WOMEN, PART-TIME WORK AND THE "WOMEN AND EMPLOYMENT SURVEY"

by

STEPHEN M. PERRY

Thesis to be submitted for a Ph.D. at the University of Keele, September 1985.

BEST COPY

AVAILABLE

Variable print quality

ACKNOWLEDGEMENTS

I would like to thank my supervisor, Dr. S. Dex, for her help and ideas which have greatly contributed to this thesis.

I wish to thank also the University of Keele for providing me with a research grant and for facilities, particularly in computing.

Last but not least, many thanks to Marylyn for her enthusiastic typing, tabulating and proof-reading.

ABSTRACT

The trend towards the increased employment of women on a part-time basis, particularly married women, has been well-documented. However, there are few studies that have sought to explain and analyse the reasons behind why so many women prefer to work part-time, *ie* to investigate the determinants of the supply of part-time female labour. Using the *Women and Employment Survey* this thesis takes the opportunity provided by the relative wealth of information contained in this Survey to investigate the determinants of the supply of part-time female labour.

The key determinants of the supply of part-time labour as compared to full-time labour are highlighted and quantified. The part-time vs full-time supply of labour decision is investigated using data relating to the interview date, but also, at a key point in the take-up of part-time work - the first return to paid employment after the birth of the first child - and compared and contrasted to the part-time vs full-time labour supply decision made over the entire length of women's working lives. The effect of working part-time, in terms of occupational attainment, is also assessed; and viewed as a direct consequence of working part-time.

Recourse to correct statistical procedures is made

following current accepted methodology, and its criticisms of earlier research which allows the key determinants of the part-time vs full-time supply of labour decision to be correctly quantified (ie statistically efficient parameter estimates are derived).

The research presented here begins to fill the gap created by other studies' omission of the part-time vs full-time labour supply decision and presents an insight into the supply of part-time female labour.

CONTENTS

INTRODUCTION

The increasing labour force participation of women in Britain from the late 1940s to the end of the 1970s is a well documented and established trend. The recent Department of Employment survey of women in employment shows that it has become the norm for women to work. Indeed, two thirds of women of working age were classified as members of the labour force, constituting 40% of the total U.K. working population.

The trend towards increased participation has been accompanied by a growth in employment that is undertaken on a part-time basis. This growth represents one of the most important changes to have emerged in British working patterns since World War II. During the last 20 years, the numbers of part-time workers has doubled to 4.5 million - constituting a fifth of total employment; a proportion that is higher than in almost any other country.

Furthermore, two thirds of part-time employment is made up by women workers. The increase in the numbers of women working on a part-time basis, occurred chiefly in the early 1970s (see Clark (1982) and Robertson & Briggs (1979)); and while this trend has now slowed down in recent years there were by 1981 still some 42% of women workers engaged in part-time employment (Dex and Perry 1984).

By and large, while the trend towards the employment of women on a part-time basis has received considerable attention in the literature, examinations and research into the principal stimulation behind such changes have not been nearly as prolific. Accordingly, this Thesis takes the opportunity provided by the Women and Employment Survey to examine the supply of female part-time labour in Great Britain. The aim of the Thesis, in providing a preliminary (empirical) investigation into the supply of female part-time labour, is to assess the principal determinants of the supply of female part-time labour. In doing so, the conscious choice made by many women who choose part-time work in favour of full-time work will be examined. In particular, the key influences on this decision mechanism will be outlined and assessed and weighted according to their level of importance.

Part-time work serves an important function in that it provides women with the ability to combine and maintain their dual roles as firstly a housewife and mother, and secondly as an employee in paid employment. This has to a certain extent already received some attention in the literature [(1)].

(1) For instance see McGoldrick (1983).

Yet, to date no study has attempted to provide an insight into, and a guide to the principal determinants of the supply of female part-time labour as compared to the determinants of female full-time labour. This is a serious omission on the part of current research, particularly given the magnitude of the trend towards the part-time employment of women in Britain.

The attractions of part-time work to both employee and employer have been recognised in the literature; however, the emphasis of this Thesis is on the supply-side considerations, rather than the demand for part-time labour. Nevertheless, the increased demand for part-time labour is discussed in part later in Chapter 2.

This Thesis is divided into seven chapters and makes consistent use of the wealth of information contained in the Women and Employment Survey [(1)].

The WES was designed to examine women's lifetime patterns of movement into and out of the labour market. Five thousand five hundred and eighty eight women in a nationally representative sample were interviewed, as were a subsample of husbands. The study gathered information on women's attachment and orientation to work; their current employment activities; the extent and range of types of female unemployment; the consequences of not working and the processes of job search; the factors affecting

(1) Social Survey Division, Office of Population Censuses and Surveys, St. Catherines House, Kingsway, London WC2.

decisions about whether to work; career and occupational mobility of women and general attitudes to women and work.

Chapter One reviews critically the British and US literature on the supply of female labour outlining and assessing in the light of recent advances some of the more interesting discoveries of previous and presently ongoing research. It will become evident that relatively little empirical work has been carried out in the area of (female) part-time work - the area of interest here. This is partly due to the lack of suitable and available data; however, the data contained in the Women and Employment Survey (WES) now provides a useful and valuable source of information. Chapter One thus presents a brief "state-of-the-arts" summary of the extent of research into the supply of female labour.

Chapter Two draws directly from the WES and other data sources as it reviews the British Literature on part-time work. Firstly, the trend towards the employment of women on a part-time basis (largely since 1970) is described and secondly, some of the personal characteristics (such as age and number of children) and employment experiences (such as present occupation) of part-time women workers are compared to those of full-time women workers in order to build up a picture of the "typical" part-time female worker.

Chapter Three uses the descriptive information reviewed in Chapter Two to begin a multivariate analysis of the determinants of part-time labour (participation and hours) as compared to the full-time equivalent. A lengthy chapter, involving a considerable number of labour supply models, provides early estimates of the key determinants of the supply of labour and their relative importance in determining the type of labour supplied (ie part or full-time). In addition, alternative estimation techniques are experimented with, in the light of the findings of earlier research described in Chapter Two.

Chapter Four builds upon the achievements of more recent research into female labour supply by re-estimating some of the models outlined and investigated in Chapter Three in the light of sample selection bias which is discussed in both Chapters One and Three.

Chapter Five makes use of the longitudinal nature of the WES data by examining the decision to work part-time over the (entire) lifecycle of women workers. By comparing and contrasting the results from Chapter Three on the supply of part-time labour at a point in time (the interview date) to that of the supply of part-time labour over the entire length of a woman's work history, a further insight into the mechanism behind the supply of female part-time labour is achieved.

Furthermore, it allows the supply of labour decision to be viewed in a lifetime perspective.

Chapter Six like that of the previous chapter, draws on the unique work history information contained in the WES. Martin and Roberts (1984a, 1984b) have shown using the WES that women do not always cease work upon marriage, returning to work after the birth of children, with an increasing tendency to return earlier and between births. This chapter examines the supply of part-time labour - once again in contrast to the supply of full-time labour - at the point of a woman's return to work after the birth of her first child. In essence, this chapter aims to discover the principal determinants of the supply of labour (part-time compared to full-time) at an important crossroads in a woman's lifecycle. By presenting these determinants, a comparison can be made with those uncovered in Chapters Three and Five - which, respectively, examined the supply of part-time labour at the time of the interview, and, over the entire length of women's work histories. Therefore, allowing the determinants of the supply of female part-time labour to be assessed at a unique point in a woman's lifecycle.

Chapter Seven received its initial impulse from Martin and Roberts (1984a) who discovered that women who re-enter the labour market as part-time employees tend to experience downward occupational mobility, ie a downgrading of occupations such that their previous occupation is of a higher standing than their present one. This chapter builds and estimates a model of downward occupational mobility - at the point of returning to work after the birth of the first child - in an attempt to assess the extent to which downward occupational mobility can be viewed as a direct consequence of returning to the labour market on a part-time basis.

Finally, the main conclusions and findings of this thesis are summarised in Chapter Eight.

Note

After Chapters Three to Seven, an appendix appears which contains the tables of regression results described in these chapters. At the end of the thesis, Appendix Eight presents the means and standard deviations of the variables incorporated in the various models.

CHAPTER ONE - A REVIEW OF THE LITERATURE ON THE SUPPLY OF LABOUR

INTRODUCTION

During the last two decades, research on the supply of female labour has expanded at a rate which even exceeds the remarkable rate of growth of the female labour force. The initial intellectual impulse for this research came from Mincer's work in 1962. Mincer's powerful contribution was a simple explanation of the discrepancies between time series and cross sectional market work patterns for white women using the standard decomposition of income and price effects of traditional price theory. Since Mincer's seminal work, paper after paper have addressed themselves to particular issues concerning the supply of female labour. The empirical research undertaken can be divided into two distinct generations based on economic and econometric methodology.

First generation empirical studies may be said to have evolved with the work of Schoenberg and Douglas (1937), and reached a high point with the collection of studies contained in Cain and Watts (1973). These first generation studies used ordinary least squares to estimate simple specifications of labour supply functions from non-experimental data. Conversely, second generation studies, largely but not exclusively undertaken since 1975, have used increasingly sophisticated econometric techniques with their foundations in the statistical theory of index functions. Such second generation studies build upon the knowledge acquired from first generation studies and attempt to correct for some (if not all) of the problems encountered by this earlier research.

Both generations of empirical studies on labour supply and related matters have their foundations based on the neoclassical analysis of individual choice. The elementary neoclassical model of the supply of labour time is simply an application of the theory of consumer behaviour. This chapter begins with an overview of the elementary neoclassical model of the supply of labour time - the utility maximising model, and follows with a review of some of the empirical results that have been uncovered by first generation studies' application of this approach. The results presented, as will be apparent, are diverse and range too wide to be of any practical policy use. Ordinary least squares is a convenient estimation technique but the diversity of income and substitution effect estimates from first generation studies stimulated a methodological enquiry during the early 1970s resulting in the birth of second generation studies. The methodology of second generation studies offers a solution to the theoretical and practical (estimation) problems that were either ignored or undiscovered by first generation studies. A general theory has been developed to correct, for example, sample selection bias - a bias that arises through using non-randomly selected samples (due to truncated data or selection bias) can all be fitted into this general methodological framework. A review of this framework follows the collection of first generation results.

The distinction between first and second generation studies is more than chronological. The true distinction is based upon a two-fold criteria. Firstly, the theoretical background to the labour supply equation:- first generation studies usually estimated simple specifications of labour supply. Often the decision to include variables in the final form of the equation is "ad hoc", or based on weak "a priori" rationalisations. For the most part this is not true of second generation studies; with their basis in index functions they are aware of the importance of theory, and accordingly they have paid careful attention to theoretical issues when specifying labour supply equations. Second generation studies are aware that careful attention to theoretical issues during the specification of labour supply functions pays valuable dividends in empirical work, and that estimates of labour supply and related parameters are of only limited value unless they are derived from careful structural analysis rather than ad hoc models, which had occurred previously. Secondly the econometric technique used to provide estimates of parameters from the labour supply equation:- by and large, first generation studies were persistent in their use of ordinary least squares (O.L.S.) as their means of hypothesis or data testing: Second generation studies have shown O.L.S. to be potentially unreliable as a means of estimating unbiased parameters from the labour supply equation in particular cases; for example, much first generation work was aimed at estimating participation equations with a zero-one (dichotomous) dependent variable. If a woman worked she took the value one, otherwise zero. However, one explicit assumption of O.L.S. is that the dependent variable - in this case the dichotomous variable - is not bounded. The participation variable, in essence a probability, is bounded between zero and one, accordingly O.L.S. is not the most appropriate estimation technique for estimating such functions. Second generation studies are aware of this problem and have employed more appropriate techniques to estimate such functions, ie binomial (logit) maximum likelihood.

The two-fold distinction that can be drawn between first and second generation studies is quite apparent. Research that has little recourse to theory and employs an inappropriate estimation technique has been called first generation studies, while studies that have their foundation in theoretical issues and engage more appropriate techniques are heralded as second generation studies. There is, nevertheless, some research that is as much in the first generation "empirical school" as it is in the second generation school. Recently some British and American studies on the supply of female labour have been presented which estimate labour supply equations using O.L.S.

By applying the distinction that has just been outlined these studies could be classified as first generation through their use of potentially inappropriate techniques for estimation purposes. Not withstanding this, these studies can also be classified as second generation studies, since their final form labour supply equations have their basis on sound theoretical issues, and not derived from "ad hoc", data determined, behaviour of models. This minor dilemma required that a separate section, after the review of second generation literature, be devoted to those hybrid generation studies.

This chapter also concentrates on the static labour supply models. The conclusions reached are that first, theory is crucial. The past fifteen years or so of research on the supply of labour and related matters indicates that careful attention needs to be paid to theoretical issues. Secondly, technique matters. Another important lesson to be learnt is that empirical results on labour supply are quite sensitive to the choice of estimation technique. Finally, and corollary to the two previous points: theory and technique make an important and vital practical difference in enhancing the ability of policy makers and analysts to analyse the more important features of labour supply behaviour, and similarly to evaluate policy measures. As indeed Heckman, Killingsworth and MaCurdy (1981) note, it is sometimes supposed that while attention to theory and technique are desirable in principle, differences in theoretical approaches and/or in estimation techniques have few (if any) practical consequences. However, the research experience of the last fifteen or so years suggests that this is not the case: at least as far as empirical evidence on the supply of labour is concerned, differences in theory and technique lead to important differences in results. In turn, this leads to important implications for practical questions of analysis and policy.

The discussion to follow is selective. The major concern of the inquiry is with the quantitative aspect of labour supply (participation, eg. hours worked per period) and for the most part the qualitative aspects of work effort (such as occupation choice) are ignored. The discussion here is confined to an analysis of labour supply in a static setting of certainty and complete information since the area of research addressing the dynamics of labour supply would itself require a considerable discussion as Heckman et al (1981) note.

Even with these self-imposed restrictions, a vast body of work remains. The first and second generation division of the literature has already been highlighted and is the basis by which the history of labour supply theory, estimation and evidence will be discussed in the next sections. It is possible to provide a further division of the literature whilst still maintaining this ordered (almost chronological) distinction by generations. Within each generation, and also within the group of studies that fall equally into both generations, it is possible to divide research again according to the issues which are addressed. The theory of labour supply and its econometric methodology covers an array of subjects. The range is impressive and includes, among others, the choice between linear and non-linear methods of investigation, the availability of alternative definitions of labour supply (eg. participation, hours of work, weeks of work), the role of monetary and time costs of entry into employment and the extent of employment, and the problems associated with censored/truncated samples encountered when estimating wage and hours functions. These, and others, provide a means by which the literature can be subdivided within each generation. Of course, these subdivisions are more applicable to the second and hybrid generation studies, since the strictly first generation studies persistently ignored, or were otherwise unaware of this impressive range of issues.

Relative to its predecessor, second generation studies have taken the correct methodological and theoretical steps towards providing a better framework for the analyst of labour supply. The work is far from completed, and some commentators would argue that it is still in its infancy. Like first generation studies, second generation studies are open to criticism. There are serious omissions which second generation studies are guilty of. In particular, relatively few studies address the topic of part-time work. As will become apparent later, the trend towards the part-time employment of women, especially in Great Britain, is a well established phenomenon. Explanations of this trend are as rare as the studies that analyse this important change in Britain's developing labour market.

This is a serious omission on the part of second generation (and also first generation) studies, which will receive considerable attention in later chapters. This chapter will illustrate this omission: Section One reviews the basic utility maximising model which provides the basis of the labour supply models used by first generation and second generation studies. An overview of first generation studies, together with some of the more interesting British and American results are given in Section Two. An appreciation of second generation studies is saved for Section Three with the next section, Section Four, reviewing some of the mainly British Studies that are simultaneously first and second generation studies. The conclusions are presented in Section Five.

SECTION ONE

THE BASIC NEOCLASSICAL UTILITY MAXIMISING MODEL

1.1 The Maximisation Problem

The elementary Neoclassical model of the supply of labour time involves an application of the theory of consumer behaviour. Individuals devote time to both non-market activities (leisure) and market activities (work). Maximisation of utility occurs by choosing a unique composite bundle of goods (obtained from work) and leisure (which allows for the consumption of this bundle of goods) subject to a time and budget constraint. Thus, the individual receives utility for leisure (L) and consumption goods (C), receives income from property, per period (V), and is paid a wage rate per period (W). In its simplest form, there are assumed to be no taxes and no fixed costs associated with entering the labour market. Acting as if enjoying perfect information and certainty, and neither saving or borrowing the individual divides time between market work (H) and leisure: so that $H + L = 1$. Hence, utility is maximised so that total (real) income $WH + V$ may not exceed C. The labour supply function for the individual becomes $H = L\ (W,V)$, with H positive whenever the wage offered exceeds some predetermined critical value (the reservation wage).

Most first generation studies on the supply of labour time treated the labour supply decision as one dimension of the more general problem ascribed by the more conventional static model of optimising behaviour. For instance see Abbot and Ashenfelter (1976) for an application of the model to labour supply. The model may readily be extended to the case of persons who make up a family unit. The most commonly used version of such an extension views the family as maximising a joint (family) social welfare function which has as its arguments, family consumption and family leisure. The labour supply function for any family member (i) is:

$$H_i = h_i(W_i, \dot{V}_i + \sum_{j=0}^{M} W_j H_j)$$ where M are the other family members.

Whether the unit is an individual or a family, the principle of maximisation is the same. The unit is assumed to maximise a well-behaved neoclassical utility function. In the case of J family members, and M consumption goods:

$$U = u(L_1,\ldots,L_m;C_1,\ldots,C_n)$$ is maximised subject to the constraint:

$$V + \sum_{i=0}^{i=j} W_i(1-L_i) \geq P_i C_i$$ where i is the ith family member and P_i is the price of the ith consumption good.

Reforming the maximisation problem into the more usual Lagrangian function the necessary and sufficient conditions for maximisation of utility can be derived. Precisely,

$$(U_{L_i} - \lambda W_i)\ (1-L_i) \quad = 0 \qquad i=1,\ldots,M \qquad (1.1)$$

$$(U_{C_i} - \lambda P_i)\ C_i \quad = 0 \qquad i=1,\ldots,n \qquad (1.2)$$

and $$(V + \sum_{i=0}^{i=m} W_i) \quad = \quad \Sigma W_i\ L_i + \Sigma P_j\ L_j \qquad (1.3)$$

which measures here the marginal utility of V to the family, and λ is the Lagrangian multiplier; U_{L_i} and U_{C_i} are the partial derivatives of U with respect to L_i and C_i. If the utility function is strictly quasi concave in its arguments then the second order conditions are maximised. A full mathematical explanation of the process of maximisation is contained in Killingsworth (1980).

The simple theoretical labour supply model just outlined implies a number of testable propositions as laid down by Killingsworth (1980) and Heckman, Killingsworth and MaCurdy (1981). These are:

(i) Negativity - the own substitution effect (of a compensated change in family members own wage rate on leisure time) must always be negative if leisure is a normal good.

(ii) Symmetry - the own substitution effect (of a compensated change) in family member i's wage on family member j's wage, and vice versa, must always be equal.

(iii) Homogeneity - labour supply functions are homogeneous of degree zero in nominal wages, nominal property income and prices, so that labour supply responds to real wages, real property income and relative prices.

(iv) Continuity - the supply of labour time function will be continuous (except, perhaps, for cases where the marginal rate of tax cause discontinuous changes) and entails zero or positive hours of work. Zero if the offered wage is less than the reservation wage, and positive if greater.

1.2 Extention to the Simple Model

The conventional static structural model of the previous section can be theoretically extended to allow for corner solutions, discontinuities in the supply of labour schedule, tax and transfer payments and endogenous wages. An excellent survey by Perlman (1969) describes the discontinuities in the supply of labour schedule emphasing the 'take-it-or-leave-it' regime facing most workers: ie the early studies were often associated with cases where firms decided to offer prospective workers a given package of hours of work from which individual workers could not deviate. This obviously imposes constraints on the individual's ability to choose freely the desired hours of work (for instance see: Meyers 1965 and Perlman 1966).

Both Killingsworth (1981) and Heckman, Killingsworth and MaCurdy (1981) describe the corner solutions and tax and transfer payments extentions to the basic static model of utility maximisation. The extention that deals with endogenous wages will be discussed later in Section 3, as indeed will discontinuities in hours of work schedule and the budget constraint.

Remaining true to the spirit classical utility maximisation Abbot and Ashenfelter (1976) describe three main approaches to the empirical estimation of labour supply models:

(a) By starting with a direct utility function and by maximising it subject to the budget constraint, hours of work can be solved at the optimal and the labour supply schedule can be derived.

(b) By starting with an indirect utility function the specification of the labour supply schedule can be derived using Roy's identity (see below).

(c) Dispensing with any reference to utility functions a "free-form" labour supply function may be specified, chosen either arbitrarily or on the basis of some a priori considerations.

In the main, first generation studies tended to estimate simple specifications of the labour supply schedule under the third approach above. Second generation studies have tended, on the other hand, to make use of the first two approaches to estimate labour supply schedules. In a sense the second approach to providing estimates of labour supply - that of starting with an indirect utility function, the specification of the labour supply schedule can be derived via Roy's identity - is an approach commonly used by both generations of studies. Precisely, given a wage rate and property income (in real terms per period) maximum utility is given by a unique combination of wages (W) and property income (V) ie $Z = z\ (W,V)$:- Wand V determine maximising utility levels of C and L, and since utility in turn depends upon C and L, W and V indirectly determine utility. Therefore, maximum utility may be given by $Z = z\ (W,V)$; this function is often known as the indirect utility function. By Roy's Identity, labour supply, H, may be written as a function of the partial derivatives of the indirect utility function:

$$H = Z_W / Z_V$$

As Brown and Deaton (1972) show, it is possible to derive a labour supply function obeying all the restrictions of the neoclassical consumer-worker model by applying Roy's identity. The convenience of such an approach means that reference to any utility function per se is unnecessary for purposes of deriving the exact specification of the labour supply functions. In the following Section examples of prototype labour supply functions used by first generation studies are described.

SECTION TWO

FIRST GENERATION STUDIES

Section 1 has shown that the basis of both first and second generation studies can be found in the neoclassical analysis of individual choice. In the main, first generation studies used O.L.S. to estimate simple specifications of the labour supply function derived by dispensing with any direct reference to any utility function, instead a freeform approach was used as already noted. Examples of linear specification prototypes of labour supply functions generally used in first generation research, include:

(a) $$H = a + bW + cV + \varepsilon \qquad (3.1)$$

(b) $$H_i = a_i + \sum_j b_{ij} W_i + c_i V + \varepsilon_i \qquad (3.2)$$

(c) $$H_i = a_i + b_i W_i + c_i (V + \sum_{j \neq i} W_j H_j) + \varepsilon_i \qquad (3.3)$$

where ε (ε_i) is the usual error term with mean zero and standard normal variance, denoting omitted variables, errors in measurement of variables and errors in other forms.

The first of these prototypes (3.1) specifies the labour supply of any individual who supplies labour in ignorance of other family members' decision to supply labour. The second and third prototype (3.2 and 3.3 respectively) are specifications of the supply of labour of the ith family member who includes the jth family member's decision to supply labour to the market (or not) as a choice variable. The former of these (3.2) allows for non zero intra family (cross substitution effect) on i's labour supply arising from a change in the wage rate of other family members (ie j), whereas in (3.3) these effects are constrained to zero.

It should be noted that (3.1) to (3.3) are written as linear functions only for simplicity; however, and more importantly, first generation studies ignored, generally, questions about the sources of the error term (ε). On the whole the error term was brushed aside by empiricists - a maintained hypothesis was introduced into first generation empirical models assuming the error term to be randomly generated, and therefore of little importance. ε was believed to arise explicitly from facts known to the family (member) but not known to the empirical investigator. As will become apparent in the next section, the error term has been promoted from this secondary role to a more prominent role by second generation studies whose attention has very much been concentrated on this term. In particular, as Heckman et al (1981) point out, ε may arise from unobserved components from either side of the labour supply equation such as (3.1).

2.1 Empirical Estimates : British Studies

The studies in this section estimate labour supply equations, either by means of an hours of work specification or a participation specification. The basic neoclassical utility maximising model allows both total hours of work per period and participation to be determined by an individual's wage rate and property income as well as preferences between income and leisure. These preferences are most generally proxied by personal characteristics and family circumstances (such as age, marital status, number and ages of children and race).

Econometric studies using aggregate British cross sectional data in an attempt to estimate women's labour supply are sparse, largely due to a lack of adequate data on individual characteristics. However, in 1979 and 1980 Greenhalgh estimated single equation participation models for men and women using 1971 Census data and comparable wage rate data from the New Earnings Survey. Preferences between leisure and work were proxied by three children variables in the married women equations. Property (unearned) income was proxied by an asset variable reflecting the quality of housing. For both men and women the results were consistent with earlier American findings (such as those found in Cain and Watts (1973)) ie for both sexes own wage rate was correlated positively with participation;

spouse's wage and property income were both negatively related with participation.

The effects of children on the participation of men and women is to increase it for the former and decrease it for the latter, as predicted. The results showed that the loss in participation by the wife attributed to the presence of children was largely compensated by an increase in male participation - hence, leaving little overall net (family) loss in participation. The presence of younger children can be seen to promote specialisation between husband and wife rather than enducing more or less participation, so affecting the composition of and not the total level of participation. Interestingly, little attention has been paid to part-time work. It can be argued that the increasing tendency of married women to work part-time (60% of part-time work is undertaken by married women, and 20% of employees are part-time workers) adds fuel to the theory of specialisation within the family unit, since it allows women to maintain a commitment to both housework and market work, whilst her husband provides the major income.

A selection and summary of similar American research is presented in Cain and Watts (1973), Killingsworth (1981) and Heckman et al (1981), some of which is reproduced later in this section. These British and American researchers have typically hypothesised single equation models of labour supply using individual data and have assumed the exogeneity of the wage rate. Wage rates are therefore implicitly assumed to be determined at the market level. A summary of existing estimates of wage and income elasticities of labour supply for women presented in Table A. Table A is based on a summary of results found in Greenhalgh and Mayhew (1981).

In all but one of the studies listed in Table A a positive own wage elasticity is yielded (Ashworth and Ulph 1977). Apart from this one difference, the studies agree about the direction of elasticity. However, there is an obvious lack of consistency concerning magnitudes of parameters across these studies. Firstly, there is a considerable difference of results obtained when aggregate and individuals' data are used to estimate supply elasticities of married women, the latter yielding smaller estimates. This is more apparent when the evidence presented by Greenhalgh and Mayhew (1981) is examined in detail. Secondly, a comparison of aggregate data reveals considerable differences in the size of supply elasticities - the same is also true of studies using individuals' based data. There is much closer agreement about the effect of children on the supply of labour. In Greenhalgh's and Layard's individual hours of work and participation functions, there are large negative coefficients for children aged under 5 years, smaller negative coefficients for 6-10 year olds and non-significant or small positive coefficients for children aged 11-16 years. <u>Greenhalgh</u>

Table A. FIRST GENERATION ELASTICITIES

Supply elasticities with respect to the wage rate and income.

	OWN WAGE	SPOUSE'S WAGE	PROPERTY INCOME
PARTICIPATION			
GREENHALGH 1980 (Married women) GHS DATA 1971 (Lrg sample) (A)	0.36	-0.35	
GREENHALGH 1977 (Married women) CENSUS DATA 1971 (Sm sample) (A)	1.35	0.88	-0.23*
HOURS OF WORK			
ASHWORTH AND ULPH 1977 (Married Women) (Sm sample) (I)	- 0.07	NA	-0.10
GREENHALGH 1979 (Married women) GHS DATA 1971 (Lrg sample) (I)	0.68	-0.18	
LESLIE 1978 (Married women) INDUSTRY DATA (Sm single) (A)	0.08	NA	NA
ZABALZA 1979 (OLDER WOMEN) OPCS SURVEY 1977 (Lrg sample) (I)	0.42	NA	-0.44

*: Proxy variable. Sm: hundreds. Lrg: thousands.

NA: Not Availables. (A): Aggregate Data (I) Individual Data.

(1980) in fact estimates that the total effect of a reduction in family size by one child would be to raise participation 4%, and total hours by 12.5%. Layard et al (1980) show that the postponement of the birth of a child would have a greater effect of the order of 60% on labour supply whether measured by participation or hours. Cross tabulations by Joshi (1979) confirm the presence of younger children as a major factor limiting labour force participation. Using the Women and Employment Survey, Joshi (1984) produced further evidence to add weight to this 'child-effect'. Joshi (1979) suggests that the 'child-effect' on participation is tempered by the financial constraint children impose on their parents; in her calculations, the youngest age group (18-24 year olds) although having the largest proportion of children under five, do not have the lowest age specific participation rate.

The typical result in many of the British studies classified loosely as first generation (empirical) studies that make use of primarily individuals' data is a poor fitting model and an apparently inelastic supply curve. Before making any more general conclusions about the supply elasticity estimates produced by first generation studies, we can examine the extensive American first generation literature.

2.2 Empirical Estimates : American Studies

There are many more first generation empirical studies that have their home in America. Cain and Watts (1973), Killingsworth (1981), and Heckman et al (1981) present between them a comprehensive review of some of these American first generation studies. The same divergence of results is also apparent.

Cain and Watts observed that the collection of estimates presented in their collection of relatively advanced first generation studies implied that a reduction in work hours attendent upon the introduction of a negative income tax scheme could be anything between 4 and 40%, depending upon the specific set of estimates used to predict the effects of such a scheme.

Killingsworth (1981) shows the results of first generation studies of several important labour supply parameters for women only. In most cases these are derived from regressions where the dependent variable was hours of work per period. The tables present the range of values into which most estimates of a particular parameter typically fall , together with a list of several studies whose results fall into that range. A list of several studies that obtain results falling outside the "typical" range, together with estimates, were also given. Where there were no elasticities given in the particular papers reviewed by

Killingsworth, he computed the elasticities using data or sample means, interpolations etc. When a variety of elasticities (estimates) were given by authors, the "preferred" elasticity was used, where "preference" was decided upon by the authors of the various papers.

In a more recent publication, Heckman et al (1981) have provided a summary table of the range of estimates of labour supply elasticities from first generation studies. This is reproduced in part below.

Table B SUMMARY OF ELASTICITIES OF LABOUR SUPPLY FROM FIRST GENERATION STUDIES

Labour Supply Elasticities (Women)

Property Income	Gross Own Wage	Compensated Own Wage	Compensated Spouses' Wage
-0.1 to -0.75	-0.1 to +1.6	-0.05 to +2.00	-0.1 to -1.0

Several difficulties from Table B, are immediately apparent. Consider, first, the range of the gross (uncompensated) own wage elasticity ie ε_{HiWi}. $\varepsilon_{HiWi} = (2H_i/2W_i)(W_i/H_i)$. This could be calculated as $b(W/H)$, $b_{ij}(W_i/H_i)$ or $b_i(W_i/H_i)$ from estimates of (3.1), (3.2) and (3.3) respectively, which may help to explain the vast range of results apparent from the above tales. Virtually all first generation studies found the supply of female labour to be strongly positively sloped with respect to the wage rate.

However, a serious methodological problem has faced first generation studies; since there has always been a substantial proportion of the female population not in employment, there have always been similarly 'missing' observations on the wage rate of non-working women.

In an attempt to overcome this methodological problem, first generation research assumed symmetry of cross substitution and income effects. Exactly, that the effect of one spouse of an income compensated increase, on the offered wage of the other spouse is equal to the reverse effect (on the second spouse of a similar income compensated increase in the first spouse's income), ie:

$$\left(\delta H_i/\delta W_j\right)_{\substack{\text{Constant}\\\text{Utility}}} \equiv (\delta H_i/\delta W_j) - H_j\,(\delta H_i/\delta V)$$

as presented in Ashenfelter and Heckman (1974). For symmetry to exist, the following relation must hold :

$$\left(\delta H_i/\delta W_j\right)_{\substack{\text{Constant}\\\text{Utility}}} = \left(\delta H_j/\delta W_i\right)_{\substack{\text{Constant}\\\text{Utility}}}$$

The elasticity of labour supply with respect to property income (V) ie ε_{H_iV}, is open to less debate, though the range of estimates presented in Table B are far from coherent. ε_{H_iV} as it is written in Table B can be rewritten as

$$(\delta H_i/\delta V)\ (\delta V/\delta H_i).$$

The studies outlined have been successful in producing estimates of ε_{H_iV} that suggest that leisure is a normal good. Unfortunately, they have been less successful in producing a range of estimates of any practical use.

There are many perceived failures associated with first generation studies. Their range of estimates of elasticities ($\varepsilon_{H_iW_i}$ etc) are too wide for any practical (policy) purpose. Some empirical results have rejected the symmetry assumption and at times empirical evidence has questioned the 'negativity' assumption. These failures of first generation studies stimulated a more careful examination of the theoretical labour supply models.

2.3 Conclusions of First Generation Studies

First generation studies, in omitting to consider some of the structural aspects of the supply of labour decision and in using empirical techniques that did not address adequately some of the complexities of the structure, suffered from a series of serious problems.

Cataloguing these problems provides a partial explanation of an insight into the wide range of labour supply estimates observed in typical first generation studies. While using the same set of explanatory variables and the same basic data source, it was possible to derive many distinct estimates of key labour supply elasticities given the different ways to:

(a) measure the dependent variable (H).
(b) measure the independent variable W.
(c) allow for non-linearities, kinks, gaps and discontinuities in the budget constraint
and (d) select the estimation sample.

It is apparent that this serves only to increase the potential range of variation in key parameter estimates, made more diverse by the switching of data sets between studies.

Killingsworth (1981) suggests that it may be possible by "judicious selection evaluation" (page 49) of different first generation studies to discard some results altogether on grounds that various procedures used in some of these studies are seriously flawed. The range of 'surviving' results may be therefore smaller and of more practical use. Borjas and Heckman (1979) do much the same thing for studies concentrating on prime age males; the effect is to reduce the range of estimates; this exercise can be rather arbitrary and subject to some pitfalls.

Rapid progress has been made on several fronts by second generation studies because first generation studies at least identified or helped identify the majority of the problems that second generation studies are actively addressing. The results of second generation studies suggests that solving these problems makes a considerable difference to parameter estimates from the supply of labour equations. This has obvious implications for analytical and policy purposes, but second generation studies are still in their infancy.

SECTION THREE

SECOND GENERATION STUDIES

Second generation studies, unlike their predecessor - first generation studies - pay particular attention to theoretical issues when estimating and specifying labour supply functions, and to the appropriate and better econometric techniques when estimating labour supply parameters and elasticities. In this section, the theoretical models and statistical techniques used in second generation studies, most of which have appeared since the early 1970s, are examined, together with a review of some of their more interesting findings.

Second generation studies take into account the non-randomness of the error term for individuals at different points on the budget constraint (*ie* workers versus non-workers). This section highlights some of the more advanced studies, with emphasis being placed on sample selection, wage rates of non-workers and the findings of second generation research.[1]

[1] For a detailed insight into the research being carried out by second generation labour economists in the area of taxes and transfer payments and other forms of discontinuities in the budget constraint, see *Heckman et al* (1981)

3.1 Second Generation British Studies

Second generation British studies are rare. Labour supply responses of married women have been estimated by Layard et al (1980) and Zabalza (1980). However, only Zabalza takes into account both the non-linearity of the budget constraint (generated by the tax system), and the joint participation and hours of work decision. Layard et al (1980) consider the joint decision but ignore the non-linearity of the budget constraint. Greenhalgh (1980), on the other hand, criticises some of the advances made by second generation studies, as being computationally expensive - particularly when applied to large data sets like the General Household Survey, and even more so when a model with large numbers of explanatory variables is being estimated. She is able to criticise Layard's (1978) approach for estimating the supply of hours of married British men, of using an auxiliary tax equation to produce imputed tax parameters (so taking an instrumental approach to the problem) as ineffective when applied to women. This is because the British tax system incurs a sharp dichotomy between zero and standard rates of tax which occurs at the earnings level of the wife's earned income tax allowance. She prefers to adopt a reduced form specification which involves a linear approximation of the non-linear budget constraint as do Layard et al (1980). This has the added advantage of being computationally simpler.

Greenhalgh's (1980) study produces similar elasticity estimates to Layard et al's. Own wage elasticity with respect to hours of work and participation is 0.68 and 0.36 respectively. The joint effect of the spouse's wage and V are respectively -0.18 and -0.35. These are comparable with Layard et al's estimates of 0.49 and -0.32 for participation elasticities with respect ot the own wage rate and the sum of the spouse's wage and V.[1]

Zabalza (1981) shows that the C.E.S. utility function, despite not generating a linear hours of work function, can be very useful for estimating labour supply responses when the budget constraint is non-linear. Zabalza uses his C.E.S. model to derive the usual elasticities of labour supply - these are illustrated with a study of participation and hours of work decisions by married women in Great Britain. The results obtained on labour supply responses are at least as good as those of other non-utility based specifications. He suggests that previous first and second generation studies on British data, which do not fully take into account the endogeneity and specification problems presented by non-linear budget constraints, may have underestimated the responsiveness of of female labour supply to economic factors.

[1] These estimates are reasonably close to estimates of labour functions estimated by Hurd (1976) using a more sophisticated procedure, as well as to the earlier results of Ashenfelter and Heckman (1974).

Zabalza notes that the C.E.S. model produces only marginally better results than other non-utility based specifications. Similar results to those obtained by Greenhalgh (1980) and Layard et al (1979) are produced. The complexities of Zabalza's specification seem unnecessary, as a comparison of results shows. However, it is only after work like Zabalza's, which uses more complicated and appropriate statistical techniques, that Greenhalgh's criticism of computational inefficiency can be applied. Zabalza has shown that simpler labour supply specifications, such as those of Greenhalgh (1980) and Layard et al (1979), have been successful in producing reliable labour supply elasticities, at least when compared to the responses obtained from his study.

A serious omission on the part of most British studies concerns an analysis of part-time employment though this is not just restricted to British studies. Much effort has been spent in estimating labour supply functions for married women. Very little effort has been directed towards an understanding of the part-time supply decision. Zabalza et al (1980) have looked at the choice between part-time and full-time employment facing older individuals, with a special reference to the social security system. Elias and Main (1982) - discussed in the next section - have also taken time to examine the supply of part-time female labour.

SECTION FOUR

CROSS GENERATION STUDIES

This section briefly records some of the British studies that can be categorised as both first and second generation studies. These hybrid, or cross generation studies are included here to provide a complete picture of advances made by labour supply studies more recently.

These cross generation studies, which include Joshi and Owen (1980), Joshi, Layard and Owen (1980), Elias and Main (1982) and Joshi (1984), have used a variety of specifications and estimation techniques, as well as a variety of data. Three of these four studies (Joshi (1984) being the exception) examined the participation rates of successive cohorts of women. They are included here, as cross generation studies, since they take the opportunity of using a two step framework while, simultaneously testing for autocorrelation. Such a model could take the form:

Let $$E_{tj} = X_{tj}b + D_j a + U_{tj} \qquad (10.1)$$

where X is a vector of non-cohort specific variables (such as personal characteristics), D is a vector of cohort dummy variables, a and b are vectors of coefficients, U is the usual randomly distributed error term, and E is the employment participation (dependent) variable, for J (j=1toJ) individuals.

Step one of Joshi and Owen's (and earlier Joshi, Layard and Owen) procedure is to estimate (10.1). The second step comprises of estimating the effects of cohort variables by regressing the $\hat{a}_j$'s estimated above on the purely cohort-specific variables (C_j).

ie

$$\hat{A}_j = C_j c + V_j \qquad (10.2)$$

where V is the error term as before.

Allowing for autocorrelation, which was found to exist between adjacent time periods (ie U_{tj} and U_{t-1j}) the authors found the main life cycle variables (age of participant and number of dependent children) to explain the life cycle pattern well. Each pre-school child lowered participation by 35% and each primary school aged child by 7% (for the 'standard' cohort). For ages between 20 and 59 years participation is lowered by twenty percentage points due to an ageing effect. Interestingly, the male-female relative wage ratio proved to have an insignificant effect on participation, other than an effect which was indistinguishable from a time trend. The two papers by Joshi and Owen (1980)and Joshi et al (1981) have been included in this section rather than discussed under

First Generation Studies for two specific reasons: firstly, the authors are aware of the problems uncovered by first generation studies and accordingly follow a two step procedure for estimating supply of labour decision parameters, so testing for autocorrelation and state dependency; and secondly, they follow a cohort approach in order to capture time (cohort) specific effects.

Elias and Main also follow a cohort approach. Unfortunately, they do not test for serial correlation but are aware of the consequences of such an omission. Joshi et al, on the other hand, find that the presence of a lagged dependent variable within the specification of their model, whilst testing for state dependency, also helps reduce the problem of serial correlation. The authors remain cautious, and do not jump to the conclusion that state dependency exists because of their findings. They conclude that it is not realistic to rule out the possibility of serially correlated omitted variables which may be giving the appearance of state dependency.

In the latter part of their study Elias and Main take steps towards providing an insight into the determinants of the supply of part-time labour. The authors are restricted in their analysis and in the specification of their part-time labour supply function by the nature of their data - the National Training Survey. A complete review of their work together with some improvements to their study are presented in Chapter 5. However, at this point it is perhaps worth noting that Elias and Main were one of the first studies to examine part-time employment.

The studies described in this section maintain a single aim: to provide a precise and clear specification of the supply of female labour decision making process that stands the test of estimation and prediction. These studies produce remarkably similar conclusions. For instance, they all report that young children - under five years of age - have a negative effect on the supply of labour; in particular, the first child exerts the strongest effect; older children - those aged eleven years and over - on the other hand have a slightly significant positive effect on the supply of labour. In addition the studies point to the importance of the wage rate and a woman's age as determinants of the supply of labour.

Cross generation studies have met with some success in that they are capable of producing mutually inclusive conclusions, such as the importance of younger children as restrictions on the supply of female labour. Notwithstanding this, the call for further research exists. The call for further research is important, particularly in the light of recent trends towards part-time employment for purposes of policy development.

SECTION FIVE

SUMMARY AND CONCLUSION

This chapter has provided a review of some of the more important and interesting theoretical and methodological analysis on static labour supply models where static is taken to include cohort models. First generation studies have amassed a vast amount of information on the labour supply decision. The large range of estimates of parameters (and elasticities) from various labour supply specifications stimulated an inquiry into the theoretical, methodological and practical aspects of their studies. Second generation studies, spearheading this inquiry, have highlighted, and in some instances corrected these practical (estimation and theoretical) problems, encountered by their predecessors; for instance, sample selection bias.

Second generation research is still in its infancy, and accordingly only general conclusions can be drawn from such analysis. However, in recognising the omissions and ignorances of first generation studies, these latter day studies have been successful in pushing the frontier of research into the supply of labour beyond its first generation limits. First generation studies should not be regarded as inadequate studies on the supply of labour. Indeed, the reverse is true. They were the initial intellectual stimulus behind second generation research, since they were capable of providing an insight into the labour supply decision and the problems that might be encountered when using too simple a labour supply specification that ignores, for example, corner solutions or selectivity bias.

In addition to these first and second generation classifications, there exists a small group of studies that I have called cross generation studies. These studies, aware of some or most of the problems raised by first generation studies, have estimated largely cohort-specific labour supply specifications. Such cross generation studies have taken some of the first steps towards assessing the determinants, and developing models of, for instance, part-time employment, and age-specific labour supply. These initial steps have provided others interested with first hand information on the labour supply decision that proves to be very important.

Yet, despite all this interest and effort it appears that there has been very little knowledge acquired about some important aspects of the supply of labour in Britain.

The most difficult area of labour supply forecasting - with which most models of labour supply can ultimately be tested, and with which most interest in labour supply models directs itself, relates to the predicted participation of married women and their hours of work. From at least the point of view of policy formulation forecasting the supply of labour is crucial.

Accordingly, clearly defined and truly representative data-realistic models of the supply of labour must be developed. These need to be capable of standing the test of prediction if they are to be used reliably by policy analysts. The growth of part-time employment of recent years has been rapid, especially the part-time employment of women with children. Female unemployment has also risen, quite substantially since 1974 and at a faster rate than male unemployment. Although these rapid changes in labour market trends have not gone unnoticed it is not surprising to find that the task of forecasting the labour force participation of married women has presented considerable problems, particularly to the Department of Employment (DE).

At first sight the DE projections of the labour force participation of married women seems to be erratic, seemingly always being revised. However, the constant revision of DE estimates indicates that the dramatic increases in married women's participation rate have taken most researchers by surprise. For example, Elias (1981) shows that in 1966 the DE forecasted a participation rate of 54% for married women in the 35-44 age group in 1981. In 1974 this forecast was revised to 63%. In 1977 the forecast was once more revised to 70% by 1981. This rise in labour force participation has correctly been associated with a rapid rate of increase of part-time working. During the 1970s, the part-time employment of women grew by between 1.5% and 2% per annum. These fundamental changes question the extent to which the present state of knowledge and research can cast light upon the labour market process underlying these developments especially given the scarcity of studies addressing the trend towards part-time employment with an aim to improving the forecasting procedure. Trends in participation and hours of work are well documented. However, the analytical work carried out and its contribution to explaining the past is generally open to much criticism. Furthermore, it suggests that part-time women workers are a distinctly separate group of workers to the full-timers, a point which has received only scant attention in the literature.

CHAPTER TWO - TRENDS IN PART-TIME WORK AND THE CHARACTERISTICS OF PART-TIME WOMEN WORKERS.

INTRODUCTION

This chapter uses the Women and Employment Survey (WES) data and other available information to examine the characteristics of working women. By identifying the key "economic" characteristics of working women, and in particular the differences that emerge when part-time and full-time working women are contrasted, it will be easier to understand the decision to supply labour. Once this has been achieved, it will then be possible to pursue a more rigorous treatment of the decision to work (part or full-time) as is done in following chapters.

It is to be expected that women who work part-time have fundamentally different characteristics to those working on a full-time basis. Indeed, this has already been described by Martin and Roberts (1984, 1984a) using the WES. This chapter draws from their findings and provides a picture of the trend towards part-time work in Britain, as well as a description of, the fundamental characteristics of women who work part-time compared to those working full-time.

Section One draws attention to the trend towards the employment of women on a part-time basis, and discusses the various definitions of part-time employment, contrasting those used by the Department of Employment (DE) and the WES. In Section Two, the literature on women and part-time employment is partly surveyed as the principal characteristics of part-time working women are compared to those working full-time.

The principal differences to emerge from the literature on part-time working women are reported in the light of the evidence to emerge from the WES in Section Three. This is followed in Section Four by a brief discussion of the legislative changes that have emerged over recent years which are thought to have altered the demand for part-time (female) labour; in particular the Equal Pay Act and the Employment Protection Act are assessed.

SECTION ONE

2.1 The Definition of Part-time Employment

An important problem which emerges when discussing part-time employment is the matter of definition. No universal definition exists. Hallaire (1968) puts forward three criteria which emerged from his early research into the subject; these provide an objective and clearly defined concept of part-time employment in general terms. Precisely, these are:

(1) Regular and stable work, in contrast to casual or seasonal employment.

(2) Voluntary work, work deliberately chosen by the individual and of shorter hours than normal.

(3) Total working hours appreciably shorter than normal, which would exclude shorter hours of work caused by the nature of the job.

