this context. In principle there

²³ The index for the household is suppressed.

is no reason to prefer this utility function to any other direct utility function with the same (or greater) flexibility. Van Soest (1995), for example, uses a direct utility function which is quadratic in log income and log leisure of both spouses (direct translog). This has the drawback that it cannot deal with negative incomes, which imposes restrictions on the way in which fixed costs can be incorporated (see below).

We impose parameter restrictions to guarantee that utility increases with income, since this is necessary for the economic interpretation of the model.²⁴ We do not impose quasi-concavity of preferences and thus avoid the critique by MaCurdy *et al.* (1990).²⁵ (Quasi-concavity is not needed to compute or to interpret the utility-maximising outcome as we have a discrete choice model.)

In the specification of the direct utility function in (1), A is a 3×3 matrix of unknown parameters and b is a three-dimensional vector. We assume that b_2 and b_3 depend on individual or household characteristics i.e., we allow for variation of preferences across the sample through observed characteristics:

$$b_k = X_k \beta_k + v_k \quad k=2,3 \quad (2)$$

Here the X_k are vectors of observed characteristics (log age and log age squared of husband (in b_2) or wife (in b_3), a dummy for health problems of husband (in b_2) and wife (in b_3), number of children, and a dummy for the presence of children younger than 6). The error terms v_k ($k=2,3$) represent unobserved characteristics, reflecting unobserved heterogeneity of preferences. We will discuss assumptions concerning their distributions below.

Husband and wife are assumed to maximise the same utility function. The labour supply decision is thus modelled at the household level, as in, for example, Hausman and Ruud (1984) and van Soest (1995). A more general framework would be a game theoretic model with different utility functions for the two spouses (see Kooreman and Kapteyn, 1990, for example). This is outside the scope of the present study.

A.2.2 Constraints

The answer to the question: “How many hours would you like to work?” is based upon utility maximisation under constraints. An obvious constraint is the budget restriction: to each choice of the number of working hours of husband and wife corresponds a different net income. To determine net income as a function of working hours of both spouses, we need earnings of both spouses, other household income (child benefits, asset income), taxes, potential unemployment assistance and other social security benefits. Other household income is always observed and can therefore directly be drawn from the data. To determine earnings for each number of working hours for each spouse, we assume that gross hourly

²⁴ This is achieved by penalizing the likelihood. An alternative would be to use a less flexible utility function, such as CES (see Vlasblom, 1998).

²⁵ That is, that imposition of quasi-concavity heavily constrains or even determine the estimates of all effects (MaCurdy *et al.*, 1990, pp. 465-466).

wage rates do not depend on hours worked. For workers with observed wage rates, we can then compute gross earnings for each possible number of working hours.

For those not in paid work, we need to predict the before tax wage rate. For this purpose, we have estimated wage equations for men and women, accounting for selection bias in the usual way (see Heckman, 1979).²⁶ The estimates of the wage equations are then used to predict the wages of non-workers. Because the labour supply model is non-linear in wages, it is necessary to take the wage rate prediction errors into account to get consistent estimates of the labour supply model (see the description of the estimation technique given in Section A.2.6 below).

To determine social security benefits for those working few or zero hours, we take account of the basic system of Unemployment Assistance (UA) only. This is relatively easy to model: families are entitled to social assistance if family income falls below the minimum standard of living, which depends on age, marital status and family composition. We do not model insurance-based Unemployment Benefit (UB). This is difficult to model due to lack of data (on individual's social insurance contribution records) and due to the static nature of our framework, since unemployment insurance benefits are of a temporary nature. Given that the labour supply decision is being modelled in a static framework, it could be argued that the long-term Unemployment Assistance rate is the most relevant one to set against the alternative of in-work income. However, in Chapter 4, where the duration of unemployment spells are modelled, both UA and UB are explicitly taken into account.

Following van Soest (1995), the budget constraint under which the individual maximises utility will be approximated by a finite number of points. In our benchmark model, we take multiples of 8 hours (0,8,...,48) for each individual. This gives seven possible choices for both husband and wife yielding 49 points for the couple. We will analyse the sensitivity of our results for the number of points we use. The vectors appearing in the utility function are denoted by v_j :

$$v_j = (y_j, 80-hm_j, 80-hf_j)' \quad (j=1,\dots,49)$$

where y_j is net family income in the situation where the husband works hm_j hours per week, and the wife works hf_j hours per week.

There are two ways to interpret the answer to the preferred hours question (see Section A.2.2). The first is that each spouse answers in terms of the hours they would work if, as a couple, they were to agree on the hours combination which best suited them – technically this corresponds to unrestricted optimisation of family utility. In this case, the husband's and wife's preferred hours yield the vector v_j which maximises utility over the full set of 49 points. The second interpretation is that each spouse answers the preferred hours question taking the partner's hours as given at

²⁶ Details of the wage equation can be found in Callan, van Soest and Walsh (2003). The variables included are: age, age squared, dummy variables for 5 education levels (Group Certificate, Junior Certificate, Leaving Certificate, Diploma and Degree with reference category no qualifications) and for 3 "size of place" variables (large town, city or Dublin with reference category countryside or small town).

their current level. Technically this corresponds to restricted optimisation under the constraint that the partner's hours are equal to their actual hours. In this case the husband's and wife's preferred hours correspond to potentially different v_j which both maximise utility in a set of only seven points. In either case, utility maximisation is straightforward. First order conditions are not required; the choice set is finite. We estimate the model for the first interpretation. An estimation procedure based on the alternative interpretation of the answers to the "preferred hours" question gave rise to similar estimates of the elasticities with respect to wages. The main reason for working with the unrestricted optimisation interpretation is that policy simulations can then be performed without considering actual hours. Our policy simulations focus on the effect of taxes on desired hours. If desired hours also depend on (the spouse's) actual hours, a policy simulation would also require an analysis of the response of actual hours to changes in desired hours.

A.2.3 Alternative- Specific Error Terms

The only error terms included so far are random preferences. In addition, we introduce alternative-specific error terms as follows:

$$u(v_j) = U(v_j) + \varepsilon_j$$

We assume that the ε_j are iid and follow an extreme value distribution.²⁷ We assume that the answer to the desired hours question is based upon maximising $u(v_j)$ rather than $U(v_j)$. The ε_j can be seen as the error made in evaluating alternative j . There are several reasons why these errors are incorporated. First, they are needed to give non-zero probability to choices which cannot be optimal for any value of the random preferences. Such choices may very well exist in case of a non-convex or discontinuous budget set, where some points on the budget frontier may give very low family income compared to adjacent points. In this sense, they play the same role as the optimisation or measurement errors in the Hausman (1985) model. The second reason for including the ε_j is computational: we will see below that they facilitate simulated maximum likelihood estimation. In this sense they function as a smoothing device. The same interpretation is given to them by Keane and Moffitt (1998). They use the same type of error terms, though they impose that the error terms have a small variance compared to the remaining part of $u(v_j)$ – an assumption we do not make.

Due to the assumption on the distribution of the ε_j the resulting model closely parallels the multinomial logit model.²⁸ The probability that an individual chooses alternative j , conditional on wage rates, tax and benefit rules, exogenous variables, and random preference parameters, is given by:

²⁷ Under the extreme value assumption, the model is similar to the multinomial logit model. McFadden and Train (2000) show in closely related models that the extreme value assumption is not a major limitation, as long as the systematic part (here, the utility function) is sufficiently flexible.

²⁸ See van Soest (1995) for details.

$$P[j] = \exp\{U(v_j)\} / \sum_k \exp\{U(v_k)\} \quad (3)$$

Given our interpretation of the desired hours question, the combination of desired hours of both spouses (hm_j, hf_j) reflects the family optimum, and the summation in (3) is over all 49 points in the family choice set. Other interpretations of the desired hours questions would imply that the summation is over a smaller set.

$P[j]$ increases with $U(v_j)$ (for given values of the other $U(v_k)$). Since U is increasing in income, the utility of working increases with the (before and after tax) wage rate. The utility of non-participation does not depend upon the wage rate. As a consequence, the participation probability increases with the wage rate. On the other hand, the participation probability decreases with the benefits level: a higher benefits level increases the utility level if a benefit is received, but does not affect utility values of the alternatives where working hours are so large that benefit income is zero.

A.2.4 Fixed Costs of Working

The model described so far typically underpredicts the number of non-workers. A possible explanation is that there are fixed costs of working. In other words, there is some gain to not working compared to all the other possibilities, which makes not working more attractive than working a small number of hours per week. The level of the fixed costs may depend on individual and household characteristics X_k ($k=2,3$) we model them as:

$$FC_k = X'_k \alpha_k + \eta_k, \quad k=2 \text{ (husband) and } k=3 \text{ (wife)}$$

Here the X_k are the same family and individual characteristics as in the utility function (see (2)), and η_k are error terms reflecting unobserved heterogeneity in fixed costs. In computing the values of the utility function, we replace income y_j by $y_j - FC_2$ if according to alternative j the husband works, by $y_j - FC_3$ if the wife works, and by $y_j - FC_2 - FC_3$ if, for alternative j , both husband and wife work. Since U is increasing with income, positive fixed costs increase the utility of not working compared to the utility of working. They thus make working less attractive, and decrease the probability of participation.

If log income were used in the utility function, negative values of income corrected for fixed costs could not be handled. With normally distributed random errors η_k , this problem would occur with positive probability. In such cases, censoring family income to a small positive value would be necessary. This can be seen as a drawback of the quadratic in logs specification, which we avoid by using the quadratic in levels specification.²⁹ Fixed costs were also used by Callan and van Soest (1996) and Euwals and van Soest (1999). Another possibility to explain the lack of part-time jobs is to model the availability of part-time jobs using job offer probabilities. This implies that the choice set varies across households, with a common probability distribution for all households in

²⁹ In the quadratic in logs utility function model, this problem could be avoided by modelling fixed costs multiplicatively, but this seems less plausible from an economic point of view.

the sample. This approach is followed by Dickens and Lundberg (1993), Woittiez and Tummers (1991), and van Soest *et al.* (1990). While this may be plausible for actual hours, it seems less appropriate for explaining preferred hours, which should not be affected by availability constraints. Van Soest (1995) used disutilities of part-time jobs, assumed to be independent of family characteristics. These disutilities reflect search costs of jobs with irregular hours. Again, for explaining preferred hours this seems less plausible.

A.2.5 Distribution of Error Terms

The error terms in the model are the alternative specific errors ε_i , the random preference terms υ_k ($k=2,3$), the unobserved heterogeneity in fixed costs η_k ($k=2,3$), and the error terms in the wage equations (ζ_k , $k=2,3$, say). We already made the assumption that the ε_i follow an iid generalised extreme value distribution. The other error terms are assumed to be normal with mean 0. We assume that all the error terms are independent of all the covariates incorporated in the vectors X_2 and X_3 , and the regressors in the wage equations. For identification and computational convenience, we assume that all the error terms are independent of each other, with some exceptions: we allow for correlation between ζ_2 and υ_2 and between ζ_3 and υ_3 . The main reason for this is that allowing for such a correlation makes it possible to capture the what is termed “division bias” in wage rates. This can arise because the hourly wage is calculated as the ratio of gross pay to hours worked in the period. In this context, a positive measurement error on hours (e.g., overstatement of hours) can lead to an underestimate of the hourly wage, whereas a mismeasurement of hours worked in the other direction (e.g., an understatement of hours) would lead to an overestimate of the hourly wage. Gong and van Soest (1998) show that in a model for female labour supply, such a correlation is significant, and not allowing for it leads to underestimation of the wage elasticity. We have also experimented with a non-zero correlation between husband’s and wife’s random preference terms υ_2 and υ_3 , to allow for flexible substitution patterns. This correlation, however, appears hard to estimate with any reasonable level of accuracy, and we find setting it to zero hardly affects the other results.