Hallaire's 1968 study thus incorporated the International Labor Office's (ILO) definition of regular, voluntary work carried out during normal working hours distinctly shorter than normal. However, both the 1963 and 1973 ILO International Survey's of part-time employment emphasise the fact that there can be no universally (and hence quantifiable) definition of part-time employment. The ILO recognises that there are a variety of national definitions of part-time employment; in some countries there is no definition of part-time employment.

The 1973 ILO Survey reported considerable diversity in national approaches to the concept and definition of part-time employment. Some countries -

(1) defined the concept as daily or weekly employment for less than the normal or statutory hours of work, whilst other countries defined it by reference to a fixed maximum of working hours or employment within a fixed range.

(2) included part-week work as part-time employment, while other countries refused to do the same.

(3) included workers who held a second part-time job as part-time workers, others did not.

(4) allowed for the inclusion of homework within their working definition of part-time, while other countries omitted it from theirs.

The problems, more typical of the General Labour Force Survey (LFS) are also problems encountered by empirical studies on part-time employment, <u>ie</u> an assessment of an individual's labour force status is dependent largely upon the individual being in employment thus excluding the unpaid (family) helper - which particularly applies to women, and the self-employed.

The 1973 ILO Survey therefore recognises that it is not possible by reference to existing definitions of part-time employment to suggest anything more than a general guide to the definition of part-time employment. The general definition should include work that is regular, voluntary and of hours shorter than normal.

The DE defines part-time employment as work involving less than thirty hours per week, excluding meal breaks and overtime; in the case of agricultural workers and teachers the 30 hours a week threshold is replaced with 25 and 22 hours, respectively. The LFS, on the other hand, asks respondents to assess their own part-time or full-time status. Hence, great care needs to be exercised when using published statistics on part-time employment, both nationally and internationally. The WES takes a compromising stand, asking respondents to assess their own status (part or full-time) whilst recording the normal hours of work, excluding meal breaks and overtime, of each respondent. This leaves analysts free to choose the definition of part-time employment, and test various types of definitions.

Part-time employment can of course take on a number of forms, from working one day a week to working part of every day. Table 2.1 shows the number of hours worked and proportions in each hours category for 1971.

Table 2.1 DISTRIBUTION OF HOURS WORKED IN GREAT BRITAIN 1971

HOURS WORKED EXCLUDING MEAL BREAKS AND OVERTIME

MALES %	12 or less	13-17	18-23	24-29	30-35	36-39	Over 40
15-64 Yrs	0.6	0.1	0.2	1.2	5.6	60.4	27.0
65 +	12.1	10.6	19.2	7.0	4.1	22.7	16.3
FEMALES %							
15-59 Yrs	7.9	5.9	10.5	9.8	13.6	37.4	11.1
60 +	20.5	10.5	17.2	11.4	7.7	15.9	8.9

SOURCE CENSUS OF POPULATION

From Table 2.1 it is apparent that while 40% of females work under 18 hours per week, there remains a clear spectrum of hours worked, with little distinction between part-time and full-time employment that can easily be inferred from the distribution of hours worked.

2.2 The WES and the Definition of Part-time Employment

It is possible to compare the definition of part-time employment given by the DE (the 30 hours threshold) to the response given by women in the WES who assessed their own work status. By contrasting the proportion of women who assess themselves as part-time and who would be "officially" classified as part-time according to the DE the effectiveness and efficiency of the DE definition (or the efficiency of women's own assessment) can be gauged. The results from such a comparison are given in Table 2.2.

In 92% of the cases considered in the WES, the informant's opinion agreed with that of the DE. The remaining 8% were divided between those who thought they were working part-time but who, according to the DE were in fact full-time (5%), and those who thought they were working full-time but who were defined as part-time (3%)

Table 2.2 AGREEMENT BETWEEN INFORMANT'S OPINION OF WHETHER SHE WAS WORKING PART-TIME AND THE DE DEFINITION OF PART-TIME EMPLOYMENT.

Informant's opinion and the DE definition

		%
(1) AGREE	Both Part-time	53
	Both Full-time	39
	TOTAL	92
(2) DISAGREE	Informant's opinion is:	
	(a) part-time and DE is full-time	5
	(b) full-time and DE is part-time	3

Source WES SAMPLE 3312

It is important to remember that the comparisons presented in Table 2.1 use the standard (DE) definition of 30 hours or less as applied to all workers, with no distinction being applied to agricultural workers or teachers. Since there are likely to be many women who work as teachers, these figures are all the more reassuring.

When the US definition of part-time employment is used (where the threshold becomes 35 hours or less) the results alter considerably. Over a fifth of those women who assessed themselves as full-time were classified as part-time, while only a half of one per cent was true of the reverse. If a 25 hour or less threshold is introduced the distribution of Table 2.1 is almost exactly repeated.

Clearly, as the hours threshold is raised, so the proportion of part-timers in agreement with the standard definition currently being experimented with increases, while the proportion of full-timers in agreement decreases. The reverse is obviously true if the threshold is reduced. The difficulty associated with choosing a workable and exact definition of part-time employment has already been highlighted: notwithstanding this it appears that as far as the WES data are concerned the DE definition of part-time appears to function relatively well in comparison to an informant's self-assessment of their current work status. The following sections make use of each informant's assessment of their own part or full-time status rather than the DE's definition of part-time employment.

2.3 Recent Trends in Part-time Employment

(a) In 1948 the labour force comprised 34% women, rising to 37% in 1966 and 42% in 1980. While the number of male employees rose from 13.3m in 1948 to reach a peak of 14.7m in 1966, declining to 12.8m in 1980, the number of female employees had risen consistently. It has climbed from 6.7m (1948) to 8.6m (1966) and then on to 9.2m in 1980.

Consistent data on the numbers employed on a part-time basis is only available since 1971 from the annul Census of Employment - with the proviso that individuals holding two jobs are counted twice. Table 2.3 records the trend in the employment of females (as well as males) in Great Britain between 1971 and 1981, and it is to this period that attention is focused.

Table 2.3 EMPLOYEES IN EMPLOYMENT 1971-1981

Great Britain	June 1971	Changes since the previous June							June 1978	Sept 1981
		1972	1973	1974	1975	1976	1977	1978		
Male and Female	21,648	1	533	114	-84	-165	78	128	22,253	21,148
Full-time	18,307	-135	182	-167	-223	-200	64	42	17,870	16,679
Part-time	3,341	136	351	282	138	36	14	86	4,384	4,468
Male	13,424	-106	159	-114	-124	-143	-21	20	13,096	12,135
Full-time	12,840	-121	94	-138	-132	-144	-4	-3	-2,392	11,426
Part-time	584	16	65	24	9	1	-18	23	704	709
Female	8,224	107	374	229	39	-22	99	108	9,158	9,013
Full-time	5,468	-14	88	-29	-90	-56	67	45	5,478	5,254
Part-time	2,757	120	286	258	130	34	32	63	3,679	3,759

Source: Department of Employment 1984.

On the whole the economic activity rate for women rose rapidly during the 1970s, by about 4.5 percentage points; Table 2.3 identifies the simultaneous trend away from female full-time employment and the trend towards female part-time employment. In addition the table highlights the reduction in male employment.

The DE (DE Gazette, February 1981, Vol 89:2: pp61; and February 1983, Vol 91:2: pp62) draws attention to the underlying trend discussed; specifically, the increased employment of women (compared to men) on a part-time basis (compared to a full-time basis). Furthermore the DE (DE Gazette December 1982) notes that during the period 1978 to 1981 the only increase in employment in Great Britain has been in part-time employment (71,000) compared to an overall loss of 1,126,000 other jobs. This was a result of an overall decline in manufacturing industries employment of 1,193,000 and an increase in services industries employment of 214,000, of which about 83% were part-time jobs.

Table 2.4 constructed from DE published data shows the change in employment of females over the decade 1971-1981 in all manufacturing industries, with some interesting results.

Table 2.4 CHANGES IN EMPLOYMENT IN MANUFACTURING INDUSTRIES SIC 1968 III TO XIX, BRITAIN. 1971-1981

Year	Change '000s	Change %	Status
1971/2	-67	-3.7	FT
	-17	-3.6	PT
1972/3	-8	-0.4	FT
	12	5.6	PT
1973/4	-25	-1.4	FT
	77	15.2	PT
1974/5	-120	6.8	FT
	-63	-10.8	PT
1975/6	-68	-4.1	FT
	-38	-7.2	PT
1976/7	34	2.1	FT
	3	0.6	PT
1977/8	-7	-0.5	FT
	-8	-1.7	PT
1978/81*	-286	-17.8	FT
	-111	-23.1	PT

FT = Full-time, PT = Part-time

1978/81 is taken together as there was no Census of Employment taken in 1979 and 1980.

SOURCE: Department of Employment

Summing all the increases in employment during this period, approximately 80% is accounted for by increases in part-time employment. Of the losses, only 20% are attributable to part-time employment. Clearly, during times of employment expansion the vast majority has come about through an increase in part-time employment while full-time employment suffered the greatest decline in times of employment contraction.

A similar picture emerges when the Services Industries are examined. All of the 21,000 female job losses in the Professional and Scientific Industry over the same period can be attributed to full-time employment. Of the increases, 68% are accounted for by part-timers. In the case of Miscellaneous Services, 85% of the period's increases are in part-time employment.

Between 1971 and 1978 there was an increase in employment of 1.5m in all Service Industries, of which about two-thirds were in part-time employment. By 1980, three sectors accounted for the 74% of all part-time employment; these are, Miscellaneous Services, Professional and Scientific Services and Distributive Trades.

For both sexes, part-time employment belongs predominantly in the services sector; 86% of women and 82% of men who work part-time can be found employed in the service sector. Women are over represented in part-time employment according to their overall labour force representation: 42% of women work part-time and 54% of women work in services, while the labour force is made up of 40% women (1980).

(b) While there has been this increase in the part-time employment of women and simultaneously a decline in their full-time employment, the reasons behind this trend have not been fully appreciated.

It is important to both recognise and understand the causes of this trend, particularly if the trend is to continue, since it may be necessary to introduce national policy changes to best cater for the trend towards increased female part-time employment. The policy changes may include, a review of the employment (protection) laws giving improved rights to part-time workers, improved childcare facilities, the ability for potential workers to register as seeking part-time employment, etc. Only when the mechanism behind this trend is understood can the correct policies be implemented.

SECTION THREE

3.1 Part-time Women Workers

(a) Personal Characteristics and Dependent Children

Part-time employment often offers the most convenient and sometimes only way of combining family responsibilities and paid employment for many women. The convenience of part-time employment allows women to undertake a dual role as "housewife" and "worker".

The characteristics of part-time working women have received some attention in the literature. Leicester (1982) recognises that about 60% of part-time work is undertaken by married women, and suggests that research to date claims to reveal three special features about married women workers:

1. Married women tend to assume a conscious dual role (housewife and worker), thus raising a family and working are complementary.

2. Married women have a strong commitment to their domestic roles; and their equally strong commitment to paid employment is strongly correlated with the number of children present, and more especially the age of the youngest. Elias and Main (1982) stress the importance of the role and responsibilities of motherhood, domestic work and the nature of employment by hours.

The effect of children on the choice between part-time and full-time employment is strong; however, this has led research to concentrate attention on the characteristics of married women workers (when assessing the trend to part-time employment) when in fact the more appropriate group would be those women who had children. This will be made clear in the following chapter.

The effect of children on the part-time/full-time employment choice has been discussed by Rimmer (1981) who points to the importance of child care facilities in determining the type (part/full-time) of employment sought. The suggestion is that inadequate childcare facilities limit the supply of labour. Using 1980 OPCS data Rimmer found that 7% of mothers with children under 5 years of age worked full-time compared to 39% who worked part-time.

3. Married women's earnings generally make a substantial contribution to family income, with earnings being used to purchase necessities like food and clothing.

In addition to Leicester's three special features there may be a commitment to elderly/dependent relative, which act on the supply of labour in a similar way to dependent children.

Characteristics and the WES

The following Tables and Charts use the WES data and can be found in a similar form in Martin and Roberts (1984, 1984a), unless otherwise stated, and are repeated here because of the interesting issues they raise.

On the basis of each respondent's assessment of their present labour force status, 56% of respondents in the WES worked full-time, and 44% worked part-time. This proportion varies considerably among different groups; some of the more interesting differences to emerge are reported here.

1. AGE

Table 2.5 shows how the proportion of women who work part-time varies by age.

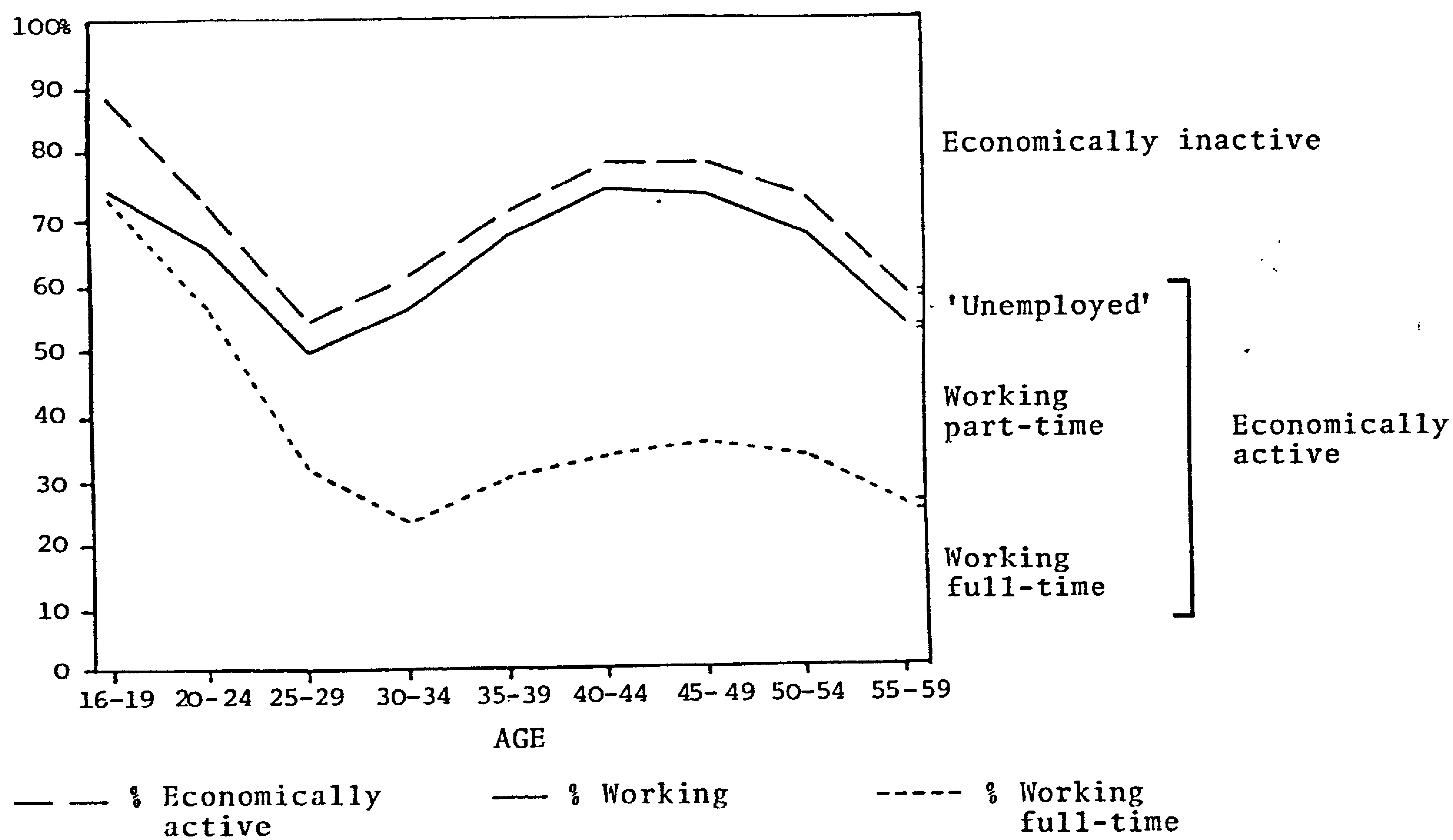
Table 2.5 THE PROPORTION OF WOMEN IN PART-TIME EMPLOYMENT BY AGE

Age (Yrs)	Proportion in part-time work %	Base
16-19	2	258
20-24	13	366
25-29	26	335
30-34	59	469
35-39	55	431
40-44	55	435
45-50	52	407
51-55	51	376
55-59	53	396
All women	44	3353

Source WES

The results are as expected; older women tend to work part-time, while those aged between 16 and 24 working proportionately the least part-time. Elias and Main (1982) found a woman's age to have been the most important factor (statistically) associated with the proportion of time spent working during a ten year period (this is discussed at length in Chapter 5). They concluded that, *ceteris paribus*, older women tend to work part-time, a result born out by Table 2.5, and by Chart 2.1.

Chart 2.1. CURRENT ECONOMIC ACTIVITY AGE (EXCLUDING STUDENTS)



SOURCE: WES

The proportion of women involved in part-time employment peaks for the 30-34 year age group, and thereafter shows only a slight decline across older age groups. Layard, Barton and Zabalza (1980) are also correct in noting that older women are more likely to work part-time than similar, but younger, women; their discovery was justified by their regression results.

2. Marital Status.

Research has noted that married women tend to be associated with part-time employment (see above); the WES data adds weight to this tendency; see Table 1.6.

Table 1.6 PROPORTION OF WOMEN IN PART-TIME EMPLOYMENT BY MARITAL STATUS

Marital Status	Proportion in part-time employment %	Base
Single	4	626
Widowed	51	99
Divorced	32	132
Separated	27	62
Married or Cohabitating	55	2,375
All Women	44	3,353

Source WES

Clearly, married women and cohabitating women are more likely to experience part-time employment than are single women; the former group (married and cohabitating) are also most likely to have children. Being widowed is similar to being married in the sense that similar proportions work part-time (51% and 55% respectively); whilst only 32% and 17% of working divorced and separated women respectively work part-time. However, given the small sizes of the ex-married sample, care needs to be exercised when drawing conclusions from this group. Being in any category other than single increases the chances of working part-time.

Table 2.6 shows that over three-quarters of the sample of working women are married, and of these married women over half work part-time. This confirms the findings of Table 2.5 which indicates that younger women are less likely than older women to work part-time, and also less likely to be married.

3. Dependent Children

The importance of dependent children in determining current work status is examined more fully in the next chapter when multivariate models of labour supply are described and estimated; however, Tables 2.7 and 2.8 highlight the negative effect young children have on the supply of labour. Furthermore, the increasingly stronger negative effect of younger children on the supply of labour is apparent.

Table 2.7 THE PROPORTION OF WOMEN WHO WORK PART-TIME BY NUMBER OF DEPENDENT CHILDREN

No. of Children	Proportion in Part-time Employment %	Base
1	62	618
2	74	556
3 or more	72	193
All women with children under 16 yrs	68	1,367
All women with no children under 16 yrs	27	1,986
All working women	44	3,353

Source WES

Table 2.7 indicates that women with dependent children are significantly more likely to work part-time than those without;

68% of women with dependent children work part-time.

Table 2.8 <u>THE PROPORTION OF WOMEN IN PART-TIME EMPLOYMENT BY AGE OF YOUNGEST CHILD-WORKING WOMEN WITH CHILDREN UNDER 16 YEARS</u>

Age of Youngest (yrs)	Proportion in Part-time Employment (%)	Base
0-2	73	138
3-4	74	138
5-10	75	553
11-15	58	558

Source WES

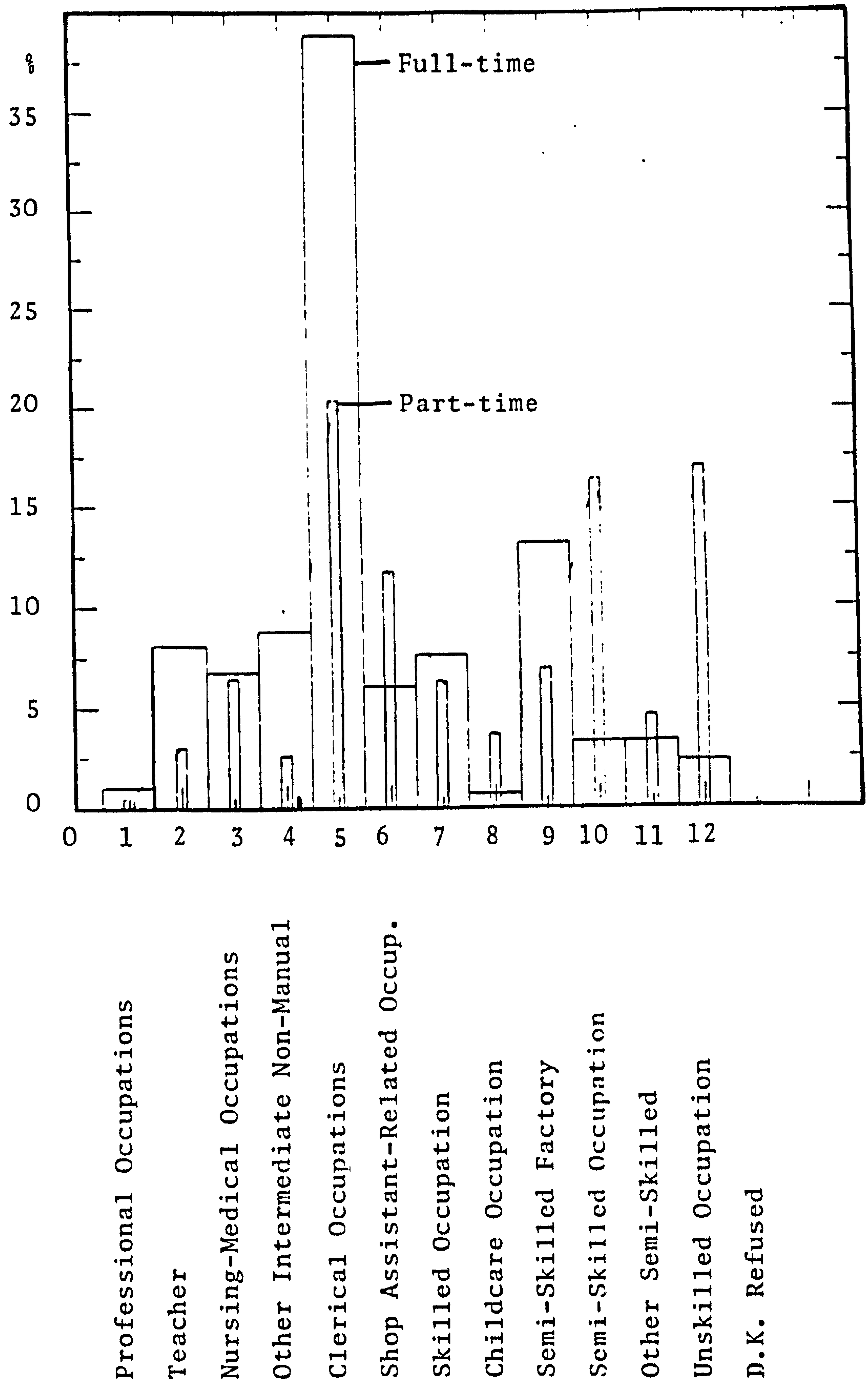
Table 2.8 adds to the evidence presented in Table 2.7; namely that it is the presence of the youngest child that has the most significant impact on the supply of labour as measured by the choice between part-time and full-time employment. Additional children appear to have only a minor impact on the proportion involved in part-time employment.

The crude cross tabulations presented so far point to the importance of young children (as given by the age of the youngest child) and a woman's age in determining the likelihood of working part-time; this is borne out by other studies also (see Elias and Main, 1982).

(b) Occupational and Industrial Distributions

It was shown earlier that women workers have tended to move towards part-time employment and away from full-time employment; this has been matched simultaneously by a movement towards employment in the service sector. Hurstfield (1979) contends that these women tend to be concentrated in the occupations that offer the least pecuniary reward. Using the occupational grouping in the WES Chart 2.2 displays the occupational distribution of women workers.

Chart 2.2 THE OCCUPATIONAL DISTRIBUTION OF WOMEN WORKERS



- OCCUPATIONAL GROUPS -

SOURCE: WES BASE: 3350

Both part-time and full-time working women are heavily employed in the clerical occupations (category 5) - 39% of full-timers and 20% of part-timers respectively. Of the first nine groups, part-timers are only dominant in shop-assistant and related occupations (category 6), and childcare occupations (category 8); this is generally to be expected since it is these groups (out of the first nine) that lend themselves easily to flexible hours. Elias and Main (1982) found twice as many part-timers working as shop assistants (and related occupations) than full-time women workers.

Of the remaining categories, approximately 16% of part-time working women are employed in semi-skilled domestic occupations (category 10), as compared to only 3% of full-timers. Similarly, category 10, unskilled occupations - which includes cleaners, kitchen hands, labourers, etc, accounts for 17% of part-time workers in the survey and 2% of full-timers. These occupations make use of skills developed in the home; hence, little (or no) training is usually required thus making this form of employment an easy form of employment for women to return to after a spell away from the labour market (say, for child rearing). The supply of such suitable labour may explain the dominance of part-time workers in these occupations. Similarly the often unsociable hours of employment associated with these occupations is likely to have led to a shortage of suitable full-time labour; if this is the case then part-timers offer the only real solution to the labour shortage. Of course the demand for part-time labour has changed, as will be discussed in the following Section, and this has had a bearing on the trend towards women's part-time employment.

A recent EOC survey (1981) recognises that the shortening of the national working week (and day), and longer holidays has made it increasingly difficult to recruit suitable full-time staff into industries where peak-pressures are in the evenings, weekends and holiday periods. In particular this peak load problem applies to the semi-skilled occupations just described, which includes waitresses, barmaids and housemaids.

This development, towards labour being required at unsociable times in large quantities (peak-loading) has coincided with a general deskilling of many jobs in particular in the service sector. For example, the DE (Manpower Studies No. 11) has shown that various changes have been made in the method of service available to enable less skilled individuals to be recruited into catering. In hotels recourse has been made to convenience foods (such as "dummy waiters"); this has in turn increased the demand for part-time labour which by its very nature can be utilised during periods of peak demand.

Industry

Table 2.9 draws attention to the industrial distribution of women workers (by part-time and full-time status). Trends in the industrial distribution of these women workers has already been described (briefly) earlier; however, using the WES Table 2.9 highlights the predominace of the service sector as an employer of part-time women workers.

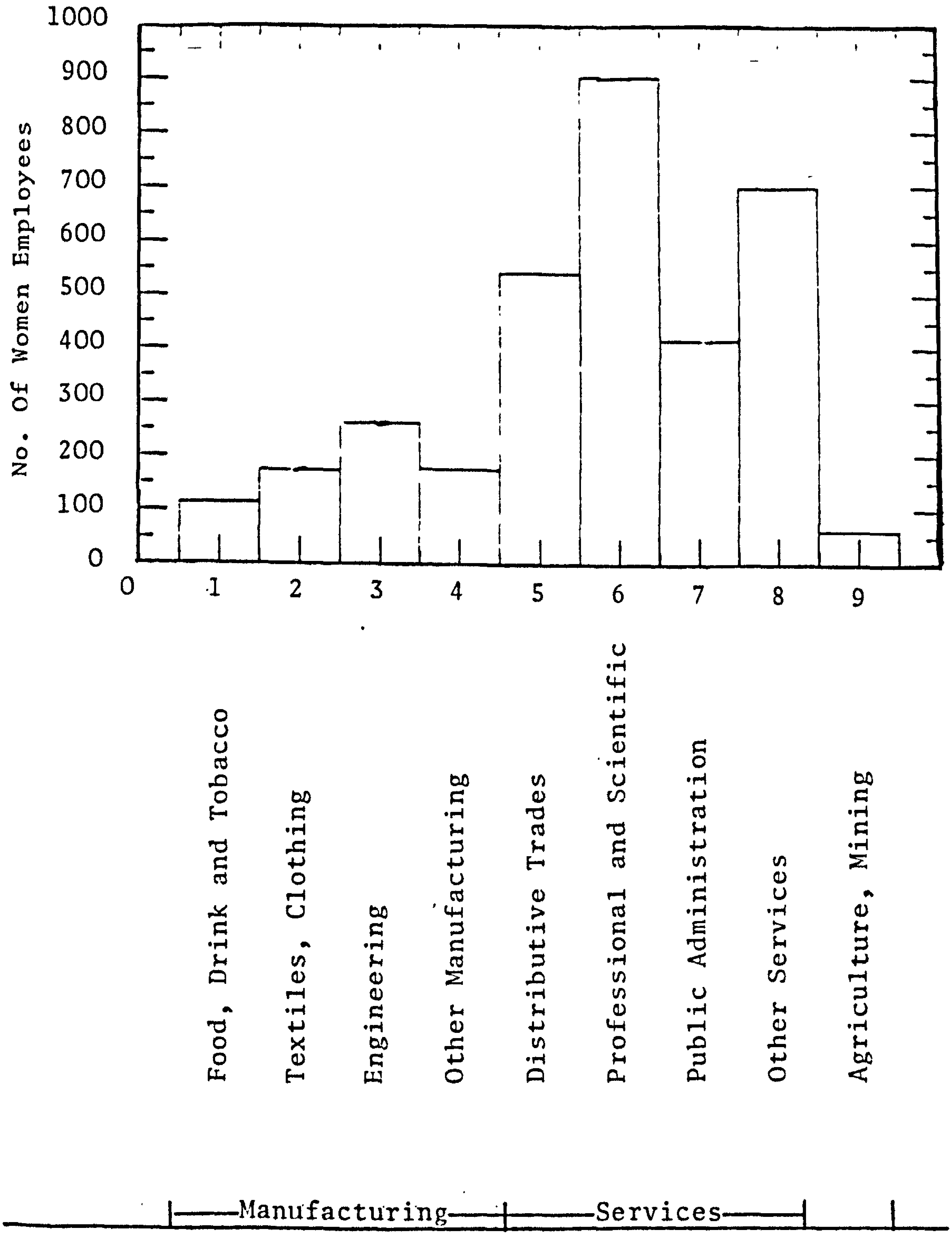
Table 2.9 *THE DISTRIBUTION OF WOMEN WORKERS BY INDUSTRIAL GROUPS* (SOURCE: WES)

Industry	Full-time	Part-time	Working women
MANUFACTURING INDUSTRIES	%	%	%
Food, drink and tobacco processing	4	3	3
Textiles, clothing, footwear, leather goods	6	4	5
Engineering, metal goods, metal manufacture	10	5	8
Other manufacturing industries	7	3	5
Total manufacturing	27	15	21
SERVICE INDUSTRIES			
Distributive trades	14	18	16
Professional and scientific services	25	30	28
Insurance, public and local government administration	16	8	12
Other services	17	26	21
Total services	72	82	77
PRIMARY INDUSTRIES			
Agriculture, forestry, fishing, mining, quarrying	1	3	2
Total	100	100	100
Base	1877	1476	3353

Over 80% of part-timers and 72% of full-timers work in the services sector; services are, as expected slightly more predominant amongst part-timers, while the reverse is true of the manufacturing sector. Similar results emerge from the September 1982 General Household Survey, where 78% of women part-time workers can be found in the services sector.

The industrial distribution given in the table above (Table 2.9), is represented graphically in Chart 2.3.

Chart 2.3 DISTRIBUTION OF WOMEN WORKERS BY INDUSTRY



SOURCE WES

(c) An Overview

The discussion so far has shown over half (between 51% and 59%) of all work undertaken by women aged over 30 years was part-time. Full-time employment is concentrated amongst younger women. The association between part-time and full-time employment and age stems from the typical pattern of family formation between the ages of 20 and 35 years, coupled by responsibilities for domestic and child care shouldered by most women. As this is clearly the case, the distribution of part-timers and full-timers by occupation may simply be reflecting the various occupational choices that younger women and older women find themselves facing.

SECTION FOUR

The Demand For Part-Time Workers

It must be born in mind that over the period when women's part-time employment was experiencing an upward trend, unemployment was increasing too. The considerable increase in part-time employment, particularly made up by women, discourages the view that the increase of employment on a part-time basis of women was entirely a supply-side phenomenon, given the rising levels of unemployment. As Mallier and Rosser (1980) note, any increase in the supply of (part-time) labour must be matched by an increase in the demand for the labour if there is to be an increase in employment.

The rise in the demand for part-time labour can be separated into two distinct categories. The first of these discussed below, changes in the industrial structure, has altered employment patterns. The second category, more widespread changes (principally legislative changes), has made part-time workers more attractive to firms, in contrast to the the full-time equivalent.

(a) Structural Changes

As has already been discussed, some parts of the economy experienced a shortage of suitable full-time labour (such as in retail distribution and catering), giving cause to turn to part-time labour to fill the employment void. Furthermore many of these service sector jobs were seen as unattractive to males - since the alternatives in manufacturing were relatively higher paid and usually more prestigious. Combined with the shortening of work hours and longer holidays it has become increasingly difficult to recruit males into the type of jobs part-time women workers can today be found in; ie, the industries where peak pressures are in the evenings, weekends and holiday periods.

This has coincided with the bias of part-time work to the service sector; Mallier and Rosser (1980) have suggested that the bias of part-time work in this way has exaggerated the trend towards service sector employment away from manufacturing.

Thus, changes in the industrial structure (towards the Services) technological advances and changing operating methods have greatly contributed to altering the basic pattern of employment in Britain, in particular, the trend towards the increased employment of women on a part-time basis.

More widespread changes have taken place which have made women wishing to be employed on a part-time basis relatively more attractive to employers than full-time equivalents. Accordingly, part-timers may have become a relatively cheaper form of labour.

(b) Legislative Changes

These more widespread changes include recent alterations in the (employment) legislative framework. The rise in the demand for part-timers may have occurred because of a relative fall in their wage and/or non-wage employment costs. A New Earnings Report (1978) revealed that in every industry where information was available part-time workers had gross hourly earnings below that of full-timers (excluding the effect of overtime).

There is evidence that suggests that part-time workers are the subject of wage discrimination - whilst this may be true (and there appears to be a difference between the average hourly earnings of part and full-timers) this is likely to be insufficient to explain the 1970s rise in demand for part-timers. Other factors must have occurred during this period which have some bearing on the increased demand for part-timers - which needed to have taken place for the rise in part-time employment to have occurred.

Before 1975, when the Equal Pay Act came into operation, it had been possible to employ women at lower rates of pay than their male counterparts; this had the effect of making women cheaper as a source of labour compared to male workers. This may, therefore have increased the demand for women workers - both full and part-time. After the introduction of the Act, the incentive to employ women (as a cheaper labour input) was removed, as "equal pay for equal work" was introduced. The legislation required women to be paid the same rates as men if they undertook the same work. However, few women were able to find male counterparts against which they could claim parity, since they were often segregated into different occupations.

As has already been noted, part-time work is almost exclusively carried out by women; this has the effect of making particularly scarce male counterparts against which these women can claim parity. This may go part of the way towards explaining the relative attractiveness of part-time workers.

By 1972 Selective Employment Tax had been removed. During its lifetime, 1967-1972, the tax required each employer to pay a lump sum which was proportionate to the size of his labour force, irrespective of the wage bill. Once this tax was removed the effect on the demand for part-time labour is obvious, as it left firms free to employ part-timers rather than full-timers (and therefore increase the size of the labour force employed) without incurring additional costs.

Three years after the abolition of Selective Employment Tax, employers' national insurance contributions were reorganised. The old flat-rate tax was replaced by a percentage contribution based on the earnings of each employee over a minimum income and up to a maximum level. Hence, before 1975 employers' contributions were disproportionately higher for part-timers. The new system removed this inconsistency.

The 1975 Employment Protection Act (EPA) gave employees certain rights whilst at work. In particular, it became more difficult and costly (through redundancy payments) to dismiss staff. Prior to the introduction of the Act, those workers who worked less than 21 hours per week were excluded from most of the Act's protection. This left about the 20% of working women outside of the ACTs the EPA replaced. Workers who worked less than 8 hours a week or who worked less than 16 hours and had not been employed by the same employer for at least 5 years were excluded from the type of employment protection found in the Act. Accordingly, firms that wanted to have a greater control over their workforce now had the added incentive to employ part-timers up to a maximum of 16 hours a week. This may add some weight to the Marxian idea of the reserve army of labour, where paid labour is taken on and laid off according to the dictates of capital.

In many low paying occupations, employers point to particular fringe benefits enjoyed by their workforce, as a non-pecuniary factor offsetting low wages. Fringe benefits, such as paid holidays, private welfare schemes - such as sickness benefit - and subsidised services are very scarce when part-time employment conditions of work are examined as compared to full-time conditions. This lack of benefit, which involves the employer in extra employment costs, if it can be avoided is an obvious way of improving the likelihood of increased part-time employment.

The lack of benefits associated with part-time jobs are probably a reflection of the lack of trade union power associated with part-timers. Part-timers tend to be outside of the scope of collective bargaining. The fact that so few statistics are available on part-timers' membership in trade-unions is an indication of the dilemma facing part-timers. The fact that part-timers tend to be non-unionised may itself be an incentive to employers to employ part-time staff.

(3) The Costs of Employing Part-timers

The benefits of employing part-timers, through their lack of unionisation and their failure to be covered by the financially expensive statutes of the EPA (at least those who work for less than 16 hours per week) have been outlined. As might be anticipated, the benefits to the employer of employing part-timers are incurred whilst costs are also experienced.

Since, by definition, more part-timers will be required than full-timers to achieve a given output, a part-time labour force will incur the employer additional costs. For example, selection, induction and training costs will be higher. Supervisory and administrative costs will also increase as a part-time labour force is employed.

However, many part-timers have already experienced employment previously; many indeed will have been employed as full-time workers. Thus, they willalready possess some of the skills, training and aptitudes required by their part-time job. If this is the case, the induction and training costs associated with part-time staff could be considerably reduced. Furthermore the type of work that many part-timers find themselves engaged in builds upon the skills they are likely to possess as housewives and mothers - such as those required when employed as a cleaner or in childcare occupations.

Induction costs may not be as large as they might be; but, supervisory and administrative costs are likely to be very much larger than those associated with a full-time labour force. It is difficult to see where the concept of cheap labour comes from as an explanation for the increased demand for part-time workers since part-time workers are not necessarily a cheap form of labour. Perhaps the advantage of part-timers over full-timers lies in their "flexibility", namely, the ease with which they can be removed from the labour force, incurring the employer in smaller redundancy bills.

There remains a great deal of scope for future research into the causes of the recent rise in the demand for part-time labour, particularly as the literature on the subject remains very much in its infancy. However, there have been some advances in the literature; which more recently includes Robinson and Wallace's (1984), Department of Employment Research Paper (No. 47).

SECTION FIVE

CONCLUSION

This chapter has summarised some of the more interesting findings from a preliminary investigation into the differences that emerge from a comparison of part-time and full-time women workers. For most women paid employment is commonplace, as indeed is the spending a greater proportion of their lives in paid employment. The flexibility offered by part-time employment to women allows them to maintain their dual roles as housewife and mother and as paid worker.

The secondary nature of their role as employee has had well recorded impacts on their labour market position; the dual role exists with both roles viewed as complementary rather than conflicting activities. The primary role appears to be housewife and mother, with market work taking second place. The trend towards part-time employment is associated with labour market segregation and a division of labour that begins in the home and stretches across occupations and industries.

Part-time employment is clearly associated with the stage in a woman's life when domestic responsibilities are strongest, as measured by the presence of young dependent children, and by an individual's age. Women who work part-time thus generally possess different family characteristics than full-timers, since they are at different stages in their life cycle and family formation patterns.

It has been shown, see Ballard (1984), that part-timers compete in the labour market on different grounds to full-time women workers and male workers; this is reflected by the absence of fringe benefits in part-time jobs. The segregation of the labour market and the often secondary nature of part-time female employment is further evidence of this. That women appear to put up with this employment role is most likely maintained by their insistence to carry out their dual roles; in carrying on as mothers, wives and employees, a trade-off emerges between pay (and employment prospects, conditions of work etc) and having a job that allows the dual roles to simultaneously exist. The convenience associated with part-time employment is bought at a cost for women who choose this form of employment, just as it is for employers who choose to employ part-timers.

CHAPTER THREE - MODELS OF LABOUR SUPPLY PARTICIPATION AND HOURS OF WORK.

INTRODUCTION

This chapter builds upon the discoveries of Chapter Two - which analysed the different characteristics of women who work part-time as compared to those who work full-time. In this chapter various models of women's participation are investigated using some of the unique information to be found in the WES data.

Using multivariate regression techniques models of women's participation are estimated in order to identify and quantify some of the more important determinants of women's participation. In particular this chapter is concerned with highlighting some of the differences that can be drawn between the decision to participate on a part-time or full-time basis, between the samples of married women and the sample of women with children. Previous studies[1] have concentrated on married women's participation - but the opportunity is taken here to investigate the effect on parameter estimates of choosing different samples. Since, as was noted in Chapter 2, that young children play an important role in determining part-time work it seems more appropriate that the sample to be

(1) described in Chapter 2.

investigated is the sample of women with children.

To date, no study has attempted to estimate models of participation while providing a distinction between part-time and full-time participants. In Sections One and Two, the opportunity is taken to provide an insight into the determinants of part-time participation as distinct from full-time participation.

In Section Three, similar models to those estimated for participation are estimated for hours of work. Once again the distinction between part and full-time work is made. The results from Section One and, in particular Two, are re-investigated in Section Four. It is well known in the literature on the supply of women's labour that estimating a binary dependent variable by ordinary least squares in subject to heteroscedasticity, and hence inefficient parameter estimates. Given this problem a revised version of the models estimated in Section Two are re-estimated using maximum likelihood techniques - logit and probit models - in order to identify the effects of estimating a binary dependent variable model by OLS.

These results, developed by OLS and ML, are contrasted and provide a meaningful account of the effects of heteroscedasticity in this particular instance.

The conclusion is presented in Section Five.

SECTION ONE

1.1 An Overview Of Joshi's Equations

Recently, Joshi (1984) undertook a study of the determinants of the supply of female labour using the WES data. Her multivariate study aimed at identifying the main determinants of participation and also sought to quantify the effects of such factors that increase and decrease the probability of participation.

Some of the results from Joshi (1984) relating to the sample of married women can be found in Table 3.1 together with a replication of her work. The replication is not exact since some of Joshi's original variables have been excluded since they would have proved difficult to replicate: in addition, it is not sure what these omitted variables are measuring as Joshi notes.

It is apparent from Joshi (1984) that the most important factors in reducing the chances of participation considered are the presence of young children, low earnings power (ie opportunity cost of foregone earnings) and family income. Other factors which were found to have little effect on participation were marital status, earlier family history, education and regional differences. The importance of children as constraints on the decision to work is stressed. In order to capture these "child effects" Joshi makes extensive use of the information on child formation found in the WES. The age of the youngest child, the age of the second youngest child and the age of the youngest child given that the wife said she intends to have more children, were all included in the specification.

1.2 An Overview Of The Variables Included In The Replication Of Joshi's Study

The variables used in the replication study follow, wherever possible, those used by Joshi. An exact definition of the variables used can be found in the Appendix immediately after this Chapter which also contains the tables of results for this Chapter. Exactly the same child specification variables are included; the regional variables, age variables, marital status variables, qualification variables and age at first birth variables are specified exactly as in Joshi's (1984) study.

The imputed earnings term used throughout this Chapter is derived from an auxillary wage equation as outlined by Joshi (1984), except that latest occupational category was used instead of Joshi's highest occupation. Without more information it would be difficult to decide upon the better alternative. Last occupation was easily available, while highest ever occupation was not. In other respects, the imputed earnings variable is exactly as specified by Joshi: this variable makes use of the information on work histories contained in the WES, in particular, previous work experience, with an allowance for part and full-time employment, is included. As already noted, some of Joshi's (1984) variables were omitted from the replication, in an attempt to capture some of the effects of 'other income',[1] a pooled family income was included in the replication. This 'Family Income' variable is derived from husbands socio-economic grouping arranged on a seven-point scale. A fuller description of this variable, which does not include transfer payments as included by Joshi,[2] can be found in the Appendix.

1.3 Summary Of Results Of Comparison Between Replication And Joshi's Study

The results from the replication of Joshi's study and Joshi's original study (for married women only) can be found in Table 3.1. Only estimated coefficients with an F ratio of two or more are included in Table 3.1 following Joshi's procedure. These variables are treated as if they are more or less causally independent of the variables to be explained. It can

1. From husbands' market work, etc.
2. The problem of including transfer payments was discussed in Chapter 1: transfer payments can cause kinks and discontinuities in the budget constraints facing women participants.

be assumed that these variables are not systematically (linearly) related to the unexplained element of the dependent variable as the estimated coefficients were less than the square root of two times its standard error, and therefore there is only a 17% chance that there is no true effect. The cut-off point of F greater than or equal to two (t-test statistic of 1.414 or above) admits some variables into the final equation whose effects are at best marginal. The F test statistic for the more conventionally used 0.05 level of significance (5% level) would have been 3.84.

The results presented in Table 3.1 (and also in Table 3.2 which concentrates on the extended model) are based on the basic linear probability model. The dependent variable, a dichotomous choice (dummy) variable, being regressed on a set of exogenous variables. Precisely, the different dependent variables examined, excluding those in full-time education are:

(a) WORKING - assumes the value 1 if a woman is currently working, and zero otherwise.

(b) ACTIVE - assumes the value 1 if a woman is currently working or is seeking work, and zero otherwise.

(c) ACTFULL - assumes the value 1 if a woman is currently working full-time and zero otherwise.

The results in Table 3.1 suggest that for both the WORKING and ACTIVE regressions the variables included "explain" statistically about a third of the variance of their dependent variables, (the R^2 for the WORKING and ACTIVE regressions are respectively 0.346 and 0.377, which are only slightly larger than Joshi's original overall fits). A cursory glance at Table 3.1 reveals, as would be expected, quite similar parameter estimates between this replication study and Joshi's study. The differences that do exist are likely to be due to the slightly different samples used and the exclusion of certain variables in the replication study. The most striking difference between the two sets of comparable results, which would also have possible spill-over effects on other variable estimates, is the size of the parameter or the earnings potential variable. Once again, however, this is to be expected, since the replication study incorporated a log of earnings variable based in part on current occupation, whilst Joshi used highest occupation It is to be expected that difference in the size of coefficients be achieved since the highest ever occupational group for some women will be higher than latest occupational group (ie for those women who have experienced downward occupational mobility) and therefore these women will have a lower earnings potential than Joshi's imputed variable would attach. Accordingly, the smaller estimate on this variable in the replication study is to be expected: for instance, in the ACTIVE regression, the size of this coefficient is 0.17 in the replication case and 0.576 in Joshi's model.

All the models reported in Table 3.1 (and Table 3.2) are estimated by Ordinary Least Squares (OLS). As Joshi notes, there may be a statistical problem associated with estimating a binary choice model by OLS; since the dependent variable is restricted to assuming a value of one or zero one of the basic assumptions of OLS is broken. The problem ofheteroscedasticity is examined in Section Three. This should be borne in mind when relating to the results in Table 3.1 (and .2).

Perhaps the most interesting aspect of these results is the relative importance children exert on participation. Joshi like Greenhalgh and Layard et al,[1] emphasised the impact children have on participation. It is particularly young children that have this restrictive effect, while children over sixteen years of age have a positive effect. The effect of young children will be covered in more detail in the next subsection but it worth noting at this stage that while children of all ages under sixteen years tend to decrease the level of full-time activity (with youngest children exerting the strongest effect) it is only children under the age of

(1) Greenhagh (1980) and Layard, Barton and Zabalza (1980)

three years that have a negative effect on participation (and considerably smaller effects than on full-time participation). Other special information available from this unique Survey included in Joshi's (1984) specification has not added very much to the explanation of participation. Special information, such as age of first birth, fertility, intentions and marital history have added little to the analysis.

SECTION TWO

2.1 The Extended Joshi Model

In addition to the list of variables included in the replication study of Table 3.1,other variables have been used to supplement and see if the original specification can be added to and improved. On the whole these additional variables draw upon the unique information on attitudes to work, family formation and work history available from the WES.

The Additional Variables:

(i) Attitude to Work

Respondents were asked many questions about what they thought was women's role as wives and workers. They were asked if they thought that mothers of pre-school age children should stay at home to look after the children and not to go to work. Those women who agreed that such mothers should indeed remain at home were coded one, and those who disagreed, zero. The purpose of including this variable is to allow for women's own views about their roles as wives (mothers) and workers to play a part in determining their supply of labour, as measured by the participation rates. It would be expected intuitively that this would reduce the probability of participation, and this is borne out by the results shown in Table 3.2.

(ii) Husband Helps at Home

For women who have a home to look after and a job to keep up time becomes a scarce resource. Any reduction in the time needed to be spent at home doing housework is going to make participation in employment more likely. Hence, 'Husband helps at home' is a variable designed to pick up this influence. If the husband helps with at least some of the housework the variable takes the value one, and zero otherwise.

(iii) Total Time Spent Working Before First Birth

This variable is measured in months, combining family formation and age at first birth in a unique way. The purpose of including this variable is to note how family formation and age at first birth jointly interact to influence participation. The variable has been checked for correlation with other independent (regressors) variables, but the cross-correlation was minimal.

(iv) Unemployed as First Event

Respondents who were unemployed before starting work (or still unemployed at the time of the Survey) were given the value one, and zero otherwise. This work history variable is designed to test the importance of a "good" start to women's working lives, the expected sign of this variable is difficult to predict. A traditional human capital approach might suggest that being unemployed reduces the probability of currently being employed due to a loss of on-the-job training and human capital accumulation. It has been the norm for women to start work straight after completing full-time education, though the high unemployment figures of recent years have made this increasingly difficult. It is possible that women who find themselves unemployed (as a first event) spend the time rearing a family rather than in the future, accordingly, freeing themselves for employment later; but of course, this is unlikely unless married.

(v) Birth Patterns

A series of variables representing family formation, birth and work patterns were tried out. The two most successful are reported here. Combining home and work responsibilities puts severe pressure on women as mothers and workers. Some women choose to devote all of their time to two roles and spend only their maternity leave away from work. Of course, in between these two extremes a whole spectrum of possibilities exist. Two patterns, B1 and B2, are chosen to reflect the return to work patterns that do not overlap with one another and the other variables included in the specification. Variable B1 takes the value one if women return to work after all their childbirths are complete[1] and zero otherwise. Variable B2 refers to women who have had at least two births and returned to work between births.

(vi) Experience & Training

Having experienced any form of training is likely to have positive effects on future employment possibilities. In particular, it may lead to full-time rather than part-time employment as the latter tend to be less skilled jobs. This variable takes the opportunity offered by the WES of testing whether previous training has any future impact on labour supply and since it is a part of human capital and earnings potential but was not incorporated in the specification of earnings, it is included here as extra variable.

(1) In a few cases there may be some errors in the construction of this variable because of incomplete records. Point is that ie when women's family formation is complete, some may be in a different category than one allocated on the basis of incomplete information.

2.2 Samples

Different samples of women were investigated, in an attempt to identify and test out the possible differences between the sample of married women and the sample of women with children (the mother sample). The whole sample of women consists of 5285 women who have work history information, of which 4038 are married and 3984 are mothers.

2.3 Dependent Variables

The same dependent variables as described in Section One are reproduced and in addition other dependent variables were experimented with. These are

(a) ACTPART - assumes the value one if a woman is currently working part-time, and zero otherwise.

(b) ACTFULL - assumes the value one if a woman is currently working full-time, and zero otherwise.

(c) PART-TIME - assumes the value one if a woman is currently working part-time and zero if working full-time; non-working women or women seeking work are excluded.

2.4 The OLS Results

The results of the extended OLS regressions build upon the results and discoveries of the replication study of 2.1.

The variables included as additional variables have added much to the analysis compared with the original Joshi specification. Comparing the married sample first; the effect of these seven variables raises the R^2 ($\bar{R}^2$) from .377 to .513 (.371 to .507) in the ACTIVE case; the R^2 ($\bar{R}^2$) in the WORKING case rises from .346 to .511 (.340 to .506), and in the case of the ACTFULL and ACTPART regressions the R^2 rises from .280 to .319, and .118 to .272, respectively.

Table 3.3 also compares the different samples: women who are married, or who have children or the entire sample of 5285. Examining only the improved version, the married sample gives the slightly better fit in the ACTIVE and WORKING regressions, with R^2 of .513 and .511 respectively. In the case of the ACTFULL and ACTPART regressions, the best fit occurs for the entire sample making no selection for married or 'with children' women. On the whole there is little to choose between the sample when looking at the ACTIVE and WORKING regressions, as measured by the overall fits presented in Table 3.3.

(i) <u>The ACTIVE and WORKING regressions (OLS)</u>

The ACTIVE regression refers to a model of participation. The results in Table 3.3a for the participation rate points to several variables as important determinants of the level of participation. In particular, all children under the age of sixteen reduce participation while older children - those over sixteen have the reverse effect. The same is also true in the case of the WORKING regression - which represents a model of employment participation, except that parameter estimates on these children variables are very slightly smaller in magnitude than in the case of the participation model. The strongest effect exerted by children on participation (both in the participation and employment participation models) comes from the youngest child. The younger the youngest child the greater the impact on participation: for instance children under the age of one year reduce participation by 0.47 percentage points, while a youngest child aged between six and ten years by only 0.054 percentage points. In the case of employment participation these parameter estimates are respectively 0.439 and 0.039.[1].

In addition to these 'child effects' other variables that prove to be important, include age and age squared, predicted earnings, family income and many of the new variables described in (2.1) below. Interestingly, having experienced some form of training whilst being in employment proves to be a very significant variable: in the participation (ACTIVE) and employment participation (WORKING) models respectively, the estimated effect of this variable is considerable; precisely,

(1) These results refer to the whole sample ie no allowance being made for marital status or presence of children to determine the sample.

the effect is to increase participation and employment participation by 0.275 and 0.355 respectively, with t-ratios of 25.4 and 30.8. When the sample is restricted to those women who are either married or who are mothers (ie have children) the effect of the 'experienced training variable' is increased . However, in the case of 'age of youngest children', their effect on participation and employment participation is slightly reduced when the sample under investigation is the married sample, or the mother sample, see Tables 2a and b.

A woman who has a husband who helps with the housework is clearly important since it "frees" women from homework making them more likely to seek employment. This is borne out by the results in Tables 3.2a and b with 'husband helps at home' variable taking a positive sign. Being unemployed immediately after completing full-time education proves to be of little importance as measured by the size of the coefficients in Table 3.2a - relating to the participation model. In all three samples, the coefficient is 0.001, though it is significant in every case.

The two birth pattern variables B1 and B2, and similarly the time spent working before the birth of the first child have an important part to play in determining the level of participation and employment participation. All three variables increase the likelihood of employment participation, though they have differing quantitative effects, _ie_ the effect of having spent time working before the birth of the first child increasing the level of employment participation by only 0.014 while having had all of one's children in a 'block birth' pattern (B1) increases the level by 0.14 percentage points. In the case of the married and the mother samples, these effects are increased. Clearly, having worked between births has the strongest effect on participation.

The similarity that can be drawn between the results from the participation and employment participation models, and between the three different samples, are quite clear. On the whole the estimated parameters in Tables 3.2a and b are comparable in size and significance: interestingly, the effect of children on participation - in all three samples - are slightly smaller than in the equivalent employment participation model. This may imply that children restrict employment less than they restrict participation because some women are claiming they are seeking work when in fact they are not 'actively' seeking work. The overall fits of these models are very good indeed, as shown by the $R^2(\bar{R})$ given in Table 3.3. The overall fit in the case of the participation model is at its highest when the sample is restricted to the 4038 married women - 0.513 - compared to 0.498 when the sample is the sample of mothers. Similar results are achieved when the model is employment participation with R^2 of 0.511 and 0.497 respectively.

<u>The Distinction Between Full-time And Part-time Status</u>

The distinction that can be drawn between full-time and part-time status, and in particular the different effect the variables in the specification have on current work status relates to the results presented in Tables 3.2e and f and also the third column in Table 3.2d. The dependent variable in Tables 3.2e & 3.2f refers to full-time and part-time participation, respectively.

The difference between the results presented in these two tables is quite striking. The size and sign of coefficients are often very different. It is quite apparent from Table 3.2f that young children (as shown by the 'age of youngest child', 'age of second youngest child' and 'age of youngest child family incomplete' variables) all deter full-time participation: for example, having a youngest child aged under one reduces full-time participation by almost 0.39 percentage points, whereas, they only reduce part-time participation by 0.035 percentage points; similarly, their respective t-statistics are 11.3 and 1.0. Having an older child reduces full-time participation but actually promotes part-time participation. Children aged over sixteen play an important role in determining full-time participation but play a reduced role in part-time participation, giving insignificant parameters at the 5% level. This is to be expected since part-time employment is often a type of work sought by women returning to employment after a spell out of the labour force - perhaps for family formation reasons.

These interesting comparisons between part-time and full-time status highlights the importance of children as determinants of this status, in particular the importance of the mother sample is identified. The decision to work on a part-time basis - ie to supply only labour on a part-time basis - is clearly a two stage issue. In the first instance, children play an important and singularly decisive role. Notwithstanding this, and complementary to this, are other variables that seem to have an important role to play in determining whether or not to supply part-time labour. Some of these are discussed below, and relate to the more interesting mother sample.(1)

(a) Qualifications

Having qualifications increases the probability of full-time participation while decreasing the chances of part-time participation if the highest qualification is A-level or above (with a coefficient of 0.078 and - 0.032 in the

1. ie the sample of women with children

ACTFULL and ACTPART models respectively), or O-level (0.104 and -0.048 respectively). Having a CSE as a highest qualification increases the level of full-time participation (.061) but is insignificant in the case of the ACTPART model.

(b) Husband Helps At Home

Having a husband who helps at home increases the chances of full-time participation (with a coefficient of 0.119) but decreases the chances of part-time participation with a coefficient of -0.034. Therefore, having a husband who helps at home not only increases the probability of participation but also reduces the probability of part-time work in favour of full-time participation.

(c) Unemployed As First Event

Capturing the effect of a bad start to a working life, this variable shows that being unemployed immediately upon completing full-time education increases the likelihood of part-time participation while reducing full-time participation. The effect is symmetrical in that a coefficient of 0.001 and -0.001 are reported in ACTPART and ACTFULL regression results, respectively.

(d) Own Mother Worked

Having a mother who worked increases the likelihood of part-time participation while decreasing the chances of participating on a full-time basis. This at least shows that the labour market experience of respondents' mothers is an important determinant of the probability of currently participating on a part-(full) time basis.

(e) Earnings Potential

The imputed earnings variable measures the opportunity cost of not working by imputing the potential earnings of respondents. Earnings potential increases the likelihood of full-time participation while decreasing part-time participation. High earnings potential is most likely to lead women into full-time jobs since these offer the greatest pecuniary rewards as measured both by earnings and promotion prospects. Accordingly, it is to be expected that high earnings potential promotes full-time participation away from part-time participation.

(f) Family Income

The effect of family income is very much reduced when the sample is restricted to mothers, since the coefficient in the ACTPART model is insignificant. However, family income has a negative effect on full-time participation.

(g) Adult Dependent

Having an adult dependent to care for is very much like having a dependent child in terms of its effect on the type of participation. As is expected therefore an adult dependent reduces the likelihood of full-time participation while increasing the probability of part-time participation.

In addition to those variables that can be described as having an imported and clear-cut effect on the type of part participation supplied there are, as is to be expected, some variables that either increase or decrease both the probability of part-time and full-time participation. These variables are relatively small in number but include having had one's children in a block birth and returning to work at the end. This variable increases the likelihood of both forms of participation. Also as expected, the size of the coefficient in the ACTPART regression is larger (0.221) compared to the one in the ACTFULL regression (.006). Clearly, block births are more likely to result in part-time participation which reiterates the idea that women return to part-time employment after a period family formation rather than full-time participation, because of the pressure exerted by children on a mother's time. The effect of young children on the type of participation undertaken by mothers has already been discussed, and its effect is already well known. These additional effects, from earnings potential, adult dependent, qualifications etc, play an equally important role in determining the extent of part-time (full-time) participation.

On the whole the overall fits of the ACTPART and ACTFULL models are quite distinct from one another. Comparing firstly the two sets of regressions, the ACTFULL regressions, relating to full-time participation are very much larger than in the regressions relating to part-time participation, when the whole sample is investigated and when the sample is restricted to married women only. However, similar R^2 are evident when the sample of women with children are compared; in the case of the part-time participation the R^2 is 0.272, and for full-time participation it is 0.236. The best R^2 reported are for the whole sample, with an R^2 of 0.282 and 0.402 for the part-time and full-time participation models, respectively.

To add weight to the distinction that can be brought between part-time and full-time work (participation) status, Table 3.2c reports on a model based on a dependent variable which takes the value one if each woman was currently working part-time and zero if she was working full-time; all other women (ie those not working and those in full-time education) were excluded from the sample. These results highlight the variables that are important determinants of part-time labour supply.

Turning to Table 3.2c, it is clear that the presence of children promotes part-time work while detering full-time employment. Interestingly, children aged between one and two have the strongest effect when they are the youngest child present.

The sample of 2418 working mothers produces a fit with an R^2 of 0.293 and an F statistic of 22.92. The most significant variables include earnings potential (-0.298 with a t-test statistic of 9.7); having a husband who helps at home (-.132 and at fit of 7.3); being unemployed immediately after completing full-time education (0.001, with a t-test of 8.5). Having been unemployed as a 'first event' reduces, though only very slightly, the probability of be becoming full-time employed, while increasing the chances of being part-time employed. The effect is very small. However, it is nevertheless a significant effect. A further significant variable is having experienced training at work. Respondents who have experienced training at work have an increased chance of full-time employment, as the likelihood of their being in part-time employment is reduced; the coefficient of -0.106 has a t-test of 7.1. Training, prior to employment, as measured by the three qualification variables, also reduces the likelihood of part-time employment while stimulating an increase in the probability of full-time employment. Once again, this is to be expected, since one would expect the more "qualified" and "trained" women to work full-time and the less well qualified and trained to work on a part-time basis since these latter jobs are concentrated in the less demanding sectors of the economy.

Comparing the coefficients of the three samples: the sample of all workers, the married sample and the sample of mothers (women with children), different results are obtained. Examining only the significant variables, it is clear the age of youngest child plays a significant but reduced role in the sample of women with children with a coefficient of -0.405 compared to -0.298 and -0.195 in the married and whole samples respectively. These elasticities - since this variable is measured in logs - have clearly different values depending upon the sample investigated.

Apparently, the choice of sample makes slight differences - in the case of earnings potential variable this effect is exaggerated - to the parameter estimates. Since it is children that largely deter the decision to work full-time while promoting the part-time decision, it is more appropriate to choose this as the estimation sample, rather than a sample based on marital status, as has previously been the case.(1)

(1) Previously, studies described in Section 1, restricted their analysis to a sample of married women or making no allowance for women with children.

A more complete examination of the determinants of participation, with a distinction being made between full and part-time, required an investigation into the 'appropriate' sample; a more complete picture is achieved if other samples are investigated, which has been the case here. Choosing a joint sample of married women with children vastly reduces the sample size to 1966, producing an R^2 of 0.206. This joint sample does not improve the overall fit or change very much the size or sign of the variables included in the specification. As might otherwise be expected, the parameter estimates lie somewhere between the estimates derived from the married sample and the sample of women with children:see Table 3.2d. The results presented in Table 3.2 a-f have attempted to provide a preliminary investigation into the determinants of the supply of female labour as measured by various forms of participation. The aim has also been to identify a set of variables that can be said to influence the choice between part-time and full-time employment. The results have shown the presence of young children, particularly the age of the youngest child, to be important variables in the choice; also of importance have been earnings potential (designed to measure the opportunity cost of not working), having experienced training, birth pattern variables (B1 and B2) and a variety of work experience variables such as being unemployed immediately after completing full-time education. Work experience also contributes towards the importance of the earnings potential variable. The inclusion of these variables, based initially upon the original specification of Joshi, produces relatively good results when compared to some of the participation results reported elsewhere.[1] These variables have produced good fits in a way that is not a product of multicollinearity. The variables included in the final specification reported in Tables 3.2 a-f were tested for multicollinearity (interdependence) and found not to be highly correlated with one another.

(iv) Summary

The scarcity of studies that have attempted to explain part-time employment and in doing so examine the extent to which the determinants of full-time participation are significantly different from part-time participation, may be due to the belief that part-time working women are just adjusting their hours of work according to their reservation and offered market wages. Indeed, it could be argued that the principal determinants of the reservation wage - below which no participation occurs, include family circumstances, fertility intentions and work history.

As has been shown by the results here, women who are part-time workers or participating on a part-time basis are clearly

(1) For instance see Layard, Barton and Zabalza (1980): where an R^2 of 0.3 is reported.

different from full-timers. These women are rarely in a position to adjust their hours of work according to the divergence between offered and reservation wage. It is more common to observe a take-it-or-leave-it offer of hours and wages. Accordingly and most importantly, women who are either part-timers or full-timers are not likely to be simply adjusting their hours of work according to the ratio of offered and reservation wages, instead they are more likely to be consciously choosing a form of work (part or full-time) that best suits their family circumstances etc, from the opportunity set facing them. This is a serious omission on the part of other studies that have aggregated part-timers and full-timers.

SECTION THREE

Hours Of Work

In this section the sample of workers (3350) used to estimate the participation model of Section Two are used to investigate the determinants of the hours of work of working women. The same explanatory variables as in Section Two are also used, and several samples including married women and women with children (the mother sample).

3.1 Introduction

The earliest estimates of the relationship between hours of work and hourly earnings were made by Douglas in 1934. More recent estimates using American data can be found in Abbot and Ashenfelter (1976), and using British data, in Layard, Barton and Zabalza (1980). At best the results from these studies are diverse - as will have been noted in Chapter One: for instance, most studies yield a positive own wage effect but are in disagreement over the magnitude of the effect. Most studies such as Layard et al (1980)), Zabalza (1981)and Greenhalgh (1979) typically report a poor fit and inelastic supply of labour for British estimates using individuals' data.

While there is some disagreement over the effect of income and wages on married women's labour supply, there is much closer agreement about the effects of children on married women's labour supply. There has been a tendency to put the emphasis on 'married' women's labour supply, rather than on any other sample. This analysis intends to broaden the discussion by considering other samples. There are large negative coefficients for children under five, small and negative coefficients for children aged between six and ten years, and insignificant or small positive effects for children aged over ten years, in the individual hours (and participation) functions of both Greenhalgh (1980) and Layard et al (1980). Joshi, more recently, has found similar results for participation, though she did not examine hours of work.

As yet no study has attempted to estimate the hours of work equations for part-time working women. The results in Tables 3.2 c-f showed, quite convincingly, that part-time working women's supply responses were significantly different to those of full-time participants. The extent to which this distinction can be drawn between the hours of work of part and full-timers' hours of work is examined in this section. The results are presented in Table 3.5.

3.2 The Models Investigated

The hours of both part-time workers and full-time hours, and also the joint hours of work of part and full-time workers have been investigated. The overall fits as given by the R^2 is presented in Table 3.4.

The wealth of information on offer from the WES allows for the estimation of the hours of part-timers as distinct from full-time workers to be carried out via two routes. These routes are described here:

(i) Individual respondents were asked whether they thought they were currently working part-time or full-time. Individuals therefore determined their own work status.

(ii) Using respondents' own hours of work per week it is also possible to test the distinction between part and full-timers' hours of work using the Department of Employment's definition of part-time hours of work. This threshold, of thirty hours or more of work provides some interesting results.

Before these results are examined it should be borne in mind that examining the hours of part-timers (ie those who work thirty or more) involves the division of the hours schedule into two parts. Truncating the dependent (hours of work) variable into lower and higher values is likely to cause serious statistical problems, since the variation of the dependent variable has been restricted. Whilst this truncation problem may give rise to parameter inefficiency it has been carried out and is reported here only to provide a restricted analysis on sample of women workers. With this in mind the actual size of coefficients reported needs to be treated with some caution.

Specifically the models investigated are of the form

$$H_{PT+FT} = f(C_X, W_X\ Z_X) \quad \text{where } 0<H_Y\ 0\leq H \tag{1}$$

$$H_{PT} = f(C_X, W_X, Z_X) \quad \text{where } 0<H_{PT}<30 \tag{2}$$

and

$$H_{FT} = f(C_X, W_X, Z_X) \quad \text{where } 30\leq H_{FT} \tag{3}$$

where C_X, W_X and Z_X, are vectors of variables relating to family formation, work history and other variables respectively. PT,FT: Part-timers and Full-timers respectively.

3.3 The Results

(a) Hours Of All Workers

The hours of all (part-time and full-time) workers, a total sample size of 3350, produces R^2s of 0.122 and 0.121 and 0.100 depending upon the sample under investigation: see Table 3.5. The R^2 of 0.122 belongs to the model of hours of all workers with no allowance made for married women or women with children. An overall F statistic of 10.64 is reported in Table 3.4a which does not compare favourably with the majority of the F statistics given in Table 3.2 though it nevertheless shows that the model has some significance ie a significant relationship exists between the explanatory variables and hours of work; the age of the youngest child in every case except for youngest child aged between 11-15 years, has the effect of reducing hours of workers, the effect of the age of the second youngest child also has the same effect, though its effect is relatively smaller. Children over the age of sixteen have the anticipated positive effect on hours of work, probably because of the financial pressure they impose on parents. Other variables that reduce the hours of work of workers include, having experienced training at work, family income, and having been unemployed as a first event - represents the human capital effect of a loss of on-the-job training so leading to a reduced hours of work as women who return to work after child rearing are more likely to be paid in part-time work the less qualified and experienced they are. All three qualification variables are also significant, and positive. The effect of qualifications, as represented by the three qualification dummy variables, is to increase the hours of work by similar amounts (the size of these three coefficient estimates are all similar at approximately 0.2).

The married sample of workers has an R^2 of 0.121 and an overall F statistic of 7.63 - the overall fit of the married sample is only very slightly less than the overall fit of the whole sample (by 0.01). Very similar results to the results on the whole sample are to be found. Generally the same variables are significant in both the whole sample and the married sample, with the latter producing very slightly smaller coefficients on the whole. In the case of the sample of women who have children the same comparison does not exist. The effect of children on hours of work are very different. The same 'child effect' of age of youngest child aged under one still exists though its magnitude is less than half that of the same variable in the married model. All other age of youngest children variables are insignificant, though interestingly, the age of the second youngest child is significant in three out of the four instances. Both of the CSE and O-level Qualification variables are significant and positive as in the case of the two other samples.(1) However, holding an A-level proves to be insignificant and negative. The (log) earnings predicted variable is slightly larger than its counterparts in the two other instances, and having experienced training takes a different sign (this time positive) implying that on the job training of some description leads to longer hours of work.

(1) QUAL 1 and QUAL 2.

(b) Hours Of Workers and Non-workers

Constraining the hours of work of women who do not work to zero is bound to improve the fit of the model since it causes a clustering of observations. However, it is not for this purpose that those results are reported, rather it is to provide an initial insight into the effect non-workers, as part of the sample, can incur on the distinction that has so far been drawn up between part-timers and full-timers. There are specific statistical problems involved when one estimates a model that is based on a sample that is not randomly generated. It is possible to argue that the samples so far examined which are based on a sample of workers, are not randomly selected. The non-random selection of the sample may cause a bias in parameter estimates. Sample selection bias, as it is known, will be examined in depth in a later Chapter. (1) For the moment however, it should be borne in mind that estimation of a behavioural relationship based on a non-randomly selected sample - such as a sample of workers - is likely to lead to biased parameter estimates.

The results presented in Table 3.4d are different to the ones produced for the sample of workers in as much as different parameter estimates are found in many instances. For instance, all the age of youngest child variables except those aged 11-15

(1) Chapter 4.

are significant with very large values. However, the results from the hours of workers and non-workers reaffirm some of the results highlighted earlier, namely the importance of children, earnings potential, qualifications, work history and family income in the determination of the supply of hours of work.

(c) Hours Of Part-timers And Full-timers.

Quite distinct results are achieved by these two routes. A comparison of the individuals who were classified as part-time (full-time) according to their own definition and who were otherwise full-timers (part-timers) according to the Department of Employment was discussed in Chapter 2, and it should be borne in mind that there were relatively few individuals who were found to be in disagreement with the Department of Employment definition.

The R^2 values in Table 3.5 vary from 0.052 to 0.322. Comparing rows 3-6, for hours of part-timers and hours of full-timers using both Route (i) and Route (ii) the best results - as measured by theoverall fits - is found via Route (ii) (the Department of Employment's definition of part-time employment hours of work). The hours of work of part-timers using Route (ii) produces an R^2 of 0.203 compared to one of 0.052 using the self-assessed, Route (i) method, for the whole sample of workers with no distinction being made for marital status or women with children.

Given the overall fits of the hours of work regressions it is not surprising to find many insignificant variables in the results presented in Table 3.5. Nevertheless, some interesting results can be drawn between comparable results.

Examining the whole sample of workers with no restrictions on the sample being made for marital status and children, it is possible to compare the results of the hours of work specification of part-timers and full-timers as defined by Route Two (the DE definition). Most surprisingly, the age of the youngest child in all categories except the 11-15 year old category reduces the hours worked by part-timers while simultaneously increasing the hours worked by full-timers. The coefficient on youngest child aged under one is 11.5 and -4.3 when regressed on full-time and part-time hours respectively. These results are also to be found when the sample is restricted to these women who are married and the sample of women with children. These child effects are difficult to match up to the findings of the participation study which highlighted children, and particularly young children as the part determinants of the part-time/full-time distinction - where young children induced part-time employment at the expense of full-time employment. The results from the hours of work regressions via Route Two provide partly conflicting evidence on the effect of children, namely that children increase the hours of full-timers while decreasing the hours of part-timers.

More consistent child effects are found when the same model of hours is respecified using Route (i) (the self-assessed definition). When Route (ii) is followed children, particularly younger children, tend to have a discouraging effect on hours of full-timers while encouraging increased part-time hours of work. However, these effects are insignificant. It might have been anticipated that children would limit the hours of both types of work, however, following Route Two, for the sample of women with children produces insignificant 'child effects' as measured by age of youngest child aged under one, one to two, three to four, five, and six to ten, with the eleven to fifteen group barely significant, for both the hours of work of full-timers and part-timers. The same is also true for the married sample and the whole sample. Given the insignificance of these children variables it is not surprising to find the other children variables - age of second youngest child and age of youngest child family incomplete - insignificant also. It is only older children, those over sixteen, that can be of any significance.

Other variables worthy of comment, following Route (i) include family income and earnings potential. Family income raises the hours of full-timers while reducing the hours of part-timers, while the reverse is true of the imputed earnings variable. Route (ii) provides similar results. Clearly these two variables provide some insight into the distinction that can be drawn between part-timers and full-timers in as much as they have different effects on part-timers' hours and full-timers' hours. In particular, these results relating to Family Income and Earnings Potential relate directly to the participation models. Indeed, as was shown earlier, women with a high earnings potential are to be expected to be working full-time rather than part-time since it is in full-time jobs that high earnings potential are most likely to be realised. The results here show high earnings potential to lead to a reduced number of full-time hours and an increased number of part-time hours.

On the whole, few conclusions can be drawn from the distinction between full-timers' and part-timers' hours of work given the results. Using Route (i) or (ii) produces strikingly different child effects, though similar 'pecuniary effects' as derived from the family income and earnings potential variables. Once again it is possible using the Chow Test (CT) to test the extent to which part-timers hours of work are distinctly different, at the statistical level, from full-timers' hours of work.

Firstly, turning to the whole sample of workers, using the self-assessed Route (i) definition, a CT of 14.6 is produced.

The sample of married women produces a CT of 10.3 and the sample of women produces a CT of 9.60, indicating that the hours of part-timers are statistically distinct from those of full-timers even though indifferent parameter estimates have been recorded. Turning next to the definition employed by the Department of Employment, CTs of 249.1, 186.3 and 159.3 respectively, indicating an even stronger statistical difference between the two groups of workers hours of work. The relatively large Chow Test statistics produced by the results from following Route(ii) is largely attributable to the small size of the residual sum of squares on part-time hours as compared to the residual sum of squares on the full-time hours and the joint part and full-time hours models; but, of course, these relate to restricted (truncated samples) and care needs to be exercised when drawing conclusions.

(d) The Distinction Between Part-timers And Full-timers Hours Of Work

The mass of information contained in this section has been accumulated in an attempt to provide an insight into the major determinants of the supply of labour as measured by participation and hours of work. Alongside this the aim has been to identify the principal determinants of the part-time and full-time work status of women, and in doing so to point out the variables that provide the key to distinguishing between these two groups.

The results have been rewarding and have provided some of these insights. The distinction that can be drawn, and has been drawn, between the supply of labour on a part-time or a full-time basis is a two stage distinction. The effect of children on the choice between part and full-time labour supply has been discussed at length and has been discussed elsewhere.(1) In addition to this child effect the results in this chapter have identified other key variables. In particular the effect of earnings potential and family income have stood out as key variables determining the choice of labour supply. High earnings potential is seen as being a significant determinant of current work status and participation in as much as it is associated with full-time participation. High family income, similarly, is seen also as affecting work status (participation) in an opposite direction.

In addition to these two effects other variables have also emerged as important determinants. These include, having experienced training at work,and qualifications - having work experience (on the job training) and/or pre-job training have the effect of increasing the likelihood of full-time participation and reducing the likelihood of part-time participation. Having been unemployed as a first event - another measure of human capital formation - increases the likelihood of part-time participation. All three human capital formation variables give the expected results and show they are important in identifying

(1) Joshi (1984). Layard, Barton and Zabalza (1980)

the distinction between part and full-time participation.

Other similarly important variables include having a mother who worked, a husband who helps with the housework and the two birth pattern variables. Previous studies have been unable to address the problem of part-time workers, however, the preliminary investigation that has been undertaken here has shown that many variables that are seen to affect the supply of labour of women can have completely opposite effects on the part-time and full-time definitions of labour. Therefore to pool together observations on part and full-timers is to also pool together those differing effects, so distorting and disguising the true effects.

SECTION FOUR

4.1 Introduction

The results reported earlier in this chapter have all been based on a basic linear probability model (LPM) which assumes that there are two possible choices - to work or not to work, to work part-time or to work full-time - taken as a linear function of a set of pre-determined explanatory variables. This model was then estimated by ordinary least squares (OLS) regression to produce the results presented in Table 3.1 to Table 3.5. However, it is not statistically appropriate to estimate a LPM by OLS since a LPM, by definitions, constrains the dependent variable to be equal to either one or zero, breaking one of the fundamental assumptions of the OLS model.

The effect does not necessarily involve biased estimates - in fact this would only occur if one of the other assumptions concerning the random generation of the error term, for instance, were violated; instead it involves inefficient estimates, due to heteroscedasticity.

Some of the earlier regression results presented in this chapter are reestimated by OLS and then by Maximum Likelihood Estimation (MLE) techniques so as to provide an insight into the extent to which estimating a linear probability model by ordinary least squares involves inefficient estimates and therefore an estimate of the effect of heteroscedasticity. [1] It was not practically possible just to estimate the models presented in Section Two of this chapter by MLE techniques - specifically logit and probit models - due to computational problems. Specifically, the available packages used to calculate the maximum likelihood (ML) estimates allowed for a maximum of thirty variables, whereas the results reported in Tables 3.2a - 3.2f are based on a total of forty-three variables. Therefore, a revised version of these models were devised - not to provide any improved parsimonious model, rather to test for the effect of heteroscedasticity- and estimated to examine the extent to which OLS can be seen to produce inefficient parameter estimates when gauged against ML estimates of the same model.

4.2 General Linear Models

The Generalised Linear (Interactive) Models Package (GLIM) used to derive the estimates presented later produces a measure of overall significance - the Scaled Deviance - which has the likelihood ratio underlying its meaning. The scaled

(1) See Stewart (1979) for a discussion of heteroscedasticity and corrections that can be made.

deviance is in fact - 2 log likelihood ratio and as Wilks[1] has shown is distributed asymptotically chi-squared (X^2) with M degrees of freedom for large samples when the null hypothesis is true. Accordingly, if the scaled deviance is observed to be greater than some predetermined level the null hypothesis (that parameters are not significantly different from zero) is rejected. Some caution is needed to be expressed when examining the scaled deviance term as rather little is known about how good the asymptotic approximation is for small sets of data. Indeed, the authors of the statistical package suggest that the scaled deviance is probably better as a measure expressing the relative importance of single variables or groups of variables by subtracting different scaled deviances from one another in order to see the relative importance of additional variables. Some question therefore exists as to the appropriateness of the scaled deviance statistic as an absolute deviance expression the goodness of fit of known models.

A further statistical package 'Shazan' was used to test out a selection of the results. The results reproduced were exactly those produced by the GLIM[2] package.

Given the large sample size it is safe to assume that the

(1) Wilks. S. 'Mathematical Statistics'. John Wiley & Son Inc. 1962

(2) GLIM Manual Rebase 3. Baker. R. and Nelder. J. Royal Statistical Society Numerical Algorithms Group, Oxford, page 2 section 6.2.

scaled deviance is indeed distributed asymptotically as χ^2. A word of caution concerning the t-test statistics also needs to be made. It needs to be borne in mind that although the standard errors used to test the significance of a given set of variables is well known when applied to the classical OLS model; no general results are known about the adequacy of t-test statistics for maximum likelihood models.

Given these cautionary notes, care needs to be taken when an examination of the results presented is undertaken. In as much as the results presented are for comparative purposes - for comparing estimates across estimation techniques - the problems highlighted are somewhat reduced, since the aim is not to choose a preferred model.

The results presented in this section are discussed below and the parameter estimates are presented in Table 3.6a and b. Given this caution there are likely to be some variables in the Tables (3.6a - c) that are deemed significant when in fact the reverse is true; variables that are insignificant - according to the rule outlined earlier, where the t-test cut off value of 1.414 was chosen - therefore need to be treated with some caution. The problem arises here because the t-test statistics relies on the assumption that the error term is normally distributed. This is equivalent to assuming that the dependent variable is similarly distributed which of course it is not.

In the following sections the parameter estimates obtained by estimating a model by OLS and by ML techniques are contrasted. It is to be expected that differences between estimates derived by these two alternative techniques is likely to occur. This will be highlighted in the next sections.

4.4 The Results: A Comparison Of Techniques

The results in Tables 3.6a,b and c relate to three different dependent variables; participation (ACTIVE), employment participation (WORKING) and currently working part-time instead of full-time (PART TIME) as described earlier in 2.2. The GLIM statistical package could not handle the entire sample of 5320 women; accordingly it was possible only to investigate a smaller sample. The chosen sample therefore, by which the OLS parameter estimates and the MLE could be contrasted is the sample of women who have children.
The ACTFULL and ACTPART (full-time participation and part-time participation) regression equations were also estimated and contrasted, and these results are reported here also, giving

similar results of comparison as those reported for ACTIVE, WORKING and PART-TIME.

It is not possible to compare and contrast the raw OLS and ML (logit and probit) estimates directly, since they are based on different distribution assumptions about the error term as already noted. However, by transforming the results it is possible to directly contrast the parameter estimates obtained by using these two (OLS and ML) different estimation techniques. Three different transformations were experimented with following the suggestions contained in Amemya [(1)] and Madala [(2)]. Different transformations were carried out since the literature to date has been unable to decide upon the appropriate and correct form of transformation. By comparing and contrasting the different transformation suggested in the literature it is possible to identify the possible differences in parameter estimates that occur by assuming one transformation in favour of another.

Specifically, these transformations involved, in two of the cases, multiplying the estimated parameters of the logit coefficient by (0.625) so as to convert the logistic distribution. distribution into the cumulative normal (Probit) distribution; the second method involved multiplying the same logit c coefficients by 0.5513 since empirical evidence, as reported in Madala, has shown 0.5513 to give a better approximation of

(1) Amemya (1981)
(2) Madala (1983)

the two distributions, than 0.625. The effect of these two alternative transformations is that they allow the logit and probit coefficients to be compared directly to one another. The next step, for both of these methods of transforming the logit into the probit-comparable results, is to transform the OLS estimates so that they become directly comparable with the transformed logit and raw probit estimates. This is achieved, simply, by multiplying the OLS estimates by 2.5 (except for the constant term which has 1.25 subtracted from it).(1)

These transformed results together with the raw OLS and Logit estimates are reported in Tables 3.6a, b and c. The third and final transformation, as followed by Layard, Barton and Zabalza (1980) requires the raw logit estimates to be multiplied by P(1-P) where P is the mean of the dependent variable (ie the participation rate of the sample). This means of transforming the logit coefficients allows the raw OLS to be compared to the new P(1-P) logit coefficients. For an exact guide to this form of transformation, see Layard et al (1980).

It is quite clear from Tables 3.6a, b and c that the effect of estimating these binary dependent variable models by OLS, as compared to those estimated by ML techniques does not result in any divergence of results in terms of their sign.

(1) See Amemya (1981)

In no one instance does there appear any disagreement over the direction of the importance of any variable on the three different dependent variables. Throughout the three results reported, and the two that are not reported, all positive (negative) estimated coefficients appear positive (negative) regardless of the technique employed.

The most striking differences across estimation techniques that occurs concerns, as already noted, the magnitude of these effects.

The raw OLS (OLSA) coefficients can only be compared with the transformed logit coefficients (Logit D) transformed at the mean of P. It is clear from the comparison that the OLS coefficients underestimate their "true" effect as compared to the logit coefficients transformed at the mean of P. The size of this underestimation varies from variable to variable, and accordingly it is not possible to say conclusively how large this degree of underestimation is. For instance, in the case of the WORKING (employment participation model), the effect of having a youngest child aged under one is -0.31 by OLS and -0.44 by ML. Having experienced training is also understated by OLS, 0.24 compared to 0.28 when estimated by ML. Earnings potential is similarly affected, with an estimated coefficient of 0.17 and 0.26 in the OLS and ML cases, respectively. On the whole similar results are recorded when comparisons across estimation techniques (OLS and ML) are made.

When the ACTIVE (participation) model is examined it is clear that the same pattern emerges. For example, the three qualification dummy variables report coefficients of 0.04 (A-level or above), 0.04 (O-level) and 0.03 (CSE) when estimated by OLS. When re-estimated by ML and transformed at the mean of P, the coefficients increase, respectively to 0.06, 0.06 and 0.16.

The largest effects, as would be expected, occur on the variables that report the largest (absolute) values. The largest parameter estimates show the largest absolute differences between techniques, as shown by the earnings potential and experienced training variables.

When the results contained under columns headed OLS_B, and the columns headed LOGIT B and LOGIT C, it is apparent that a similar discrepancy of results exists; namely, that the OLS estimates are significantly smaller than their logit estimates. The probit estimates appear to lie somewhere in between the Logit B and Logit C estimates, showing that both 0.625 and 0.5513 are reasonable approximations by which the logistic can be transformed into the cummulative normal distribution.

In particular, contrasting the results in OLS_B and $LOGIT_B$ and $LOGIT_C$ it is possible to note some of the more striking differences in parameter estimates that arise through using two different estimation techniques to estimate the same behavioural relationship. In the case of the ACTIVE model, the effect of having a youngest child aged between 1 and 2, as given by the parameter estimate, increases by at least a quarter from -0.85 to -1.13 in the OLS_B and $LOGIT_C$ case. Both $LOGIT_B$ and $LOGIT_C$ aim to transform the raw logit estimates into parameter estimates than can be directly contrasted to the transformed OLS estimates. $LOGIT_B$ transforms the raw estimates into parameter estimates that can be directly contrasted to the transformed OLS estimates. $LOGIT_B$ transforms the raw estimates by 0.625 - which is the theoretically correct transformation (as noted earlier). $LOGIT_C$ on the other hand, transforms the raw estimate by 0.5513 which Amemya (1981) suggests is the empirically more successful transformation.

In the case of the age of the youngest child being between 1 and 2 the $LOGIT_B$ estimate is -1.00. Of course, the $LOGIT_B$ estimate will always be less than the $LOGIT_C$ estimate since the latter transforms the raw estimate by a smaller factor. If as Amemiya suggests, that 0.5513 is the "correct" factor to transform raw logit parameters then using the 0.625 factor exaggerates the contrast.

The effect on earnings potential is to raise the parameter estimate from an OLS estimate of 0.13 to a comparable logit estimate of 0.66 and 0.75 depending on the transformation. In the ACTIVE model this difference is most striking. Given the inadequacy of OLS on a theoretical basis, the evidence here points out the empirical effect of using OLS in this instance to estimate a binary dependent variable model. Family income is also similarly underestimated, respectively -0.02 as compared to -0.05 and -0.06. Similar results are to be found in all of the models - WORKING, ACTFULL, ACTPART and PART.

For example, in the PART model the effect on the number of children aged over sixteen variable is most apparent. Estimated by OLS gives a coefficient of -0.03, but by ML the $LOGIT_B$ and $LOGIT_C$ estimates are respectively, -0.39 and -0.44. The effect on the attitude to work variable is not dissimilar. Respectively, these parameter estimates are 0.04 (OLS), 0.13 ($LOGIT_B$) and 0.15($LOGIT_C$).

The effect of estimating these binary dependent variable models by OLS, as discussed earlier is to produce inefficient estimates. The extend of this inefficiency is borne out by the results presented. OLS clearly produces estimates that are significantly smaller than ML equivalent estimates - once some form of necessary transformation has taken place. There is little to choose between these transformations (0.625, 0.5513 or P(1-P)) since the extent of the discrepancies between OLS and ML are similar whichever transformation rule is tried.

Having stated this, it has nevertheless been worthwhile using these alternative transformations, since (as noted earlier) no consensus of opinion exists as to which transformation is the most appropriate. In fact, there are scarcely any studies that compare OLS and ML estimates. One of these rare studies is that by Layard, Barton and Zabalza (1980). Layard et al compare logit and OLS estimates by transforming the logit estimates around the mean of the dependent variable - the method employed in the Logit_D column of results already discussed. Layard et al also discovered that there were specific discrepancies between the OLS and ML estimates of the same regression equation. As described here it similarly was found that OLS estimates are inefficient estimates as compared to the ML estimates.

4.5 The Results: A Comparison Of Other Studies

There are few results which are comparable to the ML estimates derived in this section. Those that do exist tend to be American, for instance Heckman (1976), Heckman (1980) and Cogan (1980); though there are some that are British ie Layard, Barton and Zabalza (1980). These American studies used a variety of explanatory variables and were based on a variety of samples.

In 1976 Heckman estimated the own wage elasticity with respect to hours of work to be 1.46 when estimated by OLS(1) and 4.31 when estimated by ML. Whilst the actual estimates are based on hours, and on a restricted sample of white married women aged 30-44, the results, though not directly comparable, show the probable effect of estimating an equation by OLS as compared to ML.

The appropriateness of ML over OLS - of second generation methods compared to first generation methods - is apparent. Heckman (1976) and Schultz (1980) both obtain larger absolute values of own wage and unearned income estimates when using second generation methods than they do using OLS. That these differences should emerge, as they do in this Section, is not too suprising. What is suprising is the magnitude of the difference in, for example Heckman's (1976) study, and the results shown here.

4.6 Logit vs Probit

It was possible to estimate the models described in Section 4.1 and 4.2 by ML probit techniques. It was to be expected that logit and probit would give similar estimates since the only difference between logit and probit models of binary dependent variables is the assumption that is made about the cumulative distribution of the error term. In the case of

(1) Using an auxillary wage equation to estimate.

the logit model it is assumed to be logistic, and in the case of probit, it is assumed to be cumulative normal.

The results show the logit and probit estimates to be very similar, and clearly there is little to choose between the two sets of results. For example, in the case of the PART regression, the PROBIT and $LOGIT_B$ and $LOGIT_C$ estimates of family income are -0.001. Only the $LOGIT_B$, $LOGIT_C$ and PROBIT estimates (together with the OLS estimates) are directly comparable. Generally, the $LOGIT_B$ and $LOGIT_C$ estimates are respectively slightly smaller and slightly larger than the PROBIT estimates. This is true for all the models investigated.

Clearly, since the two transformed Logit models produce estimates around the Probit estimates (once the correct transformations have been made) it is apparent that there is little to choose between a logit or probit model as a description of the model being examined.

CONCLUSION

The results presented here have drawn attention to the distinction that can be drawn between part-time and full-time participation, and also the importance of using the correct estimation technique.

Previous research had highlighted the importance of children and in particular the importance the age of the youngest dependent children in determining whether a woman participates part-time or full-time. This chapter has reiterated this important distinction. In addition the first half of this chapter has recognised the distinction that exists between part and full-time participation that exists from other sources; such as, for example, the effect of earnings potential, family income, experienced training, qualifications and birth/work patterns (B1 and B2). On the whole these variables had opposite effects on part-time participation as compared to the full-time equivalent; for instance, having received training increases the likelihood of working full-time while reducing part-time.

The results have also shown the distinction that can be drawn between alternative samples. Alternative samples of women who have children and women who are married give very different results. It is important to be aware of this distinction since different results emerge according to the sample chosen.

The maximum likelihood estimates presented in the latter part of this chapter have added much to the analysis of women's participation. Estimating labour supply - participation -

equations by OLS when the dependent variable is a binary choice variable produces inefficient (and underestimated) parameter effects when compared to ML. Probit and Logit estimates are clearly more efficient and hence accurate.

Finally, it is important, and has been shown in this chapter that a distinction be drawn between part and full-time work (participation) of women. Interesting and otherwise clear-cut differences emerge when a model of part-time participation is compared to the full-time equivalent.

Whilst these results draw attention to the effect of non-constant variance (heteroscedasticity) on parameter estimates it should be remembered that it is only in magnitude of parameter estimates that there appears to be any problem, and not in the direction of the effect. On the whole, the evidence points to future research being made aware of the problems associated with a binary dependent variable model being estimated by OLS; in particular, it seems, from the results presented here, beneficial to reproduce some results that have been estimated by more sophisticated and statistically appropriate estimation techniques if only to produce some means of measuring the accuracy of OLS parameter estimates.

APPENDIX 3

Table 3.1 <u>OLS REGRESSION ESTIMATES OF WOMEN'S PARTICIPATION AND JOSHI'S (1984) RESULTS</u>.