As noted earlier, the random preference error terms, υ_k ($k=2,3$ for men and women respectively) represent unobserved characteristics, reflecting unobserved heterogeneity of preferences. For identification and computational convenience, we assume that all the error terms are independent of each other. As an exception, we allow for correlation between ζ_2 and υ_2 and between ζ_3 and υ_3 (ζ_2 is the error in the wage equation for men, etc.). To incorporate the correlation, we implement these random preference terms in the following way for men (for women, just replace 2 by 3 and m by f). All $N(0,1)$ draws are independent of each other and of everything else):

- Let $e_2(w)$ be either the standardised residual from the wage equation (if the wage is observed) or an $N(0,1)$ draw (if the wage is unobserved)
- Let $e_2(rp)$ be an $N(0,1)$ draw
- The random preference term υ_2 is generated as $\Phi_{um}e_2(rp) + \lambda_{wm}e_2(w)$

The parameters Φ_{um} and λ_{wm} are estimated and reported in Table 2.3. They can be used to compute the variance of v_2 and the covariance of v_2 with ζ_2 :

$$V[v_2] = \Phi_{um}^2 + \lambda_{wm}^2 \text{ and } \text{Cov}[v_2, \zeta_2] = \lambda_{wm}.$$

A.2.6 Estimation

Due to the multinomial logit nature of the model, estimation by maximum likelihood would be straightforward if all wages and all random preference terms and fixed costs heterogeneity terms were observed. In that case, the likelihood would follow directly from (3), since the v_i would then be known functions of parameters, explanatory variables, and observed error terms. Since we do not observe the error terms (including those in the wage equations for non-workers), the likelihood contribution is not simply given by (3). Instead, it is given by the mean value of the appropriate expression according to (3), with the mean taken over the unobserved errors. Since there are between four and six unobserved errors, this implies that a four to six dimensional integral is needed. Approximating such an integral by conventional numerical (quadrature) routines is time consuming and intractable. A more convenient alternative is simulated maximum likelihood: the integral is replaced by a simulated average based upon R independent draws from the (multivariate normal) distribution of the unobserved errors (conditional upon the residuals in the equations of the observed wages, if any). Due to the law of large numbers, the approximation will be accurate if R becomes large. With independent draws across observations, it can be shown that the approximation is accurate enough to make simulated maximum likelihood asymptotically equivalent to exact maximum likelihood if R tends to infinity faster than the square root of the number of observations (see Hajivassiliou and Ruud, 1994, for example). In our benchmark model we will use $R=20$. We have also examined the sensitivity of our results for the choice of R , and find that there is little variation for values of R between 20 up to 100.

The simulated maximum likelihood procedure is greatly facilitated by the presence of the ε_i . Without these, the likelihood contribution conditional on the unobserved error terms would be either 0 or 1. The simulated likelihood would become a discontinuous function of the parameters, its maximisation would be numerically much harder, and zero contributions would have to be dealt with. Adding the ε_i smoothes the likelihood and bounds it away from zero. Adding the ε_i could thus be seen as a smoothing device, without giving the ε_i any real economic meaning. This is the interpretation of McFadden (1989) and Keane and Moffitt (1998). In both of these articles, the variance of the ε_i is fixed at some small value, while at the same time, a normalisation is imposed on the systematic part of the utility function. This *a priori* limits the share of the variance of the ε_i in the total variance of $u(v_i)$. We normalise the variance of ε_i only, and do not impose an additional normalization on the utility function, and therefore do not impose *a priori* that the ε_i should play only a minor role. This corresponds to the view that the ε_i could have some meaning as alternative specific errors in the economic model. We let the data decide how important this is.

3. ESTIMATING THE LABOUR SUPPLY IMPACT OF TAX REFORMS

3.1 Introduction

Tax reforms of interest in the present context include packages involving cuts in the standard and/or top rate of tax, increased personal allowances, and widening of the standard rate tax band. Structural reforms, extending beyond such simple changes are also of interest. We may wish to examine, for example, structural changes in the tax treatment of married couples.³⁰ Over time a number of countries have moved from systems involving “income-splitting” or extensive transferability of allowances between spouses to systems involving greater independence in the tax treatment of husband and wives – and, correspondingly, more restricted transferability of allowances and/or bands.³¹ The EU Employment Strategy (EU Commission, 2001) has identified low participation of women as a supply-side weakness for the EU as a whole, and set a target participation rate of 60 per cent to be achieved by 2010. In recent years the Irish tax system has moved towards greater independence in the tax treatment of couples, in what has been termed “individualisation” of the standard rate tax band. The National Employment Action Plan (2002) counts this as an initiative which will increase female participation; but there has been considerable speculation as to how great an increase in the participation of married women in the paid labour market is likely to be induced by this policy change. Analysis of the type set out here is necessary to provide estimates of likely impacts which can be used to inform the debate.

In this chapter we analyse the first round labour supply effects of changes to tax rates, personal tax-free allowances and wider rate bands, as well as the effects of more substantial changes to the structure of the tax system, such as increased independence in the taxation of husbands and wives. The model set out and estimated in the last chapter is particularly useful for this purpose, since it accounts for the complete structure of the

³⁰ The introduction of tax credits is often thought of as a structural reform. In fact, it makes little difference to the menu of policy choices available to government, though it may influence what policy is actually chosen, by altering the “optics” of certain policy changes. For more detail on this, see Callan *et al.* (1998).

³¹ See OECD (1977), Callan *et al.* (2001); O’Donoghue and Sutherland (1999) found that 10 out of 15 EU countries had income tax systems which were based around independent or individual taxation of husbands and wives.

tax system.³² Moreover, the model predicts the effects on labour market participation – whether or not an individual seeks paid work – as well as the distribution of hours worked for those in paid employment.

The way in which the effects are predicted is very similar to the method of computing the elasticities in Section 2.4. Using the parameter estimates, we first predict labour supply using the actual 1994 tax rules. We then repeat the simulation using the tax rules after the reform in question. Comparing the two outcomes gives the predicted changes. For the simulation after the reform, we assume that gross (pre-tax) wage rates remain the same as in the pre-reform situation. Thus, we do not attempt to calculate a new equilibrium situation within the labour market, or a wider general equilibrium. However, the labour supply effects which we identify are the driving force behind the impact of a tax reform on employment. In principle a wider equilibrium could be calculated by linking microeconomic results such as ours with a wider macroeconomic model.³³

In Section 3.2 we compare the labour supply effects of equal-valued tax cuts through the four main routes actually used to cut taxes over the past decade: the top and standard rates of tax, the width of the standard rate tax band, and the size of the basic personal allowance. We also consider the impact of a structural reform, in which the transferability of allowances between husbands and wives is reduced. Alternative uses of the incipient rise in revenue – increasing child benefit, or reducing income tax rates – are considered. Section 3.3 reports results which, based on the analysis in the previous chapter, provide estimates of the responsiveness of labour supply to the various tax changes and policy options. Section 3.4 concludes.

3.2 Labour Supply Impact of Alternative Tax Cuts

3.2.1 SPECIFICATION OF POLICY OPTIONS

In this section, we ask which form of tax cut does most to stimulate aggregate labour supply? In order to answer this question, we simulate the labour supply response to four different types of income tax cut: a cut in the standard rate of tax, a cut in the top rate of tax, a rise in the personal allowance, and a widening of the standard rate band. Each form of tax cut is scaled to have approximately the same Exchequer cost (about £200m per annum) on a static basis i.e., before any behavioural response.³⁴ For example, this amount is sufficient to finance a cut of 2.8 percentage points in the standard tax rate, or to widen the standard rate band by £2,400. Thus, the options considered are:

³² This includes such features as potential “poverty traps” whereby increased earnings lead to lower disposable income and “unemployment traps” whereby disposable income if unemployed exceeds that attainable from employment.

³³ There are relatively few micro-to-macro models of this type to be found in the literature. For an example see Creedy and Duncan (2001).

³⁴ An alternative would have been to calibrate the tax cuts so that the net Exchequer cost after behavioural responses would be the same. Such a calculation could only be undertaken for the sample of 1,296 tax units analysed here, as against a full sample of over 4,000 tax units. For the purposes we have in mind – ranking policies by the size of their labour market impact – the more comprehensive coverage of the static cost calculation seems preferable.

1. A cut of 2.8 percentage points in the *standard rate of tax* (from 27 per cent to 24.2 per cent).
2. A cut of 6.3 percentage points in the *top rate of tax* (from 48 per cent to 41.7 per cent).
3. An increase of £2,400 in the *standard rate band* (from £8,200 to £10,600 for single taxpayers, and double these limits for married couples).
4. An increase in the *basic personal allowance* (and the allowance for widowed/lone parents) of £465 (from £2,350 to £2,815).

Our exploration of the labour supply impact of these different forms of tax cut is of considerable interest in its own right. In addition, however, it helps to shed light on the wider debate concerning the appropriate balance between these different elements when cutting income taxes. Between 1987 and 2002 considerable resources were devoted to a range of tax cuts, over and above what would have been needed for indexation of the income tax system with respect to prices or wages. Over this 15 year period the standard rate of tax was cut from 35 per cent to 20 per cent, and the top rate of tax was reduced from 65 per cent to 42 per cent. While wages almost doubled over the period, the basic personal allowance was almost trebled and the standard rate band for a single person was increased by almost 470 per cent.

There was considerable debate as to the appropriate structure of tax cuts at various times during this period. While such debate usually received greatest attention at annual budget time, it was also a recurring theme in partnership negotiations, and was a leading issue in the 1997 election campaign. On the one hand, it was argued that a focus on increasing personal allowances would help to concentrate the benefits of tax cuts on low-income earners. As against this, it was sometimes argued that other forms of tax cut – including widening of the standard rate band and reduction of income tax rates – could lead to greater employment growth, and might therefore be preferable. The framework provided by Chapter 3 allows these issues to be analysed in a more comprehensive way than heretofore.

3.2.2 ESTIMATED LABOUR SUPPLY RESPONSES TO ALTERNATIVE TAX CUTS

Table 3.1 shows the estimated changes in participation rates for men and women in response to various tax policy changes. A cut in the standard rate of tax of just under 3 percentage points leads to a rise of about half a percentage point in both male and female participation rates. An increase in personal allowances (with similar exchequer cost) has very similar effects. Changes to the top rate of tax or to the standard rate band, however, have rather different consequences. A cut in the top rate of tax of more than 6 percentage points is estimated as leading to a rise of about 1 percentage point in the participation rate for married women, but only to a very small rise in the participation rate for married men (0.1

percentage points). Widening the standard rate band leads to very similar, but marginally greater changes in participation rates.

Table 3.1: Response of the Labour Force Participation Rate to Selected Tax Cuts

Tax Cut Option	Change in husbands' participation rate	Change in wives' participation rate	Exchequer cost as estimated by SWITCH on full sample
Standard rate cut by 2.8 percentage points	+0.5	+0.6	Ir£199m
Top rate cut by 6.3 percentage points	+0.1	+1.0	Ir£201m
Standard rate band up by Ir£2,400 from Ir£8,200	+0.2	+1.1	Ir£202m
Personal allowances increased by Ir£465 from Ir£2,350	+0.5	+0.5	Ir£200m

The overall change in participation (male and female combined) is rather similar across the different options. The major difference is on the sex distribution of the change in participation. A cut in the top rate of tax, or a widening of the standard rate band, prompts a greater increase in female participation and much less in male participation. A cut in the standard rate of tax, or an increase in personal allowances, leads to similar increases in participation rates for both sexes. There may, of course, be other differences in the impact of policy (e.g., as between high and low income families, or those with above and below average education) which could be of interest.