\- Sample of Married Women -

Dependant Variable REGRESSORS	ACTIVE JOSHI	ACTIVE	WORKING JOSHI	WORKING
Youngest Child				
Aged 0	-.688	-.557	-.482	-.522
1-2	-.588	.450	-.457	-.429
3-4	-.394	-.299	-.379	-.232
5	-.296	.176	-.347	-.201
6-10	-.151	*	-.279	*
11-15		.087	-.106	.096
Other Children Present Aged				
0-2	-.098	-.156	-.120	-.081
3-4	-.067	-.129		-.116
5-10		-.044	-.033	*
11-15	.051	.021	.064	*
Family Incomplete				
Youngest 0-4		-.102		-.095
Youngest 5	.453	*		*
Youngest 6-10		-.163		-.205
Youngest 11-15	-.427	-.795		-.745
No. Of Children 16 Years Plus	.022	.057	.023	.054
Age At First				
Birth 15-19	.073	.070	-.078	*
20-22	.050	*	-.109	*
23-24		*	-.123	*
25-29		*		*
30-34	-.055	*	-.135	*
35-39		-.080	-.173	-.076
40+		.057		-.067
Age (months) ÷ 10	-.012	.095	-.015	.095
$(\text{Age}-\overline{\text{Age}})$ ÷ 10,000	-.014	-.026		-.027
Earning Potential (In £ per hour)	.576	.170	.536	.187
Other Income (£ per week)	-.002		-.001	
Outright Owner Occupier	-.089		-.047	

Continued .....

		ACTIVE JOSHI	ACTIVE	WORKING JOSHI	WORKING
Dependant		-.084	-.068	-.075	-.053
Husband Unemployment Benefit	FAMINC	-.306		-.241	-.012
Husband other non-work		-.200	-.016	-.075	
Local Unemployment %					
Region:					
North					*
E.Midlands		-.055	-.043	-.080	*
E.Anglia		-.108	-.102		-.077
GLC			*	.040	*
South-West		-.049	*		*
Wales			*		*
Scotland			*	.067	-.047
Qualified:					
A-level Qual	3	-.059	.080		.091
O-level Qual	2		.059	.037	.066
CSE etc Qual	1		.053		.065
Remarried			*	.087	.060
Never Married					
Widowed					
Own Mother Worked			*	-.034	*
Constant		1.176	1.213	.948	1.102
R^2		.367	.377	.322	.346
Regression	df	26	37	29	37
Residual	df	3949	4000	3946	4000
F-Statistic		87.91	65.32	72.36	57.11

* insignificant

Table 3.1 Continued .....

OLS REGRESSION ESTIMATES OF WOMEN'S PARTICIPATION AND JOSHI'S (1984) RESULTS.

- Sample of Married Women -

Dependant Variable REGRESSORS	FULL-TIME JOSHI	FULL-TIME	PART-TIME
Youngest Child Aged 0	-.644	-.388	-.134
1-2	-.556	-.374	-.055
3-4	-.363	-.308	.036
5	-.263	-.261	.104
6-10	-.114	-.244	.252
11-15		-.108	.204
Other Children Present Aged 0-2	-.081	-.139	*
3-4	-.066	*	*
5-10		-.149	.131
11-15	.037	*	.037
Family Incomplete Youngest 0-4		-.097	*
Youngest 5		-.326	.291
Youngest 6-10	-.128	-.146	*
Youngest 11-15		*	*
No. Of Children 16 Years Plus	.021	.029	.026
Age At First Birth 15-19	.073	*	*
20-22	.045	.041	*
23-24		.120	-.086
25-29		*	*
30-34	-.069	*	*
35-39		*	-.083
40+		.106	-.173
Age (months) ÷ 10	-.011	.032	.062
$(Age-\overline{Age}) \div 10{,}000$	-.017	.020	-.004
Earning Potential (In £ per hour)	.582	.213	*
Other Income (£ per Week)	-.002		
Outright Owner Occupier	-.053		
Mortgage	.026		

Continued .....

	FULL-TIME JOSHI	FULL-TIME	PART-TIME
Dependant	-.071	-.043	*
Husband Unemployment Benefit	-.456	-.011	*
Husband Other Non-work	-.209		
Local Unemployment %	-.004		
Region:			
North		*	*
E.Midlands	-.047	*	*
E.Anglia	-.092	-.091	*
GLC		.038	*
South-West	-.041	-.035	.035
Wales	-.046		*
Scotland			*
Qualified:			
A-level Qual.3	-.048	.114	*
O-level Qual.2		.108	-.042
CSE etc Qual.1		.053	*
Remarried		*	*
Never Married			
Widowed			
Own Mother Worked		-.028	*
Constant	1.100	.950	.153
R^2	.339	.280	.118
Regression	28	37	37
Residual	3947	4000	4000
F-Statistic	64.73	42.10	14.78

Table 3.2a OLS REGRESSION ESTIMATES OF WOMEN'S PARTICIPATION. DEPENDENT VARIABLE IS ACTIVE.

REGRESSORS	SAMPLE: All Women	t	Married Women	t	Women With Children	t
Youngest Child						
Aged 0	-.470	15.6	-.425	6.2	-.336	9.5
1-2	-.382	15.2	-.332	11.7	-.252	8.3
3-4	-.233	9.6	-.187	6.9	-.134	4.7
5	-.114	5.1	-.166	3.3	-.073	2.4
6-10	-.054	3.0	-.019	0.9	-.027	1.2
11-15	.015	1.0	.039	2.2	.070	3.7
Age of Second Youngest Child						
0-2	-.177	4.3	-.176	4.1	-.144	3.3
3-4	-.176	5.9	-.174	5.5	-.149	4.7
5-10	-.138	7.0	-.132	6.2	-.095	4.4
11-15	-.083	4.7	-.083	4.3	-.065	3.4
Age of Youngest Child Family Incomplete						
0-2	-.108	4.3	-.105	3.9	.054	0.7
3-4	-.017	0.2	-.127	0.9	-.134	1.1
5-10	-.078	1.2	-.102	1.4	-.073	2.7
11-15	-.557	2.5	-.554	2.3	-.525	2.1
No. of Children Over 16 Years	.027	5.4	.026	4.6	.022	3.6
Age At First						
Birth 15-19	.102	4.3	.025	0.6	.109	2.8
20-22	.006	0.3	.015	0.7	.006	0.2
23-24	-.026	1.2	-.022	0.9	-.035	1.4
25-29	-.045	3.4	-.036	2.4	-.036	2.3
30-34	.002	0.2	-.017	1.0	.006	0.3
35-39	-.021	1.0	-.027	1.2	-.027	0.9
40plus	-.037	1.5	-.044	1.5	-.016	0.4
Age	.878	18.6	.939	16.2	.878	15.7
Age Squared	-.022	26.4	-.021	21.5	-.017	16.0
Earnings Potential	.142	12.1	.154	10.1	.170	11.2
Family Income	-.018	7.1	-.146	4.1	-.013	4.2
Dependent Adult	-.047	3.5	-.047	3.1	-.050	3.1

Continued .....

Region:	North	-.005	0.3	-.004	0.2	.005	0.2
	E.Mid.	-.032	1.8	-.027	1.3	-.035	1.6
	E.Ang.	-.070	2.6	-.069	2.3	.089	2.7
	GLC	.005	0.3	.0001	0.01	.003	0.2
	S.West	-.020	1.7	-.025	1.7	.023	1.5
	Wales	-.031	1.7	-.029	1.4	.037	1.7
	Scotland	-.022	1.1	-.002	0.1	-.002	0.4
Qualified:							
	A-level Q3	.058	4.0	.036	2.1	.033	1.7
	O-level Q2	.064	4.9	.048	3.1	.054	3.2
	CSE Q1	.058	4.1	.049	2.9	.053	3.1
Own Mother Worked		.012	1.2	.008	0.7	.012	1.1
Attitude to Work		-.052	5.6	-.072	6.3	-.074	6.3
Husband Helps at Home		.078	7.7	.077	7.0	.086	7.3
Experienced Training		.275	25.4	.301	23.6	.336	25.1
Unemployed As First Event		.020	1.6	.029	1.9	..017	1.0
Birth Pattern	B1	.225	17.4	.233	16.3	.227	16.7
	B2	.115	7.2	.116	6.6	.102	5.9
Time Spent Working Before First Birth		-.001	6.0	-.001	6.3	-.001	5.9
Constant		1.142	44.5	1.100	31.9	.958	21.8
R^2		.504		.513		.498	
F Ratio		121.009		95.430		88.80	
Sample Size		5285		4038		4005	

Table 3.2b OLS REGRESSION ESTIMATES OF WOMEN'S PARTICIPATION. DEPENDENT VARIABLE IS WORKING

SAMPLE

REGRESSORS	All Women	t	Married Women	t	Women Wi Children	
Youngest Child	-.434	13.3	-.376	11.0	-.280	8
Aged 0	-.434	13.3	-.376	11.0	-.280	8
1-2	-.349	13.1	-.300	10.3	-.220	7
3-4	-.209	8.1	-.165	5.9	-.108	3
5	-.087	3.1	-.067	1.9	-.066	2
6-10	-.039	2.0	-.002	0.1	-.040	1
11-15	.013	0.8	-.041	2.3	.072	3
Age of Second Youngest Child						
0-2	-.142	3.2	-.100	3.5	-.108	2
3-4	-.157	5.0	-.149	4.8	-.132	4
5-10	-.108	5.2	-.104	4.7	-.067	3
11-15	-.084	4.5	-.083	4.2	-.063	3
Age of Youngest Child Family Incomplete						
0-2	-.105	4.0	-.140	3.0	-.054	2.
3-4	-.250	2.1	-.120	0.8	-.082	0.
5-10	-.126	1.9	-.132	1.8	-.053	0.
11-15	-.505	2.1	-.483	2.0	-.463	1.
No. of Children Over 16 Years	.022	4.3	.023	4.0	.026	16.
Age At First Birth 15-19	-.063	2.5	-.018	0.5	-.053	0.
20-22	.020	1.0	-.004	0.2	.005	0.
23-24	-.021	0.9	-.005	0.2	.019	1.
25-29	-.038	2.7	-.021	1.3	-.016	1.
30-34	.013	1.1	-.019	1.0	.009	1.
35-39	-.024	1.1	-.028	1.2	-.016	1.
40plus	-.053	2.0	-.058	1.9	-.036	1.
Age	.723	14.4	.887	14.9	.724	13.
Age Squared	-.020	22.5	-.020	19.7	-.015	15.
Earnings Potential	.184	14.8	.169	10.7	.169	11.
Family Income	-.016	6.0	-.106	2.9	-.013	3.
Dependent Adult	-.033	2.3	-.031	2.0	-.028	1.

Continued .....

Region:	North		.001	0.5	.002	0.1	-.001	0.3
	E.Mid.		.011	0.6	.0002	0.01	-.001	0.2
	E.Ang.		-.042	1.5	-.039	1.3	-.033	1.1
	GLC		.027	1.6	.022	1.1	.016	1.2
	S.West		.002	0.4	-.008	0.5	.003	0.9
	Wales		-.007	0.4	-.009	0.4	-.002	0.1
	Scotland		-.014	3.5	-.020	0.8	-.010	0.2
Qualified:								
	A-level	Q3	.067	4.3	.046	2.5	.047	2.6
	O-level	Q2	.092	6.6	.056	3.5	.073	4.4
	CSE	Q1	.090	6.0	.062	3.7	.079	3.7
Own Mother Worked			.014	1.4	.007	0.6	.005	0.4
Attitude to Work			.067	5.3	.056	4.8	.070	5.9
Husband Helps at Home			.085	7.9	.085	7.6	.090	7.7
Experienced Training			.355	30.8	.372	28.4	.414	30.8
Unemployed As First Event			.001	5.3	.001	5.8	.001	4.3
Birth Pattern		B1	.104	6.1	.228	15.0	.224	16.1
		B2	.220	15.8	.108	6.0	.103	6.0
Time Spent Working Before First Birth			.014	1.1	.035	2.2	.019	1.5
Constant			1.028	37.7	.953	26.9	.861	20.2
R^2			.484		.511		.497	
F Ratio			111.636		94.777		89.833	
Sample Size			5285		4038		4005	

Table 3.2 c OLS REGRESSION ESTIMATES OF WOMEN'S PARTICIPATION. DEPENDENT VARIABLE IS ACTPART.

SAMPLE

REGRESSORS	All Women	t	Married Women	t	Women With Children	t
Youngest Child Aged 0	-.035	1.0	-.062	1.5	-.102	2.4
1-2	-.026	1.3	-.003	0.9	-.038	1.1
3-4	.085	3.0	.082	2.5	.022	0.6
5	.144	5.5	.139	4.8	.087	1.7
6-10	.209	9.7	.208	8.3	.146	5.5
11-15	.137	7.4	.138	6.5	.089	4.0
Age of Second Youngest Child						
0-2	-.035	0.7	-.027	0.5	-.052	1.0
3-4	-.038	1.1	-.034	0.9	-.052	1.4
5-10	.033	1.5	.032	1.2	.011	0.4
11-15	-.051	2.5	-.061	2.6	-.062	2.7
Age of Youngest Child Family Incomplete						
0-2	-.004	0.1	-.012	0.4	-.023	0.7
3-4	.201	1.6	.202	1.2	.119	0.9
5-10	-.055	0.7	-.047	0.5	-.059	0.8
11-15	-.055	0.7	-.197	0.7	-.195	0.7
						0.7
No. of Children Over 16 Years	.010	1.7	-.004	0.6	.005	0.7
Age At First Birth 15-19	-.049	1.7	-.015	0.3	.105	2.3
20-22	.010	0.5	-.001	0.04	.012	0.4
23-24	-.085	3.5	-.097	3.3	-.098	3.1
25-29	-.021	1.3	-.016	0.9	-.027	1.4
30-34	-.138	0.8	-.004	0.2	-.007	0.3
35-39	-.055	2.3	-.048	1.7	-.048	1.6
40plus	-.052	1.8	-.046	1.3	-.0002	.004
Age	.372	6.7	.468	6.7	.347	5.2
Age Squared	-.003	2.8	-.004	3.1	-.005	4.1
Earnings Potential	-.057	4.2	-.070	3.8	-.054	3.0
Family Income	.016	5.5	.002	0.4	.011	2.9
Dependent Adult	.005	0.3	.001	0.1	-.080	0.4

Continued .....

Region: North		.009	0.4	.011	0.4	.014	0.5
E.Mid.		.007	0.3	.014	0.6	.012	0.5
E.Ang.		.050	1.6	.041	1.1	.030	0.8
GLC		-.013	0.7	-.009	0.4	-.007	0.3
S.West		.011	0.7	.022	1.2	.018	1.0
Wales		.027	1.3	.023	0.9	.028	1.1
Scotland		.007	0.3	.006	0.2	-.022	0.8
Qualified:							
A-level	Q3	-.043	2.5	-.032	1.5	-.029	1.3
O-level	Q2	.049	3.3	-.048	2.6	-.033	1.7
CSE	Q1	-.025	1.5	.001	0.03	.003	0.2
Own Mother Worked		.167	1.5	.032	2.4	.015	1.1
Attitude to Work		-.033	2.9	.037	2.7	-.030	2.2
Husband Helps at Home		-.008	0.7	-.034	2.6	.003	0.2
Experienced Training		.313	24.7	.351	22.9	.394	24.8
Unemployed As First Event		.001	5.4	.001	4.1	.001	3.1
Birth Pattern	B1	.271	14.3	.221	12.9	.193	11.7
	B2	.140	7.5	.149	7.1	.125	6.1
Time Spent Working Before First Birth		-.153	1.1	-.007	0.4	-.020	1.1
Constant		-.036	1.2	-.053	3.1	.101	1.9
R^2		.282		.272		.261	
F Ratio		46.717		33.979		31.679	
Sample Size		5385		4038		4005	

Table 3.2d OLS REGRESSION ESTIMATES OF WOMEN'S PARTICIPATION. DEPENDENT VARIABLE IS ACTFULL

REGRESSORS	SAMPLE All Women	t	Married Women	t	Women With Children	t
Youngest Child Aged 0	-.336	9.0	-.294	7.8	.102	1.0
1-2	-.244	7.5	-.217	6.6	.139	1.9
3-4	-.121	4.0	-.102	3.4	.125	2.3
5	-.030	1.9	-.039	2.1	.109	2.6
6-10	.037	1.6	.057	2.4	.119	3.1
11-15	.080	4.0	.084	4.2	.046	1.5
Age of Second Youngest Child 0-2	-.153	3.4	-.118	2.6	.072	0.4
3-4	-.152	4.7	-.137	4.2	.089	1.0
5-10	-.102	4.5	-.076	3.3	.087	2.0
11-15	-.071	3.5	-.074	3.6	.038	1.2
Age of Youngest Child Family Incomplete 0-2	-.082	2.9	.075	2.7	-.129	1.9
3-4	.218	1.5	-.035	0.2	-.032	0.1
5-10	-.096	1.3	-.136	1.7	.102	0.8
11-15	-.516	2.1	-.448	1.8		
No. of Children Over 16 Years	.020	3.1	.016	2.4	.020	1.8
Age At First Birth 15-19	.045	1.0	.003	1.0	.126	1.5
20-22	-.017	0.6	.005	0.2	-.025	0.6
23-24	-.039	1.5	-.028	1.0	-.139	3.1
25-29	-.034	2.1	-.019	1.2	-.013	0.5
30-34	-.020	1.0	.023	1.3	-.006	0.2
35-39	.042	1.6	.031	1.2	-.022	0.1
40plus	-.001	0.01	.004	0.1	.031	0.4
Age	.970	15.2	.935	14.5	-.408	0.3
Age Squared	-.017	14.8	-.016	13.9	.006	2.5
Earnings Potential	.163	9.5	.174	10.1	.386	10.7
Family Income	-.015	3.8	.011	2.7	.002	0.5
Dependent Adult	-.049	3.0	-.024	1.5	-.001	0.1

Continued ......

Region:	North	.011	0.5	.006	0.3	.019	0.5
	E.Mid.	-.022	1.0	-.003	0.2	.045	1.2
	E.Ang.	-.075	2.2	-.053	1.6	.131	2.1
	GLC	.004	0.2	.025	1.2	.025	0.7
	S.West	.023	1.4	.012	0.7	.049	1.8
	Wales	-.036	1.5	-.029	1.2	.061	1.5
	Scotland	.007	0.3	-.019	0.8	-.007	0.1
Qualified:							
	A-level Q3	.024	1.2	.029	1.4	-.036	1.0
	O-level Q2	.045	2.6	.054	3.1	.105	3.5
	CSE Q1	.055	3.0	.066	3.6	-.029	1.0
Own Mother Worked		-.006	0.6	-.0005	0.03	.043	2.1
Attitude to Work		-.086	6.9	-.066	5.2	.020	0.9
Husband Helps at Home		.079	6.5	.087	7.2	-.145	7.1
Experienced Training		.329	23.4	.396	28.0	.105	5.3
Unemployed As First Event		-.001	6.2	.001	6.1	.002	5.4
Birth Pattern	B1	.235	15.9	.231	15.5	.016	0.6
	B2	.106	5.8	.100	5.4	.074	2.4
Time Spent Working Before First Birth		-.022	1.3	-.028	1.6	-.020	0.6
Constant		.975	20.0	.843	17.1	.165	2.0
R^2		.520		.528		.206	
F Ratio		84.252		87.209		11.624	
Sample Size		5385		4038		4005	

Table 3.2 e OLS REGRESSION ESTIMATES OF WOMEN'S PARTICIPATION. DEPENDENT VARIABLE IS PART.

REGRESSORS	SAMPLE: All Women	t	Married Women	t	Women With Children	t
Youngest Child Aged 0	.294	3.7	.279	3.0	.126	1.[illegible]
1-2	.367	6.2	.313	4.7	.175	2.[illegible]
3-4	.271	6.3	.271	5.4	.119	2.[illegible]
5	.210	6.9	.259	6.3	.110	2.[illegible]
6-10	.270	9.7	.254	7.9	.124	3.[illegible]
11-15	.141	6.1	.139	5.3	.048	1.[illegible]
Age of Second Youngest Child 0-2	.073	0.5	.130	0.8	-.025	0.[illegible]
3-4	.148	1.9	.144	1.7	.094	1.[illegible]
5-10	.180	5.1	.167	4.1	.092	2.[illegible]
11-15	.005	0.2	-.001	0.2	-.023	0.[illegible]
Age of Youngest Child Family Incomplete 0-2	.007	0.1	.046	0.7	.116	1.7
3-4	.415	2.1	.245	1.0	.012	0.1
5-10	.056	0.6	.059	0.5	.019	0.2
11-15						
No. of Children Over 16 Years	.012	1.5	.018	1.9	.012	1.2
Age At First Birth 15-19	.138	4.0	-.025	0.3	-.156	2.0
20-22	-.001	0.5	-.011	0.3	-.008	0.2
23-24	-.093	3.0	-.122	3.1	-.128	2.9
25-29	-.001	0.6	-.001	0.1	-.016	0.6
30-34	-.021	0.9	-.020	0.7	-.014	0.4
35-39	-.056	1.8	-.047	1.2	-.044	1.0
40plus	-.013	0.4	-.001	0.0	.040	0.5
Age	-.443	4.4	-.228	1.8	-.269	0.2
Age Squared	.017	9.5	.015	7.0	.007	3.0
Earnings Potential	-.195	9.5	-.298	9.7	-.405	11.9
Family Income	.034	9.0	.008	1.5	.029	5.4
Dependent Adult	.048	2.3	.034	1.4	.019	2.7

Continued .....

Region: North		.011	0.4	.002	0.1	.015	0.4
E.Mid.		.023	0.9	.034	1.0	.048	1.3
E.Ang.		.158	3.6	.147	2.8	.170	2.1
GLC		-.021	1.0	-.030	1.0	-.037	1.2
S.West		.034	1.8	.047	1.9	.059	2.2
Wales		.056	2.0	.059	1.7	.085	1.9
Scotland		.020	0.6	.017	0.4	.001	0.1
Qualified:							
A-level	Q3	-.123	5.6	-.091	3.1	-.035	1.0
O-level	Q2	-.134	6.7	-.136	5.3	-.127	4.5
CSE	Q1	-.092	4.4	-.053	2.0	-.060	2.1
Own Mother Worked		.018	1.3	.047	2.7	.014	0.7
Attitude to Work		.001	0.1	.004	0.3	.023	1.1
Husband Helps at Home		-.095	6.0	-.132	7.3	.106	5.3
Experienced Training		-.102	7.1	-.106	6.0	-.110	5.8
Unemployed As First Event		.001	8.5	.002	7.3	.002	5.7
Birth Pattern	B1	-.044	2.1	-.045	1.9	-.016	0.7
	B2	.076	3.0	.087	3.0	.077	2.6
Time Spent Working Before First Birth		-.030	1.6	-.027	1.1	-.025	0.8
Constant		-.197 *	5.0	-.111	1.9	-.032	0.4
R^2		.378		.293		.203	
F Ratio		46.657		22.919		13.011	
Sample Size		3350		2418		2240	

- Table 3.3 OLS -

OVERALL FIT OF THE OLS REPLICATION AND EXTENDED REGRESSION EQUATIONS

		A		B	
		R^2	$\bar{R}$	R^2	$\bar{R}$
Active	All	.387	.383	.504	.500
	Married	.377	.371	.513	.504
	Child	.344	.337	.498	.492
Working	All	.338	.333	.497	.490
	Married	.346	.340	.511	.506
	Child	.325	.322	.497	.493
Actfull	All	.379	.374	.402	.397
	Married	.280	.274	.319	.311
	Child	.198	.191	.236	.227
Actpart	All	.146	.140	.282	.276
	Married	.118	.110	.272	.264
	Child	.095	.087	.261	.253

A: Replication Model

B: Extended Model (includes 7 additional variables)

OLS REGRESSION ESTIMATES OF WOMEN'S HOURS OF WORK.

Table 3.4a HOURS OF WORK OF BOTH FULL-TIME AND PART-TIME WOMEN WORKERS.

REGRESSORS	SAMPLE: All Women	t	Married Women	t	Women With Children	t
Youngest Child Aged 0	-0.15	-0.3	-3.93	-1.0	-1.79	-0.5
1-2	-0.20	-0.6	-3.83	-1.4	-1.51	-0.5
3-4	-0.72	-0.3	-3.59	-1.6	-0.17	-0.1
5	-0.89	-0.6	-3.61	-1.5	-0.65	-0.3
6-10	-1.12	-0.7	-3.79	-2.8	-1.05	-0.7
11-15	0.93	1.3	-0.88	-0.9	0.78	0.7
Age of Second Youngest Child						
0-2	12.78	1.9	11.07	1.7	13.01	2.0
3-4	-5.92	-1.6	-6.95	-2.0	-6.40	-1.8
5-10	-4.16	2.3	-6.15	-3.7	-4.75	-2.8
11-15	0.77	0.6	0.07	0.1	0.17	0.2
Age of Youngest Child Family Incomplete						
0-2	6.7	2.3	4.93	1.8	5.10	2.0
3-4	0.62	-0.0	-6.20	-0.6	-1.21	-0.1
5-10	-0.61	-0.1	0.28	-0.1	-0.17	-0.0
11-15						
No. of Children Over 16 Years	1.36	2.9	1.04	2.6	1.14	2.7
Age At First Birth 15-19	6.32	1.8	3.03	1.1	5.85	1.8
20-22	0.94	0.5	1.21	0.7	0.28	0.2
23-24	4.31	2.2	4.0	2.5	5.24	2.8
25-29	1.57	1.4	1.33	1.3	1.78	1.6
30-34	0.85	0.6	1.74	1.5	1.05	0.8
35-39	-0.22	-0.1	2.14	1.3	0.09	0.1
40plus	-2.33	-0.7	0.49	0.2	-2.65	-0.9
Age	-29.96	-61.25	52.40	1.0	-19.32	-0.3
Age Squared	-0.16	-1.5	-0.35	-3.9	-0.19	-2.0
Earnings Potential	1.07	1.53	0.79	6.34	1.04	7.3
Family Income	0.99	3.5	0.65	2.7	0.11	0.5
Dependent Adult	-1.61	-1.4	-1.43	-1.4	-2.11	-1.9

Continued .....

Region:	North	-0.16	-0.1	0.30	0.2	0.33	0.2
	E.Mid.	0.75	0.5	0.59	0.4	1.07	0.7
	E.Ang.	2.45	0.9	2.14	1.0	1.34	0.5
	GLC	2.03	1.4	2.13	1.70	2.45	1.9
	S.West	1.03	0.9	0.64	0.6	1.05	1.2
	Wales	1.04	1.3	3.73	2.1	3.28	1.7
	Scotland	2.52	0.6	1.6	1.1	1.10	0.7
Qualified:							
	A-level Q3	-2.91	-1.9	-0.61	-0.5	-1.49	-1.1
	O-level Q2	1.72	1.4	1.67	1.6	2.42	2.1
	CSE Q1	2.14	1.7	2.00	1.8	2.44	2.0
Own Mother Worked		-1.39	-1.6	-1.67	-2.7	-0.59	-0.7
Attitude to Work		-0.23	0.6	-0.02	-0.0	-0.85	-0.9
Husband Helps at Home		3.12	3.6	2.80	3.7	1.85	2.3
Experienced Training		-4.06	-4.8	-4.25	-5.8	-4.26	-5.4
Unemployed As First Event		1.56	1.2	1.60	1.5	1.52	1.2
Birth Pattern	B1	-1.73	-1.6	-2.00	2.0	-1.14	-1.2
	B2	1.16	0.9	0.71	0.6	1.45	1.2
Time Spent Working Before First Birth		-0.02	-1.4	-0.03	2.9	-0.02	-1.5
Constant		32.82	11.1	38.99	16.3	29.67	13.6
R^2		0.122		0.121		0.100	
F Ratio		5.68		7.63		5.70	
Sample Size		3350		2418		2240	

Table 3.4b HOURS OF WORK OF PART-TIME WOMEN WORKERS USING THE DEPARTMENT OF EMPLOYMENT'S DEFINITION OF PART-TIME WORK.

REGRESSORS		SAMPLE					
		All Women		Married Women		Women Wit Children	
			t		t		t
Youngest Child Aged	0	-4.31	-2.7	-3.71	-1.6	-3.0	-1.
	1-2	-3.78	-3.3	-2.96	-1.7	-2.73	-2.
	3-4	-3.86	-4.4	-3.32	-2.2	-3.07	-3.
	5	-2.31	-3.6	-2.61	-3.0	-1.69	-2.
	6-10	-1.95	-3.3	-2.07	-1.9	-1.20	-1.
	11-15	-0.21	-0.4	-0.18	-0.6	0.28	0.
Age of Second Youngest Child	0-2	-6.57	-2.4	-5.56	-2.2	-6.09	-2.
	3-4	-0.47	-0.3	-1.37	-0.1	-0.40	0.
	5-10	-0.08	-0.1	-0.46	-0.7	0.44	0.
	11-15	0.83	1.5	0.11	1.7	1.06	1.
Age of Youngest Child Family Incomplete	0-2	-0.65	-0.6	-0.61	-0.3	-0.01	0.
	3-4	-2.40	-0.8	-2.39	-0.1	-0.27	-0.
	5-10	-3.05	-1.4	-2.67	-1.7	-3.56	-1.
	11-15						
No. of Children Over 16 Years		0.71	4.0	0.91	3.1	0.69	3.5
Age At First Birth	15-19	3.66	2.6	3.36	1.6	3.03	1.8
	20-22	1.24	1.5	1.75	1.6	1.31	1.6
	23-24	0.27	0.3	0.30	0.3	0.28	0.3
	25-29	-0.82	-1.7	-0.86	-1.9	-0.74	-1.5
	30-34	-0.55	-1.0	-0.71	-1.7	-0.90	-1.6
	35-39	-1.59	-2.2	-2.63	-2.9	-2.13	-2.7
	40plus	-0.04	-0.1	-0.91	-0.3	-0.16	-0.1
Age		33.80	1.4	13.47	1.0	16.95	0.6
Age Squared		-0.17	-4.2	-0.31	-2.6	-0.11	-2.5
Earnings Potential		0.40	7.4	0.66	7.3	0.46	7.7
Family Income		-0.32	-3.3	-0.33	-2.3	-0.21	-2.1
Dependent Adult		-1.45	-3.1	-1.61	-3.3	-1.28	-2.6

Continued ......

Region:	North	-0.44	-0.7	-0.59	-0.6	-0.51	-0.7
	E.Mid.	0.56	0.8	0.59	0.8	0.39	0.6
	E.Ang.	-0.33	-0.3	-0.44	-0.6	-0.76	-0.7
	GLC	1.46	2.4	-1.61	1.9	1.41	-2.2
	S.West	-0.8	-1.7	-0.59	-1.8	-0.46	-1.0
	Wales	-0.85	1.2	-0.61	-0.3	-0.37	-0.5
	Scotland	0.28	0.3	0.11	0.1	0.18	0.2
Qualified:							
	A-level Q3	1.37	2.3	1.04	1.7	0.22	0.3
	O-level Q2	1.09	2.0	0.86	2.0	1.17	2.1
	CSE Q1	0.63	1.7	0.70	1.0	0.48	0.9
Own Mother Worked		-0.53	-1.5	-0.63	-1.3	-0.54	-1.5
Attitude to Work		-0.49	-1.3	-0.93	-2.0	-0.54	-1.4
Husband Helps at Home		1.73	4.7	1.64	5.2	1.76	4.7
Experienced Training		-1.28	-3.7	-1.31	-4.0	-1.35	-3.9
Unemployed As First Event		0.27	0.5	0.09	0.6	0.56	1.0
Birth Pattern	B1	-0.47	-1.0	-0.53	-1.1	-0.46	-1.0
	B2	-0.86	-1.6	-0.66	-1.7	-0.88	-1.6
Time Spent Working Before First Birth		-0.017	1.8	-0.002	-1.3	-0.01	-1.7
Constant		25.85	22.9	27.61	20.1	24.40	16.5
R^2		0.203		0.169		0.190	
F Ratio		7.70		6.91		6.52	
Sample Size		1340		1339		1238	

Table 3.4c HOURS OF WORK OF PART-TIME WOMEN WORKERS, USING A WOMAN'S OWN ASSESSMENT OF HER CURRENT WORK STATUS.

REGRESSORS	All Women	t	Married Women	t	Women With Children	t
Youngest Child Aged 0	0.75	0.1	0.78	0.3	0.89	0.3
1-2	0.99	0.3	0.86	0.3	1.02	0.8
3-4	0.46	0.2	0.83	0.6	0.78	0.3
5	0.09	0.1	0.39	0.1	0.61	0.4
6-10	-0.002	0.0	0.09	0.2	0.48	0.2
11-15	2.03	1.3	3.01	1.4	2.45	1.5
Age of Second Youngest Child						
0-2	7.58	1.0	9.31	1.1	7.28	0.9
3-4	-7.00	-1.7	-8.10	1.9	-6.98	1.6
5-10	-4.46	-2.2	-4.94	2.1	-4.17	2.0
11-15	-1.90	-1.2	-2.16	1.9	-1.83	1.7
Age of Youngest Child Family Incomplete						
0-2	0.57	0.2	0.65	0.4	0.57	0.2
3-4	-3.10	-0.3	-2.11	-0.1	-1.38	-0.1
5-10	-4.50	-0.7	-4.13	-0.8	-3.69	-0.3
11-15	0.10	0.3	0.19	-0.6	-5.52	-0.8
No. of Children Over 16 Years	0.68	1.3	1.31	1.6	0.94	1.7
Age At First Birth 15-19	2.27	0.5	4.11	0.9	3.41	0.7
20-22	0.84	0.4	0.98	0.3	1.29	0.5
23-24	0.98	0.5	2.66	1.1	3.33	1.3
25-29	1.31	0.9	1.96	0.9	1.22	0.9
30-34	0.81	0.5	0.89	0.42	0.42	0.3
35-39	0.12	0.1	-1.41	-0.9	-1.81	-0.8
40plus	-2.14	-0.7	-3.66	-1.1	-3.93	1.0
Age	9.02	0.1	11.61	0.4	-49.05	-0.7
Age Squared	-0.15	1.2	-0.19	1.1	-0.10	-0.8
Earnings Potential	0.39	2.3	0.41	2.9	0.53	2.7
Family Income	0.64	2.2	0.75	2.4	0.64	2.0
Dependent Adult	-2.40	-1.7	-3.69	-2.3	-3.07	-2.05

Continued .....

Region:	North	-0.61	-0.3	-0.66	-0.5	-0.22	-0.1
	E.Mid.	2.02	1.0	2.36	1.1	2.19	1.1
	E.Ang.	4.50	1.6	5.06	1.7	4.83	1.5
	GLC	3.27	1.8	3.87	2.1	3.77	2.0
	S.West	1.05	0.8	1.69	0.9	1.74	1.2
	Wales	2.29	1.2			1.71	1.9
	Scotland	-0.25	0.1	-0.33	0.2	0.31	0.1
Qualified:							
	A-level Q3	0.08	0.1	0.19	0.3	-0.33	-0.2
	O-level Q2	0.68	0.4	0.79	0.7	0.98	0.6
	CSE Q1	3.10	2.0	3.61	1.9	2.88	1.8
Own Mother Worked		-1.41	-1.4	-1.51	-1.3	-1.14	-1.1
Attitude to Work		0.04	0.0	0.11	0.1	-0.16	-0.2
Husband Helps at Home		0.58	0.5	0.71	0.5	0.48	0.4
Experienced Training		-2.58	-2.6	-2.11	-2.3	-2.28	-2.2
Unemployed As First Event		3.19	2.0	3.06	1.9	2.83	1.7
Birth Pattern	B1	-2.31	1.7	-2.36	-2.0	-2.36	-1.7
	B2	0.75	0.5	0.81	0.7	1.0	0.6
Time Spent Working Before First Birth		0.003	0.0	0.02	0.6	0.01	0.8
Constant		25.06	3.6	28.09	5.1	24.70	5.7
R^2		0.053		0.055		0.056	
F Ratio		1.84		1.80		1.86	
Sample Size		1474		1339		1382	

Table 3.4d HOURS OF WORK OF WOMEN WORKERS. THE SAMPLE INCLUDES NON-WORKING WOMEN WHOSE HOURS ARE CONSTRAINED TO BE ZERO.

	SAMPLE					
REGRESSORS	All Women	t	Married Women	t	Women With Children	t
Youngest Child Aged						
0	-15.87	-10.1	-13.43	-7.9	-8.32	-4.8
1-2	-13.60	-10.3	-11.01	-7.6	-6.18	-4.1
3-4	-8.65	-6.8	-7.07	-5.0	-2.71	-1.9
5	-6.71	-6.1	-5.11	-3.9	-1.31	-0.9
6-10	-4.74	-5.0	-3.25	-3.1	-0.44	-0.4
11-15	-0.77	-1.0	0.43	0.48	-3.06	-3.3
Age of Second Youngest Child						
0-2	-4.45	-2.1	-4.05	-1.8	-2.48	-1.2
3-4	-7.19	-4.6	-7.12	-4.4	-6.08	-3.9
5-10	-6.64	-6.5	-6.23	-5.7	-4.58	-4.6
11-15	-2.56	-2.8	-2.07	-2.1	-1.85	-2.0
Age of Youngest Child Family Incomplete						
0-2	-3.77	-2.9	-3.04	-2.2	-5.42	0.9
3-4	-15.55	-2.7	-10.52	-1.5	-2.71	-1.9
5-10	-3.71	-1.1	-1.0	-1.0	-2.12	-0.6
11-15	-17.29	-1.4	-16.23	-1.3	-15.81	-1.3
No. of Children Over 16 Years	1.09	4.2	1.33	4.6		
Age At First Birth						
15-19	3.78	3.0	1.13	0.5	0.75	0.4
20-22	0.93	1.0	0.79	0.6	0.47	0.4
23-24	2.26	2.1	2.55	2.1	1.97	1.5
25-29	-0.39	-0.6	0.25	0.3	0.36	0.5
30-34	1.03	1.3	1.77	2.0	1.00	1.1
35-39	0.19	0.2	0.27	0.2	-0.94	-0.8
40plus	-0.60	0.6	-1.27	-0.8	-0.44	-0.2
Age	253.59	10.3	288.89	9.7	246.24	9.0
Age Squared	-0.80	-18.0	-0.78	-15.4	-0.51	13.6
Earnings Potential	0.89	14.7	0.91	11.9	0.91	13.9
Family Income	-0.66	-5.0	0.07	0.4	-0.17	-1.1
Dependent Adult	-1.55	-2.2	-1.62	-2.1	-1.78	-2.3

Continued .....

Region:	North	-0.03	-0.1	0.05	0.5	0.12	0.1
	E.Mid.	1.07	1.2	0.42	0.4	0.31	0.3
	E.Ang.	-0.81	-0.6	0.01	0.0	-0.67	-0.4
	GLC	2.05	2.6	2.13	2.2	2.39	2.5
	S.West	0.51	0.8	0.16	0.2	0.30	0.4
	Wales	0.60	0.6	0.81	0.7	-0.13	0.1
	Scotland	0.56	0.5	1.56	1.3	1.05	0.9
Qualified:							
	A-level Q3	3.21	4.2	1.20	1.3	0.43	0.5
	O-level Q2	4.23	6.3	2.57	3.2	3.39	4.2
	CSE Q1	4.48	6.1	3.16	3.7	3.60	4.2
Own Mother Worked		-0.24	-0.5	-0.78	-1.4	-0.11	-0.2
Attitude to Work		-1.29	-2.6	-1.66	-2.9	-2.22	-3.8
Husband Helps at Home		3.71	7.0	4.42	7.8	4.06	7.0
Experienced Training		6.49	11.4	6.39	9.8	7.21	11.0
Unemployed As First Event		1.52	2.4	2.11	2.7	1.38	1.7
Birth Pattern	B1	4.12	6.0	4.07	5.6	4.60	6.6
	B2	3.42	4.1	3.26	3.6	3.20	3.7
Time Spent Working Before First Birth		-0.04	-6.3	-0.05	-6.6	-0.05	-6.2
Constant		40.55	30.2	35.33	20.4	38.61	21.1
R^2		0.322		0.309		0.294	
F Ratio		56.45		40.57		37.25	
Sample Size		5285		4038		3984	

Table 3.4e HOURS OF WORK OF FULL-TIME WOMEN WORKERS, USING A WOMAN'S OWN ASSESSMENT OF HER CURRENT WORK STATUS.

REGRESSORS	All Women	t	Married Women	t	Women With Children	t
Youngest Child Aged						
0	-4.37	-1.1	-4.74	-1.0	-2.80	-0.6
1-2	-0.10	-0.1	-1.79	-0.4	2.34	0.6
3-4	1.88	0.8	-0.20	-0.1	2.94	1.1
5	0.86	0.7	0.10	0.1	2.12	0.9
6-10	0.80	0.5	0.01	0.0	1.55	0.8
11-15	-0.80	-0.8	-1.67	-1.4	-0.33	-0.2
Age of Second Youngest Child						
0-2	17.64	2.1	30.07	2.4	19.6	2.1
3-4	1.60	0.3	4.16	2.64	2.64	0.5
5-10	-0.16	-0.1	1.50	0.6	0.82	0.4
11-15	2.61	2.0	3.41	2.3	2.94	2.0
Age of Youngest Child Family Incomplete						
0-2	6.34	1.9	7.71	2.0	7.66	2.1
3-4						
5-10	6.98	1.5	11.40	1.8	7.48	1.4
11-15						
No. of Children Over 16 Years	0.78	2.1	0.71	1.7	0.97	2.1
Age At First Birth						
15-19	-0.10	-0.1	3.84	1.3	4.59	1.5
20-22	0.43	0.4	-0.25	-0.1	-0.70	-0.4
23-24	2.41	2.1	1.65	1.1	3.20	1.7
25-29	1.17	1.4	1.32	1.2	1.90	1.5
30-34	1.89	1.9	2.20	1.7	1.3	0.9
35-39	2.09	1.5	3.67	2.1	2.36	1.2
40plus	2.41	1.6	3.20	1.6	2.34	0.6
Age	129.71	2.9	84.32	1.5	53.76	0.8
Age Squared	-0.24	-2.9	-0.18	-1.9	-0.11	-1.0
Earnings Potential	-0.05	-0.6	-0.05	-0.13	0.13	0.7
Family Income	0.07	0.5	0.36	1.4	0.42	1.7
Dependent Adult	1.53	1.7	1.26	1.1	0.09	0.1

Continued .....

Region:	North	1.30	1.2	1.91	1.2	2.56	1.4
	E.Mid.	0.86	0.8	0.38	0.3	1.28	0.7
	E.Ang.	1.60	0.8	3.23	1.3	1.70	0.5
	GLC	-0.23	-0.3	0.28	0.2	-0.60	-0.4
	S.West	1.48	1.9	1.8	1.7	2.91	2.3
	Wales	2.30	2.1	3.18	2.1	4.11	2.1
	Scotland	5.56	4.2	8.56	4.9	7.74	3.9
Qualified:							
	A-level Q3	-0.18	-0.2	-1.58	-1.3	-3.35	-2.3
	O-level Q2	-0.97	1.3	-1.09	-1.0	-0.59	-0.5
	CSE Q1	-1.24	-1.5	-2.18	-1.8	-1.41	-1.0
Own Mother Worked		-0.44	-0.8	0.42	0.5	0.93	1.3
Attitude to Work		-0.49	-0.8	-0.57	-0.7	-0.86	-0.9
Husband Helps at Home		0.09	0.2	0.48	0.6	0.01	0.0
Experienced Training		-2.05	-3.5	-2.37	-3.0	-2.97	-3.3
Unemployed As First Event		0.21	0.3	-0.68	-0.7	-1.79	-1.3
Birth Pattern	B1	1.26	1.3	0.82	0.7	1.12	1.0
	B2	4.27	3.6	3.72	2.7	4.32	3.2
Time Spent Working Before First Birth		-0.01	-1.5	-0.006	-0.5	-0.002	-0.2
Constant				36.96	15.1	35.73	10.0
R^2		0.060		0.093		0.113	
F Ratio		2.76		2.54		2.47	
Sample Size		1876		1079		858	

Table 3.5 OVERALL FIT FROM THE OLS REGRESSIONS ON WOMEN'S HOURS OF WORK.

HOURS DEPENDENT VARIABLE	ALL WOMEN	MARRIED WOMEN	WOMEN WITH CHILDREN	
PT and FT workers *	.322	.309	.294	1
PT and FT workers o	.122	.121	.100	2
PT workers ***	.203	.199	.190	3
FT workers ***	.092	.115	.116	4
PT workers **	.053	.055	.056	5
FT workers **	.060	.093	.113	6

* Sample of workers and non-workers looking for work and not looking for work (excludes those in full-time education); those who have zero hours of work have their hours constrained to zero.

** Sample of part-time workers and full-time workers: the distinction between part-time and full-time workers in each respondent's opinion of her current work status, and not the thirty hours per week (deparmtnet of employment) threshold as is the case in ***.

o Sample of part-time and full-time workers.

A COMPARISON OF OLS, LOGIT AND PROBIT ESTIMATES OF WOMEN'S PARTICIPATION.

DEPENDENT VARIABLE IS ACTIVE. SAMPLE: 4005 CASES OF WOMEN WHO HAVE GIVEN BIRTH.

Table 3.6a

REGRESSORS		OLS (A)	OLS (B)	LOGIT (A)	LOGIT (B)	LOGIT (C)	LOGIT (D)	PROBIT
AGE OF YOUNGEST CHILD	0	-0.43	-1.07	-2.42	-1.33	-1.51	-0.57	-1.44
	1-2	-0.34	-1.81	-1.81	-1.00	-1.13	-0.43	-1.07
	3-4	-0.18	-0.45	-0.99	-0.55	-0.62	-0.24	-0.62
	5	-0.13	-0.33	-0.66	-0.43	-0.41	-0.16	-0.40
	6-10	-0.01*	-0.03*	-0.12	-0.07	-0.06	-0.02	-0.07
	11-15	0.07	0.18	0.50	0.28	0.31	0.12	0.30
AGE OF SECOND YOUNGEST CHILD	0-2	-0.12	-0.30	-0.65	-0.33	-0.38	-0.15	-0.38
	3-4	-0.13	-0.33	-0.98	-0.50	-0.56	-0.21	-0.56
	5-10	-0.07	-0.18	-0.65	-0.36	-0.38	-0.14	-0.36
	11-15	-0.04	-0.10	-0.20	-0.11	-0.13	-0.05	-0.11
AGE OF YOUNGEST CHILD FAMILY INCOMPLETE	0-2	-0.05	-0.13	-0.22	-0.12	-0.14	-0.05	-0.12
	3-4	0.23	0.58	0.98	0.50	0.56	0.21	0.51
	5-10	-0.05*	-0.13*	-0.21	-0.11	-0.13	-0.05	-0.12
	11-15	0.55	1.38	0.24	0.13	0.15	0.06	0.14
QUALIFICATION	A-level	0.04	0.10	0.26	0.14	0.16	0.06	0.06
	O-level	0.04	0.10	0.66	0.37	0.41	0.06	0.04
	CSE	0.03	0.08	0.11	0.06	0.07	0.03	0.16
AGE		0.70	0.17	(a)	(a)	(a)	(a)	(a)
AGE SQUARED		-0.02	-0.05	-0.07	-0.04	-0.04	-0.02	-0.04
LOG EARNINGS POTENTIAL		0.13	0.33	1.21	0.66	0.75	0.29	0.69
MARRIED		-0.03*	-0.07*	-0.43	-0.24	-0.27	-0.10	-0.25
FAMILY INCOME		-0.02	-0.05	-0.09	-0.05	-0.06	-0.02	-0.05
SEPARATED/W/D.		-0.09	-0.23	-0.38	-0.21	-0.24	-0.09	-0.23

RESULTS

A COMPARISON OF OLS, LOGIT AND PROBIT ESTIMATES OF WOMEN'S PARTICIPATION.
DEPENDENT VARIABLE IS ACTIVE. SAMPLE: 4005 CASES OF WOMEN WHO HAVE GIVEN BIRTH.