Table 3.2 examines a different perspective on the labour supply response, the change in average desired hours. This includes both the participation response, and the change in desired hours for those who were initially in employment or seeking employment.

As with the participation response, the aggregate (male and female combined) labour supply response is rather similar across the options, with a rise in average desired hours of 0.2 to 0.3. The differences between the options are also similar to those observed for the participation response: a cut in the top rate of tax or a widening of the standard rate band give rise to a much greater response by married women than by married men. There is little difference between the sexes in the response to a standard rate tax cut or a rise in personal allowances.

Table 3.2: Response of Average Desired Hours to Selected Tax Cuts

Tax Cut Option	Change in husbands' average desired hours	Change in wives' average desired hours
Standard rate cut by 2.8 percentage points	0.2	0.2
Top rate cut by 6.3 percentage points	0.1	0.5
Standard rate band up by Ir£2,400 from Ir£8,200	0.2	0.5
Personal allowances increased by Ir£465 from Ir£2,350	0.2	0.2

3.3 Labour Supply Response to Tax and Welfare Policy Changes

3.3.1 TAX TREATMENT OF MARRIED COUPLES

The second major area examined here relates to the income tax treatment of couples. The Irish tax system – like the UK system – initially treated married couples as a unit for income tax purposes, with the wife’s income being aggregated along with that of her husband. While there was a “married man’s allowance” tax was assessed on the basis of the same band width as for single persons. Compared to two cohabiting single persons, a married couple received a marriage subsidy if the wife was not earning an independent income, or earned a very low one. But if the wife’s earnings were greater, she, and the couple, faced a substantial tax penalty – a married couple with both partners in employment could face a higher tax bill than an unmarried couple in identical circumstances.

The Supreme Court ruled in the Murphy case (1979) that this feature of the tax system was unconstitutional. A number of responses to this ruling may have been possible. The one chosen by the government, and implemented in Budget 1970, was to allow doubled rate bands and doubled allowances to all married couples. Formally, this was equivalent to allowing “income splitting” i.e., calculating the couple’s tax liability on the basis of assigning half the income to each partner and taxing them as if they were single. It was also equivalent to full transferability not only of allowances but also of rate bands. Married couples were permitted to minimise their tax liabilities by assigning allowances and rate bands freely to either partner.

Box 3.1: Tax Treatment of Married Couples in the UK

The UK system, like the Irish one, was built around the “male breadwinner” model. Until the 1970s, the systems were broadly similar in structure. But during the 1970s the UK introduced the option of separate taxation for wives on earned income, removing a major source of unfairness from the system. Further UK reform of the tax treatment of couples involved a move towards independent treatment of each partner’s income. The last vestige of the old system was the “married couples allowance”, which became seen as an ill-targeted subsidy, and was abolished in 2000.

The net effect of these different policy responses is that Ireland, prior to the recent individualisation measures, was close to one extreme with respect to the tax treatment of couples, while the UK was close to the other extreme. Other countries can be found with intermediate positions.

One implication of income-splitting is that widening of the standard rate band has been much more expensive in revenue terms in Ireland than in the UK. Until recently, in order to widen the band by £1,000 for single persons, the band was raised by £2,000 for married couples, including the

large number of one-earner married couples. In the UK, the band could be widened by £1,000 for each earner, without extending the benefit to £2,000 for one-earner married couples. This restricted the ability of Irish policy makers to attain the desired end of reducing substantially the number and proportion of taxpayers paying the top rate of tax. (See Callan *et al.*, 2001 for more on these issues).

The main reason given for this approach in the 1980 Budget Speech was that

A narrow approach towards effecting the minimum changes to meet the Supreme Court's decision would lead to unjustifiable discrimination against the one-income family, particularly where a married woman elects to care for the family on a full-time basis at home rather than take up work outside the home." (Minister for Finance, 1980, p. 18).

Callan and Farrell (1991) comment that if, as would appear from this statement, the policy objective was to subsidise childcare undertaken by married women in the home, the mechanism chosen was a rather inefficient one. The tax subsidy is not conditional on having children, but on being married – implying that “... the benefit from this tax break is, in terms of its main stated objective, rather inefficiently targeted”. Furthermore, the mechanism imposed high effective tax rates on married women with and without children, thereby giving rise to a substantial efficiency loss. Callan and Farrell concluded that other methods of providing child income support, notably through child benefit, might involve smaller efficiency losses and better targeting. Fahey (1998) came to a similar conclusion, based on an analysis of Labour Force Survey data, finding that “Many who receive the subvention are not engaged in childcare, and many of those with young children who have a heavy childcare burden do not receive the subvention”.

The major structural innovation in Budget 2000 was a move towards individualisation of the standard rate tax band. This involved restricting the extent to which tax bands are transferable between spouses. In 1999 the standard rate band was £14,000 for an individual, or £28,000 for a couple i.e., a non-earning partner could transfer 100 per cent of his or her tax band (and, indeed, of his/her allowance). In 2000, tax allowances remained fully transferable as before, but there were, in effect, restrictions on the transferability of the standard rate band. The band for a single person was increased from £14,000 to £17,000 per annum; for a married couple with one income the band remained unchanged at £28,000 per annum; but the band for a married couple, both earning, rose to £34,000 (twice the single band, thereby meeting the requirement of “no marriage penalty”). Thus, in effect, only two-thirds $[(28,000-17,000)/17,000=11/17]$ of a non-earning partner's band was transferable.³⁵ The stated objective was to arrive at a position after three years where each individual, whether single or married, has his/her own standard rate tax band which can be set off against his/her own income but cannot be transferred between spouses. By December 2001 the proportion of the band which was

³⁵ In the immediate aftermath of the budget, a special Home Carer's Allowance was introduced for couples with one partner staying at home to care for a child or children, an elderly person or someone with a disability.

transferable had fallen to about one-third, remaining at that level after Budget 2003.

In this section, we do not attempt to summarise the extensive (and often heated) debate that has grown up around the shift from an income-splitting system to a system with greater independence (and less transferability of rate bands) between husband and wife.³⁶ Our aim instead is to bring new evidence on the likely outcomes linked with different policy choices in this area, which can help to inform those on all sides of the debate. With this in mind, we examine the potential size of labour supply responses to a full-scale individualisation of tax bands, and how this is affected by alternative uses of the incipient rise in tax revenue associated with restrictions on the transferability of the rate band.

3.3.2 LABOUR SUPPLY RESPONSE TO ALTERNATIVE REFORM PACKAGES

Table 3.3 shows the impact of alternative ways of implementing increased independence in the tax treatment of husbands and wives. Option (A) simply involves the elimination of transferability of the standard rate tax band, and would generate something over £200m per annum in extra tax revenue.³⁷ Option (B) returns this revenue to taxpayers, via proportionate cuts in the standard and top tax rates. Option (C) is also revenue neutral, but the incipient rise in revenue is used to fund an increased child benefit.

Table 3.3: Response of Husbands' and Wives' Participation Rates to Increased Independence in Tax Treatment of Married Couples

Change in tax structure	Per cent point change in husbands' participation rate	Per cent point change in wives' participation rate	Net change in Exchequer revenue as estimated by SWITCH on full sample
(A) Standard rate band made non-transferable	-0.5	+1.8	+1r£210m
(B) Band non-transferable, tax rates cut to 25.4 per cent and 45.1 per cent	-0.1	+2.6	-1r£8m
(C) Band non-transferable, Child Benefit increased by 69 per cent	-0.9	+1.6	+1r£1m

³⁶ For many purposes it is convenient to summarise recent changes in the income tax treatment of couples as a move from full transferability of rate bands and allowances (100 per cent transferability) to a system with (currently, in 2003) 32 per cent transferability of bands and 100 per cent transferability of allowances. A fully independent system would have zero transferability of bands and of allowances.

³⁷ All calculations are undertaken in a 1994 setting.

A notable feature of option (A) is that it gives rise to a net increase in labour market participation (a fall in married men's participation being more than offset by a rise in the participation of married women), while at the same time actually increasing net revenue for the Exchequer. Options (B) and (C), returning this revenue via general tax cuts or via child benefit, are designed to be approximately revenue neutral.³⁸ Option (B), combining non-transferable bands with cuts in tax rates, gives rise to a sharp rise in married women's participation, and leaves men's participation almost unchanged. Option (C), using the revenue from restrictions on transferability to fund an increased child benefit, also boosts married women's participation, but leads to a fall in men's participation.

Table 3.4 shows the total labour supply response in terms of desired hours of work. This includes not only the participation response described in Table 3.3, but also changes in desired hours of work for those who are, and remain, in employment. Under option (A), the rise in average desired hours of work for women is almost offset by a fall in desired hours for men. Under option (B), which includes a significant cut in tax rates as well, the response of married women is more positive, and that of married men is less negative. As a result, the overall response is positive. Indeed, when the labour supply response of single people is also taken into account, the total rise in labour supply would be greater than that shown here. Under option (C), the gain in tax revenue arising from non-transferability is applied to fund a rise in child benefit. This gives rise to a fall in male labour supply which is only partially offset by a rise in the labour supply of married women.

Table 3.4: Response of Husbands' and Wives' Labour Supply to Increased Independence in Tax Treatment of Married Couples, Average Desired Hours of Work

Change in tax structure	Change in husbands' average desired hours	Change in wives' average desired hours	Change in average desired hours
(A) Standard rate band made non-transferable	-0.5	0.6	0.1
(B) Band non-transferable, tax rates cut to 25.4 per cent and 45.1 per cent	-0.2	0.9	0.4
(C) Band non-transferable, Child Benefit increased by 69 per cent	-0.8	0.5	-0.2

3.4 Conclusion

In this chapter we examined the labour supply response to a number of policy experiments. These included equal valued tax cuts through four different channels: cuts in the standard and top rates of tax, widening of the standard rate tax band and increasing the basic personal allowance. A structural change in the tax treatment of couples, introducing greater

³⁸ As noted earlier, this is revenue neutrality on a static basis; increases (falls) in participation/hours would give rise to increased (reduced) revenues.

independence between the taxation of husband and wife, was also examined: this approximated the full individualisation of the standard rate tax band announced in Budget 2000. Alternative uses of the incipient rise in tax revenue – including a proportionate cut in income tax rates, or an increase in child benefit – were also analysed.

Looking at the results on equal-valued tax cuts, we found that both men's and women's desired hours responded positively to a standard rate tax cut (of 2.8 percentage points) and to an increase (of about 20 per cent) in the basic personal allowance. An increase in band width (of about 30 per cent) or a cut in the top rate of tax (of 6.3 percentage points) led to a positive response in married men's desired hours similar to that for a standard rate tax cut or personal allowance increase. But the response of married women to a top rate tax cut or to band-widening was more than twice as strong as that of men, and more than twice as big as their response to a standard rate tax cut or allowance increase. Most of the change in desired hours appeared to be driven by changes in labour force participation.

Turning to the results on increased independence in the taxation of married couples, we find that full individualisation of the standard rate tax band can have quite different impacts on labour supply depending on the use made of the rise in tax revenue that would result. If this revenue is retained by government for use outside of the tax/transfer system, then married women's participation rate would rise by close to 2 percentage points, while married men's participation rate would fall by half of a percentage point. Average desired hours of work would rise very slightly (0.1 hours per week). If the revenue were used to fund a general tax cut (through proportionate cuts in standard and top rates of tax) then men's participation would remain roughly constant, while married women's participation would rise by about 2½ percentage points. Average desired hours of work would rise by 0.4 hours per week. If the revenue were used to finance an increase in child benefit, married women's participation would rise by more than the fall in married men's participation; but there would be a net fall in average desired hours of 0.2 hours per week.

Taking these results together, some light can be shed on a number of current issues. We must note here that the modelling undertaken here is based on the 1994 data and policy context; despite this, we would expect the major features highlighted below to apply in the later setting. However, the present analysis does not take account of the "home carer's allowance" introduced in Budget 2000: this feature of the budget would tend to reduce married women's participation. A further contrast is that our analysis deals, in effect, with full individualisation, whereas current policy still involves significant transferability of rate bands (about one-third): thus, the impact of current policy would, if anything, be less than the impacts estimated here.

First, to the extent that increasing labour supply is a policy priority, it should be noted that a revenue-neutral package involving individualisation of the tax bands and cuts in tax rates has more positive effects on labour supply than any tax cut costing IR£200m per annum. Second, even the individualisation package with maximum impact on labour supply (combining full individualisation with proportionate cuts in tax rates) has quite a limited impact on married women's participation rates. Our results

suggest a one-off rise of about 2½ percentage points in the labour market participation rate for married women as a result of this policy package. This can be compared with an increase of about 30 percentage points in married women's labour force participation since 1980.

4. FINANCIAL WORK INCENTIVES AND THE DURATION OF UNEMPLOYMENT³⁹

4.1 Introduction

Previous chapters have examined the impact of tax and welfare structures on labour supply decisions regarding participation and hours of work, modelled in a “static” framework. In this chapter we focus on a different aspect of labour supply: we explore influences on the duration of spells of unemployment, paying particular attention to the potential effects of tax and welfare policies on unemployment durations via their impact on the balance between in-work and out-of-work income.⁴⁰

This has been a very active research topic for quite some time. The general rise and persistence in unemployment throughout Western Europe in the late 1970s and 80s led many economists to investigate the possible contribution of unemployment compensation to this situation. The prevailing wisdom was that unemployment benefits “...created substitution effects in favour of [a] greater frequency and longer duration [of] periods of unemployment” (Lindbeck 1981, p. 38). Indeed, the evidence, mostly from Great Britain and the United States did seem to suggest that there was a relationship between unemployment benefits and the duration of unemployment (Danziger, Haveman, and Plotnick, 1981; Nickell 1979a; Lancaster and Nickell, 1980; Narendranathan, Nickell and Stern, 1985). However this seemingly well established pattern was undermined by a series of articles by Atkinson and Micklewright (1991) and Atkinson *et al.* (1984) which argued that such evidence was built upon shaky methodological and theoretical foundations and was less than robust. Atkinson and Micklewright showed that previous papers had taken a very limited view of the labour market and its relationship to the benefit system and regulatory structure. Moreover, by varying the period covered by their analysis, using different benefit variables and varying the specification of the replacement rate, Atkinson and Micklewright found

³⁹ This chapter is based on material published during the course of the project as Layte and Callan (2001).

⁴⁰ As will be seen, the balance between in-work and out-of-work income is often summarised in this work by a replacement rate (the ratio of out-of-work to in-work income).

much weaker, or even negative effects for benefits on unemployment duration.

Work from Germany and the Netherlands has also cast doubt on many of the US and British results by finding no significant effect from unemployment insurance benefits.⁴¹ Roed and Zhang (2003) summarise the situation as follows:

In continental Europe, the evidence is more mixed, and the typical result is that significant incentive effects associated with the compensation level cannot be robustly identified at all...Some studies indicate substantial responses...The European evidence is more unanimous in its evaluation of effects associated with benefit exhaustion: the exit rate does seem to increase just prior to when benefits run out.

Against this background, it is clear that detailed empirical studies of the Irish situation are needed to investigate the potential influence of unemployment compensation on the duration of unemployment spells. Relatively little work has been done on this topic in the Irish context, but that which does exist suggests that the average duration of spells on the Live Register are affected by changes in the unemployment insurance programme (Hughes and Walsh, 1983; O'Mahony, 1983). In this chapter we examine the lessons that can be drawn from previous literature on the disincentive effects of unemployment payments before attempting to assess whether and to what degree such effects can be said to exist in the Irish context. Using the first Irish unemployment duration data for a general population we specify a structural model of exit from unemployment. The structure of the chapter is as follows. Section 4.2 reviews findings from different national contexts on the effects of unemployment compensation before outlining the criticisms that Atkinson and Micklewright (1991) have made of previous research on this subject. Section 4.3 describes the data and variables that are used to examine possible disincentive effects, and outlines the different specifications of disincentive effects themselves. In Section 4.4 we begin the empirical analysis of Irish unemployment duration data using descriptive techniques before applying more analytical techniques in Section 4.5. The final section draws together the findings of the chapter and some implications.

4.2 International Evidence

The general rise in unemployment in OECD countries in the late 1970s spawned a great deal of research on the possible effect that unemployment compensation may have on transitions in the labour market and particularly on the duration of unemployment. No consensus has emerged on the impact of compensation on transitions, primarily because of different model specifications and assumptions and the difficulties in comparing results across different national contexts. Model specifications and assumptions have been discussed and criticised at length by Atkinson and Micklewright (1991), but before we turn to these we should briefly review the main findings of earlier work.

In the US and UK a number of studies have found a small, but significant negative relationship between replacement rates and

⁴¹ For reviews see Pedersen and Westergård-Nielsen (1993) and (1998).

unemployment duration (cf. Fallick 1991; Katz and Meyer 1990; Lancaster 1979; Meyer 1990; Moffitt 1985), but this effect has been shown in the UK to depend upon the duration of unemployment (Narendranathan, Nickell and Stern 1985; Narendranathan and Stewart, 1993; Narendranathan and Stewart, 1995; Nickell, 1979b; Nickell, 1979a). Research in Continental Europe on the other hand has not produced consistent results with research using Dutch and German data finding no significant effects for Unemployment Insurance benefits (UI) (cf. van den Berg, 1990; Hujer and Schneider, 1989; Groot, 1990; Wurzel, 1990), while more recent research in Spain has found small, but negative effects among the short-term unemployed (Jenkins and Garcia-Serrano, 2000).

How do we reconcile these contradictory results, particularly given the more generous benefit systems in Continental European states which standard search theory would predict might give rise to even stronger disincentive effects? Several factors have been suggested to account for this paradox (Pedersen and Westergård-Nielsen, 1993). First, the maximum duration of benefits is longer in European countries compared to the US and those who exhaust their entitlement of UI can usually transfer onto a means-tested programme of unlimited duration. US research has shown that unemployment exit rates increase as benefit exhaustion approaches (cf. Ham and Rea, 1987; Katz and Meyer, 1990; Bratberg and Vaage, 2000). Second, the persistently higher rates of unemployment and particularly long-term unemployment in Europe may limit the relationship between duration and compensation since research shows that benefit effects tend to be concentrated among the short-term unemployed. Lastly, the absence of minimum wage legislation and greater variance in the US wage distribution may make it easier to get a job by lowering one's reservation wage, an option less readily available in many European countries.

Atkinson and Micklewright (1991) have suggested a number of other dimensions that may well contribute to the range of results that have been found. First, the factors associated with exit may well vary with different exit states, thus it is essential to differentiate exits to employment from those to education, retirement or full-time caring. Similarly, employment itself can be heterogeneous in a number of ways. Korpi (1991) has differentiated between exits to temporary and permanent positions and Jensen and Westergård-Nielsen (1990) have compared differences between recalls to previous jobs and to new jobs.

Atkinson and Micklewright also argue that unemployment compensation itself cannot be summarised simply as the level of benefit. We have already seen that the duration of benefit entitlement has been shown to be important in the US context, but the duration of benefits is often related to the type of benefits offered, thus they argue that different types of benefit, their durations and relative value should be assessed.

A range of other institutional features may also be important. For instance, in the British benefit system, claimants need to show that they are making efforts to find a job and fulfil contribution conditions to obtain certain types of benefits. These dimensions of benefit systems mean that levels of benefits may change considerably over time (cf. Jenkins and Serrano, 2000) both as a direct result of duration, but also because of the economic activities of other household members. It is extremely

important then to be able to control for both the structure of the benefit system and the interaction of this with the household structure of claimants in assessing the impact of disincentive effects.

Most empirical research in this area has tended to use a combination of the standard theory of job search (job offers come at a constant rate and the first offer above the reservation wage is accepted) plus an extremely simplified model of the unemployment compensation system. Thus, most make no distinction between unemployment insurance benefits and those gained through means tested or minimum income schemes and most assume that benefits are of indefinite duration, are neither monitored nor subject to withdrawal (say if job offers are rejected) and do not depend on past contributions. The typical practice is to consider the benefits received by a hypothetical or 'representative' person, or use the average benefits received by the unemployed. These are then compared to the average earnings of the employed to derive a replacement rate. In reality levels of benefit can vary enormously across claimants and across time because of the factors mentioned above, as of course, can in-work incomes. Atkinson and Micklewright (1991, p. 1708) argue that it is essential that analyses should take into account the diversity of individual receipt of unemployment benefit and recognise that "... hypothetical calculations based on a reading of the social security manuals are highly misleading".

Taking these points into account it seems plain that the accurate estimation of disincentive effects requires a more fine-grained approach to the estimation of both benefit receipt and the in-work counterfactual. As will be seen in Section 4.4, our analysis has access to detailed individual level data on benefit receipt, but can also make use of micro-simulation methods to estimate the in-work income of individuals and tax units taking into account the activity status of the partner.

It is also clear that we should explicitly model the structure of the benefit system in terms of the type and duration of benefits available. In the Irish context this means the important distinction between Unemployment Benefits (UB) and Unemployment Assistance (UA) and the restriction of the former to a period of 15 months duration. Given the emphasis placed on the heterogeneity of processes by Atkinson and Micklewright we should make distinctions between different destination states when modelling the process of exit. It is highly likely that different states will be associated with very different processes. Lastly, it has been widely shown that the relationship between unemployment exit rates and the duration of the spell ('pure' duration dependence) is not usually monotonic, thus it is important to use flexible specifications of the baseline hazard function (cf. Jenkins and Serrano, 2000).

In the next section we outline the data to be used from the Living in Ireland Panel Survey and how variables are defined. Though there has been some research in the Irish context on the duration of unemployment spells and the possible contribution of compensation levels, this has either been through the use of aggregate data (Hughes and Walsh, 1983) or descriptive techniques (O'Mahony, 1983). The results reported here are based instead on modelling of exits from unemployment using individual level duration data. This was first undertaken for a general sample of the unemployed in the Irish context by Layte and Callan (2001). Russell and

O’Connell (2001) examined exits from unemployment for the young unemployed.

4.3 Data and Variables

The data used here come from four waves of the Living in Ireland Survey (LII): those carried out in 1994, 1995, 1997 and 1998. The LII is the Irish component of the European Community Household Panel Survey (ECHP) – an initiative of the Statistical Office of the European Union (EUROSTAT). As its name suggests, the ECHP is a fully harmonised survey of individuals and households carried out in 12 EU states each year since 1994. The aim of the survey was to produce comparable data over time on the economic, financial and other circumstances of households throughout the EU. The novel feature of the ECHP is its longitudinal design where the same sample of households and individuals were reinterviewed in each successive year. This allows researchers to examine changes in individual and household circumstances over time and thus get a clearer picture of the processes in operation.

As information is gathered at both the household and individual level we are able to link individual characteristics to household circumstances and also to other individuals within the household. This is particularly important in studying the impact of benefits on unemployment durations since we are able to link individuals to ‘tax-units’. Tax-units consist of an individual, or married couple, together with dependent children: the taxes and benefits of one spouse can typically depend on the income of the other. This issue will be discussed in greater detail below when we describe the in and out-of-work incomes simulated using *SWITCH*, the micro-simulation model. The ability to link individuals to household circumstances also means that we can examine the way in which the incentive structure faced by individuals is related to the level of household ‘needs’ in terms of the number of dependants such as children or other compositional factors. More in-depth information on both the ECHP and LII can be found in Callan *et al.* (1996) Chapter 3, and details of the sampling frame and response rates are given in Appendix 4.1.