REGRESSORS	OLS (A)	OLS (B)	LOGIT (A)	LOGIT (B)	LOGIT (C)	LOGIT (D)	PROBIT
ADULT DEPENDENT	-0.06	-0.15	-0.49	-0.27	-0.31	-0.12	-0.28
EXPERIENCED TRAINING	0.20	0.50	1.28	0.71	0.80	0.30	1.52
NUMBER CHILDREN OVER 16 YRS	0.03	0.08	0.13	0.06	0.08	0.03	0.07
B1	0.26	2.58	1.53	0.83	0.96	0.36	0.89
B2	0.12	0.30	1.05	0.58	0.66	0.25	0.61
ATTITUDE TO WORK	-0.11	-0.28	-0.72	0.40	-0.45	-0.17	-0.42
CONSTANT	0.855	-0.395	1.622	0.92	1.014	0.39	0.950

OLS		LOGIT		PROBIT	
RSQ =	0.422	SD =	27900 (-13,950)	SD =	27910 (-13,955)
F =	99.91	$\frac{SD}{DF}$ =	7.02	$\frac{SD}{DF}$ =	7.02

* Insignificant

A COMPARISON OF OLS, LOGIT AND PROBIT ESTIMATES OF WOMEN'S PARTICIPATION.
DEPENDENT VARIABLE IS SAMPLE: 4005 CASES OF WOMEN WHO HAVE GIVEN BIRTH.

Table 3.6b

REGRESSORS		OLS (A)	OLS (B)	LOGIT (A)	LOGIT (B)	LOGIT (C)	LOGIT (D)	PROBIT
AGE OF YOUNGEST CHILD	0	−0.31	−0.77	−1.78	−0.98	−1.11	−0.44	−1.00
	1-2	−0.24	−0.60	−1.20	−0.66	−0.75	−0.33	−0.68
	3-4	−0.09	−0.23	−0.23	−0.13	−0.14	−0.06	−0.15
	5	−0.05*	−0.13*	0.02	0.01	0.01	0.01	0.003
	6-10	0.07	0.18	0.50	0.28	0.31	0.04	0.30
	11-15	0.11	0.28	0.79	0.44	0.44	0.19	0.48
AGE OF SECOND YOUNGEST CHILD	0-2	0.08	0.20	0.32	0.18	0.20	0.08	−0.21
	3-4	−0.12	−0.29	−0.96	−0.53	−0.60	−0.23	−0.55
	5-10	−0.05	−0.13	−0.56	−0.31	−0.35	−0.13	−0.33
	11-15	−0.05	−0.13	−0.24	−0.13	−0.15	−0.05	0.14
AGE OF YOUNGEST CHILD FAMILY INCOMPLETE	0-2	−0.04*	−0.10*	−0.26	−0.14	0.17	0.06	0.14
	3-4	−0.05*	−0.13*	0.16	0.08	0.10	0.04	0.19
	5-10	−0.10*	−0.25*	−0.77	0.43	0.48	0.19	0.44
	11-15	0.46	1.16	0.36	0.22	0.19	0.09	0.26
QUALIFICATION	A-level	0.03*	0.08*	0.32	0.17	0.20	0.08	0.19
	O-level	0.05	0.12	0.13	0.07	0.08	0.03	0.07
	CSE	0.04	0.09	0.18	0.19	0.11	0.04	0.10
AGE		0.41	0.10	(a)	(a)	(a)	(a)	(a)
AGE SQUARED		−0.01	−0.03	−0.05	−0.28	−0.03	−0.01	−0.03
LOG EARNINGS POTENTIAL		0.17	0.42	1.04	0.57	0.65	0.26	0.62
MARRIED		0.13	0.33	1.47	0.81	0.92	0.36	0.83
FAMILY INCOME		−0.01	−0.03	−0.04	−0.02	−0.03	−0.01	−0.02
SEPARATED/W/D.		0.07	0.18	1.15	0.63	0.72	0.28	0.66

RESULTS

A COMPARISON OF OLS, LOGIT AND PROBIT ESTIMATES OF WOMEN'S PARTICIPATION.

DEPENDENT VARIABLE IS

SAMPLE: 4005 CASES OF WOMEN WHO HAVE GIVEN BIRTH.

REGRESSORS	OLS (A)	OLS (B)	LOGIT (A)	LOGIT (B)	LOGIT (C)	LOGIT (D)	PROBIT
ADULT DEPENDENT	-0.04	-0.10	-0.32	-0.18	-0.38	-0.07	-0.18
EXPERIENCED TRAINING	0.24	0.60	1.14	0.63	0.71	0.28	0.58
NUMBER CHILDREN OVER 16 YRS	0.02	0.67	0.09	0.50	0.06	0.02	0.05
B1	0.27	0.67	1.6	0.88	0.99	0.39	0.94
B2	0.12	0.30	0.97	0.53	0.61	0.24	0.57
ATTITUDE TO WORK	-0.10	-0.25	-0.64	-0.35	-0.40	-0.16	-0.47
CONSTANT	0.46	-0.79	-1.37	-0.76	-0.86	-0.34	-0.81

RSQ = 0.428
F = 102.39

SD = 26770 (-13,385)
$\frac{SD}{DF}$ = 6.73

SD = 26740 (-13,370)
$\frac{SD}{DF}$ = 6.73

OLS (A) = RAW OLS ESTIMATES
OLS (B) = OLS (A) x 2.5
LOGIT (A) = RAW LOGIT ESTIMATES
LOGIT (B) = LOGIT (A) x 0.5513
LOGIT (C) = LOGIT (A) x 0.625
LOGIT (D) = LOGIT (A) x P (1-P)
PROBIT = RAW PROBIT ESTIMATES

(a) refers to Aliased variables. Aliased variables which are dropped from the model by the statistical package if they add little to the explanation of the dependent variable ie other variables already included explain a given degree of the variation in the dependent variable while adding one or more variables can be seen to have no 'extra' explanatory power. The ELIM package therefore removes these variables from the model.

Table 3.6c A COMPARISON OF OLS, LOGIT AND PROBIT ESTIMATES OF WOMEN'S PARTICIPATION.
DEPENDENT VARIABLE IS PART-TIME.

Sample: 2212 Cases of Working Women who have ever given birth.

	OLS(A)	OLS(B)	LOGIT A
Age of Youngest Child 0	0.22	0.55	1.16
1-2	0.28	0.70	1.16
3-4	0.24	0.60	1.16
5	0.23	0.58	1.14
6-10	0.22	0.55	1.16
11-15	0.07	0.18	0.39
Age of Second Youngest Child			
0-2	0.06 *	0.15 *	0.43
3-4	0.01 *	0.03 *	0.65
5-10	0.06 *	0.15 *	0.45
11-15	-0.01 *	-0.03 *	-0.35
Age of Youngest Child Family Incomplete			
0-2	-0.10	-0.25	-0.44
3-4	-0.09 *	-0.21 *	0.58
5-10	-0.08 *	-0.16 *	-0.42
11-15	0.03 *	0.08 *	0.15 *
Qualifications			
A-level	-0.05	-0.13	-0.68
O-level	-0.12	-0.30	-0.58
CSE	-0.09	-0.23	-0.22
Age	1.36 *	3.4 *	
Age Squared	0.01	0.03	0.03
Log Earnings Potential	-0.10	0.25	-0.58
Married	-0.31	0.78	-1.53
Family Income	0.002 *	0.01 *	-0.001
Sep/Wid/Div.	0.14	0.32	0.68
Adult Dependent	0.001 *	0.003 *	0.13
Experienced Training	-0.09	-0.23	-0.55
No. of Children Over 16 Yrs	-0.03	-0.08	-0.71
B1	0.06	0.15	0.34
B2	0.06	0.15	0.16
Att.	0.04	0.10	0.24
Const.	-0.771	-1.996	-1.485
R^2	0.141		-
F Ratio	13.0		-
Scaled Deviance	-		26,640

Table 3.6c Continued .....

	LOGIT B	LOGIT C	LOGIT D	PROBIT
Age of Youngest Child 0	0.64	0.73	0.27	0.69
1-2	0.64	0.73	0.27	0.96
3-4	0.64	0.73	0.27	0.70
5	0.63	0.71	0.27	0.70
6-10	0.64	0.73	0.27	0.70
11-15	0.22	0.24	0.09	0.23
Age of Second Youngest Child				
0-2	0.24	0.27	0.10	0.26
3-4	0.36	0.26	0.15	0.39
5-10	0.24	0.28	0.11	0.26
11-15	-0.19	-0.22	-0.08	-0.21
Age of Youngest Child Family Incomplete				
0-2	0.24	-0.28	-0.10	-0.27
3-4	0.32	0.36	0.14	0.26
5-10	-0.23	-0.26	-0.10	0.28
11-15	0.08	* 0.09	* 0.04	* 0.01
Qualifications				
A-level	-0.37	-0.43	-0.16	-0.41
O-level	-0.32	-0.36	-0.14	-0.35
CSE	-0.12	-0.14	-0.05	-0.13
Age	*	*	*	*
Age Squared	0.02	0.02	0.01	0.02
Log Earnings Potential	-0.32	-0.36	-0.14	-0.35
Married	-0.84	-0.96	-0.360	-0.94
Family Income	-0.001	-0.001	-0.0002	-0.001
Sep/Wid/Div.	0.37	0.43	0.16	0.42
Adult Dependent	0.07	0.08	0.03	0.08
Experienced Training	-0.30	-0.34	-0.13	-0.34
No. of Children Over 16 Yrs.	-0.39	-0.44	-0.17	-0.05
B1	0.19	0.21	0.08	0.20
B2	0.08	0.10	0.04	0.10
Att.	0.13	0.15	0.06	0.14
Const.	-0.819	-0.906	-0.350	-0.913
Scaled Deviance				26,740

GLOSSARY OF VARIABLES USED IN THIS CHAPTER TO ESTIMATE THE DIFFERENT FORMS OF LABOUR SUPPLY

The Dependent Variables

ACTIVE - A dummy variable which assumed the value one if a woman respondent was currently working or looking for work; otherwise zero.

WORKING - A dummy variable which assumed the value one if a woman respondent was currently working; zero otherwise.

ACTPART - A dummy variable which assumed the value one if a woman respondent was currently working part-time; zero otherwise.

ACTFULL - A dummy variable which assumed the value one if a woman respondent was currently working full-time; zero otherwise.

PART - A dummy variable which assumed the value one if a woman respondent was currently working part-time, and zero if she was currently working full-time. Women who were not currently working were excluded.

HOURS - Usual hours of work per week, excluding meal breaks and overtime hours.*

(2.2) Explanatory Variables

(a) Children Variables

(i) Age of Youngest Child Aged 0-2 years - a dummy variable which assumed the value one if a woman respondent's youngest child was under two years old; zero otherwise.

3-4 years - a dummy variable which assumed the value one if a woman respondent's youngest child was aged between three and four years old; zero otherwise.

5 years - a dummy variable which assumed the value one if a woman respondent's youngest child was aged five years old; zero otherwise.

*All the dependent variables are based on a woman respondent's own assessment of her part-time status except where stated.

	5-10 years	-	a dummy variable which assumed the value one if a woman respondent's youngest child was aged between six and ten years old; zero otherwise.
	11-15 years	-	a dummy variable which assumed the value one if a woman respondent's youngest child was aged between eleven to sixteen years old; zero otherwise.
(ii) Age of Second Youngest Child	0-2 years	-	A dummy variable which assumes the value one if a woman respondent's second youngest child was aged under two years of age; zero otherwise.
	3-4 years	-	A dummy variable which assumes the value one if a woman respondent's second youngest child is aged between three and four years old; zero otherwise.

5-10 years - A dummy variable which assumes the value one if a woman respondent's second youngest child is aged between five and ten years old; zero otherwise.

11-15 years - A dummy variable which assumes the value one if a woman respondent's second youngest child is aged between eleven and fifteen years old; zero otherwise.

(iii) Age of Youngest Child Family Incomplete 0-2 years - A dummy variable which assumes the value one if a woman respondent's youngest child is aged under two years <u>and</u> if she expects to have subsequent children; zero otherwise

3-4 years - A dummy variable which assumes the value one if a woman respondent's youngest child is aged between three and four years <u>and</u> if she expects to have subsequent children; zero otherwise

5-10 years	-	A dummy variable which assumes the value one if a woman respondent's youngest child is aged between five and ten years <u>and</u> if she expects to have subsequent children; zero otherwise.
11-15 years	-	A dummy variable which assumes the value one if a woman respondent's youngest child is aged between eleven and fifteen years <u>and</u> she expects to have subsequent children; zero otherwise.

(iv) No. of Children over Sixteen - The number of children aged over sixteen years old.

(b) <u>Age</u>

(i) Age in Months - The age at the interview recorded in months

(ii) Age Squared - The age at the time of the interview recorded in months months minus the sample mean

- (of age), squared; and divided by 10,000.

(c) Age at First Birth

A set of dummy variables was established which recorded the age of a woman respondent at the time of the birth of her first child. The age ranges are in years -

15-19, 2o-22, 23-24, 25-29, 30-34, 35-39, and, over 40.

The variables are binary and assume the value one if a positive response was discovered and zero otherwise.

(d) Earnings Potential

- This variable is derived from Joshi (1984), and is the log of imputed earnings potential. The formula used to create this variable is:

Log of (
0.088
+ 0.0029 x (Total time spent working full-time in months)
+ 0.0024 x (Total time spent working part-time in months)
+ 0.0145 x (Total time spent working, squared by 10,000)

- 0.0026 x (Total time spent working x age (in months)/10,000)

+ 0.0038 x (Total time spent in present job)

+ 1.0345 if occupation of the time of the interview was in the 'Professional' occupation group

or + 0.9027 if 'Teaching'

or + 0.3750 if 'Nursing or Other Intermediate Non-manual'

or + 0.2640 if 'Clerical'

or + 0.1100 if 'Skilled Manual, or Semi-skilled Factory'

or + 0.0871 if 'Semi-skilled Non-factory or Non-domestic'

or - 0.1536 if 'Child-care' occupation).

(e) Family Income

A scale of family income was constructed from information on the socio-economic groups of women respondent's husband's occupation at the interview and their earnings, where available. There was a large amount of missing data on husband's earnings. However, a cross-tabulation of socio-economic groups and earnings by age of the husband provided a ranking of socio-economic groups by average earnings and socio-economic groups were then allocated to a five-point ranked family income scale. The seven categories are described below, starting from the lowest:

Category 1 All non-working and information unavailable. Assumed to be lowest income group. This may be an unrealistic assumption but there is no way of checking.

Category 2 Socio-economic groups 7,11,14 or 15, that is personal service, unskilled manual, farmers (own account) and agricultural workers.

Category 3 Socio-economic groups 6 and 10, that is junior non-manual and semi-skilled non-manual.

Category 4 Socio-economic groups 8 and 9, that is formen and supervisors and skilled manual.

Category 5 Socio-economic groups 5 and 12, that is intermediate non-manual and own account (not professional) farmers.

Category 6 Socio-economic groups 13, 16 and 17, that is employers, managers and inadequately described.

Category 7 Socio-economic groups 1, 2, 3 or 4, that is employers, managers of large and small establishments, professional self-employed, professional employees.

Various alternative groupings of these occupations were constructed but they made little difference to the overall results.

(f) Regions

A set of regional dummy variables were used in the models to describe the region where a respondent currently lived; the regions were, with codes in parenthesis, NORTH (NORTH), EAST MIDLANDS (E.MID), EAST ANGLIA (E.ANG), GREATER LONDON COUNCIL (GLC), SOUTH WEST (S.WEST), WALES (WALES) and SCOTLAND (SCOT).

The Variables are binary, assuming the value one if positive; zero otherwise.

(g) Education Qualifications

QUAL 1 - If a woman respondent's highest qualification after leaving school was CSE (not grade 1) or a clerical or trade apprentice qualification, the value one was assumed; zero otherwise.

QUAL 2 - If a woman respondent's highest qualification after leaving school was GCE O'level or CSE grade 1 or City and Guilds, the value one was assumed; zero otherwise.

QUAL 3 - If a woman respondent's highest qualification after leaving school was GCE A'level or above, the value one was assumed; zero otherwise.

(g) <u>Other Variables</u>

(i) Adult Dependent - A dummy variable which assumes the value one if a woman respondent cared for a sick, elderly relative; zero otherwise.

(ii) Own Mother Worked - A dummy variable which assumes the value one if a woman respondent's mother worked while she was a child; zero otherwise.

(iii) Attitude to Work - A dummy variable which assumes the value one if a woman respondent believed that mothers of pre-school children should remain at home (to look after the children) rather than working; zero otherwise.

(iv) Husband Helps At Home - A dummy variable which assumes the value one if a woman respondent's husband helped <u>at all</u> with the housework; zero otherwise.

(v) Experienced Training - A dummy variable which assumes the value one if a woman respondent ever experienced any formal or informal

- training whilst at work; zero otherwise.

(vi) Unemployed as First Event - A dummy variable which assumes the value one if a woman respondent experienced a spell of unemployment immediately upon completing schooling; zero otherwise

(vii) Birth Patterns

B1 - A dummy variable which assumes the value one if a woman respondent returned to work after the completion of childbirths, and not in between childbirths; zero otherwise.

B2 - A dummy variable which assumes the value one if a woman respondent returns to work between successive childbirths; zero otherwise.

(viii) Time Spent Working Before First Birth - records the total time, in months, spent in employment before the birth of the first child.

(ix) Marital Status

Never Married	-	A dummy variable which assumes the value one if a woman respondent has never been married; zero otherwise.
Married	-	A dummy variable which assumes the value one if a woman respondent was married at the time of the interview; zero otherwise.
Widowed	-	A dummy variable which assumes the value one if a woman respondent was separated, widowed or divorced at the time of the interview; zero otherwise.

Many of these variables are incorporated into the models described and estimated in the following chapters.

CHAPTER FOUR - SAMPLE SELECTION BIAS IN A MODEL OF LABOUR SUPPLY.

INTRODUCTION

The ignorances and omissions of first generation models of female labour supply have been successfully highlighted by second generation research. One such omission was the failure to recognise the bias in estimated coefficients that results from using non randomly selected samples to estimate behavioural relationships, such as the determinants of the supply of part-time female labour. This problem of "sample selection bias" arises because data is missing on the dependent variable.(1) Heckman,(2) suggests that regressions estimated on a non-randomly selected sample will be of generally little direct use to the analyst wishing to estimate the parameters of the model. So Heckman remarks that "such estimated regression coefficients can find meaningful structural parameters with the parameters of the function determining the probability that an observation makes its way into the non random sample".(3)

(1) In general the problem of sample selection bias arises because data is missing on the dependent variable of the analysis; in the case in question, the dependent variable is part-time employment.

(2) HECKMAN, J., "Sample Selection Bias as a Specification Error with an application to the Estimation of Labour Supply Functions". In Smith (Ed) RAND CORP pp206-244. 1980.

(3) Heckman (1983)

Sample selection bias may arise through self-selection by the individuals being investigated. One observes the hours of work of working women but cannot observe the potential hours supplied by non-working women. First generation studies generally assumed that the hours of work of non-working women, which could not be observed, were zero or the same distribution as workers; women who are not currently working, but who will be in the labour force at a subsequent date, have their present hours of work valued at zero because they are unknown. This assumption was made by empirical studies since data on the potential hours of work of non-workers is not usually available. The effect of this assumption on the estimated results depends upon the extent to which currently non-working women have different characteristics to currently working women. If non-working women have different characteristics to working women, then estimating the same labour supply equation at a future data, so that women currently non-working would be included as workers, would alter the final results. This problem is ultimately a problem of data. Firstly, data is not usually available on the potential hours of non-working women, and secondly, recourse made to cross sectional data for estimation purposes implies that the 'snapshot' view of the labour supply may not in fact be a representative picture of the labour supply if workers and non-workers possess different characteristics.

The issue, therefore, is whether workers and non-workers have different characteristics so that were the supply function to be run on future data, ie data on the sample at a later date, the results would be altered.

The collection and use of longitudinal cohort data of recent years is a move towards the recognition of this issue. The availability of hours of work data from these longitudinal data sets would hopefully improve the estimation procedure. The availability of such data is, relative to other data sets, restricted. The "Women and Employment Survey" data are a move in the right direction, but are far from ideal, since exact hours of work are only available at the time of the interview and not retrospectively. Nevertheless, the WES data provides some useful information for research and therefore is the first step to examining this issue.

Specifically the WES provides information on the hours of work of women who were working at the time of the interview(1), their current part-time and full-time work status as determined by their hours of work(2) and on a self-assessed basis. The Survey asked women who were currently not working if they were looking for work or if they expected to be looking for work in the next year. Women who were currently (at the time of the interview) not working but who said they were looking for work (or expected to look for work within the next year) were asked

(1) Normal hours of work per week at the time of the interview, excluding overtime and meal breaks.

(2) Hours of work in excess of thirty hours per week are classified as full-time hours of work. However, the self-assessed part-time/full-time definition is used throughout this chapter.

whether they would prefer a part-time or full-time job, and if they would prefer to work less than ten hours, between ten and thirty hours, or over thirty hours per week.

Whilst this information is limited, it does, however, provide some insight into the part-time and full-time 'status' of non-working women which can then be compared to currently working women while examining their characteristics. Indeed, Section Three examines these non-workers, describing their future work intentions, and compares their characteristics with those of the working sample. This will enable us to assess whether these two groups of women are significantly different, and therefore the precise ways in which that models based on samples of working women are non-randomly selected and subject to estimation problems.

The discussion of sample selection bias in Section One draws from Heckman's interesting work [1] on the subject, and shows Heckman's method of adjusting for the bias. Heckman has painstakingly shown how, theoretically at least, sample selection bias exists, and how research should be directed towards correcting for this estimation bias. The research reported in this chapter on the other hand provides an empirical investigation into the source of the bias, and also a test of the effect of this bias - if it actually exists.

(1) Heckman (1974) (1976) (1980)
Heckman & MacCurdy (1980 a) (1980 b)

Section Two explains in detail the WES information used in sections three and four. The sample sizes are examined and the exact nature of the comparative work undertaken in later sections is carefully developed. The results presented in Section Four are from a multivariate regression study on the labour supply of women who work and the potential labour supply of non-working women. These results are based on samples of working and non-working women and on a joint sample of working and non-working women in an attempt to identify the possible effects of sample selection bias. Finally, the conclusions are presented in Section Five.

SECTION ONE

This section draws heavily from Heckman (1980) and follows his discussion of sample selection bias as a specification error.

A Model With Sample Selection Bias

Following the model outlined by Heckman (1980); consider a two equation model, for a random sample of I individuals, the two equations for individual i may be written as :

$$(1) \qquad Y_{1_i} = X_{1_i} \beta_1 + U_{1_i} \quad Y_{1_i} = X_{1_i}$$

$$(2) \qquad Y_{2_i} = X_{2_i} \beta_2 + U_{2_i} \quad i = 1,\ldots,I$$

where X_{j_i} is an 1XK vector of exogenously determined regressors, B_j is a KX1 vector or parameters, which are to be estimated by the model, and $E(U_{j_i}) = 0$, with j=1,2.(1) Assuming both a random sampling scheme, so that the estimation sample is truly representative of the entire population, and a regression matrix of full rank (so that all data is available with minimal measurement errors) then it would be possible to achieve unbiased

(1) The assumptions Heckman makes about the error term are as follows: $E(U_{j_i}) = 0 \quad E(U_{j_i} | U_{j\,i}) = \sigma_{j_j} \quad j=1,2$
$E(U_{j_i} | U_j X_i X) = 0 \quad , i=i$

estimators of each regression equation by ordinary least squares.

Generally data are not available on all variables which causes the efficiency of ordinary least squares to be questioned. For example, suppose equation (1) was to be estimated, but some data on Y_{1_i} was not available (ie missing) for certain observations. The population regression function for (1) would be:

$$(3) \quad E(Y_{1_i} | X_{1_i}) = X_{1_i} \beta_1, \quad i=1,\ldots,I,$$

while the regression function for the subsample of observations, based upon some sample selection rule which "selects" only those observations on Y_{1_i} which are not missing, would now be:

$$(4) \quad E(Y_{1_i} | X_{1_i}, \text{ sample selection rule}) = X_{1_i} \beta_1 + E(U_{1_i}, \text{sample selection rule}) \quad i=1,\ldots I,$$

The effect of the 'missing' data on Y_{1_i} is apparent after a comparison of equation (3) and (4). However, if the expectation of U_{1_i} conditional on the sample selection rule is the same as the expectation of U_{1_i} in the population regression function, the selected sample and the population regression functions are exactly the same.(1) In this case least squares estimation

(1) The conditional expectation of U_{1i} (in the selected sample regression) and the expectation of U_{1i} in the population regression would be exactly the same (ie $NI \sim (0, \sigma^2_{u_1})$ if those individuals excluded from the sample regression, whilst being observations in the population regression, were not significantly different from those individuals included in the sample regression.

techniques can be applied to the subsample of the available data to estimate the population regression, since the sample regression and the population regression are identical. The only cost of an incomplete data set is a loss of efficiency.

It is unlikely, using cross sectional data, that the error terms in the population regression and in the sample regression are both normally distributed with mean zero and standard normal variance, since, in the case of our specific example of the supply of female (part-time) labour, women who are currently not working are most probably not working for some specific reason, perhaps childrearing and hence they may possess different characteristics to the sample of working women. If non working women possessed different characteristics, their subsequent exclusion from the sample would clearly result in a difference between the regression equations of the sample of working women only and the whole population of women; ie the sample regression is not based on a random sample of observations but on a sample selected according to some criteria. In this case, the criteria are whether observations are missing or not.

In general, the sample selection rule that determines the availability of data has more serious consequences than a loss of efficiency, which is the only effect when the sample regression is estimated in place of the population regression when the two regression equations are exactly the same. Consider the following sample selection rule as an example; data are available on Y_{1_i} if

(5) $Y_{2_i} \geq 0$, while if

$Y_{2_i} < 0$ no observations are obtained. The choice of zero is an inessential normalisation but in the employment participation example discussed so far the most appropriate normalisation is when the dependent variable is a binary zero-one variable. The dummy variable d_i is defined accordingly,

$$d_i = 1 \text{ if and only if } Y_{2_i} \geq 0 \qquad (Y_{2_i} > 0)$$

(6) $$d_i = 0 \text{ if and only if } Y_{2_i} < 0 \qquad (Y_{2_i} \leq 0).$$

Dispensing with Y_{2_i} altogether and utilising equation (5) the conditional expectation of U_{1_i} can be written as:

(7) $$E(U_{1_i} | \text{sample selection rule})$$
$$= X_{1_i} \beta_1 + E(U_{1_i} | U_{z_i} \geq - X_{2_i} \beta_2)$$

From (7) it can be seen that the selected sample regression function depends on X_{1_i} and X_{2_i}. Regression therefore based on the selected sample omit the final term in (7) - $U_{2_i} \geq - X_{2_i} \beta_2$. Heckman,(1980) accordingly assesses the problem of sample selection bias as an ordinary omitted variable problem.

Treating the problem as an omitted variable problem, Heckman (1978) derives a schema which allows the estimation of equations (1), (5) and (6) to take place free of sample selection bias. The evidence presented by Heckman (1980) based on a model of female labour supply estimated by this technique, suggests, as indeed he notes in his conclusion, "that sample selection bias is an important problem in estimating labour supply equations ... Very high estimates of the elasticity of female labour supply are derived, but these are shown to be consistent with conventional estimates that ignore sample selection bias.", p238.

Heckman certainly does not underestimate the impact and presence of sample selection bias, and goes to great lengths to explain its presence and devise a "computationally tractable technique" (1) which utilises simple regression analysis in order to estimate behavioural relationships free of sample selection bias.

The following sections examine the existence of sample selection bias, and the effects of using non randomly selected samples to estimate female labour supply equations on parameter estimates. Section Two recognises Heckman's illustration of sample selection bias as a specification error, and using the women and employment survey engages in an empirical investigation of sample selection bias.

(1) Heckman(1980)p 286.

SECTION TWO

2.1 The Nature of the Data

The Women and Employment Survey offers a unique opportunity to examine the nature and impact of sample selection bias on female labour supply. As already noted in the introduction, the data is far from ideal, but it does allow for the first time in Britain(1) for steps to be taken in the right direction.

Ideal data would have information on the hours of work of working and non working women over a period of time, at best over the life cycle. This would allow research to be directed towards estimating "complete" labour supply (of hours) models ie the sample used to estimate parameter coefficients and to test the rigidity of assumptions would be a true representation of the population, and hence workers and non workers would be included simultaneously as observations for hours.

Information on hours of work is only available on women employed at the time of the interview and only their normal hours of work excluding meal breaks and overtime. No information,

(1) The WES data is one of the first longitudinal data source in Britain designed specifically to assess the role of women and employment.

unfortunately, is available on non worker's potential supply of hours or on hours of work at any other time than the time of the interview. However, the Survey does provide information on the preferred hours of work of women who are currently not working and who are looking for work or expect to look for work within the next year.

These non-working women who are looking for work (or expecting to look for work) express their preferences in terms of one of the following three weekly hours of work categories:

(a) under 10 hours per week.
(b) between 10 and 30 hours per week.
(c) over 30 hours per week.

It is obviously possible to group the hours of work of women working at the time of the interview into the same three categories. When this is done, comparable information is available on the hours structure of working and non-working women as given by this three point scale. Section Three uses these interview data to compare the characteristics of non-working and working women by their hours of work.

Section Four's multivariate regression estimate supply functions for the "population" of women (workers and non workers) and for the "sample" of workers only. The point of such an exercise is to try and identify the possible effects of sample selection bias. However, it is not possible to incorporate a three point scale of hours into the model of female labour supply as a dependent variable. Accordingly, the hours of work of both working and non working women are grouped according to whether they are actual or preferred, respectively, part-time or full-time hours of work.

The hours of work of women who were working at the time of the interview are regrouped into a binary 'participation' variable according to each individual's own assessment of her part or full-time status. If the individual woman assessed her employment as part-time, a dummy variable took the value of one; if she assessed her employment as full-time, the dummy variable took the value zero.

For currently non working women, the standard Department of Employment definition of part-time employment is used; non working women who would be looking for work of over 30 hours per week (category (c)), were classified as full-time workers; these observations gave the dummy dependent variable the value zero as in the case of the working women. Women who were not working but who wanted to work less than 30 hours per week (categories (a) and (b)) were classified as part-time workers, the dummy variable taking the value one in these instances.

The development of this binary (dummy) dependent variable, taking the value one if each individual woman currently worked part-time (self assessed) or would look for part-time work within the next year, and taking the value zero for full-time work, allows the estimation of a multivariate regression to be based on the population of workers and non-workers alike.

2.2 The Sample

The sample of women who completed the Survey who had a work history of some description amounted to 5320 cases. Of these cases there are 3350 cases of working women, women who can be categorised as either part-time or full-time workers. In addition, there are 734 women who were not working at the time of the interview but who were looking for work. Accordingly, the population on which the multivariate regressions are based is 4084 workers and non workers.

As can be seen from these figures, there are still 1236 case histories which have not been incorporated into the comparisons and regressions in Sections Three and Four respectively. These 1236 women arise from two sources. Firstly, some data is missing on the 'answered' questionnaire so that some case histories are incomplete. If information was missing on currently working women, so that the dependent variable had no observations, these cases were omitted from the sample. Secondly, and by far the larger of the two, are those women who are not working but who do not intend to return to work within the next year. Of the 3350 working women 1876 (52.80%) are currently working full-time (on a self assessed basis) and 1474 (47.2%) are currently working part-time. Of the combined sample of workers and non-workers who intend to return to work within a year almost the exact proportions are working full and part-time: respectively, approximately 53% and 47%.

It is probably realistic to assume that the supply of hours to the labour force of women who do not work and do not expect to look to work within the next year is zero, since, by definition, they do not want to work. Excluding these women from the final sample is necessary since they cannot be classified as either part or full-time workers since they have no intention of working. The only problem with excluding these women from the sample arises if, at any future date these women return to the labour force.[1] Unfortunately, the nature of the Survey precludes any investigation into the propensity of this group of women to return to the labour force at a subsequent date.

(1) This will only become an estimation problem if these women possess different characteristics to the groups of women who are looking for work. If this is the case, then the problem of non-random samples arises.

SECTION THREE

This section undertakes a comparison of the characteristics of working and non-working women who intend to return to work within a year in order to gauge the extent to which the sample of working women are representative of the population of working and non-working women, and hence identify a possible source of sample selection bias. The comparisons reported, concentrate on the personal characteristics and work histories of the two groups of women. There are a few striking differences between the samples of working and non-working women that are worth commenting upon; these include age, marital status, qualifications and most recent occupation.

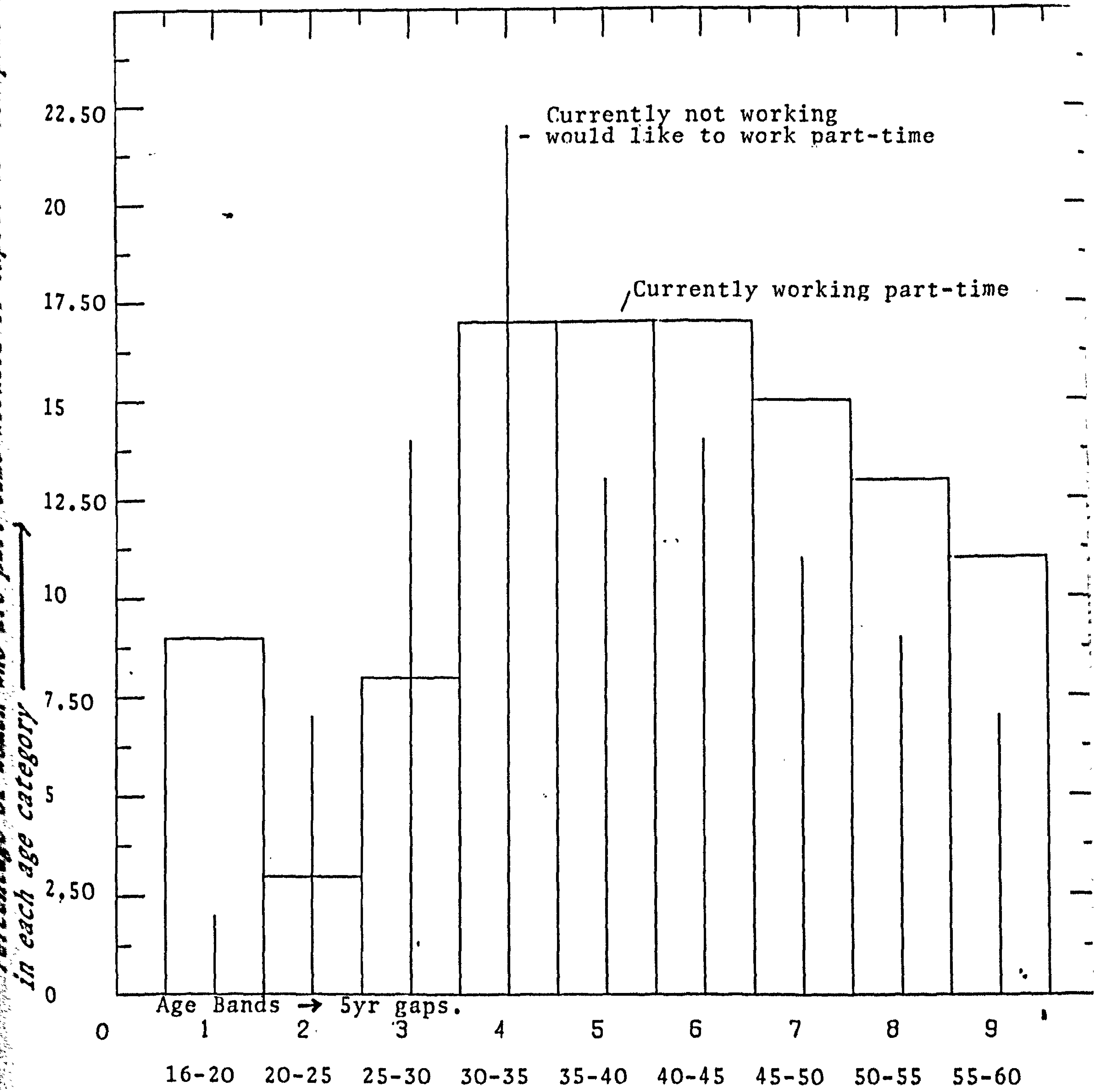
The comparisons begin with an age contrast, and as will be seen, some important implications follow on from the differences by age. The implications of the comparisons by age (Section 3.1(a)) suggests that age comparisons could be done alongside the other comparisons, which include comparisons by children, marital status, most recent occupation, qualifications and attitudes to working mothers of pre-school children.

3.1 Comparisons of the Characteristics of Working and Non Working Women (who intend to return to work)

The comparison of the age structure of working and non working women is presented in Figure4.1 according to whether they are, or want to, work part or full-time. Figure4.1 shows the age distribution for 9 5year age bands, 16-20 to 55-60 years of age. Figure 4.1(a), for part-time workers and non-workers, identifies a different age structure for workers and non-workers. This is more striking in Figure 4.1(b) for the full-time equivalent.

It is interesting to note from Figure 4.1 that whilst only 2% of the sample aged between 20 and 25 years actually work full-time, almost 9% of the non-working sample of this age expect to work full-time. A similar distinction can be drawn for the 25-30 year age group: 4% actually work full-time while 18% of the non-working sample expect to work full-time. There are two possible explanations for this apparent disparity between the age distributions. Firstly, and perhaps most obviously, the two samples - workers and non workers - may possess different age distributions ie clearly different characteristics. If this is the case, then this evidence adds fuel to Heckman's argument that estimating behavioural relationships from non-random samples leads to biased estimates. In particular, a model based on workers only is not a randomly selected sample

Figure 4.1a: THE AGE DISTRIBUTION OF PART-TIME WORKERS AND NON-WORKERS WHO INTEND TO RETURN TO WORK WITHIN THE NEXT YEAR *

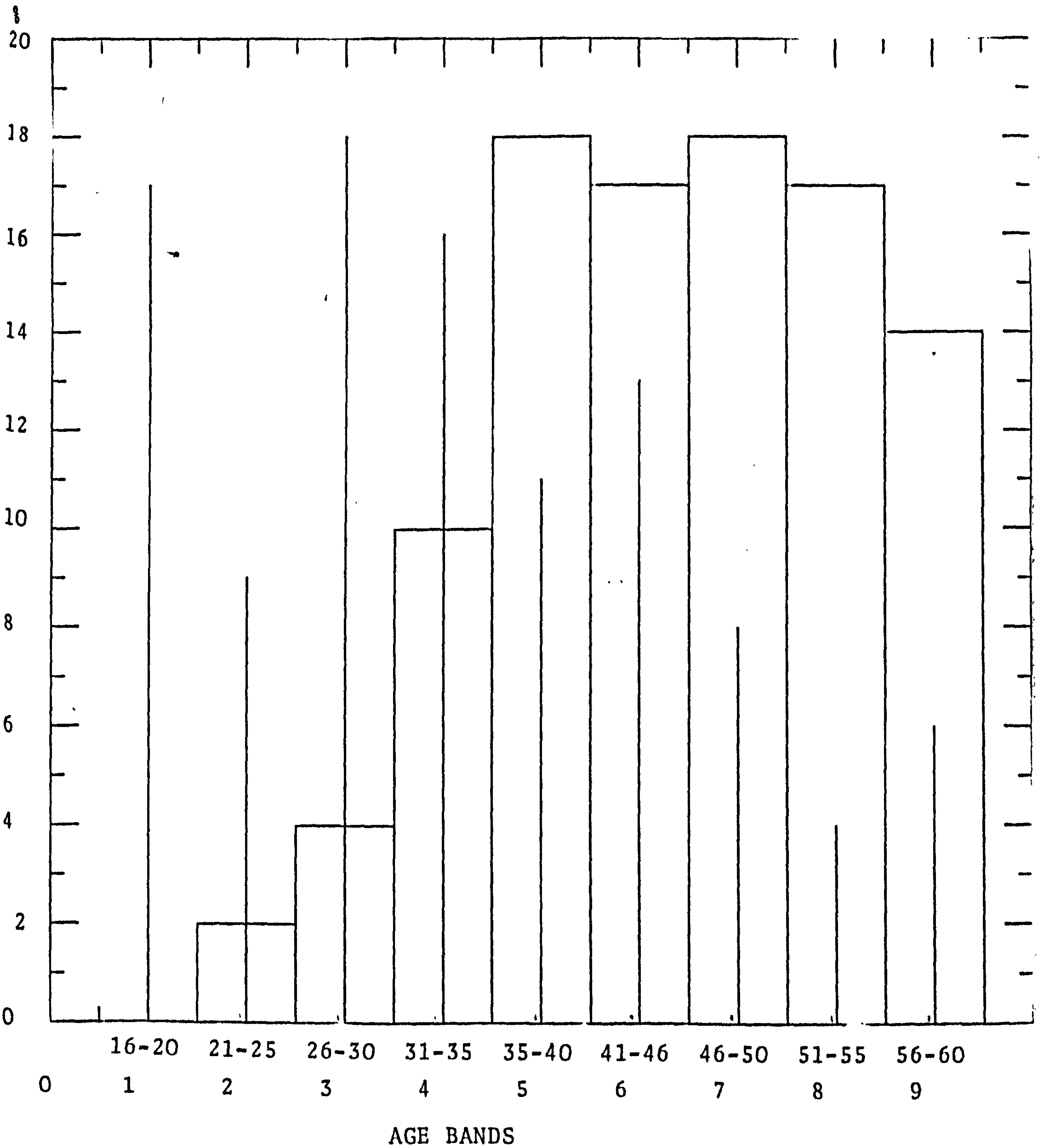


Source: WES

* Spectral lines refer to non-workers and Full histograms to workers

Workers = 3350 Non-workers = 734 (intending to return to work within a year)

Figure 4.1b THE AGE DISTRIBUTION OF FULL-TIME WORKERS AND NON-WORKERS WHO INTEND TO WORK WITHIN A YEAR **



SOURCE: WES

** Spectral lines refer to non-workers and
Full histograms to workers
Workers = 3350 Non-workers = 734
(intending to return to work within a year)

representative of the true population.

Alternatively, the disparity between workers and non workers highlighted by Figure 4.1 may be open to a simpler economic interpretation. The presentation in Figure 1 provides estimates of the proportion of non-working women who expect to work part or full-time while presently not working: for example, 18% of non-workers aged 25-29 years said they expect to work full-time within a year. This 18% is merely a representation of the supply of labour. Conversely the same 25-29 age band in Figure 4.1(b) shows only 9% of women currently working full-time. The same interpretation made for non-workers cannot be made for workers, since the 9% figure is not a measure of the supply of labour. Instead, it is the result of the interaction of the supply of and the demand for labour. Indeed, 18% of women who are working may want to work full-time (the supply) but only 9% are able to work full-time given the demand for labour.

Given these possible explanations of the disparity between the age distributions in Figure 4.1, it is necessary to examine the preferred hours of working women in comparison with their actual hours in order to assess how far preferred hours deviate from actual.

Mismatching of the Demand for and Supply of Labour

Women who were employed at the time of the interview were asked whether they were happy with the number of hours they worked, and whether they would prefer to work longer or shorter hours. By far, the majority were happy with the number of hours they usually worked each week. 86% and 67% respectively of part-time and full-time workers said they were happy with their present number of hours. Nearly 11% of part-time workers wanted to work longer hours, compared to only 1½% of full-timers; whereas nearly a third of full-time workers wanted to work shorter hours only a half of one percent of part-timers wanted to work shorter hours in a normal working week. This suggests that the disparity of age distributions discussed cannot totally be attributed to the latter simpler explanation of the mismatching of the supply of and the demand for female labour.

The discussion so far points to differences in the age distribution as a possible source of sample selection bias in as much as working women clearly have a distinctly different age structure to non-working women, which cannot adequately be explained by supply and demand mismatching. This disparity implies that the following comparisons should make some allowance for age alongside the whole sample, and hence the source of the problem of sample selection bias may be narrowed down by looking at various age groups.

(b) Number of Children

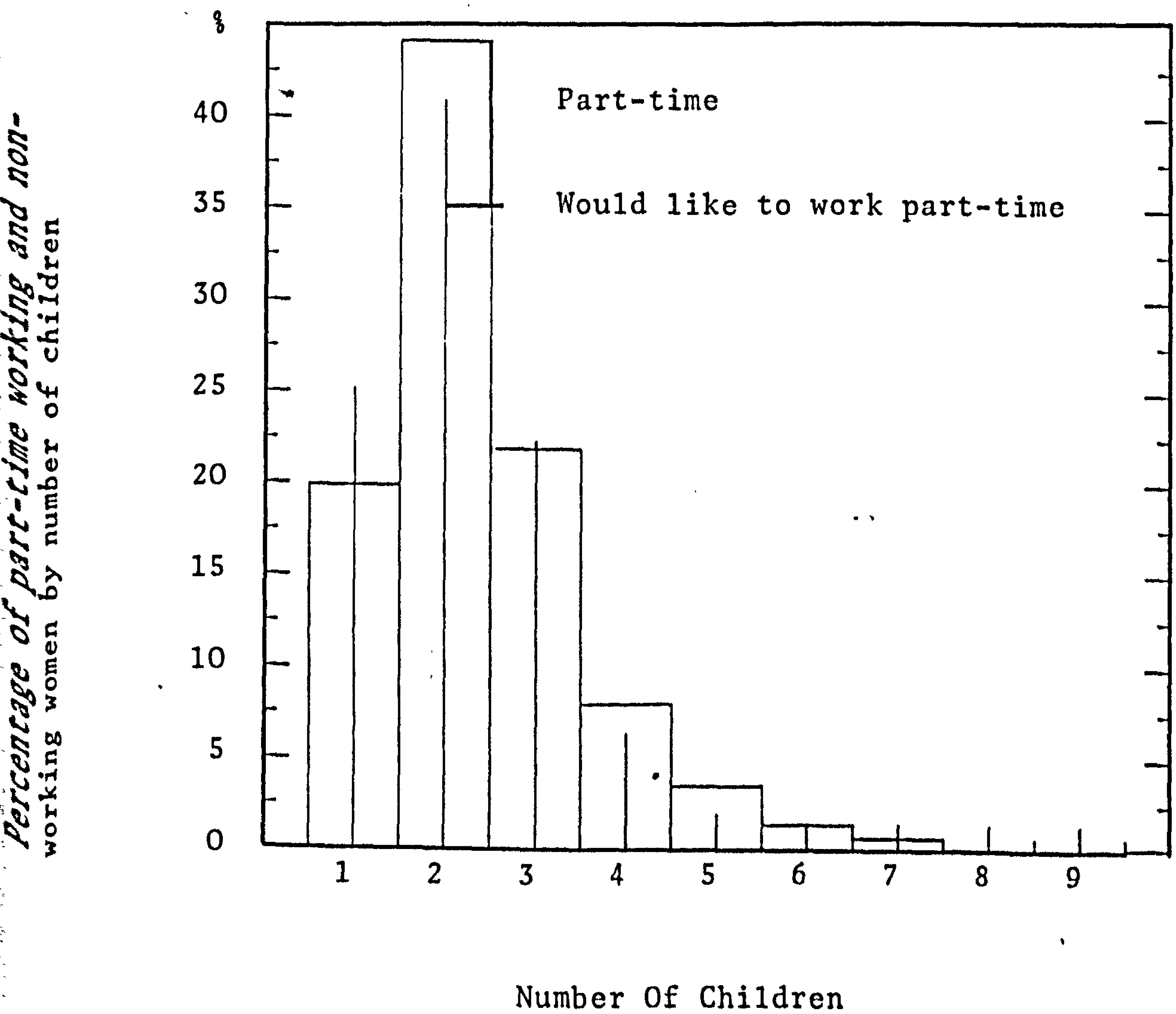
The distinction of the number of children by part-time and full-time status is illustrated in Figure 4.2. Figure 4.2(a) relates to part-time workers and non working women who expect to work part-time. The full-time equivalent is shown by Figure 4.2(b).

The most obvious distinction that can be drawn from Figure 4.2 is that more non working women with one child than working women with one child would expect to work in both part-time and full-time categories: 20% of part-time working women have one child compared to 25% of non working women who expect to work part-time (Figure 4.2a); 26% of full-time working women in Figure 2b have one child compared to approximately 36% of non working women in the same full-time category.

The comparison between workers and non workers does not end here. Whilst the distribution of women who work part-time by number of children is similar to that of non workers as shown in Figure 4.2a, for women with more than one child, the same is not so true for full-time workers and non workers.

Notwithstanding this, the distributions of the groups of workers and non workers in both full and part-time categories in Figure 4.2 are quite similar with the largest disparity occurring between both full and part-time working and non working

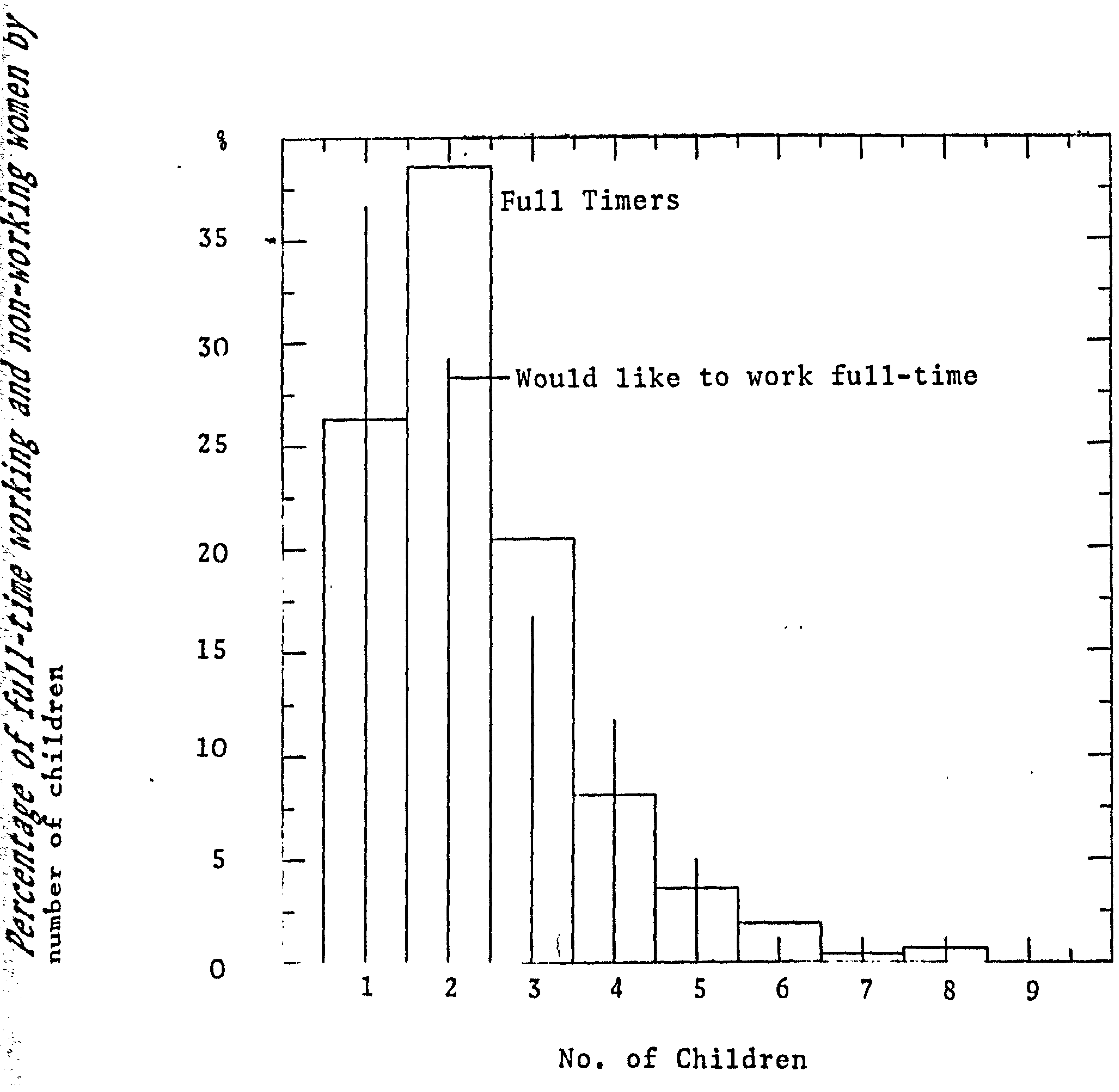
Figure 4.2a THE DISTRIBUTION OF THE NUMBER OF CHILDREN BY PART-TIME WORKING AND NON-WORKING WOMEN WHO INTEND TO RETURN TO WORK WITHIN THE YEAR*



SOURCE: WES

* Spectral lines refer to non-working women, Full histograms to working women

Figure 4.2b THE DISTRIBUTION OF THE NUMBER OF CHILDREN BY FULL-TIME WORKING AND NON-WORKING WOMEN ** WHO INTEND TO RETURN TO WORK WITHIN THE YEAR



SOURCE: WES

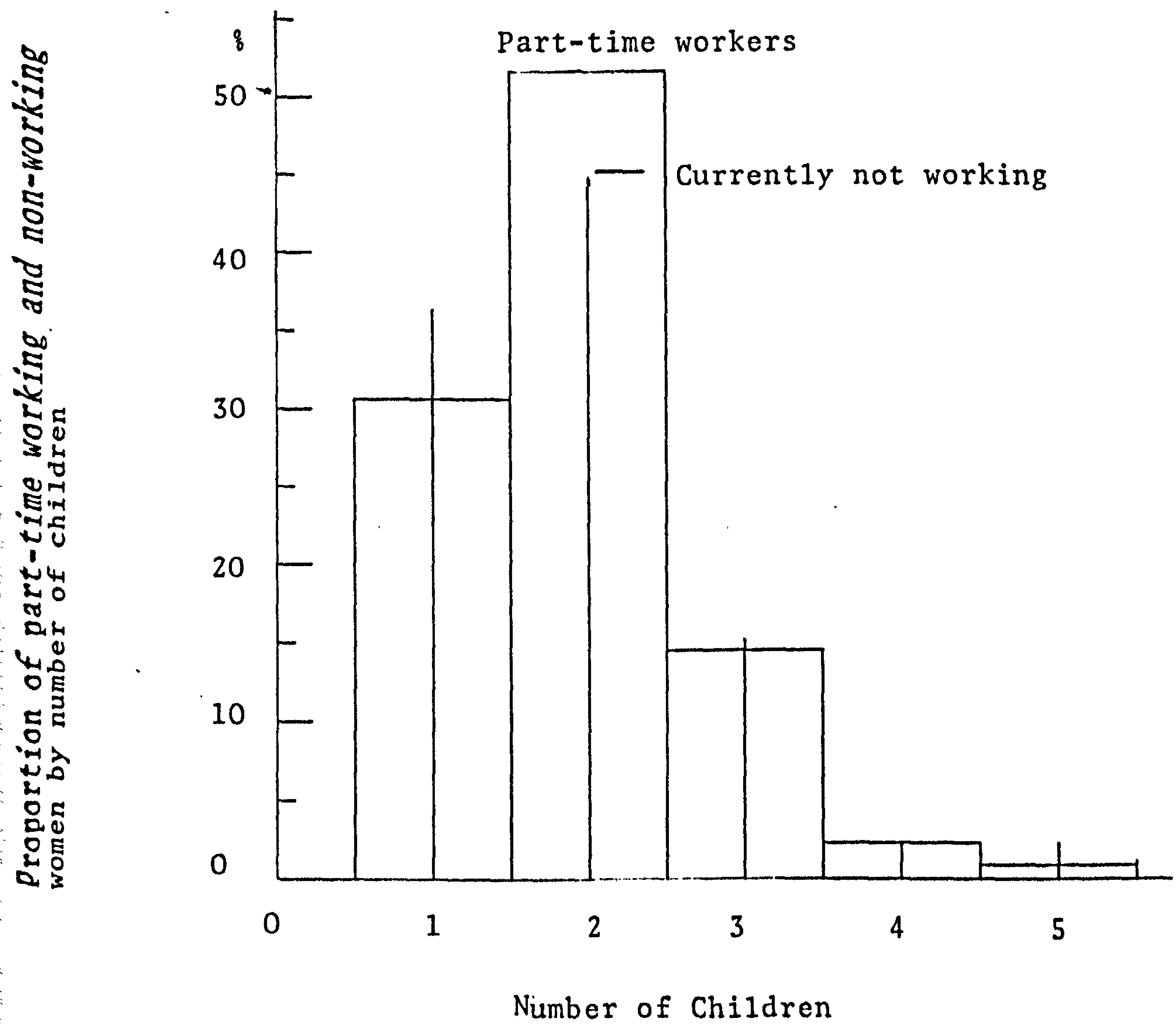
** Spectral lines refer to non-working women,
Full histograms to working women

women with one child only. These disparities are slightly reduced when the number of children are restricted to dependent children[1] only.

Figure 4.3 shows the apportionment of working and non working women aged between 20 and 40 years in both part-time and full-time categories (Figure 4,3a & 4.3b respectively) by number of dependent children. The differences between workers and non workers aged between 20 and 40 years are slightly reduced as compared to Figure 4.2a & 4.2b. As in the case of women of all ages, the largest disparity between workers and non workers occurs between women who have only one dependent child.[2] The largest difference between workers and non workers occurs between full-time workers with one child (45% of whom work full-time) and full-time non-workers with one child (55% of whom expect to work full-time). In all other instances, the disparity that can be seen from Figure 4.3 is smaller than in Figure 4.2. In the case of workers and non-workers with 3 or 4 dependent children the proportions in each category are remarkably similar, particularly as shown in Figure 4.3a (part-timers).

(1) Children under the age of sixteen
(2) This applies to both part-time and full-time categories

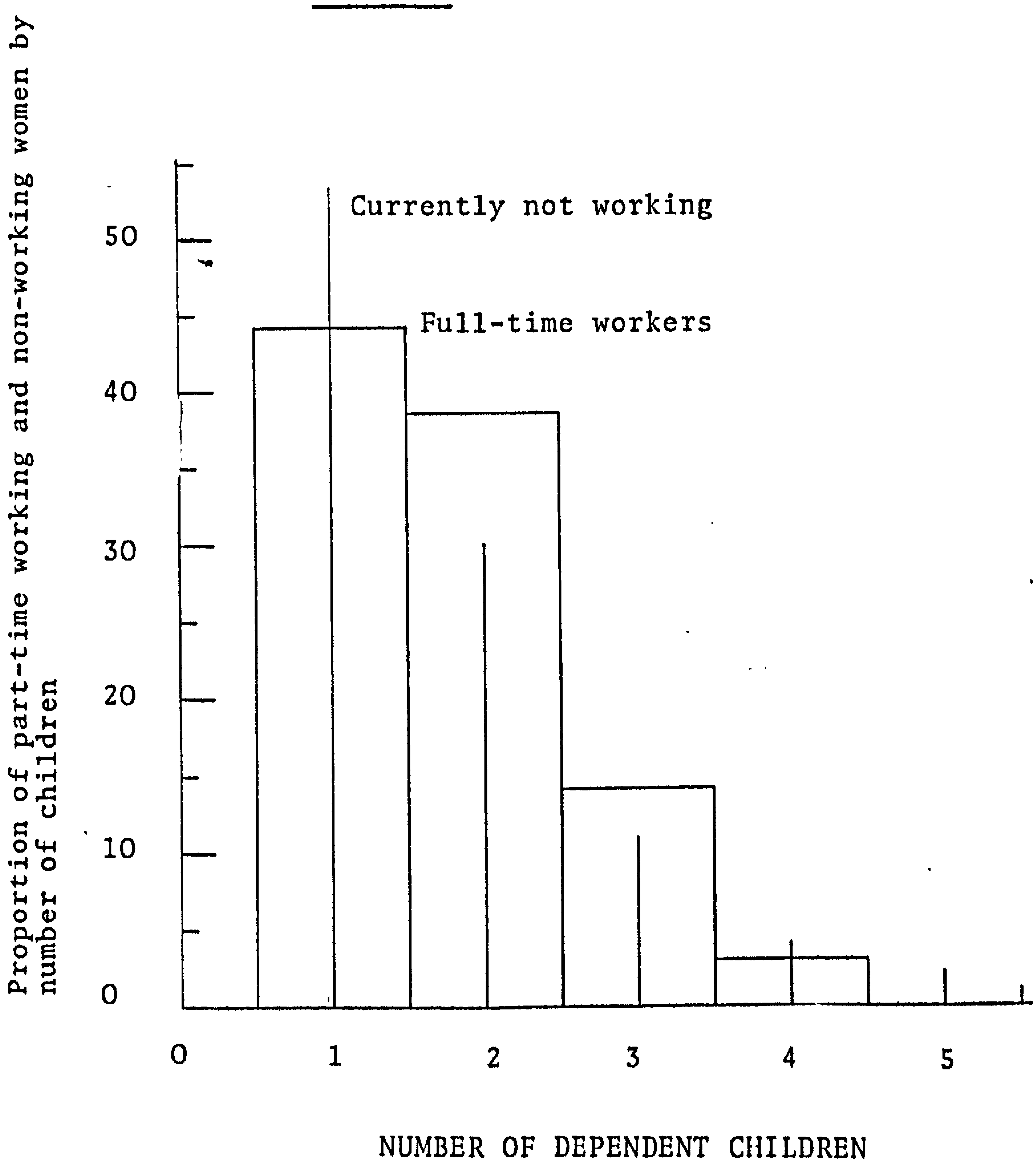
Figure 4.3a THE DISTRIBUTION OF PART-TIME WORKERS AND NON-WORKING WOMEN WHO INTENT TO RETURN TO PART-TIME WORK WITHIN A YEAR, BY NUMBER OF DEPENDENT CHILDREN *



SOURCE: WES

*Spectral lines relate to non-working women and full histograms to working women

Figure 4.3b <u>THE DISTRIBUTION OF FULL-TIME WORKERS AND NON-WORKING WOMEN WHO INTEND TO RETURN TO FULL-TIME WORK WITHIN A YEAR BY THE NUMBER OF DEPENDENT CHILDREN</u> **



SOURCE: WES

** Spectral lines relate to non-working women and full histograms to working women

c) Most Recent Occupations

Information on individuals' most recent occupation[1] from the Survey is presented in Figure 4.4. The two figures show the proportion of working and non-working women in each part-time and full-time work category, by each individual's most recent occupation.[2] Of course, for the working women, the occupation is that of their current job.

The two figures (Figure 4a and b) highlight the different apportionment of working and non working women in most occupational categories. The disparity of the proportions are clearly stronger in Figure 4a, for part-time workers. While clerical occupations are the most heavily concentrated of occupations for both part-time workers and non workers who intend to work part-time and indeed more especially for full-timers, the distribution of part-timers in Figure 4.4a points to a disparity between workers' current occupation and non-workers' most recent occupation having been a clerical occupation compared to part-time workers, the proportion of part-time workers and non workers in many of the other occupational groups are similar. The largest proportionate difference between the

1. Most recent occupation refers to current occupation for women working at the time of the interview, and to previous (ie most recent) occupation for women not working at the interview date.

2. Of the 734 women who were not working at the time of the interview and who expected to work within the next year only 686 had information to give on their most recent occupation. Therefore 48 non-working women either had no previous occupation or had 'missing' observations.

part-time sample can be found in category 9 presented in Figure 4a: Approximately 7% of part-time working women are currently working in this category while almost 21% of non-working women were part-time workers employed in this occupation.

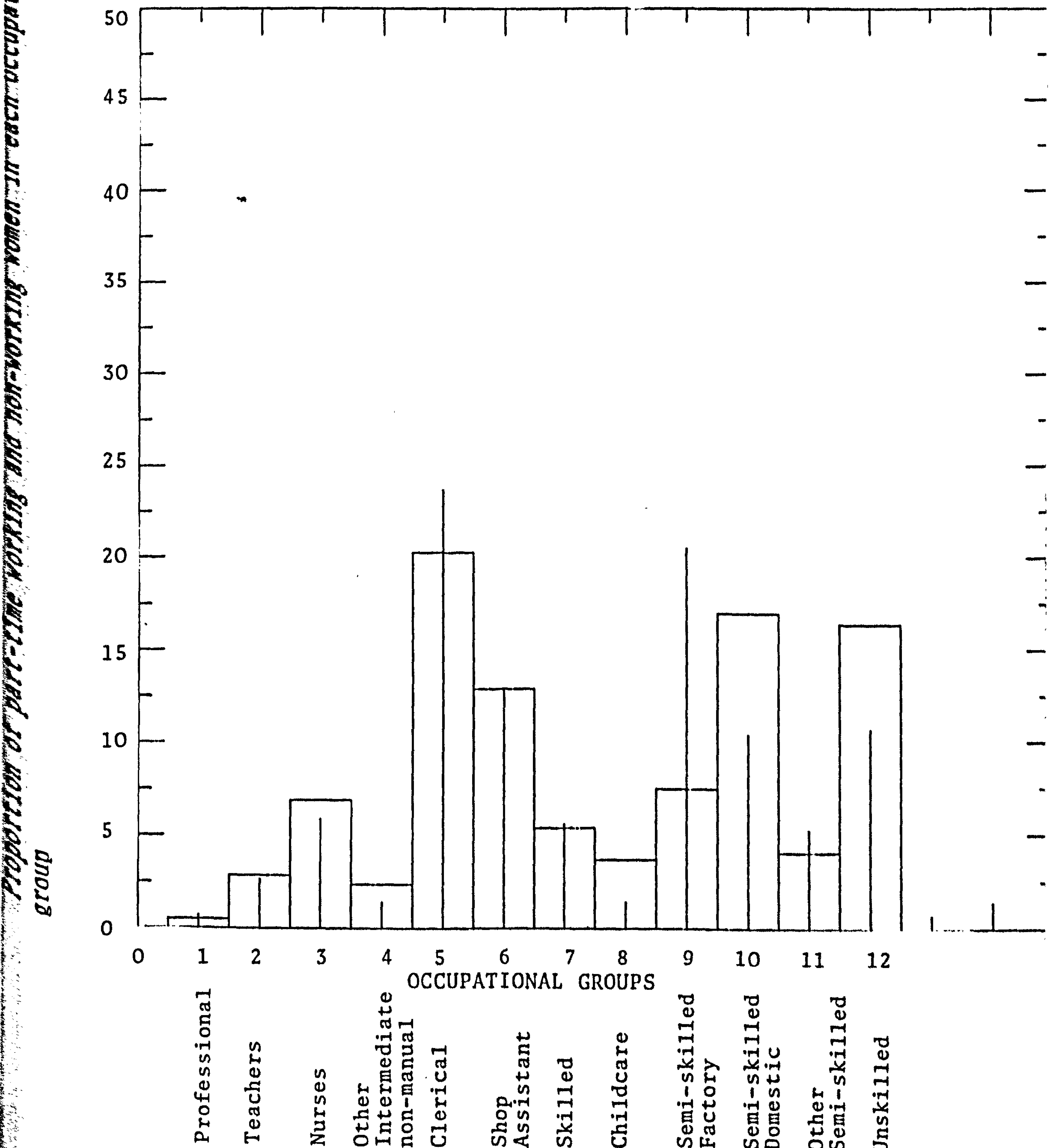
A similar comparison can be drawn from Figure 4b, for full-time workers and non-workers. As already noted, clerical occupations employed proportionately the largest number of workers and last jobs of non-workers whereas there were approximately 6% more part-time working women in clerical occupations than part-time non-working women, there are about 11% more full-time non working women in this category than women who are currently working full-time.

Allowing for the different age structure of workers and non workers as mentioned in part 1.a, Figures 4.5 and 4.6 demonstrate how the proportions in each working and non working (part-time and full-time) division by the most recent occupation alters with age. The whole sample of working and non-working women as given in Figure 4 is now subdivided according to age. Two age groups are chosen: firstly, those aged between 20 and 40 and those over 40 and under 60 years.

Examining part-time workers and non workers first, see Figures 4.5a and b, it is apparent that the proportion of part-time workers in each occupational category are remarkably similar in both age groups with only slight differences occurring between the two age groups. The same is true in the case of part-time non workers but to a lesser extent. What is most interesting, however, is the comparison that can be made between part-time workers and non workers in both of the age categories. For instance, as in Figure 4.4, the occupation category employing the largest number of part-timers is clerical occupations (No.5). Figure 4.4a showed there to be approximately 5% more part-time non-workers in this category than part-time workers. The same distinction can be made in Figure 4.5a & b, . since there are approximately 5% more non-workers belonging to this occupational category. This is just an example of differences that can be seen from a close examination of the two distributions presented in Figure 4.5a. The proportions of part-time workers and non work workers in each of the twelve occupational categories does not vary remarkably according to the age division used in Figure 4.5. However, the same analogy does not hold when the analysis is extended to include full-time workers. Figure 4.6b shows the proportion of full-time workers and non workers in the two age bands (20-40 and 40-60 years) by their most recent occupations.

The distribution of full-time workers and non-workers aged between 20 and 40 years is presented in Figure 4.6a. Figure 4.6b shows the similar distribution for 40-60 years old full-time workers and non-workers. Comparison of Figure 4.6a and 4.6b points to significantly different apportionments of workers and non workers in each occupational group according to the age

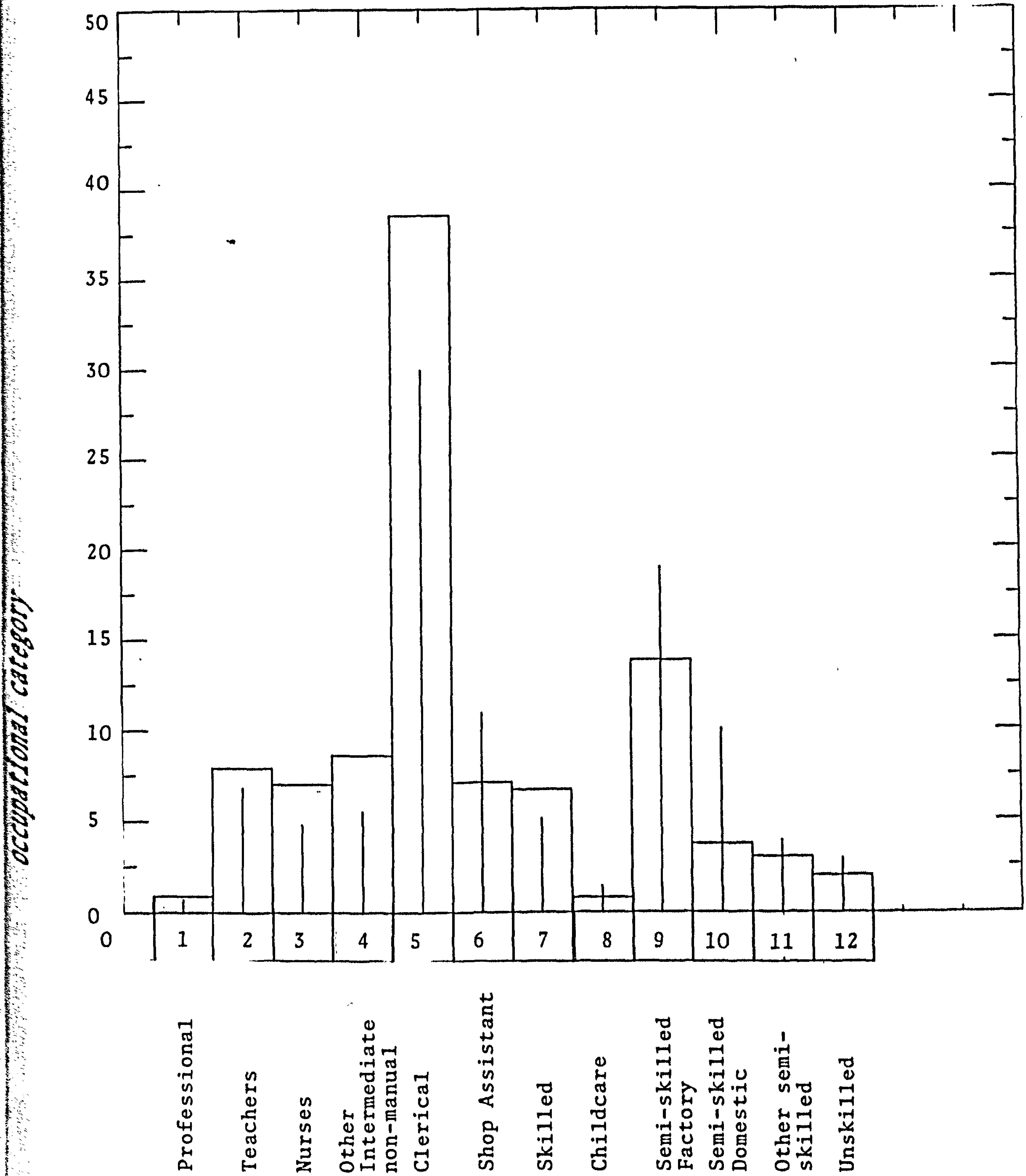
Figure 4.4a THE PROPORTION OF PART-TIME WORKING AND NON-WORKING WOMEN WHO INTEND TO WORK PART-TIME WITHIN THE YEAR BY THEIR MOST RECENT OCCUPATION *



SOURCE: WES * Spectral lines relate to non-workers and full histogram to workers.

SAMPLE: 1473 workers and 375 non-workers.

Figure 4.4b THE PROPORTION OF FULL-TIME WORKING AND NON-WORKING WOMEN WHO INTEND TO WORK FULL-TIME WITHIN THE YEAR BY THEIR MOST RECENT OCCUPATIONS **



SOURCE: WES **Spectral lines relate to non-workers and full histogram to workers

SAMPLE: 1871 full-time workers and 311 non-workers

Figure 4.5 THE PROPORTION OF PART-TIME WORKERS AND NON-WORKERS WHO INTEND TO WORK PART-TIME WITHIN THE YEAR AGED BETWEEN 20 AND 40 YEARS, AND 40 AND 60 YEARS RESPECTIVELY BY THEIR MOST RECENT OCCUPATION*

Figure 5.a
20-40 Year Olds

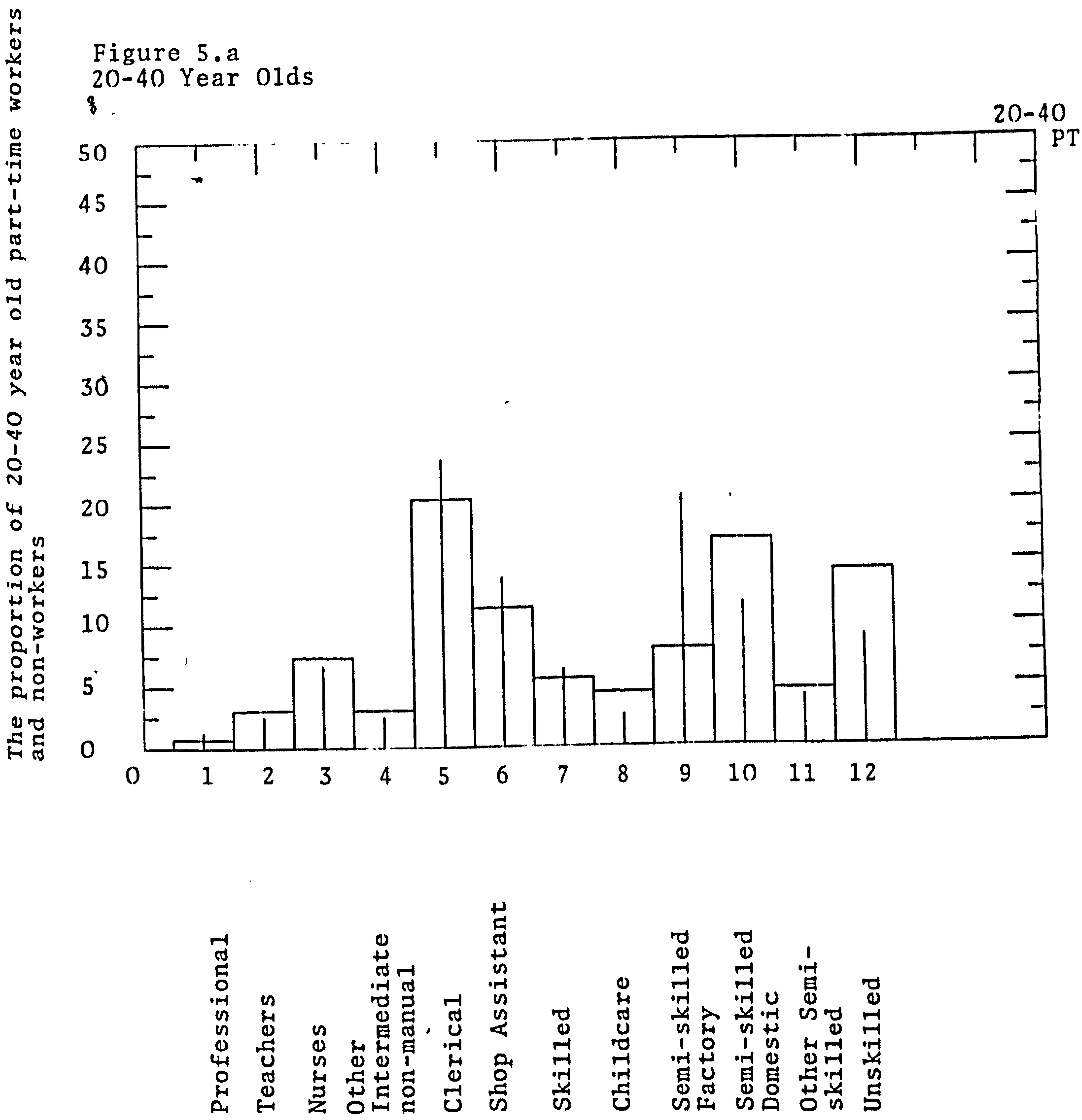
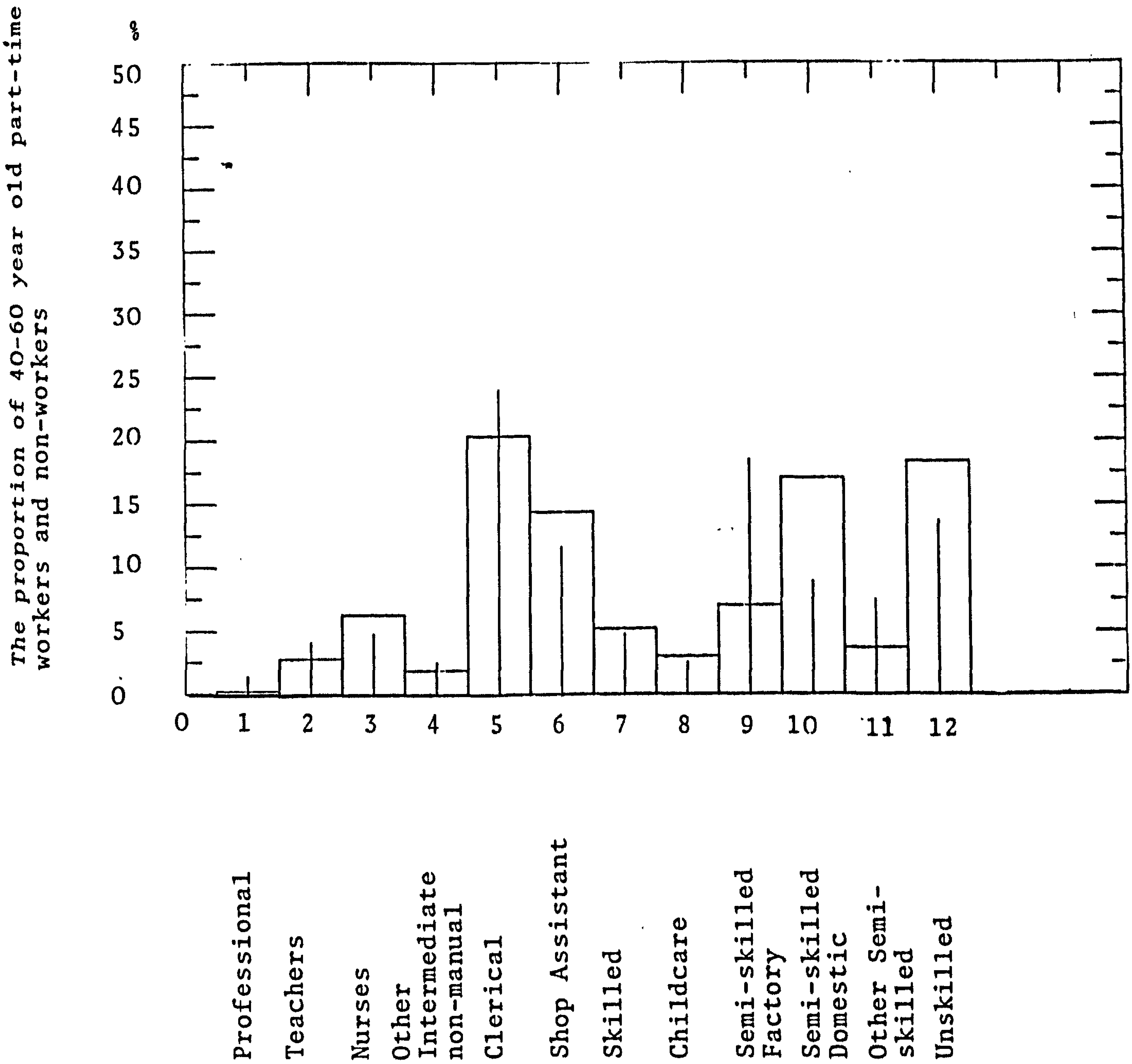


Figure 4.5 Continued .....

Figure 5.b
40-60 Year Olds



SOURCE : WES * Spectral lines relate to non-workers and full histogram to workers

SAMPLES : Figure 5a (20-40 year olds)
Workers 712 Non-workers 224

Figure 5b (40-60 year olds)
Workers 756 Non-workers 200

Figure 4.6 THE PROPORTION OF FULL-TIME WORKERS AND NON-WORKERS WHO INTEND TO WORK FULL-TIME WITHIN THE YEAR AGED BETWEEN 20 AND 40 YEARS AND 40 AND 60 YEARS, RESPECTIVELY, BY THEIR MOST RECENT OCCUPATION **

Figure 6.a Full-Time Workers And Non-Workers Aged 20-40 Years

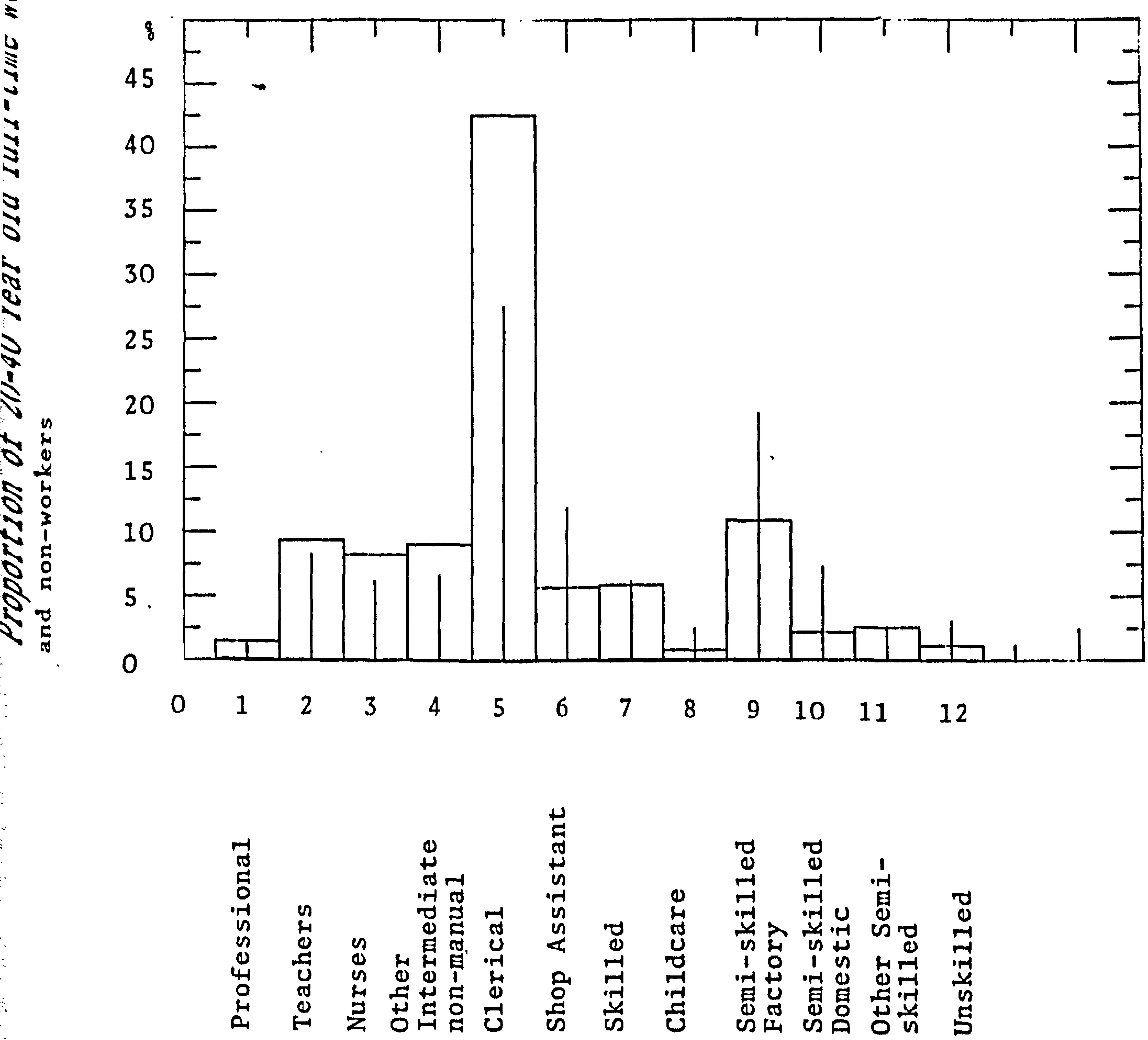
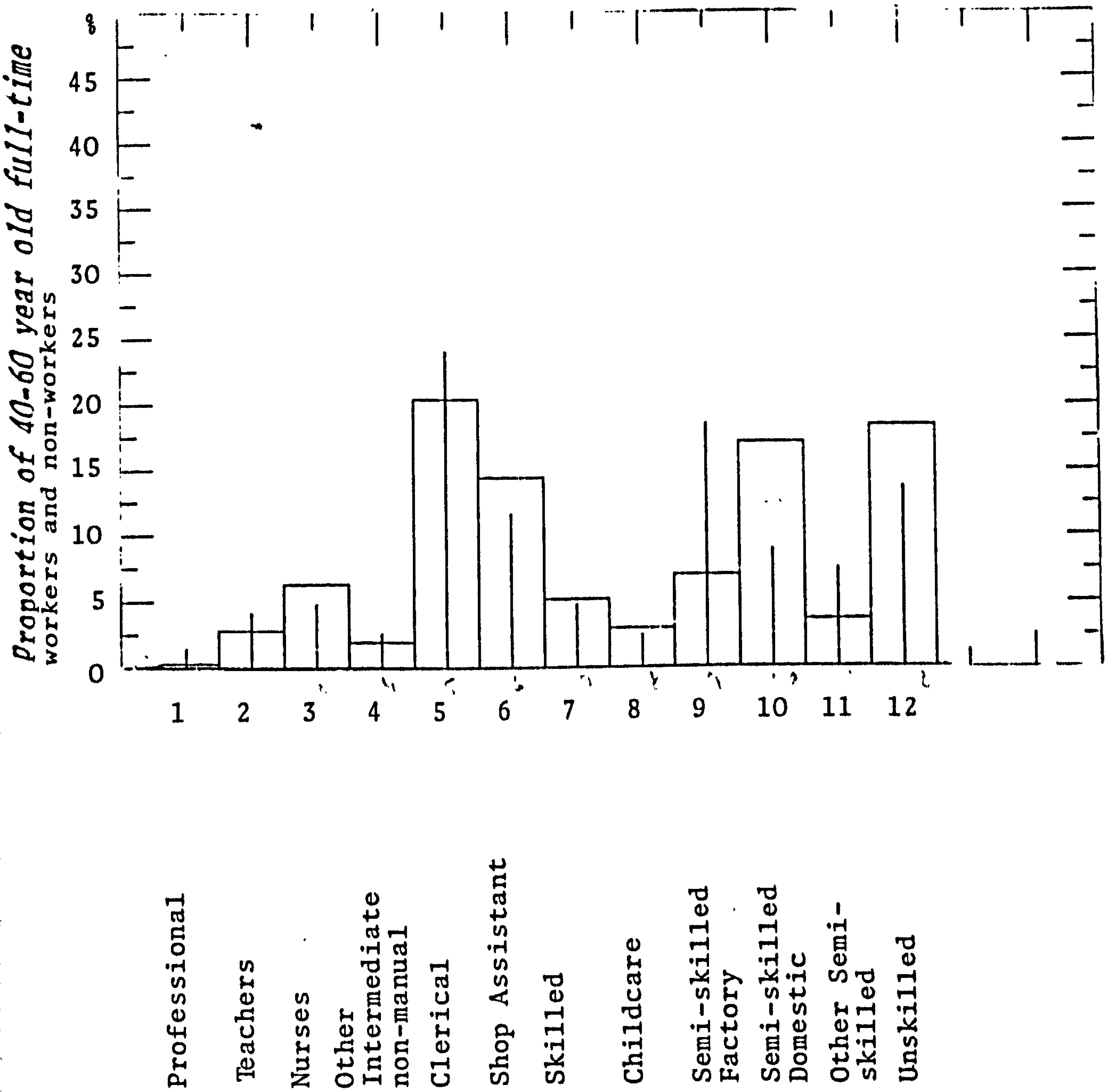


Figure 4.6 Continued .....

Figure 4.6b Full-Time Workers And Non-Workers Who Intend To Work Full-Time Within The Year Aged 40-60 Years



SOURCE: WES

** Spectral lines refer to non-workers and full histograms to workers

SAMPLE: 20-40 Year Olds Workers: 949 Non-Workers: 224

40-60 Year Olds Workers: 677 Non-Workers: 54

division distinguishing 'younger' women (6a) from 'older' (4.6b). Most striking is the comparison that can be made between the overall distributions. Approximately 42% of full-time workers aged 20-40 years were employed in clerical occupations (category 5), whereas only about 22% of 40-60 year old full-time workers are found in this category. Similarly, almost 19% and 20% of older full-time workers and non-workers, respectively, are employed in this occupational group.
In comparison, less than two percent of younger full-time working and non working women can be found to be employed in these categories.

Before any major conclusions are drawn from these findings it should be remembered that there are only 54 observations for the sample of full-time non working women aged 40-60 years old. It was to be expected that there would be relatively few women in this category since many 'older' women would not be expected to return to work, and those that did would be inclined to seek part-time employment. However, whilst care should be taken when interpreting results based on the sample of full-time non working women, it is reasonable to make comparisons based on the other samples since there are sufficient observations for the results to be statistically significant.

(d) <u>Attitudes to Work</u>

At the interview women were asked whether they thought mothers of pre-school children should remain at home and look after the children or seek employment. The results to this question are given in Table 4.1. Table 4.1 shows quite clearly the distinction that can be drawn between workers and non workers in terms of their attitude to child rearing and work. The first column of results, based on the entire sample of women (<u>ie</u> no allowances made for age), highlights this distinction: more non working women thought mothers of pre-school children should remain at home compared to currently working women. Approximately 41% and 48% of full-time working and non working women respectively took this attitude to mothers of pre-school children. About 45% and 52% of part-time workers and non workers respectively took this same view.

The most interesting results can be found in columns two and three in Table 4.1 where the sample is divided into two age groups: 20-40 and 40-60 year olds thought mothers of pre-school children should remain at home: the largest difference occurs between the part-time workers aged 20-40 years and 40-60 years: 59.1% and 32.4% respectively.

The difference in results between workers and non workers is slight in comparison to the distinction that can be seen

Table 4.1 <u>THE PROPORTION OF WORKING AND NON-WORKING WOMEN WHO THOUGHT MOTHERS OF PRE-SCHOOL CHILDREN SHOULD REMAIN AT HOME AND LOOK AFTER THE CHILDREN</u>

		AGE GROUP		
Economic Status		All Ages %	20-40 Yrs %	40-60 Yrs %
Working	FT	41.4	49.2	35.1
		(1)	(3)	(5)
	PT	45.3	59.1	32.4
Not Working	* FT	48.8	56.6	42.6
		(2)	(4)	(6)
	PT	52.2	62.4	37.4

SOURCE: WES

<u>SAMPLES</u>

(1) 3350	(3) 1661	(5) 1435
(2) 715	(4) 422	(6) 201

* and intend to work part or full-time.

from a comparison of age groups. However, Table4.1shows that the greatest proportionate difference between workers and non-workers occurs in the 40-60 year old group where 35.1% and 42.6% of full-time workers and non-workers, respectively, thought mothers of pre-school children should remain at home; and 32.4% and 37.4% of part-time workers and non-workers had the same attitude towards mothers of pre-school children.