The Sample of Unemployed

Many studies of the effects of unemployment compensation have used duration data derived from unemployment claimant registers. However, this has the inherent problem that many that could be described as unemployed do not claim benefit and are thus not available for analysis. The LII survey has detailed information on current activity status from which we can construct different definitions of unemployment. Since we are modelling exit from unemployment a definition based on subjective primary economic status may lead to excessive spell lengths, thus here we adopt the ILO definition of unemployment. This definition counts a person as unemployed if he or she:

1. is not employed that week
2. has searched for work in the past four weeks
3. is available to begin work in the next two weeks.

For the models used in the third section of this chapter we select those who are ILO unemployed at interview in 1994 and 1997 and use

information from the following year to establish whether these individuals left unemployment between interviews. If not, the unemployment spell is censored at the date of the second interview. This sampling procedure has two effects. First, this is a stock sample and thus estimates of average duration of unemployment spells will be biased upward: our modelling strategy is adjusted accordingly. Second, the individual-level information (including income) relates to the person at interview, not from the start of the spell. Nonetheless, the survey provides us with information on the total length of the spell before either censoring or exit from unemployment and the period prior to interview can thus be controlled for in the model. Descriptive statistics of the sample of the unemployed in 1994 and 1997 can be found in Appendix 4.1.

The panel nature of the data gives us the opportunity to follow the same individuals and households over almost six years. In each year all respondents are asked for details of their principal economic activities *in each month*, both in the current year and in the previous year, thus building up a dynamic picture of their labour market status throughout the period from 1993 to the last interview on a monthly basis. To get a descriptive picture of some of the factors associated with the duration of unemployment we will use this self-reported information on unemployment spells in the next section.

Income Estimates Using Micro-Simulation

The LII survey gathers detailed information on current income sources from which we can calculate individual and household incomes among the unemployed. This is a major advantage over research that posits a ‘representative’ unemployed person since we have the actual level of household and ‘tax-unit’ income for those defined as unemployed at interview and the elements from which it is formed.⁴² However, to fully understand the possible disincentive effects associated with unemployment compensation we need a counter-factual in-work income. In previous research this has been estimated using wage functions including variables such as age, sex and education, but such estimates do not take into account the interaction of the individual’s counter-factual income with the current income of their spouse or other household members. For example, though we may be able to generate an in-work income for a presently unemployed individual, their actual in work income would affect any means-tested benefits received by their partner. To this end, we used the micro-simulation tax-benefit model *SWITCH* (Callan, Richardson and Walsh, 1997) to estimate in-work incomes for the unemployed.

Using data from the 1994 Living In Ireland Survey, gross earnings for the presently unemployed are predicted using separate wage equations for married and single men and women using those currently employed. These wage equations establish a relationship between personal characteristics (such as level of education and length of labour market

⁴² However, unlike information drawn from claimant registers we do not observe any changes in levels of benefit between waves of the LII survey and thus rely on the assumption that incomes are stationary.

experience) and the wages received by those in employment. The *SWITCH* micro-simulation model then uses this information to estimate the social welfare entitlements and tax liabilities of each tax unit in the 1994 LII survey under the actual tax and social welfare policies in force in 1994. This same process is repeated for 1997 so that disincentive effects can be estimated for the two time periods.

Measuring Disincentive Effects

The financial incentive for an individual to move from unemployment into employment can be seen as depending on the disposable income of the income unit (which here is the nuclear family or tax unit) when the individual is unemployed compared to their disposable income when employed. The incentive effect should be seen in the context of the family unit to take account of the possible impact of an individual's move to employment on the social welfare entitlements and tax liabilities of others in the family since living standards depend on the total net income of the family. The replacement rate summarises this relationship by taking out-of-work income as a proportion of in-work income.

However, there are also other summaries of this relationship that have been put forward. Pearson and Whitehouse (1997) have suggested that while replacement rates have advantages, they are affected by many factors such as the incentives inherent in the tax/benefit system. As such they argue for the use of 'average tax rates' (ATRs) as a way of focusing on the impact of the tax and benefit system on the financial incentive to work. The ATR is calculated as the in-work net income minus the out-of-work net income divided by the gross income. The ATR thus measures the amount that employees lose in tax, social insurance and reduced benefits when taking up employment. The last summary measure that we will use here is the cash gap between income in employment and out-of-work income. This gives the absolute difference between the two amounts as the basis of the incentive. Given that we have no *a priori* distributional assumptions about the effect of the disincentive measures, all measures are used in linear format.

Control Variables

Research shows that in the Irish context the female unemployment rate is lower and that women leave unemployment quicker than men. In the models we control for this using a dummy variable representing whether the respondent is female. Age has also been shown to have a negative relationship with the probability of leaving unemployment: here we use both linear and quadratic age terms.

In assessing disincentive effects we need to take account of the living arrangements of the person and whether this would have an impact on their benefit entitlement. The presence of a partner in the household would increase benefit levels, but only if their earnings are below a specified level. The situation is made more complicated by the fact that the presence of a partner in the household may influence levels of compensation differently depending on the type of benefit being claimed by the respondent and this may change during a spell of unemployment. The earnings of a partner would not affect personal levels of

Unemployment Benefit (though they would influence the receipt of qualified adults allowance), but could lead to a marked reduction in Unemployment Assistance, the means tested benefit. Thus as Unemployment Benefit exhaustion approaches at fifteen months duration the presence of a working partner could alter the search behaviour of individuals.

We also need to control for the number of children when assessing disincentive effects since although taking care of children can be costly, having larger numbers of children can lead to high replacement rates because in-work incomes, unlike benefit levels, are not adjusted to take account of needs. We thus enter a variable that measures the number of children under eighteen years in the household that can vary with the month of unemployment.

As just discussed, the restriction of UB payments to those who have experienced 15 months or less of unemployment (and who fulfil the contribution requirements) means that this should be entered explicitly into the model. As such we use a linear quantitative variable to represent the time to benefit exhaustion in the month in question (the variable is thus time varying) and guard against endogeneity by giving this variable the value zero once benefit is exhausted.

Education is likely to have a significant impact on whether respondents leave unemployment, either positively if to employment, or negatively if to inactivity. To control for education, we use a four-fold classification from no qualifications or primary education only, through Junior/Intermediate Certificate, Leaving Certificate up to third level education. This variable is entered as a time varying variable.

As outlined earlier, there is evidence that past unemployment may lead to state dependence, either through decreased search intensity, or a decrease in the offer rate due to employers' statistical discrimination against unemployed people who are seen as having lower levels of productivity. Past unemployment may thus have a 'scarring' effect on the current probability of employment. To account for this we enter a variable to represent whether the person has experienced a spell of unemployment other than the current spell in the previous five years.

UA levels may be affected by the economic status of partners, thus we control for this using a four level variable differentiating between no partner present and one who is employed, unemployed and inactive using a time varying variable. Finally, the data on unemployment spells was drawn from two waves of the Living in Ireland Survey 1994 and 1997.

4.4 Descriptive Duration Analyses

Before going on to specify and present the results of the hazard rate model in the next section, it would be useful first to examine some descriptive statistics on the durations of unemployment. As this study had access to five waves of the Living in Ireland Panel Survey it would be interesting to examine the structure of spells of unemployment that occurred during this period as this will give us a context within which to place the multivariate analyses which we turn to next. However, unlike in the next analysis, the spells used here are based on a self-definition of

unemployment and this has implications for the distribution of spells among men and women that should be borne in mind.⁴³ To avoid the problem of left hand censoring, we select spells of unemployment that began after January 1993.

In Table 4.1 we show Kaplan-Meier estimates of the mean duration of unemployment in bivariate relationship with a number of different variables with estimates for transitions to both employment and inactivity. The Kaplan-Meier, or product-limit estimate calculates the risk of leaving one status (such as unemployment) for another (such as employment) at each point over a given observation period where at least one transition occurred. Using this estimate we can also calculate the probability of not leaving unemployment which is known as the ‘survivor function’ and the mean length of unemployment for any given group as shown in Table 4.1.

Table 4.1: Kaplan Meier Estimates of Mean Unemployment Duration by Destination and Various Characteristics

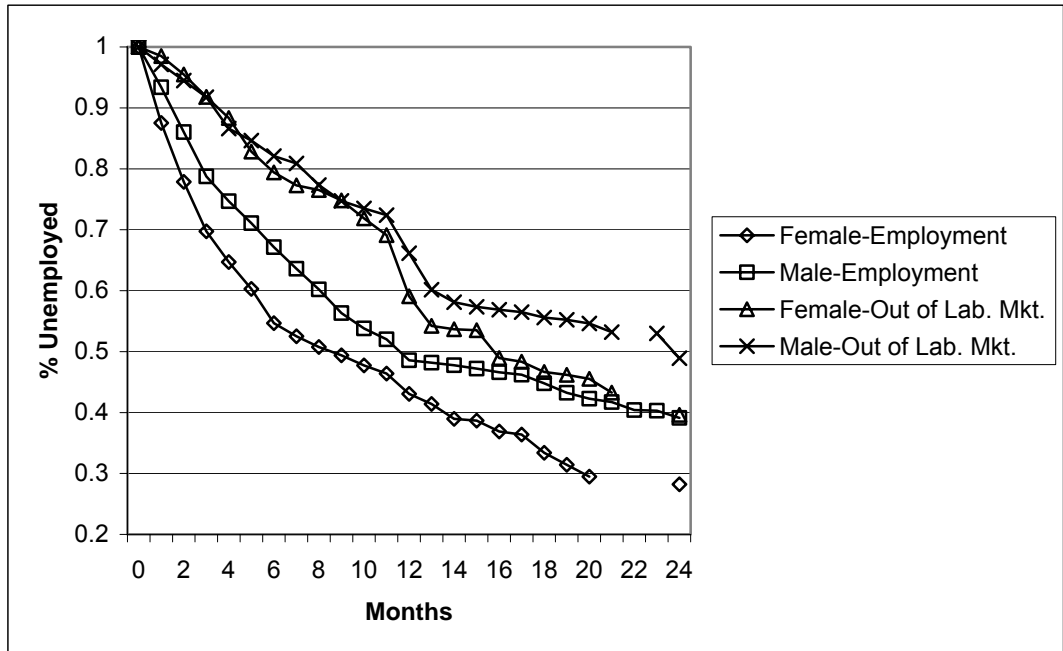
Group	Destination State		
	Employment	Out of Labour Market	All
	Mean length of unemployment spell (months)		
All	6.98	10.86	8.45
Men	7.83	11.43	9.26
Women	5.97	10.02	7.40
Highest Education:			
Primary Only	8.35	13.03	11.06
Junior Certificate	8.19	10.86	9.20
Leaving Certificate	6.43	8.99	7.19
Third Level	4.18	6.36	4.65
Age Group:			
17-24	7.15	9.92	7.94
25-34	6.88	9.89	8.06
35-44	7.46	11.25	9.26
45-54	6.27	11.80	8.54
55-64	6.36	13.79	11.02
Year unemployment Began:			
1993-4	8.75	12.67	10.30
1995-6	6.37	10.07	7.82
1997-8	3.90	6.37	4.63

The first three rows of Table 4.1 show that the mean length of unemployment spells during this period was almost seven months, but that the mean for women was almost two months less than for men. Women exited from unemployment faster whether to employment or to inactivity. Looking at the survivor curve in Figure 4.1, we can see that the difference in the rate of exit to inactivity is rather small until after one year at which point the female rate of exit becomes greater than the male rate. For exits to employment on the other hand the female exit rate is higher

⁴³ Women are far more likely than men to define themselves as inactive in the labour market, even when searching for work, whereas the opposite applies to men (cf. Layte and O’Connell 2001).

than the male rate from an early stage, with the level of female unemployment being 10 per cent lower after eighteen months.

Figure 4.1: Kaplan Meier Estimate of Exit from Unemployment by Sex and Destination

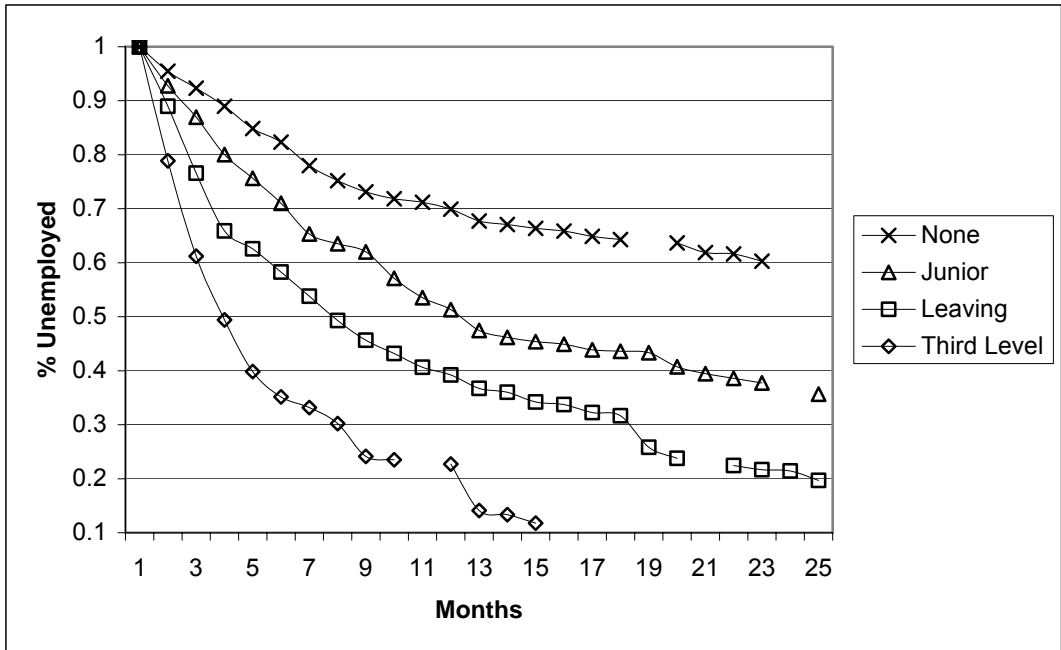


Other individual characteristics also contributed to quicker exits from unemployment. As we would expect *a priori*, those with higher levels of education have shorter durations, thus those with a third level education exit unemployment almost 50 per cent quicker than those with primary education alone, but they also exit 35 per cent quicker than those with Leaving Certificate level education.

Figure 4.2 shows this graduated effect well using survivor curves derived from Kaplan Meier estimates. This shows that whereas 68 per cent of those with primary education are still unemployed after one year, this is true of 48 per cent of those with Junior Certificates, 37 per cent of those with Leaving Certificates and only 14 per cent of those with a third level qualification.

Age also appears to have an impact on the duration of unemployment spells with older age groups having longer durations, but this relationship only holds for those spells that end in a transition to inactivity. For spells leading to employment, the age relationship is if anything reversed with those over 45 making the transition quicker.

Individual characteristics are not the only factors however, that have an influence on the duration of unemployment. The level of labour demand in the economy has a crucial effect, never more so than in the period covered by this data which begins before the start of the Irish economic boom of the 1990s and finishes after four years of sustained growth. The tightening of the labour market that this brought is clear in the mean durations at the bottom of Table 4.1 which decrease significantly across the period.

Figure 4.2: Kaplan Meier Estimate of Exit from Unemployment by Education

4.5 Empirical Estimation and Results

In this section we outline the modelling strategy used to extend the descriptive analyses in the last section. Although descriptive analyses can give an indication of the way in which certain variables affect durations they cannot control for the influence of a range of other variables and thus determine the ‘net’ effect of any particular determinant. To do this we need to model the duration of unemployment using what are termed ‘hazard rate’, or ‘survival’ models.⁴⁴ These models estimate the ‘propensity’ or ‘hazard’ of a person to exit from unemployment given certain characteristics. One of the most important characteristics of hazard rate models is that they control for the fact that some spells of unemployment may not have been completed before the end of the observation window (i.e., they are ‘censored’) so that the duration of unemployment is not known. These spells could be deleted from the analysis and only completed spells used, but this would seriously bias the results (since long spells would be excluded), but if we use hazard rate models these calculate the hazard of leaving unemployment for each month that the person is in the data file before censoring and thus includes these cases in the analysis.

However, as we only have measures of the incomes of the unemployed at the date of interview we are presented with another problem known as ‘length bias’ that occurs when ‘stock’ rather than ‘flow’ samples are used. Stock samples gather information on individuals at a particular point in time, but in doing so they are more likely to capture information on people with long spells of unemployment rather than short. This presents

⁴⁴ A detailed technical description of the models used can be found in Appendix 4.2.

statistical problems, but these can be countered if we use what are termed ‘discrete-time models’ which break each spell of unemployment down into its component months and estimate the hazard of leaving unemployment in each. This requires that the data be reconfigured from a structure where the person is the case to one where the month of unemployment is the case and the characteristics of interest are attached to these.

Modelling exit from unemployment also presents one other problem known as ‘unobserved heterogeneity’. When modelling durations we use a given set of predictor variables, but others may also be important and if these are omitted from the model may lead to results being biased. To take account of this controls for unobserved heterogeneity at the individual level are used. Finally, we use three different models of the duration of ILO unemployment, one for the total population and one each for those claiming Unemployment Assistance and Unemployment Benefit and each model estimates the competing hazard of exiting unemployment to both employment and inactivity. As we argued earlier in this chapter, the different processes involved in exits to employment and to inactivity mean that they must be modelled separately.

Estimation Results

Our primary interest here is in the effect of the variable representing the disincentive faced by the respondent, but we are also interested in the way in which the probability of exit from unemployment may change depending on the benefit being claimed and the proximity of benefit exhaustion. We therefore estimated three models for each exit destination (employment, inactivity): an overall model, a model for those claiming UB and one for those claiming UA. Given the discussion above our theoretical expectation is that the time to benefit exhaustion should only be significant in the case of those claiming UB, and should also be negative (i.e. the closer the person is to exhaustion the higher the probability) for these respondents.

First of all however, we examine the results for the full model using the total sample in Table 4.2. Statistical tests indicate that there is no significant unobserved heterogeneity in either the model of exit to employment or inactivity, though the figure comes close to 5 per cent significance in the inactivity model. There are a number of strong results in Table 4.3, the first being the significant negative relationship between duration of unemployment spell and hazard of exit to either employment or activity. This meets theoretical expectations based on the premise of decreasing job offers and search intensity over time controlling for other factors.

We also see a negative relationship between our chief variable of interest – the replacement rate and hazard of exit, though only in the model of exit to employment. The size of the effect is also extremely small at -.008, which at the mean is an elasticity of less than -.005. Such effects are much smaller than previously found, even in Continental Europe. For instance, two studies from the UK, Lancaster and Chesher (1983) and Narendranathan and Nickell (1985), found elasticities between benefits and duration of between 0.08 and 0.20. Using Spanish data Jenkins and Garcia Serrano found elasticities of 0.16. However, it should be

remembered that these studies used samples of respondents claiming unemployment insurance benefits whereas the data used here is from a general population of ILO unemployed respondents.

The time to UB benefit exhaustion is significant and negative on transitions to employment and thus in line with expectations, though we expect that this effect should only occur among UB claimants and may well underestimate the true effect.

Table 4.2: Results of Weibull Discrete Time Hazard Rate Model of Exit from Unemployment by Destination – Total Sample

Variable	Employment		Inactivity	
	β	t	β	t
Log(t)	-0.66	-8.14	-0.82	-8.36
Replacement Rate	-0.01	-2.47	0.00	0.17
Time to Benefit Exhaustion	-0.09	-3.82	-0.01	-0.40
No Partner	Reference		Reference	
Partner Employed	0.13	0.67	0.17	0.72
Partner Unemployed	0.37	1.40	-0.58	-1.26
Partner Inactive	0.05	0.22	-0.25	-0.94
Number Children	-0.04	-0.68	0.08	1.20
Year of Unemployment 1994	Reference		Reference	
1997	0.56	4.41	0.17	1.07
Age	-0.07	-2.92	-0.10	-3.48
Age ²	0.00	0.99	0.00	2.86
Female	-0.25	-1.64	-0.34	-1.85
Primary or None	Reference		Reference	
Intermediate Certificate	-0.14	-0.85	-0.28	-1.48
Leaving Certificate	0.16	0.91	-0.16	-0.74
Third-level education	0.47	2.37	-0.13	-0.51
Unemployed in Last 5 Years	0.02	0.16	0.13	0.66
Claiming Neither UA nor UB	Reference		Reference	
Claiming UB	0.59	3.18	0.48	2.12
Claiming UA	0.00	0	0.59	2.79
Log-Likelihood	-1471.7		-1102.9	
Unweighted N:	2,215		2,215	
Std of σ_v	0.000912		0.927725	
$\rho = \sigma_v / (1 + \sigma_v)$	0.0000008		0.46256	
Significance of ρ	n.s.		n.s.	

If the month of unemployment was in 1997 this has a positive effect on exit compared to 1994 as we would expect given the differences in the labour market conditions in the two years, but the effect is only significant in the case of exits to employment (though positive in both). Age has a significant negative effect on transitions from unemployment, but this effect is greater for those exiting to inactivity. Education on the other hand has a positive effect, but only in the case of those with tertiary qualifications.

Lastly for the models using the total sample we see that those claiming UB are more likely than those claiming UA, or neither benefit to exit to employment. In moves to employment we would expect that those with UB, who tend to have more employment experience and less unemployment experience than those claiming UA, to move into employment and this does indeed seem to be true.

Table 4.3: Results of Weibull Discrete Time Hazard Rate Model of Exit from Unemployment by Destination – UA Claimants

Variable	Employment		Inactivity	
	β	t	β	t
Log(t)	-0.50	-2.6	-0.58	-2.96
Replacement Rate	-0.01	-0.96	0.01	1.44
Time to Benefit Exhaustion	-0.08	-1.39	-0.01	-0.22
No Partner	Reference		Reference	
Partner Employed	0.78	1.62	1.01	2.13
Partner Unemployed	0.09	0.09	-33.18	0.
Partner Inactive	0.84	1.89	0.18	0.41
Number Children	-0.22	-1.55	-0.17	-1.32
Year of Unemployment 1994	Reference		Reference	
1997	0.77	2.69	-0.60	-1.77
Age	-0.12	-2.12	-0.07	-1.25
Age ²	0.00	1.15	0.00	0.93
Female	-0.22	-0.7	-0.35	-1.01
Primary or None	Reference		Reference	
Junior Certificate	0.16	0.5	-0.51	-1.55
Leaving Certificate	0.55	1.46	0.39	0.99
Third Level Education	1.41	3.22	-0.30	-0.48
Unemployed in Last 5 Years	-0.66	-1.83	-0.64	-1.41
Log-Likelihood	-364.697		-382.595	
Unweighted N:	448		448	
S.D. of σ_v	0.000912		0.927725	
$\rho = \sigma_v / (1 + \sigma_v)$	0.0000008		0.46256	
Significance of ρ	n.s.		n.s.	