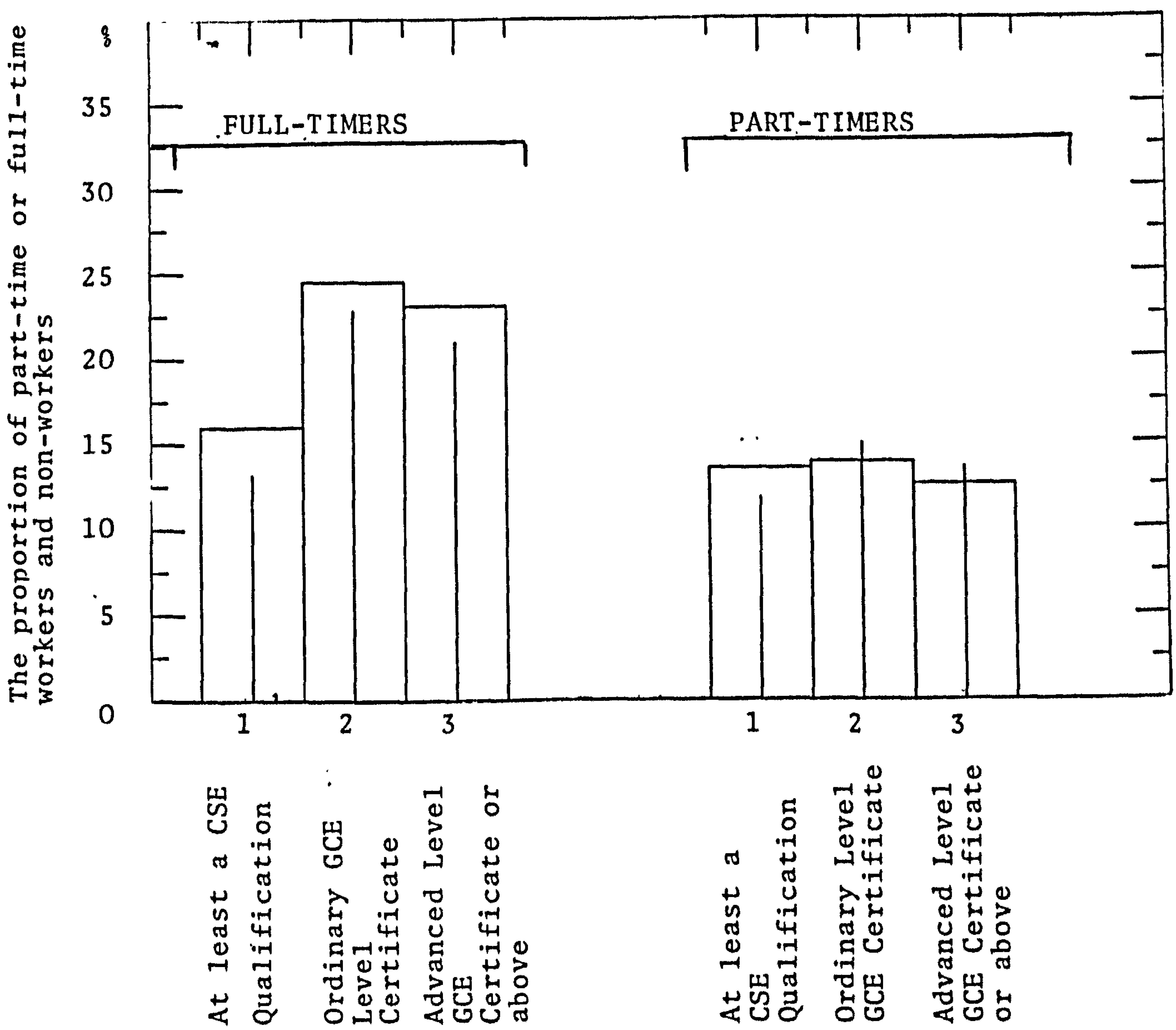
Perhaps most important is the fact that, regardless of age, more non workers than workers of either full-time or part-time status thought mothers of pre-school children should stay at home and care for the children.

(e) Qualifications

Information is available from the interview about the level of qualification attained by individual women at the time of leaving school. This information is presented in Figure 4.7. As the table shows, qualifications have been aggregated into three categories.

The proportion of part-time and full-time working women and non working women by their school leaving qualifications are given by Figure4.7. The figure, for all ages, shows that there are few differences between workers and non workers of either work status in terms of their school leaving qualifications.

Figure 4.7a THE PROPORTION OF FULL-TIME AND PART-TIME WORKING AND NON-WORKING WOMEN WHO HAVE SCHOOL LEAVING QUALIFICATIONS *



SOURCE: WES

SAMPLE

Full-Timers Workers: Non-Workers:

Part-Timers Workers: Non-Workers:

*Full histograms refer to workers and spectral lines to non-workers. Full-time workers and non-workers are presented on the right of the figure, and part-time workers on the left hand side

However, this is not the case when the sample of working and non working women is divided according to age.

It should be noted that the greatest proportion of working and non working women had no qualifications, ie from Figure 4.7a it is apparent that while 25% of full-time working women had at least one Ordinary level GCE, 75% did not have the same qualifications. This should be born in mind when comparing the distributions of working and non working womens' qualifications since the majority of women do not have any of these qualifications.

(f) Conclusions

This section has examined the diversity of characteristics that exist when a comparison is made of working and non working women. Separating the whole sample of working and non-working women according to age has helped to identify the disparity that occurs when characteristics are compared. On the whole, the different characteristics that are present are highlighted when the samples are restricted according to age. Similarly, separating the sample of working and non working women into two age groups allows for more interesting comparisons to be made between workers' and non workers' most recent occupation.

With these differences in mind, the next Section builds on this and estimates a multivariate regression based on different age samples in an attempt to assess the impact of restricting the sample to workers only. In particular, the aim is to determine the impact of assuming that non-working women (who expect to work within a year) have the same hours of work distribution as working women. This is done by examining the supply of labour function of part and full-time working and non-working (but expecting to return to work) women in the WES.

SECTION FOUR

In this section, a set of multivariate regressions are estimated. The regression equation builds upon the findings of earlier sections that exclusion of non working women who expect to work from a sample of working women can cause biased estimates. By comparing the estimates of two equations for workers only, and workers plus non workers expecting to return to work within a year, it is possible to assess the extent to which it is inappropriate to base a behavioural relationship, in this case female labour supply, on a restricted sample of workers only. This procedure, workers, and workers plus non workers, is then re-estimated on the samples of younger and older women, aged 20-40 years and 40-60 years respectively, in order to assess the impact of age and to assess whether one could resolve some of the problems by having age specific supply functions.

4.1 A Restatement of the Problem of Sample Selection Bias

As already discussed at length in Section One sample selection bias may occur when a behavioural relationship (female labour supply) is estimated from a sample of non randomly selected observations (workers only). In order to identify a possible source of this bias this Section estimates a regression equation based on the population and also based on the restricted sample.

Equation 7 (Section One) shows

$$(7)\ E(U_{1_i} | \text{Sample Selection Rule}) = X_{1_i}\beta_1 + E(U_{1_i} | U_{2_1} \geq - X_{2_i}\beta_2),$$

if the joint distribution of U_1 and U_2 is independent, then the expected value of U_1 given $U_2 > - X_2\beta_2$ is zero, then there will be no sample selection problem. In general the joint distribution will not be zero, such that the conditional mean of U_2 depends directly on X_1 and on the probability that an observation which characteristics X_1 is observed. It is possible to write the joint density of U_1 and U_2 as $f(U_1,U_2|\Theta)$ with Θ as a parameter that generates the joint density.

Accordingly, the probability that $Y_1 = 0$ is simply,

$$(8)\quad 1-F_1\ (-X_1\beta_1|\Theta) = \int_{-\infty}^{\infty} \int_{-X_1\beta,}^{\infty} f(U_1,U_2|\Theta)\delta U_1\ \delta U_2$$

where F, is the marginal distribution of U_1. The conditional density of U_2 given $Y_1 > 0$ (k) is given by (9).

$$(9)\quad K(U_2|U_1 > -X_2\beta_2,\Theta) = \frac{\int_{-X_1\beta_1}^{\infty} f(U_1,U_2|\Theta)\delta U_1}{1-F_1(-X_1\beta_1|\Theta)}$$

Thus, as Heckman and MaCurdy (1980) write,

$$(10)\quad E(U_2|U_1 > -X_1\beta_1) = \int_{\infty}^{\infty} U_2K(U_2|U_1 > -X_1\beta_1,\Theta)\delta_{u_2}$$

$$\equiv g(-X_1\beta_1,\Theta),$$

accordingly,

$$(11)\quad E(Y_2\ X_2,Y, > 0) = X_2\beta_2 + g(-X_1\beta_1,\Theta).$$

From (11) it is clear that a regression of Y_2 on X_2 that ignores the sample selection rule omits the term g(.) from the regression, this leads Heckman and MaCurdy to regard the problem of sample selection bias as a special case of the standard specification error (or omitted variable problem). What is important here, is that a regression that does not correct for the sample selection term g(.) estimates, to a first order approximation, instead of

β_{2_j} ie

$$(12)\quad \hat{\beta}_{2_j} = \beta_{2_j} + \frac{\delta g}{\delta X_{2_j}} => \hat{\beta}_{2_j} \text{ (the estimated value of } \beta_{2_j})$$

differs from the true value of β_{2_j} by $\frac{\delta g}{\delta X_{2_j}}$.

Therefore, by estimating both $\hat{\beta}_{2_j}$ (the restricted regression) and the β_{2_j} (the regression based on the whole population), it will be possible to identify a possible source of sample selection bias (ie $\frac{\delta g}{\delta X_{2_j}}$) and also the extent to which the problem is serious as measured by the relative effect on $\frac{\delta g}{\delta X_{2_j}}$ on $\hat{\beta}_{2_j}$ as composed to β_{2_j}.

4.2 The Regression Equations

The regression equations presented in Tables 4.1 and 4.2 in Appendix 4, have the same regressors as those regressions which are reported in Chapter Three. A full list of the variables, together with their exact definitions can be found in the Appendix.(1) The dependent variable is based on the sample of workers and non workers; in all of the regression equations, a dichotomous dummy variable is estimated which takes the value one if the women either work part-time or expects to work part-time within the next year if currently not working. The dummy dependent variable takes the value zero if the women currently works full-time or expects to work full-time within the next year if currently not working. For the regressions based on workers only the dependent variable takes the value 1 or Ø if women work (currently) part-time or full-time respectively.

1. Appendix 3 at the end of Chapter 3.

The nature of this dependent variable presents a methodological problem in that it is not strictly appropriate to estimate a regression equation which has a dichotomous dependent variable by ordinary least squares estimation techniques.[1] However, while it is not exactly appropriate, estimation by OLS provides a worthy insight into a possible source of sample bias and the extent of the bias as measured by $\delta g/\delta X_{2_j}$. Accordingly this is a step towards correcting for the inadequacies of previous research as discussed earlier; and while too much significance should not be attached to the final parameter estimates, it is still possible for statistically appropriate comparisons to be made between the restricted and the population regression estimated coefficients, and hence an assessment of sample selection can be made. The recognition of sample selection bias is important in itself; however, it is not the only source of bias that arises when estimating the type of model being discussed here. In the following Chapters, the problems that arise from estimating a binary dependent variable by OLS are discussed and assessed, but for the moment are ignored.

4.3 The Regression Results

(a) All Ages

The results for the whole sample of workers and non workers and for workers only, of all ages, are given in Table 4.1. The

1. A problem that has been discussed more fully in Chapter Three.

first column of results is for the population of workers and non workers while column two is for workers only. Only coefficients which are statistically significant are reported: coefficients with an F statistic of 2 (or t statistic of $\sqrt{2}$) or more are included in Table 4.1.

The overall fit of both regressions are very similar indeed. The regression based on the entire sample of workers and non-workers has an R^2 of 0.424 while the R^2 for the workers only sample is 0.426. The former regression, based on workers and non workers, is slightly more significant, as measured by the overall F statistic, 55.92 compared to 52.16.

On the whole there appears to be little difference in parameter estimates and overall fit between the two regressions based on the sample of workers and non-workers and on workers only. The coefficient estimates from Table 4.1 are very similar in both regressions. Comparison of the two regression reveals that generally the same variables are significant in both regression equations, and these always have the same sign and very similar sizes.

It is possible, using a Chow Test, to measure the extent to which the estimated coefficients in the regression based on workers and non workers are statistically different from their counterparts in the regression based on the sample of workers only. This will then provide an insight into how statistically different the two regressions are from one another.[1]

The Chow test statistic distributed as an F statistic, has a value of 8.07 which is significant at the 1% level. Therefore, since the estimated coefficients are significantly different from one another the inclusion of non-workers in a sample of workers only is a statistically different sample in contrast to one of workers only. In particular, the evidence provided by the Chow test points to a statistical difference between the two regression results - since the only difference between the two regressions is their sample size it is clear that this difference is occurring through the inclusion of non-working women in one of the regressions. However, while a statistical difference between the two regression results is apparent, the effect of this statistical disparity is not so apparent from an examination and comparison of the estimated regression coefficients, from Table 4.1. Perhaps all that can be concluded is that the regression based on the larger sample(of working and non working women) is statistically different from the regression based on working women only, but given the theoretical evidence of Section Two it is clear that the regression estimates are more accurate when based on the larger sample, as slight differences do occur between parameter estimates.

(1) As described by
Stewart J. Introductory Econometrics: Hutchinson and Co., London 1976, pp 114-117.

(2) The critical value at the 1% level lies between 1.1 and 1.3.

(b) 20-40 Year Olds

The regression equation estimated for women of all ages and reported in Table 1 is re-estimated on a restricted age sample of 20-40 year olds. The results are presented in Table 4.1[1] columns 1 and 2. The effect of restricting the two samples of workers only, and workers and non workers to those aged between 20 and 40 years is to improve the overall explanatory power of the regression equation: The regression based on the sample of workers only rises from 0.426 (Table 4.1: women of all ages) to 0.551 (Table 4.2: 20-40 year olds), and similarly for the population of workers and non-workers (0.424 to 0.52 respectively). There is a fall in the overall significance of the 20-40 year old regressions as compared to the equivalent regression based on all ages of women. Table 4.1 reports an overall F statistic of 55.92 and 52.16 for the workers' and non workers' sample and the workers' sample respectively, compared to those given in Table 4.2: 39.88 and 40.38 respectively.

It is to be expected that the regression equation estimated on younger women - aged 20-40 years - would record a higher R^2, since it is this age group which is likely to be affected by the age of younger child variables, of which there are many in the final regression equation. Similarly we might expect that the older women (40-60 year olds) would be relatively unaffected by

(1) Table 4.2 also shows the results for the regression run on 40-60 year olds.

the age of youngest child variables and other variables designed to capture family formation patterns. Table 4.2 shows this to be true. See 4.3 (c).

The differences that were anticpated to occur between the two samples of workers only, and workers and non workers were slight as reported in Table 4.1 for women of all ages. Reducing the sample to women aged 20-40 years has little effect in highlighting any estimated parameter discrepancies between working women and working and non-working women. However, the Chow test for younger age group (20-40 year olds) of 8.4 clearly indicates that the two sets of estimated coefficients are statistically different from one another, and indeed, reiterates the point made earlier that the two samples are statistically distinct.

4.4 Conclusion

This section has largely used the multivariate regression model developed in Chapter Three. The purpose has been to highlight and identify the possible effects of sample selection bias: what has emerged is that sample selection bias exists theoretically and empirically when an investigation of parameter estimates of the kind carried out in this section is undertaken. What is most interesting, is that whilst there are only slight differences between the estimated parameters from the regressions based on the two samples of workers only, and workers and non workers together, there are comments worth making when the Chow test statistics are examined.

From the three Chow test statistics reported in this section, it should be noted that the sample of women of all ages produces a statistic of 8.07 which can be compared to one of 8.4 and 2.0 for the younger and older samples. All three statistics are significant at the 1% level; that is, there are clear statistical differences between the regression results based on workers only, and workers and non workers together regardless of age. However, what is also apparent, is that the statistical differences are stronger for the younger (20 - 40 year) age group than for the older (40 - 60 year) age group since, respectively, the Chow test statistics are 8.4 and 2.0. This corroborates the evidence from Section Three, that making allowances for age has the effect of accentuating the discrepancies between workers, and workers and non workers. Also, the results have shown there to be differences worthy of note between the age groups; in particular, there are fewer parameter differences between the working and working plus non working samples in the older age group than in the younger group. If childbirth is a major reason for not working - as might very well be the case - then one would expect these differences to have occurred across the two age groups.

SECTION FIVE

CONCLUSIONS

The problem of sample selection bias has received considerable attention in the literature over the past few years. The theoretical assessment of the problem is both precise and, as can be seen from Heckman's work, succint. The effectsof sample selection bias on the parameter estimates of a behavioural relationship has been outlined. This chapter has attempted to assess the impact on the empirical parameter estimates of a female participation model of sample selection bias.

The effect on these parameter estimates has been limited. However, the question of the significance of the difference between the samples of workers only, and of workers and non-workers, is evident by the Chow tests' results. The allowances made for age, in both Sections Three and Four, have highlighted the extent to which sample selection bias may indeed be said to exist. It appears to exist mostly by age. If this is the case, it can be alleviated by age specific (group) labour supply estimates.

It was noted earlier that this Chapter is not an exhaustive investigation of selection bias; notwithstanding this, the results of this analysis help to identify the sources and extent of sample selection in practice. A complete assessment of the empirical consequences of estimating behavioural relationships from non-randomly selected observations: the problem is not just restricted to female labour supply or even labour supply [1] but to many other aspects of economics.[2]

The part-time participation regression results of Section Four and the comparison of part-timers and full-timers of Section Three have shown there to be considerable differences between the groups of part-timers and full-timers. The effect of sample selection bias on the part-time regression results has been limited. In view of these limited effects, but in particular because of the Chow tests pointing to statistical differences between the results, more research is required if a satisfactory solution to the problem (existance) of sample selection bias is to be achieved.

All that can be said at the moment is that the evidence points to discrepancies between the results of a part-time participation regression estimated both on workers only, and on workers and non-workers, which although not very great are the direct consequences of sample selection bias.

The results that have emerged have drawn attention to the

(1) Though the problem is likely to be more accute when estimates of female labour supply are sought since, for example, male labour supply has fewer "missing" observations.

(2) Such as negative tax experiments: see Heckman & MaCurdy (1980 b).

age specific nature of sample selection bias as generated from the WES data. The strength of the bias has been identified by the significance of the Chow tests and furthermore by the simple (graphical) cross tabulations presented in the earlier part of this chapter. The nature of the bias - brought about through estimating a behavioural relation from non-randomly selected sample - appears strongest across the age groups described, but also through the effect of children (which would also be linked to age), most recent occupation, qualifications and respondents attitude to work.

The models here have used part-time employment as the mode of examination; the theme throughout this Chapter and thesis, has been the supply of part-time labour as distinct from full-time labour, and this Chapter has shown that sample selection bias as applied to the supply of part-time labour is quite evident.

Table 4.1 THE RESULTS FROM THE MULTIVARIATE REGRESSION ON WORKERS AND NON-WORKERS AND WORKERS ONLY. ALL AGES.

		1	2
		COEFFICIENTS	
DEPENDENT VARIABLE: PT WORK		WORKERS & NON-WORKERS	WORKERS ONLY
REGRESSORS			
YOUNGEST CHILD AGED	0 Yrs	0.313	0.317
	1-2	0.403	0.351
	3-4	0.333	0.304
	5	0.331	0.299
	6-10	0.294	0.280
	11-15	0.143	0.133
OTHER CHILDREN PRESENT AGED	0-2	0.179	*
	3-4	*	*
	5-10	0.067	0.064
	11-15	*	*
FAMILY INCOMPLETE YOUNGEST AGED	0-4	*	*
	5	*	*
	6-10	*	*
	11-15	-0.613	*
NO CHILDREN AGED OVER SIXTEEN YEARS		*	*
AGE AT FIRST BIRTH	15-19	-0.094	-0.091
	20-22	*	*
	23-24	-0.060	-0.079
	25-29	*	*
	30-34	*	*
	35-39	*	*
	40 PLUS	*	*
AGE AT PRESENT (MONTHS)		-2.290	-2.552
AGE SQUARED		-0.015	-0.014
EARNINGS POTENTIAL		-0.400	-0.375
REGION	NORTH	*	*
	E. MIDLANDS	*	*
	E. ANGLIA	0.107	0.115
	GLC	*	*
	S. WEST	0.032	*
	WALES	0.051	0.045
	SCOTLAND	*	*
QUALIFICATIONS	A-level	-0.106	-0.112
	O-level	-0.113	-0.121
	CSE	-0.062	-0.080
REMARRIED		-0.104	-0.108
DEPENDENTS		0.029	0.031
OWN MOTHER WORKED		0.020	
FAMILY INCOME		-0.030	-0.026
ATTITUDES		*	*
HUSBAND HELPS AT HOME		-0.100	-0.104
LAST JOB BEFORE FIRST BIRTH	PART-TIME	*	*
TOTAL TIME SPENT WORKING BEFORE IST BIRTH		0.001	0.001
UNEMPLOYED AS A FIRST EVENT		*	*
B1: BIRTH PATTERN		*	*
B2: BIRTH PATTERN		*	0.064
OVERALL F-STATISTIC		55.92	52.16
CONSTANT		0.048	0.083
R2		0.424	0.426
SAMPLE SIZE (N)		3725	3350

SOURCE: WES

Table 4.2 THE RESULTS FROM THE MULTIVARIATE REGRESSIONS ON WORKERS AND NON-WORKERS, AND WORKERS ONLY. AGED 20-40 YEARS, AND 40-60 YEARS.

DEPENDENT VARIABLE : PT WORK		20-40 YEAR OLDS		40-60 YEAR OLDS	
		WORKERS ONLY	WORKERS & NON-WORKERS	WORKERS ONLY	WORKERS & NON-WORKERS
ESSORS					
GEST CHILD AGED	0 Yrs	0.210	0.260	*	*
	1-2	0.237	0.340	*	*
	3-4	0.220	0.267	*	*
	5	0.207	0.263	0.337	0.354
	6-10	0.231	0.269	0.225	0.210
	11-15	0.083	0.132	0.137	0.119
R CHILDREN PRESENT AGED	0-2	*	*	*	*
	3-4	*	0.093	*	*
	5-10	*	*	*	*
	11-15	-0.058	*	*	*
LY INCOMPLETE YOUNGEST AGED	0-2	*	*	*	*
	3-4	*	*	*	*
	5-10	*	*	*	*
	11-15	*	*	*	*
CHILDREN AGED OVER SIXTEEN YEARS		-0.047	*	*	*
AT FIRST BIRTH	15-19	*	*	*	*
	20-22	*	*	*	*
	23-24	-0.095	-0.071	*	*
	25-29	*	*	*	*
	30-34	*	*	*	*
	35-39	*	*	*	*
	40 PLUS	*	*	*	*
AT PRESENT (MONTHS)		-7.703	*	*	*
SQUARED		0.081	0.018	0.010	0.010
INGS POTENTIAL		0.396	0.383	0.462	0.536
ION	NORTH	*	*	*	*
	E. MIDLANDS	*	*	*	*
	E. ANGLIA	0.133	0.147	*	*
	GLC	*	*	*	*
	S. WEST	0.064	*	*	*
	WALES	*	*	*	*
	SCOTLAND	*	*	*	*
LIFICATIONS	A-LEVEL	-0.092	-0.062	-0.121	-0.106
	O-LEVEL	-0.104	-0.091	-0.150	-0.148
	CSE	-0.068	-0.093	-0.074	*
RRIED		-0.056	-0.075	-0.139	-0.141
NDENTS		*	*	*	*
OTHER WORKED		*	*	*	*
LY INCOME		0.020	0.023	0.028	0.031
TUDES		*	*	*	*
AND HELPS AT HOME		-0.076	-0.074	-0.134	-0.132
T JOB BEFORE FIRST BIRTH PART-TIME		0.144	0.120	*	*
AL TIME SPENT WORKING BEFORE IST BIRTH		0.001	0.013	*	*
MPLOYED AS A FIRST EVENT		*	*	*	*
BIRTH PATTERN		*	0.076	*	*
BIRTH PATTERN		0.062	*	0.079	0.075
ALL F-STATISTIC		40.38	39.88	11.60	12.32
		0.551	0.520	0.246	0.249
STANT		0.018 ⊛	0.018 ⊛	0.264 ⊛	0.249 ⊛
PLE SIZE		1561	1781	1535	1639

⊛ insignificant

CHAPTER FIVE - MODELS OF LABOUR SUPPLY OVER THE LIFE-CYCLE.

INTRODUCTION

The work of two previous chapters, Chapter Three and Four, highlighted the distinction that can and has been drawn between women who work part-time and those who work full-time. The effect of dependent children on the decision to work either part-time or full-time has already been recognised; their effect over the lifecycle is also evident. Women do not remain either part or full-time workers; indeed, they move, often frequently, between these two states; sometimes due to the pressures involved in forming a family, and other times due to other responsibilities, such as caring for an adult dependent or redundancy/dismissal, ill health etc.

It is possible, using the WES data, to examine movements between the two (part or full-time) states by women, whose work histories are available. Specifically, by investigating the determinants of the fraction of a working life of time spent working part-time (and full-time)[1] it will be possible to determine some of the influences that cause women to work part or full-time and move between these two states.

This chapter examines the determinants of the fraction of

(1) An idea originally developed by Elias and Main (1982)

time spent (out of total available time for work) working part-time and working full-time in an attempt to draw attention to the distinction that can be seen to exist between part and full-time working women.

By examining the fraction of time spent working part-time and the proportion of time spent working full-time (out of the total available time), it will be possible to look at the life-cycle pattern of part-time and full-time employment. Through careful examination of the determinants of the fraction of time spent working in these two states, a picture will be built up of what actually persuades women to work part or full-time during the course of their working lives. This is undertaken in this chapter.

Section One of this Chapter reviews the model estimated by Elias and Main (1982), and reproduces their results on the fraction of time spent working part-time using the WES data. The model is then extended and improved upon in Section Two; in this section, the choice between part and full-time, is examined. The life-cycle decision to work in either/both of these states is examined, and some of the key influences on the decision to work in these states are described and discussed. The final section, Section Four, presents the main conclusions.

SECTION ONE

Elias and Main (1982) in their original study were interested in examining the supply of part-time female labour. Given the limitations of their data set - the National Training Survey (NTS), they were forced to examine the proportion of time spent working part-time during the ten year period 1965-1975. This section represents their model together with a partial replication using the WES data. In addition, the fraction of time spent working full-time and the fraction of time spent working in either state are also investigated. The variables used in this chapter are presented below - a discussion of the major differences between the variables used by Elias and Main and the variables used to replicate their work are also explained.

1.1 The Variables

The dependent variable is the fraction of working life spent working in a particular state, *ie*, either part or full-time for women aged over 24 years of age, following the specification of Elias and Main. Precisely, it is calculated as the total amount of time spent working as, say, a part-timer, divided by the total available time for work which is calculated on the amount of time since having left school to the date of the Survey. Women who have never worked full-time are excluded when the dependent variable is the fraction of time spent working full-time. This may involve the model estimated in a specification problem through truncation of the data set.

Elias and Main, on the other hand, calculated the proportion of time spent working part-time for women aged twenty-four years during the period 1965-1975 or more because of the nature of their data. Given this obvious difference in dependent variables, as well as the difference that will become apparent between the independent (explanatory) variables used some differences in results might be expected.

The Independent Variables:

(a) Personal Characteristics

The same personal characteristic variables used by Elias and Main were used in this chapter with one exception. The Elias and Main Race variable was omitted as it was not available from the WES. The variables included, under the heading of personal characteristics, based on the original Elias and Main study were: (abbreviations in brackets)

AGE:- age in months at time of the Interview/Survey

MARITAL STATUS:- a dummy variable representing whether married or not (MD) which assumes the value 1 if married and zero otherwise.

a dummy variable representing whether separated, widowed or divorced (SWD), which assumes the value 1 if separated, widowed or divorced, and zero otherwise.

CHILDREN:- a dummy variable; for having no children (NOKIDS) which assumed the value 1 if respondents had no children, and zero otherwise.

a dummy variable; for children present aged under four years (KIDS 0-4), which assumed the value 1 if children (a child) was present aged under 4 years, and zero otherwise.

a dummy variable for children present aged over four but under fifteen years of age (KIDS 5-15) which assumed the value 1 if children (a child) were (is) present aged 5-15, and zero otherwise.

(b) Qualifications and Training

Having no passes in school leaving exams and no post-school qualifications is the same variable in both the Elias and Main and replication study. Both of these variables are dummy variables.

- having no passes in school leaving exams (NOPASSES) which assumed the value 1 if respondents had no passes in school leaving exams and zero otherwise.

- having no post-school qualifications (NOQUAL) which assumed the value 1 if respondents had no post-school qualifications and zero otherwise.

Elias and Main incorporated a nursing and teaching qualification dummy into their multivariate study: in the results presented here these two Elias and Main variables are grouped together on a single variable as information was readily available from the WES in this form:

a dummy variable representing

- having either a nursing or teaching qualification (TEACH) which assumed the value 1 if respondents had either/both qualifications, and zero otherwise.

In addition to this combined qualification variable there is a further qualification variable:

OTHER PROFESSIONAL QUALIFICATIONS -

is a dummy variable representing the presence of any professional qualification other than a teaching or nursing qualification (OTHER) and assumed the value 1 if respondents had the qualification and zero otherwise and is included in both the Elias and Main and the replication study specification.

Finally in this section:

TRAINING:-

a dummy variable representing never having experienced any kind of training whilst at work (NOTRAIN) which assumed the value 1 if respondents never experienced training at work and zero otherwise. (In the Elias and Main specification their training variable is in fact the 'number of training occasions').

(c) Work Histories

Only one of the Elias and Main work history variables was reproduced in the replication study:

AVERAGE LENGTH OF EMPLOYMENT SPELLS -

which measures in months the average length of periods of employment (AVEMPLOY).

The variables omitted but included by Elias and Main include the number of periods not in employment. This was omitted from the final model since its calculation was too close to that of the dependent variables. This was not the case when Elias and Main estimated their model. When this variable was included in the specification it proved to be significant. However, it proved also to be highly correlated with the other variables in the model, and accordingly it was removed from the final version of the model presented in this Chapter.

(d) Regional Variables

As in the case of Elias and Main, four regional dummy variables were included in the specification : specifically these were

NORTH, NORTH-WEST, SOUTH-EAST and WEST

each assuming the value 1 if respondents lived in these areas, and zero otherwise.

SECTION TWO

THE RESULTS

(a) The Fraction of Time Spent Working Part-Time

The results of the determinants of the fraction of time spent working part-time of women who have ever worked part-time - following the Elias and Main specification outlined in 2.2 together with the results from the Elias and Main study are presented in Table 5.1

The overall fit of the replication model is similar to that of Elias and Main: 0.147 compared to their 0.175. The F-ratio for the whole equation, on the other hand, is quite different: 29.6 for the replication and 117.8 for Elias and Main's original study. However, the difference is due in part to the very much larger data set used by Elias and Main :they had a sample of 17471 from the NTS compared to only 2771 in the case of the replication study using WES data.

There are both striking differences and similarities between the original Elias and Main and replication study. It is to be expected that differences between the two studies should arise since slightly different dependent variables and explanatory variables were incorporated into the specification.

The effect of children is the same in both studies: children aged under four increase the fraction of time spent working part-time - by a factor of 0.047 in the replication study and by a factor of 0.097 in the Elias and Main study. Older children - those aged over 4 and under 15 (KIDS 5-15) years of age increase the fraction of time spent working part-time by a factor of 0.140 in the replication study and 0.103 in the Elias and Main study. Having no children at all increases the fraction of time spent working part-time in the replication study, but has the reverse effect in the Elias and Main specification. It is surprising to find this latter divergence of results across the two specifications especially since the two other children variables give similar results. It is difficult to give this variable (NOKIDS) an "a priori" sign since it is realistic to expect that having no children could either increase or decrease the fraction of time spent working part-time depending on respondent's preference for part or full-time employment. What is more important is to assess this positive effect (in the case of the replication study) in comparison to its effect described in the next sub-section when this variable is included in its specification of the fraction of time spent working full-time. NOKIDS is also positive but much larger in the fraction of time spent working full-time model

(See Table 5.2). It is also positive in the fraction of time spent working in either state.

Considering the significance of this variable (NOKIDS) it is important to consider its impact on the fraction of time spent working part-time in light of its effect on the fraction of time spent working full-time and its effect on the fraction of time spent working with no distinction being made for part or full-time: in all cases, as noted, the effect on the fraction of time spent working is positive. The most important factor here is that, while NOKIDS increases the fraction of time spent working in any category, its coefficient is largest in the case of the fraction of time spent working. Unfortunately Elias and Main were unable to examine the proportion of time spent working full-time or the proportion of time spent working in either state; accordingly no comparison can be made.

Being married, and being separated, widowed or divorced have opposite effects depending on the specification. In the case of the replication study, both these variables decrease the proportion of time spent working part-time:- this is surprising since it is largely married women who work part-time: 60% of all part-time work is undertaken by married women with children. Interestingly, the effect of these two variables is also negative when the dependent variable in the fraction of time spent working full-time or the fraction of time spent working in either state. Once again, it is important to assess the relative effect of these variables in light of their impact on the fraction of time spent working full-time in particular, and also working with no distinction being made for part or full-time. The effect of being married is similar in all three specifications. The effect of being separated is much stronger in the case of the model relating to part-time and one would expect separated, widowed and divorced women to work according to this pattern - namely less likely to work part-time than full-time since they have little financial support compared to the support given to a married woman.

Having no passes in school leaving exams increases the proportion of time spent working part-time in both studies. This is also true of having no post-school qualifications. It is to be expected that both these variables would increase the fraction of time spent working part-time since it is part-time work that is likely to require the least skills and at least historically in Britain, is concentrated in semi-skilled, semi-skilled domestic and unskilled areas of work. The absence of qualifications (and training - discussed next) are likely to lead to a lowering of earnings potential, as explained by standard human capital theory. The opportunity cost of working in poorly paid occupations with little hope of advancement - typical of much part-time work - is low in terms of forgone income. Thus, the absence of qualifications (and training) reduces the opportunity cost of not working, and also not working full-time, and similarly increasing the likelihood of part-time work and the fraction of time spent in part-time work.

Therefore part-time work is the most suitable to women with few (or no) qualifications. As has been shown in the two previous chapters, women with few qualifications tend to be concentrated in part-time work, rather than full-time work. Training also proves to be an important variable. In the replication study, having experienced no training at work increases the proportion of time spent in part-time work (with a coefficient of 0.028). E/M used the 'number of training occasions' to pick-up the same effect: having experienced training decreases the proportion of time spent working part-time (between 1965 and 1975) with a coefficient of -0.011. Clearly, training experiences of any form have a negative effect on part-time work such that the fraction of time spent working part-time is reduced. Once again, this is to be expected - as was shown in Chapter 3 - since part-time employment historically has shown women to have few qualifications and little training.

The effect of "AVEMPLOY" (the average length of employment spells) has opposite and significant effects in the replication and the original Elias and Main study, implying that longer spells of employment actually increase the proportion of time spent working part-time: whereas in the case of Elias and Main's original study the effect, though still significant, was negative. The positive effect of this in the replication study is not as expected since part-time work is usually viewed as a type of employment into which women can enter and exist with ease. Therefore, work experience is an important factor in a woman's current job opportunity and if it is split up by longer spells of continuous employment, then one would expect this variable to reduce the time spent in part-time employment. This would be the case unless women jump from not working to part-time omitting full-time work entirely.

The regional variables in the replication study of the fraction of time spent working part-time are all insignificant except for NORTH, but significant in the original Elias and Main study. It would appear that regional variations pay little role, if any, when the attention is turned to the WES specification.

The Elias and Main (1982) specification appears to have performed well when using WES data, with some modifications to the model, except perhaps for the regional (dummy) variables. The replication of the model developed by Elias and Main was worth undertaking in that it now provides a benchmark against which the revised and expanded model in the next section can be gauged.

Although different results have emerged when the Elias and Main model and replication model are compared, the overall theme remains true. This is, that age (life-cycle) and children (family formation) variables have an important role to play in determining the amount of time a woman spends working part-time; other important variables include qualifications and work history variables such as the absence of training at work. More is made of these variables in the next section when the wealth of information contained in the WES is tapped.

(b) The Fraction of Time Spent Working Full-Time

The results for the fraction of time spent working full-time, together with the results for the fraction spent working either part or full-time are presented here. Elias and Main were unable to examine these models due to the nature of their data. However, as was made apparent in section (a) above, it is important to include these models, if at all possible, since they provide a more complete picture of the distinction existing between part and full-time employment. More precisely, it tests whether the determinants of part-time and full-time differ.

Exactly the same variables described in 2.1 (ii) above are included in the specification here. As described before, those women who have never worked full-time are excluded from the sample, and as before only those women aged twenty-four or over are included. This produces a sample of 4454 women workers.

The overall fit of this model is very high in comparison to the one describing the fraction of time spent working part-time at 0.493. The overall F-ratio is 269.33. Some of the more interesting results are discussed below.

Young children, those aged under four years of age appear to increase the proportion of time spent in full-time work (while decreasing the time in part-time employment). Older children have the same effect on full-time: however, the effect is approximately twice the effect of younger children. Having no children increases the fraction of time in both part-and full time employment. This life-cycle effect is being captured by these children variables and suggests that previous work is likely to have been full-time. A typical pattern of full-time employment before childbirth and part-time after childbirth, thus, might be seen to exist.

Having no school leaving or post-school leaving qualifications reducesthe fraction of time spent in full-time employment in contrast to an increase in the time spent in part-time employment. Possession of either a nursing/teaching or 'other' professional qualification increases the fraction of time spent in full-time employment.

The most significant variable, as in the case of the model presented in Table 5.1, proves to be the 'average length of employment'. This variable has a coefficient of 0.002 (with a t-test statistic of 30.9) compares to 0.013 in the case of the proportion of time spent working part-time. On the whole the same variables are significant for both the fraction of time spent working part and working full-time.

(c) Fraction of Time Spent Working

The results in Table 5.2 (column 2) provide the final analysis in this section. The two previous subsections, (a) and (b), represented the proportion of time spent working part and full-time respectively; this subsection deals with the proportion of time spent working in either state which provides the final results. It is therefore important to consider how variables, such as the presence of younger children, effect not only the fraction of time spent in part-time work or full-time work but also the fraction of time spent in work of either type, if an overall picture of the determinants of women's supply of labour is to be achieved.

For example, having no children increases the fraction of time spent in part-time work - with a coefficient of 0.09. The same variable increases the fraction of time spent in full -time work (with a coefficient of 0.547) and the fraction of time spent working with a coefficient of 0.451. Clearly, it is important to recognise that while having no children increases the fraction of time spent in any form of work, the effect is different dependent upon the activity being considered.

The effect of children on the dependent variables are however, more complex: the presence of younger children (those under four years of age), as has been noted, tend to increase the fraction of time spent working full-time - with a coefficient 0.096, while decreasing the part-time equivalent with a coefficient of -0.040.

The effect of younger children on the fraction of time spent working is also positive, with a significant coefficient of 0.035. Older children on the other hand have strong positive effects on all types of employment; it would appear that the results from a model on fraction of time spent working averages the results presented for the fraction of time spent working part-time and working full-time. This suggests that care should be exercised when aggregating what appear to be two separate groups of women workers.

Having no school leaving or post-school qualifications increases the fraction of time spent working full-time while increasing the part-time equivalent. The effect on working generally, is also negative , but in the case of post-school qualifications insignificant.

The overall fit of this model - the fraction of time spent working - is good: with an R-squared of 0.407. These results have highlighted the complex decision working process that determines the choice between work and not working and part and full-time work. It is important therefore to assess this decision process in the full context of these different states of employment: part and full-time work. This is done more fully in the next section which uses the model estimated in a previous chapter.(1)

This section has shown that Elias and Main's original 1982 specification was a good beginning as an introductory investigation in the determinants of part-time work over the life-cycle. The results from the improved model have drawn attention to the importance of human capital approach to the choice made between part and full-time work over the life-cycle, as given by work experience and qualifications. The presence of children and of age have been examined, and are likely to be interrelated. Furthermore, these discussions have shown that aggregating part-time and full-time women workers into one sample of "workers" is likely to hide the often opposite effects of some variables - such as young dependent children - which tend to increase the likelihood of part-time work while decreasing the full-time equivalent. Interestingly, extending the sample to those aged under 24 years of age does little to alter the results.

1. Chapter Three

SECTION THREE

This section is concerned with the analysis of the decision process which causes women to choose between part and full-time work. The models estimated in a previous chapter[1] relating to the supply of labour - participation and hours of work - are re-estimated once again but the dependent variables are changed to those described in Section 2.2 of this chapter, namely: the fraction of time spent working part-time, the fraction of time spent working full-time and the fraction of time spent working in either part or full-time work. The results are given in Table 5.3.

These results - Table 5.3- relate to the fractions of time spent in these three activities for women of any age - whereas previously it had been restricted only to those women aged 24 years or more following the specification of Elias and Main. As before, in Section 2, only those women who have some work experience relevant to the dependent variable are included in the estimation sample, ie in the case of the fraction of time spent working part-time only those women who have ever worked part-time are included in the sample. The same applies to the other dependent variables. This procedure was followed as without it, it would have led to, in the case of the fraction of time spent working part-time in particular, a bunching of

1. Chapter Three

observations around zero for the dependent variable. The effect of this would have been to bias the results so forcing the best linear unbiased estimator of the regression being fitted towards a zero value for the dependent variable. In an attempt to pick up this effect, the fraction of time spent working in these three different states is re-estimated by choosing only those women who have ever worked and re-running the equation. The sample size in these models is 5237. Whilst these results are of some importance they are not presented in this chapter. However, they are commented upon; by carrying out this re-estimation a reference point is achieved against which the outcome is of direct interest - namely the fraction of time spent working part-time and the fraction of time spent working full-time - can be gauged.

3.1 The Regression Results of the Fraction of Time Spent Working Part-time

The results for the fraction of time spent working part-time are given in column 1 of Table 5.3 and relate to the sample of women who have ever worked part-time and of any age. Compared to the replication version - and the Elias and Main version in the earlier section - the overall fit is much improved improved, at R^2 0. 250 (compared to 0.147 in the case of the replication study of Section 1.3).

The most significant variables are the age terms (age in months and age squared) the log of earnings potential, the number of children aged over sixteen years of age and whether or not each respondent has received any training whilst at work. Specifically older women tend to work part-time, such that the age variable has a positive effect (0.43) on the fraction of time spent working, with the usual negative age squared term included to catch the declining vintage effects of very old women. The log of earnings potential has as expected a significant effect: in this instance it has an elasticity of 0.234 - suggesting that high earnings potential increases the proportion of time spent working part-time. Interestingly, the size of the same variable's coefficient is much larger in the case of the fraction of time spent working full-time: with a coefficient of 0.331. This is as expected, and coincides with the results presented in Chapter 3; namely that women with higher earnings potential will tend to work full-time rather than part-time. At least historically this is to be expected since part-time jobs tend to require the least skills, and echoes again the human capital effects discussed earlier.

The presence of older children is interesting in that it has a positive coefficient while younger children, particularly those under ten years of age are seen to have an insignificant impact on the proportion of time spent working part-time, noted in Section 2 - where similar results emerge - this is largely a life-cycle effect: in essence, women who have recently had children - such that the children are young in age - are more likely to have worked full-time on a typical pattern of full-time, childbirth and part-time afterwards. This is a particularly interesting result given the importance of these (young) children variables as noted in Chapter 3 - relating to the participation models of labour supply.

3.2 The Regression Results of the Fraction of Time Spent Working Full-Time

The same variables described in a previous chapter - Chapter 3.2 - are incorporated into a model of the fraction of time spent working full-time. Only women who have worked full-time at least on one occasion during their life time are included in the estimation sample, ie all ages included. The The same variables described in the previous section on the part-time work prove to be significant. In addition to these variables a number of other variables prove to be significant. Given the large number of significant variables it is not surprising to find the overall fit of this model with an R^2 of 0.623. In light of the results relating to part-time work above (3.1) the results pertaining to the fraction of time spent in part-time work are discussed in order to provide an overview of the decision process that causes women to choose between part and full-time work.

Unlike the case of the fraction of time spent in part-time employment, all of the children variables prove to be significant. Children of all ages, including those over 16 years of age deter full-time employment (the fraction of time spent in full-time work): with children aged between 6 and 10 years of age exerting the greatest effect. The age of the second youngest child also exerts this negative effect. Perhaps more interestingly the age of the youngest child, when the family is incomplete, has differing effects on the fraction of time spent in full-time employment dependent upon the age of that child; eg, under two years of age the effect is positive, aged between three and four the effect is positive; elsewhere, as in the case of the fraction of time spent in part-time employment, the effects are insignificant: reiterating the life-cycle effects described earlier.

In contrast to the fraction of time spent in part-time employment the qualification variables all <u>increase</u> the fraction of time spent in full-time work - although in the case of the former (part-time) only, the A-level variable (QUAL 3) has a positive coefficient. As noted in Chapter 3, it is to be expected that more qualified women tend to work in full-time jobs as these (generally) require more skills and stronger human capital qualities than do part-time jobs. Education - as measured by these qualification variables - like earnings potential is an indication of the opportunity cost of not working. The higher it is the more likely is work going to take place. Given the historical position of part-time work in the UK today ie in low paid, low skill and undemanding positions of employment, these qualification (education) effects are as would be expected. It is possible that there could be some multicolinearity between qualification dummy variables (for which the omitted dummy variable in having no qualifications) and the log of earnings potential. However, the degree of linearity between the qualification variables and the earning potential variable was negligible.

The effect of the age variable is positive, and with a coefficient of 0.62 it is larger than the part-time equivalent of 0.43. The coefficient reported on the fraction of time spent working (1.192) highlights the fact that older women tend to work in other forms of work: in particular, the three positive coefficients suggest that a woman's age - and the older she is - has a strongly positive effect on the fraction of time spent working (both part and full-time).

A variable was included to indicate whether a husband who helps with the housework must be viewed as an asset by any woman who has to, or wants to work. A helping husband releases time for women to engage in paid work - part or full-time - and so adds to the opportunity cost of paid work relative to home (house) work. Becker and the "new home economics" (1)

1. Becker (1981)

argues that the division of labour within the home (where women traditionally do the housework) is rational only if men's potential earnings from paid work are sufficiently higher than women's. Clearly, what Becker is suggesting is that the division of labour within the household is rational if men's potential earnings from paid employment relative to wives' potential earnings are sufficiently high. The inclusion of such a variable in a model of a woman's labour supply - or in this case the fraction of time spent working part/full-time - as an explanatory variable may involve simultaneity problems. However, because of the limited information available in the WES data it was not possible to include this variable. The effect of a helping husband on the supply of labour as described here may in fact be reversed. The causal effect may be from a woman working who in turn requires her husband to help with the homework because of the pressure on her time. From the evidence presented here it is difficult to decide upon the actual direction of the effect.

Notwithstanding this, rationalisations attributable to the school of new home economics of the labour market, highlights the fact that the decision to work part-time or full-time, or to work or not to work etc. needs to be seen in a household context alongside the husband's decision (for married women only). Unfortunately no data are available on work histories of both husband and wife together, and as before would be difficult to handle due to simultaneity problems and accordingly thus interpretation problems.