In Table 4.3 we turn to the results for the sample of respondents claiming UA at interview either in 1994 or 1997. Our immediate interest is in the parameters representing the spell duration, replacement rate and time to benefit exhaustion. The log duration variable is, as in the total sample model, negative and significant suggesting that the hazard of exit is lower as duration increases, but unlike in Table 4.2, neither the replacement rate nor the time to benefit exhaustion are significant. Though the lack of effect for time to benefit exhaustion matches theoretical expectations, that for the replacement rate does not and suggests that UA recipients behaviour is rather different from UB recipients.

Table 4.4: Results of Weibull Discrete Time Hazard Rate Model of Exit from Unemployment by Destination – UB Claimants

Variable	Employment		Inactivity	
	β	t	β	t
Log(t)	-1.36	-3.7	-0.45	-1.28
Replacement Rate	-0.02	-2.33	-0.01	-0.57
Time to Benefit Exhaustion	-0.21	-3.21	0.00	-0.03
No Partner	Reference		Reference	
Partner Employed	0.23	0.41	0.24	0.38
Partner Unemployed	1.12	1.7	-0.46	-0.4
Partner Inactive	0.11	0.18	-0.55	-0.8
Number Children	0.02	0.12	0.07	0.4

Year of Unemployment 1994	Reference		Reference	
1997	0.27	0.82	0.04	0.09
Age	0.12	1.59	-0.14	-1.72
Age ²	0.00	-2.02	0.00	1.79
Female	-0.48	-1.21	0.20	0.45
Primary or None	Reference		Reference	
Intermediate Certificate	0.47	0.97	-0.30	-0.62
Leaving Certificate	0.50	1.01	-0.25	-0.47
Third Level Education	0.65	1.14	-0.33	-0.47
Unemployed in Last 5 Years	0.18	0.42	0.28	0.58
Log-Likelihood	-212.902		-186.151	
Unweighted N:	177		177	
S.D. of σ_v	0.000912		0.923819	
$\rho = \sigma_v / (1 + \sigma_v)$	0.0000008		0.460463	
Significance of ρ	n.s.		n.s.	

Year of unemployment on the other hand does have a significant effect with months in 1997 being more likely to end in employment than those in 1994, although this is not true for transitions to inactivity. Similarly, having a third level qualification has a strong positive effect on the hazard of transition to employment. Older UA recipients are less likely to make the transition to employment.

Table 4.4 shows results for the model for those respondents claiming UB. As in the previous two tables here we see a negative relationship between duration and exit probability, though here the effect is much larger for transitions to employment suggesting that UB recipients, though having rather more advantages than UA recipients, find that longer periods in unemployment carry a greater penalty in terms of future employability.

Following theoretical expectations the coefficients on the replacement rate and on time to benefit exhaustion are both very significant and negative. Although not large compared to the effects for other countries in the literature, the effect in Table 4.4 is larger than that in Table 4.2 at -0.0223 (an elasticity of 0.014 at the mean). The result for the total sample was thus driven by that for the UB recipients since there was no effect for those claiming UA. This is itself an interesting finding, since those claiming UB are far more likely to return to employment and more quickly than those on UA, yet it is among these respondents that we see evidence of a disincentive effect.

So far then we have good evidence that there are disincentive effects associated with unemployment payments, but these are confined to those on UB payments. In finding these effects though we have clearly seen the value of explicitly modelling several dimensions of the welfare system as well as the general level of benefits and the structure of the wage distribution faced by the unemployed. However, do we see similar results for the other measures of disincentives discussed earlier? Table 4.5 gives the coefficients and significance levels for our three incentive measures – the replacement rate (RR), average tax rate (ATR) and cash gap (CG). The table shows that disincentive effects are confined to those claiming UB irrespective of the disincentive measure used, though only the replacement rate and cash gap measures have a significant effect.

Table 4.5: Weibull Discrete Time Model of Exit from Unemployment – Various Disincentive Measures by Destination and Benefit Type

Variable	Estimate and Significance			
	UA Claimants		UB Claimants	
	Employment	Inactive	Employment	Inactive
Replacement Rate	-0.0065	0.0122	-0.0223*	-0.0071
Average Tax Rate	0.0003	0.0013	-0.0001	0.0044
Cash gap	-0.0001	-0.0057	0.0071*	0.0031

Significance: *= $P < 0.05$ **= $P < 0.01$ ***= $P < 0.001$.

4.6 Conclusions

Evidence from abroad shows that the existence and size of incentive effects on the duration of unemployment can only be assessed by a detailed empirical investigation, using micro-level data on the duration of unemployment and a wide range of explanatory factors at individual and household level. This chapter describes and presents results arising from this project, first published in Layte and Callan (2001). This constituted the first rigorous estimation of the impact of unemployment compensation on unemployment duration using detailed micro-data gathered from repeated household interviews.

Previous research has found negative disincentive effects of different sizes depending on the region studied, but doubt was thrown over these results by a series of papers by Atkinson and Micklewright (1991) and Atkinson *et al.*, (1984). These suggested that if researchers used more accurate models of the benefit system and more closely modelled the processes at play these effects could quickly disappear or even become positive. In this chapter we have attempted to provide a better empirical model of these processes by using high quality duration data from a random sample of unemployed people that includes benefit income information. Moreover, we have attempted to provide more accurate estimates of the in-work incomes of the unemployed using estimates from a tax/benefit micro-simulation package (*SWITCH*).

The Irish labour market and welfare regime is more similar to the UK than Continental Europe (Esping-Andersen 1990), but the presence of both insurance based and means tested benefits of similar value means that it has some elements of both. By drawing on discussions in Atkinson and Micklewright (1991) we have constructed analyses of unemployment durations that allow us to estimate the effect of alternative disincentive measures whilst controlling for many of the factors that can lead to different results. Modelling the structure of the Irish benefit system we test whether unemployed individuals are more likely, other things being equal, to exit from unemployment the nearer they are to exhausting their benefit entitlement. As the factors affecting exit from unemployment may vary depending on the destination (employment, or withdrawal from the labour force) we use appropriate models (i.e., competing risk models) to examine the processes associated with different exit destinations.

Results show that there is a significant negative relationship between unemployment compensation and duration, but the relationship varies between those receiving different types of benefit and are very small in comparison to those found in other national contexts. Disincentive effects appear to be confined to UB recipients, but even here elasticities are very small at around 0.013 when compared to those found in the UK, Continental Europe and North America. The difference in the size of the

effects found could be due to real differences in the national contexts, but may also be due to the better measures used in this study which would give more accurate estimates of effects. Also of interest is the fact that the likelihood of UB recipients obtaining a job increases as the 15-month time limit on receipt of UB approaches.

These results show that a realistic model of Irish unemployment durations, incorporating a range of structural influences, does find statistically significant disincentive effects, but the effects are rather small. It is also interesting that the effect is confined to UB recipients – a group who are relatively more advantaged in the labour market and who thus have shorter average unemployment spells that are more likely to end in employment. When accompanied by the effect of time to benefit exhaustion, this suggests that the correct interpretation of the disincentive effect could be that these respondents are using the resources provided by benefits for more effective job search and thus a better more stable job. By contrast, most media, government and academic attention given to the question of disincentive effects has tended to focus on the more disadvantaged portion of the unemployed who tend to receive means tested benefits and who show no sign of disincentive behaviour in this data.

APPENDIX 4.1: SAMPLE DESCRIPTIVE STATISTICS

The Living in Ireland survey (LII) survey was designed to provide a nationally representative sample of the population resident in private households and was drawn using a two-stage clustered process using the ESRI's RANSAM software. In 1994, the effective sample size (excluding ineligible addresses such as institutions) was 7,086 households. Contact could not be established with 609 households leaving 6,477 valid addresses that were contacted and 4,048 where actual interviews took place. This meant that 57.1 per cent of the effective sample were interviewed and 62.5 per cent of the valid contacted addresses. A total of 14,583 persons were members of these 4,048 households, 10,411 of which were eligible for interview and 9,905 of whom completed the full interview questionnaire (964 on a proxy basis). The 506 eligible people who did not respond represent less than 5 per cent of eligible persons in responding households. The rate of subsequent non-response was heaviest in 1995, but continued to occur through to the final year used in this chapter 1998. In 1995, 89 per cent of the original completed households (3,584) and 86 per cent of the original individuals (8,532) were reinterviewed, although some households and individuals were recruited in subsequent years. However, by 1998 the number of individuals interviewed had fallen to 6,324 (63 per cent of 1994) and households to 2,729 (67 per cent). Attrition effects are always a worry with panel surveys, but tests have shown (Watson and Healy 1999) that attrition to the original sample has not been skewed in any particular direction. Thus the data remain a reliable source of nationally representative information. However, even in 1994 the LII survey needed to be reweighted to be a true sample of the population and these weights were subsequently adjusted in the light of attrition.

Table 4.A.1: Unweighted Descriptive Statistics of Sample of Those Unemployed at Interview in 1994 and 1997

Variable	Year
----------	------

	1994	1997
Education		
Primary	26.0	48.3
Intermediate/Junior Certificate	43.0	24.0
Leaving Certificate	22.9	20.4
Third Level	8.1	7.4
Age Group		
17-24	12.0	5.9
25-34	19.3	16.3
35-44	26.1	25.6
45-54	24.2	26.6
55-64	18.3	25.6
Sex		
Male	22.2	22.8
Female	77.8	77.2
Mean Replacement Rate	62.58	63.68
- UA Claimants	58.39	59.41
- UB Claimants	61.75	60.10
Unemployed <12 Months	13.1	16.0
Unemployed 12+ Months	86.9	84.0
Mean Number Children	1.46	1.34
N	1,866	1,152

APPENDIX 4.2: EMPIRICAL ESTIMATION

The ‘stock’ sample used in this chapter means that we need to control for the length biasing that this will introduce. Jenkins (1995) has suggested an easy method for estimating the hazard of leaving unemployment using discrete-time duration models that take account of stock samples and we use this type of model. Using the Living in Ireland survey waves for 1994 and 1997⁴⁵ we select those respondents who are ILO unemployed and collect a range of information including the date at which the current spell of unemployment began and the date at which the spell ended, censoring the spell if it had not ended before interview in 1995 or 1998. We then estimate the probability of making a transition from unemployment and its dependence on time. We thus measure the conditional probability that the transition will occur, given that it has not already occurred up to t . This can be expressed as a discrete-time hazard rate h_{it} :

$$H_{it} = \Pr[T_i = t | T_i \geq t, \chi_{it}]$$

Where the hazard of individual i making the transition to employment at time t is dependant upon them not having reached the end of the spell (T_i) and a set of covariates χ_{it} which may or may not vary with time.

As explained, the stock sample means that we need to take account of the fact that the probability of leaving at each t is actually conditional on having not left unemployment before interview in either 1994 or 1997 (the sample selection criterion). Jenkins (1995, p.132) shows that this can be handled relatively simply via the ‘cancelling’ of terms that means that the conditional survivor probability depends only on the hazard rates and data for the months at risk between sample selection and the end of the period of observation. Nonetheless, maximising the ‘sequence’ likelihoods derived from these conditional probabilities is still difficult, but Jenkins (1995, p.133) using Allison (1982) outlines an easy estimation method which relies upon the reorganisation of the data from a spell centred unit of analysis to one based upon the spell month which allows the data to be analysed using standard regression techniques for binary variables. If τ is the interview month and $t = \tau + s_i$ indexes the month that the spell finishes for each individual, Jenkins defines a binary variable y_{it} which is 1 if $t = \tau + s_i$ and 0 otherwise. This means that $y_{it} = 0$ for all spell months except that

⁴⁵ These two years were chosen as micro-simulation estimates of various disincentive measures were available.

month where exit actually occurs in which case $y_{it} = 1$. Using this variable, the log-likelihood function can be written as (Jenkins, 1995, p.133):

$$\log L = \sum_{i=1}^n \sum_{t=\tau}^{\tau+s_i} y_{it} \log[h_{it}/(1-h_{it})] + \sum_{i=1}^n \sum_{t=\tau}^{\tau+s_i} \log(1-h_{it})$$

Given this specification of the likelihood function we still require an expression (among the many) for the hazard rate. Given that we have no strong theoretical expectation regarding the distribution of durations we chose to use three commonly used specifications and decide amongst these according to an established empirical yardstick. The three specifications are the Weibull, the complementary log-log and lastly a non-parametric piecewise constant specification. We chose the Weibull distribution because this is the most commonly used distribution in models of unemployment duration, whereas the complementary log-log was chosen as this is the discrete-time counterpart of the continuous-time proportional hazards model (Prentice and Gloeckler, 1978; Jenkins, 1995). The piecewise constant allows for a very flexible specification of the baseline hazard through the use of a number of dummy variables that represent portions of the duration period. To decide among the models we adopt the Akaike information criterion (AIC) (Akaike 1974) which penalises each log-likelihood to reflect the number of parameters being estimated in a particular model.⁴⁶ Models are estimated using a combination of time-varying and fixed covariates as listed in the previous section and we estimate competing risk models with exits to either employment or inactivity.

The generalised logistic hazard specification is thus:

$$\text{Log}[h_{it}/(1-h_{it})] = \theta(t) + \beta' X_{it}$$

However, this specification does not take account of any unobserved heterogeneity and could lead to an over-estimation of negative duration dependence. To take account of this, an unobserved individual-specific error term ε_i with a zero mean and normal (Gaussian) distribution is added to the models. In the tables to come we report the standard deviation of the heterogeneity variance (σ_v) and the ratio of this variance to one plus the variance (ρ). If ρ is significantly different from zero then individual heterogeneity in the models is important.

Table 4.2 shows the AIC values for the three models and shows that the Weibull model has the lowest value, though the piecewise constant model actually had the lowest log-likelihood showing that the non-parametric specification of the log-likelihood is the most flexible. In terms of the AIC value however, the piecewise constant is penalised for the added parameters in the model.

Table 4.2: Model Fit

⁴⁶ The AIC is defined as $AIC = -2(LL) + 2(c+p+1)$ where c is the number of model covariates and p is the number of model specific ancillary parameters. The preferred model is that with the lowest AIC value.

Hazard Distribution	AIC Value
Complementary Log-Log	125,277.86
Weibull	92,643.356
Piecewise Constant	118,387.92

On the basis of the AIC value we choose the Weibull model as the most appropriate and use this specification in the models.

5. SUMMARY AND CONCLUSIONS

5.1 Summary

This study achieves three main goals.

- It provides estimates of how strongly the labour supply of Irish married couples is linked to the financial rewards from work, based on best practice techniques from the international literature.
- Building on these estimates, the study shows how the labour supply implications of tax and welfare policy changes can be assessed in much greater depth than has been possible up to now.
- It provides empirical estimates, again based on best practice techniques, of the extent to which the durations of spells of unemployment are influenced by the balance between in-work and out-of-work incomes, as summarised by either the replacement rate (out-of-work income divided by in-work income) or the “cash gap” between in-work and out-of-work income.

In this section we sum up the main findings in each of these areas. Our conclusions draw out some wider implications and identify areas where further research, building on the base provided by the present study, seems likely to be fruitful.

Labour Supply Estimates

Chapter 2 develops a labour supply model⁴⁷ which captures important features of household labour supply behaviour from a policy point of view. The model accounts for the full structure of the basic tax rules and the key feature that the social welfare system provides a floor to income. It models the participation decision (whether to seek paid work or not) and the extent of participation (number of hours worked, whether part-time or full-time) in a unified framework.⁴⁸ The model is estimated using data drawn from the 1994 Living in Ireland Survey, which included special questions on individuals’ desired hours of work as well as on actual hours of work, pay and so on. These data on preferred hours of work help to identify individuals’ labour supply preferences more clearly.

⁴⁷ The model is adapted from van Soest (1995) and is one of the class of structural discrete choice models now commonly used in the international literature.

⁴⁸ At the same time it allows for the fact that fixed costs of work (e.g., associated with travel to work or childcare) may deter some individuals from participating in the paid labour market. The model also takes appropriate account of the structural feature that wage rate information is not directly available for those who are not in employment: equations linking wage rates to age, education level and location are estimated in a way which takes account of the fact that individuals “self-select” into employment.

We found that the labour supply of married women is significantly more responsive than that of married men to an increase in the gross wage rate. The elasticity of women's labour supply (measured in terms of average desired hours of work) with respect to the female wage rate is almost 0.9 i.e., a 1 per cent rise in the female wage rate would give rise to a 0.9 per cent increase in average desired hours of work. For men the corresponding elasticity is 0.25. Taking into account cross elasticities, a 1 per cent rise in all wages would give rise to an increase of almost 0.2 per cent in the labour supply of married men and an increase of almost 0.5 per cent in the labour supply of married women. For both men and women, increased participation accounts for the major part of the response, with increases in hours of work playing a lesser role. The findings are robust with respect to a number of changes in the specification, and fall within the range of estimated elasticities using similar models in other countries. They are also similar to the elasticities estimated by Callan and van Soest (1996) for Ireland.

Assessing the Labour Supply Impact of Tax/Transfer Policy Changes

Chapter 3 examined the labour supply response to a number of policy changes. These included tax cuts of equal aggregate cost through four different channels: cuts in the standard and top rates of tax, widening of the standard rate tax band and increasing the basic personal allowance. A structural change in the tax treatment of couples, introducing greater independence between the taxation of husband and wife, was also examined. This approximated the full individualisation of the standard rate tax band announced in Budget 2000. Alternative uses of the incipient rise in tax revenue – including a proportionate cut in income tax rates, or an increase in child benefit – were also analysed.

Looking at the results on equal-valued tax cuts, we found that both men's and women's desired hours responded positively to a standard rate tax cut (of 2.8 percentage points) and to an increase (of about 20 per cent) in the basic personal allowance. An increase in band width (of about 30 per cent) or a cut in the top rate of tax (of 6.3 percentage points) led to a positive response in married men's desired hours similar to that for a standard rate tax cut or personal allowance increase. But the response of married women to a top rate tax cut or to band-widening was more than twice as strong as that of men, and more than twice as big as their response to a standard rate tax cut or allowance increase. Most of the change in desired hours appeared to be driven by changes in labour force participation.

Turning to the results on increased independence in the taxation of married couples, we found that full individualisation of the standard rate tax band could have quite different impacts on labour supply depending on the use made of the rise in tax revenue that would result. If the revenue were used to fund a general tax cut (through proportionate cuts in standard and top rates of tax) then men's participation would remain roughly constant, while married women's participation would rise by about 2½ percentage points. Average desired hours of work would rise by 0.4 hours per week. If the revenue were used to finance an increase in child

benefit, married women's participation would rise by more than the fall in married men's participation; but there would be a net fall in average desired hours of 0.2 hours per week. Overall, though, it is clear that this structural change in the income tax system has a more positive impact on labour supply than simple tax cuts, for a given Exchequer cost.

Unemployment Payments and the Duration of Unemployment

Although much has been written about the relationship between unemployment durations and unemployment payments in the last two decades, the nature of the relationship remains problematic. Disincentive effects associated with payments have been found in research in the US and UK, but the UK research is disputed and studies in Continental European countries have typically been unable to identify significant disincentive effects. However, much research in this area has failed to adequately take into account the structure of unemployment payments and the fact that these may have a limited duration. Measurement problems when modelling disincentive effects also rear their head in the use of poor estimates of benefit levels and of in-work incomes. In Chapter 4 we used detailed information from the Living in Ireland Panel Survey on actual benefit levels in the household and estimates of in-work income from the *SWITCH* tax/benefit model to examine the effects of various disincentive measures on the duration of unemployment spells between 1994-5 and 1997-8. Moreover, we also accounted for the structure of benefit payments by examining the effect of limited benefit duration.

Our findings suggest that, controlling for other factors, the probability of leaving unemployment is negatively related to replacement rates (the ratio of out-of-work income, including unemployment compensation, to in-work income). However, the type and structure of payments is important. Disincentive effects appear to influence only those receiving Unemployment Benefits (UB) and among this group the exit rate increases as exhaustion approaches at 15 months duration. We find no significant disincentive effects amongst those receiving Unemployment Assistance (UA). The disincentive effects among UB recipients in Ireland are also of a much smaller size than those found in other studies in the UK and the US.

5.2 Conclusions

Many key decisions on income tax and social welfare policy must take account of the likely labour market consequences. For example, concerns about the adequacy of welfare payment rates must be balanced against the potential labour market implications of increased payments. This was a key theme underlying the Report of the Social Welfare Benchmarking and Indexation Group (2001). Okun (1975) stresses that the trade-off between equality and efficiency is a recurring theme in debates on tax and welfare policy. Studies of the impact of tax and welfare policy changes on individuals' labour supply decisions are vital if these labour market implications are to be assessed accurately. There has been a major research effort in this area internationally, leading to a rapid development of appropriate econometric methods and a rich store of research findings in the US, the UK, and a number of other EU countries. Empirical research

on these issues in Ireland has been much more limited.⁴⁹ Thus, the findings in this report represent significant advances on what is known about these topics in an Irish context.

The labour supply estimates derived here, which take into account the influence of tax and welfare structures on participation and hours worked, suggest that the wage elasticity of supply is about 0.25 for men, and almost 0.9 for women. These estimates are quite well defined, and in line with other estimates nationally and internationally. The results of policy experiments indicate that labour supply does increase in response to cuts in taxes, though the magnitudes are not, perhaps, as great as some may have expected. A cut in the standard tax rate of 2.8 percentage points leads to a rise in male and female participation of about half of a percentage point. A revenue-neutral package involving proportionate cuts in both tax rates, along with a change in the tax treatment of couples similar to full individualisation of the standard rate tax band has a greater impact on participation. Male participation falls marginally, but married women's participation rises by 2.6 percentage points. A rise in single people's labour supply could also be expected, but is outside the scope of the current model. While this is a large one-off change it is small compared to the trend rise in married women's participation (about 30 percentage points over the past 20 years).

The impact of higher replacement rates on duration of unemployment was also found to be identifiable and statistically significant, but rather small. The response of unemployment duration to an increase in the replacement rate was much smaller than in the UK and lower than for some European countries.

Given the base provided by the present study, further research in a number of areas could now be fruitful in developing the knowledge base on which tax and welfare policy decisions could be drawn.:

- Expanding the capacity of the model developed in Chapters 2 and 3 to simulate the labour supply impact of other tax and welfare policy changes.
- Estimating and simulating a similar labour supply model to deal with a broader sample (single persons as well as married couples).
- Estimation of the model on more recent data. Data for 2000 are currently available, but do not include information on desired hours of work.
- Projecting the model and its data forward to a current or future scenario with appropriate income growth and policy parameters, so that the potential behavioural responses to current policy proposals could be explored.
- Evaluating the distributional impact of policy changes after labour supply responses have been taken into account. This could include, for example, simulating a package leading to increased employment, and evaluating the change in income taking into account that some individuals would have obtained employment.

While there is scope for a great deal of further work, the current paper represents a significant milestone in the analysis of tax and welfare policy.

⁴⁹ For a review of studies of labour supply see Callan, Doris and Nolan (2000).

The approach taken has identified the responsiveness of married men and women to changes in gross wages, the likely labour supply implications of various changes in tax and welfare policy, and the response of unemployed persons to the balance between incomes in and out of work. This raises the prospect that decisions on tax and welfare policy can be informed, in future, by soundly-based empirical estimates of the likely effects on labour market behaviour.

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