The importance of the husband who helps with housework variable increases the fraction of time spent in full-time work - with a coefficient of 0.02. This compares with a negative value of 0.025 on the part-time equivalent. Since full-time work, by definition requires more hours of work, it is not surprising to discover such an effect. The same variable has an insignificant effect on the fraction of time spent working in either part or full-time work - this is perhaps to be anticipated given the opposing effects this variable has on the fractions of time spent working part-time and working full-time. Interestingly these results correspond to the results presented in Chapter 3.

3.3 Regression Results on the Fraction of Time (Part-time and Full-time) Spent Working

In the previous two sub-sections (I) and (2) some of the most interesting results to have emerged from the multivariate study presented in Table 5,3 have been discussed in an attempt to identify the fundamental differences between the principal determinants of the fractions of time spent working part-time and spent working full-time. In this sub-section - which completes the picture - the proportion of time spent working (with no distinction being made for part and full-time work) is analysed in terms of the same variables previously described.

The 'proportion of time spent working' model provides an R^2 of 0.744 and it produces the best fit of all: see Table 5.5 below.

Table 5.5 R-Squared Values of Fraction of Time Spent Working Models

		R^2
Fraction of time spent working	part-time	0.250
	full-time	0.623
	part-time & full-time	0.744

In most cases the same signs reported in column 2, for the fraction of time spent working full-time, are repeated in the fraction of time spent working. For instance, as before, the same children variables except two of the "age of youngest child family incomplete" variables are negative. The other most interesting results, relating to age and husband helping at home have already been discussed, and are similar for the fraction of time spent working part and full-time.

In addition to these variables, the log of earnings potential, experienced training, age of second youngest child and qualifications all prove to be significantly important determinants of the fraction of time spent working.

As noted previously, high earnings potential and qualifications increase the fraction of time spent in work: presumably through opportunity cost effects which have already been described. The age of the second youngest child (4 dummy variables) are all very significant and have negative values - as was the case in the fraction of time spent working full-time. In the case of the fraction of time spent working part-time they all proved to be generally insignificant - certainly at the 1% level. The negative effect of children on work is therefore maintained and the effect they have has been quantified; for example, children aged between 5 and 10 years (as the second youngest child) have the strongest (and most significant) impact on the fraction of time spent working, and working full-time: with coefficients of -0.130 and -0.147.

3.4 The Non-Truncated Sample

Briefly in Section 3.2 the problem of truncation was discussed. The model of the fraction of time spent working part-time was based on the sample of women who had experienced some part-time work during their work histories. Similarly, the only sample of women who had ever worked full-time were included in the estimation population for the fraction of time spent working full-time.

This subsection briefly describes some of the results from a re-estimation of the models described in Section 2 above (and presented in columns 1 and 2 of Table 5.3) for the fraction of time spent working part-time and the fraction of time spent working full-time. The only difference is that women with any work experience at all are included in the estimation population <u>ie</u> women who have some full-time work experience but no part-time experience are still included in the population used to re-estimate the fraction of time spent working part-time, and vice versa for full-time. The sample size is 5237.

The overall fit of both models is slightly increased: in the case of the fraction of time spent working part-time it is increased to 0.291 (compared to 0.250). For the full-time model it is just increased to 0.625 (compared to 0.623).

On the whole, the same overall fits of the models are maintained. Similarly, the same signs on coefficients are preserved throughout the models. The only difference to occur, and this is to be expected, is the magnitude of the parameters. Unfortunately, no clear rule emerges: the "truncated-sample", generally, does not have either larger or smaller coefficients than the larger non-truncated sample of 5237 women; instead, it has a mixture of larger and smaller parameter estimates. For instance, refering to the part-time model having an A-level or above is -0.014 in the non-truncated sample. On the other hand, the age in months variable is larger in the non-truncated sample 0.472 compared to 0.430.

However complex the differences may appear between the two samples, the fact remains that on the whole the differences are minor. The overall effect of the truncation - ie excluding women with certain work experience absent from their histories, has not resulted in dramatic alterations to the overall fit of the model and neither has it changed the significance or the signs of the explanatory variables. Its only effect has been to alter the size of the coefficients, and then only marginally.

3.5 An Overview

Women on the whole do not remain in continual employment throughout their working lives. They move from employment to non-employment and vice versa, and between part and full-time employment. This chapter has been concerned with identifying some of the factors that determine the extent to which women move within these categories: in particular the emphasis has been to identify the principle factors which determine the fraction of time spent in part-time employment. This has been aided by simultaneously assessing the principle determinants of the proportion of time spent either working or working full-time only.

It has been convincingly shown that children increase and decrease the fraction of time spent working part-time and working full-time, respectively; the pressure children exert on wives' time has been described here and elsewhere - and this is born out here.[1] Qualifications clearly increase the likelihood of full-time employment, and employment generally, while determining the part-time equivalent, in as much as they are seen to have generally significant effects on the proportion of time spent working part-time and full-time.

The most significant variables in all cases are the age and age squared variables (with a high t-statistic of 60.1) in one instance.[2] Similarly marital status is negative: both being married and separated, widowed or divorced has a negative effect on all three dependant variables. This implies, perhaps correctly, that it is non-married and (ie single) women who are most likely to work, and also are likely to spend a larger fraction of time in work.

The imputed earnings variable is also highly significant. Once again, as expected, it implies with its consistently positive effect, that women with higher earnings potential

1. As discussed in Chapter Three.
2. See Table 5.3.

(*ie* those with higher opportunity cost associated with not working) are more likely to work than those with lower earnings potential. Since the coefficient is lower in the case of the proportion of time spent in part-time employment as compared to full-time employment it follows that women with high earnings potential are more likely to work full-time and to have spent more time in full-time employment than part-time employment. However, it must be remembered that the earnings variable discussed is also positive in the case of the proportion of time spent working part-time implying that high earnings potential increases part-time employment possibilities also, and this is a particularly interesting result in that it suggests that part-time work is influenced by the opportunity costs involved of not working. In this respect at least, part-time work and full-time work are similar. The log of earnings potential proves to be very significant and positive in all three cases (see Table 5.3): the largest coefficient (0.38) relates to the fraction of time spent working part-time (0.234). Earnings potential - which measures the opportunity cost of not working - has a stronger effect on the fraction of time spent working full-time - with an elasticity of 0.331, than on the part-time equivalent at 0.234.

SECTION FOUR

CONCLUSION

The first section in this chapter addressed itself to a replication (as far as was possible) of the model described in Elias and Main (1982). The aim was to investigate the determinants of the fraction of time spent working part-time and to highlight some of the key variables.

The work carried out in that Section provided the stimulus for the models investigated and reported in Sections Two and Three relating to the fraction of time spent working part-time; the fraction of time spent working full-time, and the fraction of time spent working in either state. The life-cycle effects as given by the life-cycle pattern of work enjoyed by many women has been examined. In particular it appears important to recognise the extent to which women switch between the different states - of working part-time, working full-time and not working at all - as important considerations in the life-cycle pattern of working. This chapter has been able to incorporate some of the life-cycle and work history information contained in the WES to quantify some of these more interesting life-cycle effects.

This chapter has shown that the variables described in Chapter 3 which proved to be important determinants of current work status (participation) and of hours of work are also important variables in the determination of the fraction of time spent working part-time (and full-time) by women respondents in the WES. In particular these variables are clearly important factors in determining why some women change their current work state.

The principle variables, age of youngest child, marital status, earnings potential and qualifications outlined in Chapter 3 are once again seen to be important variables in the decision making process persuading women to switch between part and full-time work. In addition it has been found that some variables are important factors in the decision process, such as present age which has a positive effect on all three work states, as indeed does the earnings potential.

The key variables that can be seen to be important factors determining the proportion of time spent in part-time employment as compared to full-time employment have been described. Notwithstanding this the decision process must be seen as complex: it would have been too much to expect all variables to have, say, positive effects on the proportion of time spent in full-time employment though this is the case for some variables such as age at first birth. Rather, as in the case of log of earnings potential variable, the effect on both part and full-time employment is positive but with size difference. Therefore, it is important to analyse the determinants of the fraction of time spent working part-time (the aim of this chapter) in the light of the determinants of the fraction of time spent in full-time employment if a complete picture is to be achieved; and clearly this has shown by the results presented in this chapter.

The fraction of time spent in part-time work has added to the analysis and understanding of the supply of part-time labour first described in Chapter 3. It is clear that the same variables that effect and determine the level and type of participation are also significant in determining the fraction of time spent in part-time employment.

In the next chapter (Chapter 6) the same set of variables used in this chapter are incorporated into a model designed to analyse the choice of work (part or full-time) at the time of returning to work <u>after</u> the birth of the first child. This will provide another snapshot view of the determinants of the decision to work either part or full-time. Similarly, it will provide a snapshot view of the decision to work at an unusual[1] point in the life-cycle - in this instance at the return to work after the birth of the first child.

(1) Unusual since it has not previously been analysed in this context.

APPENDIX 5

Table 5.1:

FRACTION OF WORKING LIFE SPENT IN PART-TIME EMPLOYMENT. WOMEN AGED 24 YEARS OR OVER.

	NTS DATA ELIAS AND MAIN		WES DATA REPLICATION	
PERSONAL CHARACTERISTICS				
Age	0.014	(30.6)	-0.003	(-6.2)
Married	0.164	(12.4)	-0.0442	(-1.7)
Widowed/Sep/Divorced	0.046	(2.7)	-0.065	(-2.3)
No Children	-0.052	(-2.8)	0.090	((5.9)
Children 0-4 Yrs	-0.097	(-4.6)	-0.040	(-3.7)
Children 5-15 Yrs	0.140	(7.4)	0.103	(1.7)
Race	-1.41	(-6.5)	———	
QUALIFICATIONS & TRAINING				
No Passes In School Leaving Exams	0.043	(4.9)	0.016	(2.1)
No Post-School Qualifications	0.051	(6.0)	0.001	(0.4)
Nursing Qualification	0.063	(3.4)	0.004	(0.4)
Teaching Qualification	-0.062	(-3.7)		
Other Professional Qualification	-0.072	(2.4)	0.077	(2.3)
No. Of Training Occasions	-0.011	(-7.6)	0.028	(4.1)
WORK HISTORY				
Average Length Of Employment Spells (Yrs)	-0.013	(-21.6)	0.002	(18.7)
No. Periods Not In Employment	-0.035	(-8.2)		
(Proportion of Working Life In Labour Force)	———		———	
REGIONAL VARIATION				
North	-0.044	(3.3)	-0.028	(2.3)
North-West	-0.034	(-3.4)	-0.007	(-0.7)
South-East	0.030	(3.5)	0.008	(0.9)
Wales	-0.091	(-6.1)	0.012	(1.0)
CONSTANT TERM	-0.245		0.149	(2.4)
R^2	0.175		0.147	
F Ratio	177.79		29.60	
Sample Size	17471		2771	

T STATISTICS SHOWN IN PARENTHESES

Table 5.2:

FRACTION OF WORKING LIFE OF WOMEN - AGED 24 YEARS OR MORE, SPENT IN FULL-TIME, AND, IN BOTH FULL-TIME AND PART-TIME EMPLOYMENT.

REGRESSORS:	PROPORTION FULL-TIME		PROPORTION EMPLOYMENT	
PERSONAL CHARACTERISTICS				
Age	-0.006	(-15.8)	-0.005	(14.0)
Married	-0.059	(-4.3)	-0.017	(-1.3)
Separated/Wid/Divorced	-0.017	(-1.1)	-0.014	(-0.9)
No Children	0.547	(51.3)	0.451	(43.3)
Children 0-4 Yrs	0.096	(10.6)	0.035	(3.9)
Children 5-15 Yrs	0.188	(3.8)	0.162	(3.4)
QUALIFICATIONS & TRAINING				
No Passes In School-Leaving Exams	-0.042	(6.0)	-0.016	(-2.4)
No Post-School Qualifications	-0.025	(-2.4)	-0.003	(0.3)
Teaching & Nursing Qualifications	-0.031	(-1.0)	0.040	(0.2)
Other Professional Qualification	0.048	(5.8)	0.056	(6.8)
Training	0.018	(2.8)	0.088	(13.6)
WORK HISTORY				
Average Length Of Employment Spells	0.002	(30.9)	0.003	(33.7)
REGIONAL VARIATION				
North	0.008	(0.6)	-0.017	(-1.3)
North-West	-0.009	(0.9)	0.007	(0.7)
South-East	-0.020	(-2.6)	-0.006	(-0.8)
Wales	-0.050	(-4.4)	-0.045	(-3.9)
CONSTANT TERM	0.379	(7.3)	0.432	(8.5)
R^2	0.493		0.407	
F-Ratio	269.32		191.72	
Sample Size	4454		4486	

TABLE 5.3:

REGRESSION RESULTS: FRACTION OF TIME SPENT WORKING

-DEPENDENT VARIABLES -

Variables:		PROP.PT 1		PROP.FT 2		PROP.PT & FT 3	
AGE OF YOUNGEST CHILD							
	0	0.015	(0.6)	-0.07	(-4.2)	-0.058	(-4.9)
	1-2	0.007	(0.4)	-0.091	(-6.7)	-0.079	(-8.1)
	3-4	0.014	(0.9)	-0.091	(-6.9)	-0.060	(-6.3)
	5	0.015	(1.1)	-0.107	(-8.5)		
	6-10	0.016	(1.4)	-0.128	(-12.8)	-0.079	(-11.0)
	11-15	0.023	(2.4)	-0.125	(-14.6)	-0.064	(-10.2)
AGE OF SECOND YOUNGEST CHILD	1-2	0.028	(0.8)	-0.98	(-4.2)	-0.117	(-7.0)
	3-4	-0.007	(-0.3)	-0.075	(-4.7)	-0.094	(-8.1)
	5-10	0.004	(0.4)	-0.147	(-14.0)	-0.130	(-17.0)
	11-15	0.016	(1.6)	-0.107	(-11.5)	-0.084	(12.5)
AGE OF YOUNGEST CHILD FAMILY INCOMPLETE	1-2	-0.028	(-1.5)	0.042	(3.1)	-0.002	(-0.2)
	3-4	0.085	(1.3)	-0.283	(-4.5)	-0.251	(-6.1)
	5-10	0.007	(0.2)	0.041	(1.2)	0.034	(1.4)
	11-15	-0.010	(-0.8)	-0.044	(-0.4)	-0.001	(-0.006)
QUALIFICATION	A-LEVEL	-0.022	(2.1)	0.028	(3.5)	0.019	(3.3)
	O-LEVEL	-0.007	(-0.8)	0.062	(8.7)	0.045	(8.9)
	CSE	-0.008	(-0.9)	0.048	(6.2)	0.027	(5.0)
AGE		0.430	(8.2)	0.623	(15.3)	1.192	(40.6)
AGE-SQUARED		-0.007	(-11.4)	-0.018	(-37.3)	-0.022	(-60.1)
MARRIED		-0.006	(-0.3)	-0.104	(-8.9)	-0.055	(-6.5)
SEPARATED/WIDOWED/ DIVORCED		-0.031	(-1.5)	-0.068	(-5.4)	-0.054	(-6.0)
AGE AT FIRST BIRTH							
	15-19	0.130	(5.5)	-0.092	(-6.8)	-0.064	(-6.6)
	20-22	0.035	(2.6)	-0.060	(-5.8)	-0.032	(-4.3)
	23-24	-0.001	(-0.07)	-0.014	(-1.2)	-0.014	(-1.7)
	25-29	-0.011	(-1.3)	0.005	(0.7)	0.002	(0.3)
	30-34	-0.018	(-1.9)	0.043	(-5.1)	0.024	(3.9)
	35-39	-0.037	(-3.0)	0.104	(9.4)	0.055	(6.9)
	40 PLUS	-0.087	(-5.4)	0.113	(9.1)	0.005	(0.6)
LOG EARNINGS POTENTIAL		0.234	(11.6)	0.331	(21.9)	0.380	(34.9)
FAMILY INCOME		0.004	(1.9)	-0.002	(0.9)	0.003	(2.0)
ADULT DEPENDENT		0.002	(-3.5)	-0.007	(-0.9)	-0.003	(-0.5)
NO.OF CHILDREN OVER		0.020	(6.7)	-0.032	(-12.1)	-0.010	(-5.3)
ATTITUDE TO WORK		-0.022	(-3.5)	-0.001	(-0.2)	-0.023	(-6.0)
OWN MOTHER WORKED		-0.005	(-0.7)	-0.011	(-2.2)	-0.111	(3.0)
EXPERIENCED TRAINING		0.025	(3.9)	-0.022	(-3.6)	-0.017	(4.0)
HUSBAND HELPS		-0.018	(-2.7)	-0.020	(3.4)	0.002	(0.6)
CONSTANT		0.262	(11.8)	0.905	(71.1)	0.922	(100.5)
R-SQUARED		0.250		0.623		0.744	
F-RATIO		26.36		236.38		419.99	
SAMPLE SIZE		2882		5195		5237	

CHAPTER SIX - THE FIRST RETURN TO WORK AFTER THE BIRTH OF THE FIRST CHILD.

SECTION ONE

1.1 INTRODUCTION

The previous chapters have sought to provide an insight into the distinction that can and has been drawn between part and full-time work. Throughout, it was clear that the decision many women make to choose either part-time or full-time work could be captured by a range of variables including children variables, qualifications and work history variables.

This chapter takes the unique opportunity provided by the WES to examine some of the determinants of the choice women make between part and full-time work at the time of returning to work for the first time after the birth of the first child. By including in the sample only those women who have returned to work after the birth of their first child it is possible to assess the decision made between part and full-time work in the light of some of the findings of earlier chapters.

The point of returning to work after the birth of the first child represents a unique position in the life-cycle of working women. Furthermore it indicates the existence of the dual role women face as discussed in Chapter Two, principally, the role of housewife and mother and that of worker. Dex (1984b) has shown that women tend to undertake part-time work upon returning to work after the birth of children. This chapter concentrates on this position in their life-cycle and identifies some of the key decision making variables: some of the variables used in previous chapters are used again, along with other variables, in an attempt to describe the decision making process - all variables, relate to the time of first return to work after the birth of the first child.

As was discussed in Chapter 3, it is not strictly appropriate to estimate a binary choice (dependent variable) model by OLS since it will produce inefficient parameter estimates - a problem known as heteroscedasticity, which was discussed at length in Chapter Three. Accordingly, maximum likelihood estimates techniques have been employed to overcome the heteroscedasticity problem. The results from an investigation into the determinants of the first return after the birth of the first child being in part-time employment are discussed in the following sections.

SECTION TWO

THE MODEL

This section describes the variables incorporated into a model of the determinants of the first return after the first birth. The variables used are reported below:

2.1 The Dependent Variable

The dependent variable is a binary choice dummy variable, taking the value one if women worked part-time upon returning to work after the birth of the first child. The value zero was assumed if the woman returned to full-time work. Only those women who returned to work after the birth of the first child are included in this sample. The sample size is therefore 3083.

2.2 The Independent Variables

The following independent variables regressed on the above dependent variable, are described below: their abbreviations - as presented in Tables 6.1 & 6.2 - are given in parenthesis.

(a) AGE: the age of women is described by means of a cohort variable (COHORT) which divides women into groups of age specific individuals. The age bands, nine in all, are:

16-19, 20-24, 25-29, 30-34, 35-39, 40-44, 45-49, 50-54, 55-59 years.

The first age group assumes the value 1, and the latter 9. As was noted in the previous chapters, the decision to work part or full-time varies over a woman's life. This variable has been designed to capture how this decision might be expected to vary.

(b) FAMILY FORMATION VARIABLES

(i) Own Child Died Before The Return To Work: if the death of the first child occurred before the return to work the variable assumed the value one, and zero otherwise, (CHILD DIED). The effect of children, particularly young children has already been discussed (see Chapters 2, 3 and 4) - it is children that generally cause women to reduce their supply of labour and even leave the labour market; this variable recognises this fact and attempts to examine the effect of returning to the labour market with the constraint of children removed. It is to be expected that this variable would increase the likelihood of full-time work and would therefore have a negative effect on the dependent variable.

(ii) Whether Or Not Divorced At The Time Of First Return: women who at the time of their first return to work after the birth of their first child were divorced assumed the value one, otherwise zero. It is to be expected that women who returned to work divorced are likely to feel financial pressures more than married women. Accordingly, these women are more likely to work on a full rather than part-time basis. The expected sign therefore on this variable (DIVORCE) is negative. More precisely, it is to be expected that being divorced at this point in time increases the likelihood of full-time work and decreases that of part-time work.

(iii) Number Of Older Children: the effect of children, young and old, have already been described in previous chapters. This variable simply records the number of dependent children over sixteen at the time of the first return to work after the birth of the first child. Older children are inclined to invoke financial pressure on parents, rather than attentive (ie time) pressures. It is, therefore, perhaps to be expected that older children lead women to seek full-time rather than part-time work since the former (full-time work) involves greater hourly rates of pay - on the whole - and greater earnings, at least historically. The expected sign on this variable (No.of OLDER CHILDREN) is therefore positive, as it decreases the likelihood of working part-time when returning to work for the first time after the birth of the first child.

(iv) Age Of Youngest Child: the age of the youngest child has been shown to be an important factor influencing the decision to work part-time at an instance in time (Chapter 3) and in the previous chapter - the life-cycle decision to work part-time. At the time of returning to work after the birth of the first child, the age of the youngest child is recorded, in months (NAGE). The impact on the explanatory variable - whether or not part-time work is undertaken at the time of returning to the labour market after the birth of the first child - is expected to be positive.

(v) The Time Between The Birth Of The First Child And First Return To Work: the distance, in months, is measured between the birth of the first child and the first return to work, (RETURN). This variable may be seen to have a significant impact on the decision to return to work as a part-timer or a full-timer as it is likely that longer periods of non-employment would be associated with a return to part-time work rather than full-time work since it is part-time work that generally requires the least skill and allows the simultaneous (dual) roles of work and motherhood to be fully maintained.

(vi) Age At First Birth:

The same age at first birth variables as in Chapter 3 were incorporated into the model. These are:

B16-19	birth took place between ages	16yrs - 19yrs
B20-22	" " " " "	20yrs - 22yrs
B23-24	" " " " "	23yrs - 24yrs
B25-29	" " " " "	25yrs - 29yrs
B30-34	" " " " "	30yrs - 34yrs
B35-39	" " " " "	35yrs - 39yrs
B40 +	" " " " "	40yrs and over

(c) HUMAN CAPITAL VARIABLES

(i) Occupation: The occupational group that women move into at the time of returning to work at this particular point in their life-cycle should be a key explanatory variable in the decision making process. Five occupational categories were established; others were experimented with, but these, reported below, gave consistently the best results. A full description of these can be found in the Appendix.[1]

A. Professional and teaching occupations

B. Nursing, medical and social occupations and other intermediate non-clerical occupations

C. Clerical occupations

D. Skilled (manual) occupations and semi-skilled occupations

E. Others (omitted group)

Occupational groups A to D are all dummy variables assuming the value one if the individual belongs in the category, and zero otherwise. The omitted category is E.

(ii) Qualifications: The same qualification variables as in Chapter 3 are included here. These are:

(i) Qual 1 - CSE only
(ii) Qual 2 - O-level
(iii) Qual 3 - A-level or above.

The remaining variables, "Own Mother Worked", "Family Income", "Attitudes to Work", and "Distance", have all been explained in full in Chapter 3. The only variable not included before, and requiring explanation is:

1. Appendix 8.8

(d) Unemployment: the level of female unemployment at the date of each woman's return to work was recorded and included in the model. As a common measure of the state of the labour market it is included here to capture demand effects as well as the state of market in which these women are acting.

Summary Of Expected Results

Some of the *a priori* effects of variables have already been discussed in this section. However, they are worth summarising here before the model is fully tested.

The effect of children on the dependent variable, the choice of part-time work upon returning to the work for the first time after the birth of the first child, as given by the variable described by (b) is likely to be negative; *ie* having experienced the death of a child before returning to work should increase an individual's desire to work full-time rather than part-time. Being divorced is also likely to increase the likelihood of full-time work and decrease the chances of part-time work being observed, as in the case of dependent children being present at home aged over 16 years of age.

The remaining "child-variable", the age of the youngest child at the time of the first return to work after the birth of the first child, has been discussed; but suffice to say, it should increase the chances of part-time work for reasons already made clear.

The different occupational (dummy) variables that have been experimented could give effects on the dependent variable of either way. The rationale behind including those variables is to test the human capital approach to the decision a woman makes when she chooses either part or full-time work at the point in her life-cycle being discussed here (ie after the birth of her first child). Most part-time jobs are likely to be found in the less prestigious occupations - such as clerical occupations, rather than say, professional occupations. As a woman returns to work she is more likely to return to a similar occupation as the one she left before the birth of her first child rather than a 'lower' occupation as this will involve an opportunity cost. If she does return to a lower occupation, because, perhaps, it offers the choice of part-time work (and therefore the maintenance of her "dual" roles) then some opportunity cost may be involved. The occupational variables test for this effect.

Having a mother who worked cannot be given an a priori sign; and this is true of some of the other variables: "family income", "the age of the woman at marriage", "her attitude to work" (should women who have pre-school children remain at home and not work, scoring 1 if the answer was positive and zero otherwise), and "distance" (the length between marriage and the birth of the first child, in months).

The final variable included in the model is the level of unemployment at the date of each woman's return to work. This variable allows for demand side considerations to enter into the model. Again, no a priori sign can be attached. It is difficult to infer much from a single variable like 'unemployment', because, as Robinson and Wallace (1984) make clear unemployment is in aggregated form, aggregating across segmented labour markets; if segmented labour markets exist, and women belong to just one of these markets, perhaps one for part-timers, then segmented markets could experience different, perhaps contradictory, effects from a single aggregated unemployment change. However, the unemployment variable described is included here as a measure of the state of the labour market, and as will become apparent, appears to be a worthwhile inclusion.

During periods of unemployment part-time work may be the easiest form of employment to reduce - from the employers' point of view, given the few employment rights that full-time workers get that can be extended to part-timers. Accordingly, it would be expected that unemployment periods would see a reduction in the number of part-time jobs and therefore a negative coefficient. On the other hand, during periods of unemployment, employers may "shake-out" costly *ie* full-time labour while maintaining a skeleton part-time labour force - counter and counter-counter argument exist, and hence it is difficult to assign any *a priori* value to this variable.

SECTION THREE

THE RESULTS

The First Return To Work After The Birth Of The First Child

The models described in Section Two above are estimated by maximum likelihood procedures. Precisely, the form of model estimated is logit and probit. Because of a problem of heteroscedasticity associated with the estimation of binary choice model (where the dependent variable is by definition a zero-one dummy variable) by Ordinary Least Squares, the models are estimated by maximum likelihood logit and probit techniques.

The results are presented in Tables 6.1 & 6.2. The model of the first return to work after the birth of the first child includes all or most of these variables outlined. The results reported relate to models estimated by logit and probit - for comparative purposes, and also an allowance is made for the causality that is likely to exist between NAGE (age of youngest child/and RETURN (the length of time between return to work and exit from the labour market)): precisely, a model is presented which includes all the variables, then Nage and Return are separately removed to allow for this possible multicollinearity problem.(1)

Chapter Three - on the supply of labour as given by participation and hours of work equations - drew attention to the distinction that can be drawn between logistic and cumulative normal (probit) distributions. Given the slight differences made about the assumption of the shape of the distribution of the data some results for both probit and logit models are presented. A complete range of logit and probit models are not presented here since the differences between these distributions have been discussed in Chapter Three - furthermore, the principal aim of this chapter is a preliminary investigation into the determinants of the type of work undertaken (part or full-time) upon returning to work after the birth of the first child.

1. Upon investigation, it is clear that these two variables did not suffer from severe collinearity.

3.1 An Overview of the Results

The results are presented in Tables 6.1 & 6.2. All the variables prove to be significant at the 5% level of significance: however, as was noted in an earlier chapter,[1] these "normal" tests of significance do not apply directly here since they assume a normally distributed model. Care therefore has to be exercised when drawing from conclusions about the significance variables that appear to be close to the normal "cut-off points".

The presented results give very similar overall fits; the scaled deviance terms vary from 35,800 to 35,880 giving a log likelihood ratio of range - 17,900 to-17,940. The overall fits are therefore very good: the critical point for the scaled deviance is approximately the number of observations as derived from the Chi-squared distribution,[2] which is 3093. Clearly, comparing 35,800 to 3053 indicates that overall the model fits very well and that the included variables have values significantly different from zero.

In any econometric model some multicollinearity will exist. The model described here in this chapter was carefully scrutinised with this in mind. Because of the potential collinearity between some variables - the age of the youngest child, and the

1 & 2. For details see Chapter 3.

length of time between leaving work and returning for the first time (respectively NAGE and RETURN) - the model described in Section Two, was run with these variables as alternatives. In all other cases multicollinearity appeared to be unimportant.

Most of the variables included in the specification to which a priori signs could be attached have the expected signs. The quantitative effects of these anticipated results are discussed in (3.2) below.

3.2 The Probit Results

This section reports on the quantitative effects of the probit regressions presented in Tables 6.1 & 6.2. The logit results together with their adjustment (to allow comparison between logit and probit estimates of the same parameter) are also presented in the Tables.

The equation which contains both the RETURN and the NAGE variables can be found in column 2. The overall fit of this model as given by the scaled deviance term is 35830 giving a log likelihood of - 17,915; a highly significant result.

Some of the more interesting results relating to column 2 are discussed below: the cohort variable - a nine point scale with higher numbers representing older age groups - gives the expected positive parameter, at 0.006, ie successively older cohorts are more likely to work part-time. This indicates that older cohorts tend to work part-time upon returning to work after the birth of the first child. Experiencing the death of a child before the same return to work decreases the likelihood of part-time work - as expected at this point in the life-cycle by a factor of -0.051. This indicates that women who lose children (ie through death) are more inclined to work full-time upon returning to work after the birth of the first child. This is to be expected since death of a child during this period of the life-cycle is likely to remove the constraints imposed on mothers in terms of the time they would require to spend at home; and therefore releasing them for longer hours of work ie full-time instead of part-time.

Being divorced, as opposed to any other marital state decreases the chances of part-time employment by 40%. It is likely that women who experience divorce are also experiencing a reduction in the time they need to spend at home as well as financial pressures. In particular, the financial pressures brought about through divorce could be providing the stimulus which directs women into full-time employment, away from part-time employment.

The effect of children on the decision to work part or full-time as given by NAGE (age of youngest child) and Number of Older Children variables offers a further interesting insight into the effect of children on the supply of labour of women. The presence of children, given by the age of the youngest child, is of particular importance: older dependent children aged 16 years or more at the time of the first return to work after the birth of the first child - is positive as anticipated. These variables indicate that, at the time of the first return, older children increase the likelihood of part-time work.

Qualifications of any kind - A-level or above, O-level or CSE - all decrease the likelihood of part-time employment upon the first return to work. This is as anticipated and in line with the results found earlier (Chapters 3 and 4). For example, possession of A-levels or above, decreases the likelihood of part-time employment at this point in time during the respondent's life-cycle, by -0.028 percentage points. The historically low skills associated with part-time work in the UK provides the rationale behind this observation, and explains why less qualified women would be expected to be found working part-time at almost any point during their life-cycle, given the opportunity cost highly qualified women would incur from working part-time.

The longer the period between marriage and the birth of the first child (DISTANCE) decreases the likelihood of part-time work by -0.0001 percentage points. It is most common to discover newly married women working full-time; a human capital approach and assessment provides the rationale behind this result. If work and work experience enhances a woman's future employment chances, then periods of full-time work experience are likely to have a significantly strong impact over part-time experiences. Accordingly, the longer the period of full-time work experience - the typical pre-first-birth pattern - the more likely a woman is to be found working full-time upon returning to work after the birth of the first child.

Having a mother who worked whilst each respondent was young and agreeing that mothers of pre-school children should stay at home and care for their children (OWN MOTHER WORKED and ATTITUDE, respectively) have positive effects on the dependent variable. Precisely, these values are both about 1%. This is also true of the Family Income variable. Family Income increases the likelihood of working part-time (over full-time) of the first return. Presumably, women who are able to choose between part and full-time work without the financial pressures faced by women whose family income grouping is lower, choose part-time employment - according to the results - since this offers the best alternative. Other pressures, from children for example may therefore be providing the dominant effect.

Interestingly, having the first child between the ages of 35 and 39 years is the only "Age of First Birth" variable that has a positive impact ie increasing the likelihood of part-time work upon the first return to work after the birth of the first child. The remaining variables are all 'significant' and negative. The occupational groups variables are all strongly positive. Some of the more interesting comments relating to these follow.

Occupational group E (relating to shop assistants, child care, semi-skilled domestic, other semi-skilled and unskilled occupations) is the omitted reference group. The strongest impact of any of these groups is occupational group B:- Nursing, medical, social and other intermediate non-manual occupations with a coefficient of 0.038. The weakest effect is for occupational group D: skilled (manual) and semi-skilled factory occupations with a coefficient of 0.011. However, as was noted, all the four occupational groups are positive.

It would appear that having worked in any of the occupational groups increases the likelihood of part-time work. Thus having worked at all increases the chances of part-time work; women who have some occupational experience prior to their first return to the market may well have developed some skills which employers could use. It is these women - women with some work experience - that employers would employ, rather than those without. However, it would appear from these results that there is little opportunity cost associated with working part-time; opportunity cost might be incurred when a woman returns to a "lower occupation" upon returning to work after the birth of her first child; against this will be balanced the benefits of working part-time, principally the ability to maintain dual roles. Accordingly, any opportunity cost associated with working part-time, compared to previous employment, would appear to be small compared to the convenience associated with working part-time.

It has been shown [1] that women exoerience a variety of disruptions to their working experience. Women would change occupations, and therefore possibly groups, if they got married, or moved location because of their husbands' job, had children or returned to work after the birth of their first child. Dex (1984a) has shown that much of women's occupational downward mobility occurs after their first break from work for childbirth - and in essence this is what is being picked up here by examining the first return to work after the birth of the first child. Most women in this model would associate part-time employment after returning to work with occupational downward mobility given the nature of part-time work in the UK (provided they were involved in full-time work previously). [2]

(1) Dex: 1984a - 'Women's Occupational Profiles' in Employment Gazette Dec. 1984.

(2) This is examined more fully in the next Chapter.

The effect of the occupational variables shows once again that the decision to work part or full-time is part of a more complex life-cycle decision process which can only in part be captured by a model of this nature.

The level of unemployment has a positive effect indicating that higher levels of unemployment are likely to increase the chances of part-time employment. While it decreases the chances of full-time employment upon the return to work, perhaps indicating the preference employers have for part-time workers (because of their potentially lower redundancy costs etc as discussed in Chapter 2) over full-timers in periods of labour market shake-out. Then as the economy slows down, and unemployment rises, employers look to part-time workers to fill any production gaps. Part-timers thus can be employed and made redundant as the course of capital dictates, according to the Marxian theory of the reserve army of labour.

3.3 Other Probit Models

Columns 3 and 4: Table 2, present the results of two alternative probit models. The overall level of significance of the model without RETURN but including NAGE is exactly the same as that of the model that includes RETURN but omits NAGE, *ie* a scaled deviance of 35880. Inclusion and exclusion of these "alternative" variables has little effect on the model, in terms of the size and significance of the remaining variables, and certainly none on scaled deviance term. In contrast to Column 2 (Table 6.1) the two models reported in Table 6.2 omit RETURN and NAGE respectively. It was anticipated that inclusion of both of these variables might lead to a multicollinearity problem: however, these two variables were not correlated to any large degree with a cross-correlation coefficient of 0.9E-8.

Notwithstanding that, it is otherwise interesting to examine the extent to which the omittance of either one of these variables causes the results to alter. This is examined below.

3.4 Logit Models : A Comparison To Probit

In this subsection, a logit and probit version of the same model are reported. Their results can be found in Tables 6.1 and 6.2 columns 1 and 4 respectively.

As was discussed at some length in Chapter 3 it is not strictly correct to compare "raw" logit and probit parameter estimates since both assume "alternative" error distributions. As in Chapter 3, the probit model (cumulative normal distribution) is taken as the central model distribution, and the logit parameters are adjusted according to the methods outlined in Chapter 3. These results are presented in Table 6.3.

The overall level of significance of the two-logit and probit-models are not affected by the adjustment procedure (which is briefly re-affirmed below): as might be expected, the overall level of significance of these two models are very similar; the logit model has a scaled deviance of 35840 and the probit, one of 35880. These scaled deviances produce log likelihoods of - 17920 and - 17940, respectively.

Even before examining the adjusted logit results, it is clear that there are no discrepancies in signs of parameters across the logit and probit models, all logit parameters that are positive are also positive when incorporated into a probit model; the same is also true of negative parameters.

3.5 The Adjusted Logit Results Compared To Probit

The results carrying out the transformation outlined above are given in Table 6.3. In column 1, the raw logit results are presented, which are the same as those in column 2 in Table 6.1, together with the adjusted logit and raw probit results. The raw probit results are the same as those in Table 6.2, column 4.

The logit results are adjusted by multiplying each coefficient by 0.625. This gives the logistic distribution a cumulative normal shape. A more comprehensive discussion of the adjustment procedure has been presented in Chapter 3.

It would have been possible to adjust the logit coefficients by multiplying them by 0.5513 as suggested by Amemya[(1)] and reported in Chapter 3. However, a cursory glance at Table 3, columns 2 and 3, reverts that the adjustment procedure followed gives remarkably similar logit and probit results. In fact, multiplying the logit results by 0.5513 would not have improved the similarity.

It is clear from Table 6.3 that both adjusted logit and probit forms of modelling provide similar parameter estimates. In some instances, such as COHORT and FAMILY INCOME the parameter estimates are exactly the same across the models, 0.006 and 0.004 respectively. The largest absolute deviance to occur between parameter estimates derived by either adjusted logit or probit occurs on the DIVORCE variable where the logit estimate is -0.040 and the probit is -0.030. Accordingly it is apparent that it is appropriate to use either logit or probit to estimate the determinants of first return to work - part or full-time.

1. Amemya (1981)

A Summary Of The Results

The results presented in this Chapter have identified some of the key determinants of the type of work undertaken - part or full-time - at the time of the first return to work given the decision to return to work (after the birth of the first child). The key findings of earlier chapters - concerning the life-cycle effects of women's participation - are reiterated: in particular, the opportunity costs associated with not working (given by the qualification variables) is once again developed; the opportunity cost associated with working part-time, when qualified, is also made apparent. In addition, having experienced the death of a child before returning to work decreases the likelihood of part-time work; this has also been highlighted in Chapter 3. Children clearly restrict participation, experiencing a demise of this kind removes this restriction and would intuitively increase the likelihood of not working part-time in favour of full-time work.

There were other interesting results to have emerged and some of these have been discussed already. Notwithstanding this, the results presented here have provided some qualitative effects of some of the key determinants in the type of work undertaken at the time of the first birth. Of equal importance, has been the fact that the results have shown that some of the key variables that determine participation - such as the presence of children - are also of key importance at different points in the life-cycle of working women. In terms of their family formation patterns all the women are at the same point in their life-cycle ie at the point where they are returning to work for the first time after the birth of their first child; and it has been shown that the determinants of the type of work undertaken at this point in the life-cycle includes those variables incorporated into these models.

The distinction that can be drawn between logit and probit models appears to have made little difference to the absolute sign of the parameters included in the specification, and no difference whatsoever to the signs associated with each variable. Thus, both the cumulative normal and logistic distributions fit the model equally well.

The life-cycle effect, ie the effect of children (which includes the death of a child) and other family formation variables such as the age at first birth, the distance between marriage and the birth of the first child, and the time between leaving work and returning for the first time have all proved to be significant determinants of the type of work - part or full-time undertaken upon returning to work for the first time after the birth of the first child.

Similarly important have been the human capital variables which include the degree of qualifications and previous (*ie* most recent) occupation. These have provided an insight into the extent to which the opportunity costs associated with part-time work, over full-time work play a part in determining whether part or full-time work is undertaken.

Older women tend to work part-time, as shown by the cohort variable; however, the most important variables appear to be the life-cycle or family formation variables. These variables, and in particular the effect of children on the type of work undertaken, provide a mechanism determining what work, part-time or full-time, women will undertake.

SECTION FOUR

CONCLUSION

This chapter has been concerned with an investigation into some of the key determinants of the choice that can, and has, been made between part-time and full-time employment at the time of returning to work for the first time after the birth of the first child. Throughout this thesis it has been made apparent that the decision to work part and or full-time varies over the life-cycle of women. Accordingly, this chapter has identified a particularly interesting and previously unexamined point in the life-cycle of women and provided an insight into some of the key determinants of the decision to work part-time instead of full-time.

In addition, this chapter has provided some quantitative effects and reiterated some of the findings of earlier chapters: for instance, the constraint children place on the supply of labour and the opportunity cost of not working as given by the presence of qualifications. Having experienced the demise of a child increases the likelihood that women at this point in the lifecycle are more likely to work full rather than part-time; having qualifications on the other hand, represents a measure of the opportunity cost of not working - such that qualified women are also more likely to work full rather than part-time.

It is clear from the results, that whilst the decision to work part or full-time varies over the life-cycle, some of the results, so highlighted above, are consistent at different points in the life-cycle ie the presence of children. The technique used to estimate the coefficients was maximum likelihood: the distinction that can be drawn between logit and probit models - discussed in Chapter 3,has made little difference to the parameter estimates of the determinants of the type of work sought at the time of the return to work after the birth of the first child.

The wealth of information provided by the WES provided a unique opportunity to investigate this interesting point in the life-cycle of women. Also, the complexity of the decision that women make when choosing between part and full-time work has been shown by the results to be represented by a variety of variables, some of which have relevance at other points in the life-cycle.

While the effects of many of these variables appear consistent during different points of a woman's work history and life-cycle, this chapter has highlighted the importance of life-cycle (family formation) variables, work history (human capital) variables and other variables including age, family income and the level of unemployment. Typically women move between part and full-time work and between working and not working; however, no typical pattern exists. Notwithstanding this, this chapter has identified the importance of family formation and work history variables in particular in determining whether a woman works part or full-time upon returning to work after the birth of the first child (given that she returns at all). Children deter full-time work and promote part-time work; qualified women tend to work full and not part-time, probably through an opportunity cost/income forgone human capital mechanism; older women tend to work part-time and not full-time; the longer the time spent away from employment the more likely part-time work will predominate over full-time work - again probably through a human capital mechanism; and unemployment tends to stimulate part-time rather than full-time employment.

Against all of this the dual role women assume, as housewife and mother <u>and</u> as paid worker gives them the incentive to choose part-time employment rather than full-time employment. The dual role emerges from a commitment to raise and look after a family and to pursue paid employment; the two are complementary. Upon returning to the labour market, and thus employment, for the first time after the birth of the first child, this dual role is likely to be strongest. At other times in the life-cycle the wish to assume a dual role may also be strong, Accordingly, further research should be aware that rewards might be achieved from examining the determinants of decision to work part or full-time at alternative points in the life-cycle of a woman; perhaps at different stages of family formation.

APPENDIX 6

Table 6.1: DETERMINANTS OF FIRST RETURN TO WORK - PART-TIME OR FULL-TIME

DEPENDENT VARIABLE IS FIRST RETURN AFTER FIRST BIRTH (1 IF WORKING PART-TIME, 0 IF WORKING FULL-TIME

REGRESSORS		(1) LOG	(2) PROB
COHORT		0.010	0.006
CHILD DIED		-0.086	-0.051
DIVORCE		-0.064	-0.039
NO. OF OLDER CHILDREN		0.020	0.013
OWN MOTHER WORKED		0.014	0.008
QUALIFICATIONS	A-LEVEL	-0.047	-0.028
	O-LEVEL	-0.013	-0.009
	CSE	-0.016	-0.011
AGE AT FIRST BIRTH			
	15-19	-0.040	-0.024
	20-22	-0.024	-0.017
	23-24	-0.028	-0.018
	25-29	-0.010	-0.006
	30-34	0.007	0.005
	35-39	0.018	0.012
	40 PLUS	-0.068	-0.043
FAMILY INCOME		0.007	0.004
NAGE		———	0.002
ATTITUDE TO WORK		0.016	0.009
DISTANCE		-0.0001	-0.001
OCCUPATIONAL GROUP	A	-0.029	0.015
	B	0.068	0.038
	C	0.043	0.025
	D	0.021	0.011
	E	———	———
RETURN		0.001	0.0002
UNEMPLOYMENT		0.001	0.001
INTERCEPT		-0.653	-0.371
SCALED DEVIANCE		35840	35830
SAMPLE SIZE		3093	3093
		(1)	(2)

Table 6.2: DETERMINANTS OF FIRST RETURN TO WORK - PART-TIME OR FULL-TIME

DEPENDENT VARIABLE IS FIRST RETURN AFTER FIRST BIRTH (1 IF WORKING PART-TIME, 0 IF WORKING FULL-TIME)

REGRESSORS		(3) PROBIT	(4) PROBIT	(5) LOGIT
COHORT		0.055	0.061	0.010
RETURN		——	0.033	——
CHILD DIED		-0.510	-0.511	-0.086
DIVORCE		-0.401	-0.389	-0.066
NO. OF OLDER CHILDREN		0.177	0.156	0.031
OWN MOTHER WORKED		0.070	0.078	0.013
QUALIFICATIONS:	A-LEVEL	-0.280	-0.280	-0.046
	O-LEVEL	-0.090	-0.089	-0.014
	CSE	-0.108	-0.133	-0.017
AGE AT FIRST BIRTH:-				
	15-19	-0.220	-0.245	-0.037
	20-22	-0.180	-0.145	-0.027
	23-24	-0.180	-0.156	-0.030
	25-29	-0.069	-0.056	-0.018
	30-34	0.050	0.044	0.090
	35-39	0.112	0.100	0.022
	40 PLUS	-0.430	-0.430	-0.069
FAMILY INCOME		0.041	0.040	0.007
NAGE		0.0030		0.005
ATTITUDE TO WORK		0.100	0.100	0.016
DISTANCE		-0.010	-0.010	-0.001
OCCUPATIONAL GROUP	A	0.120	0.167	0.021
	B	00.345	0.400	0.061
	C	0.214	0.267	0.038
	D	0.100	0.130	0.015
UNEMPLOYMENT		0.060	0.050	0.010
CONSTANT		-0.297	-0.373	-0.587
SCALED DEVIANCE		35880	35880	35800
SAMPLE SIZE		3093	3093	3093
		(3)	(4)	(5)

No correlation of independent variables: - to 5 places (some to 12)

Table 6.3: DETERMINANTS OF FIRST RETURN TO WORK-
PART OR FULL-TIME

REGRESSORS	DEPENDENT VARIABLE IS FIRST RETURN AFT AFTER FIRST BIRTH (1 IF WORKING PART-TIME, 0 IF WORKING FULL-TIME)		
	LOG	LOG ADJ	PROBIT
COHORT	0.010	0.006	0.006
RETURN	0.001	0.001	0.003
CHILD DIED	-0.086	-0.054	-0.051
DIVORCE	-0.064	-0.040	-0.030
NO. OF OLDER CHILDREN	0.020	0.013	0.016
OWN MOTHER WORKED	0.014	0.009	0.008
QUALIFICATIONS: A-LEVEL	-0.047	-0.030	-0.028
O-LEVEL	-0.013	-0.008	-0.009
CSE	-0.016	-0.010	-0.013
AGE AT FIRST BIRTH:-			
15-19	-0.040	-0.025	-0.025
20-22	-0.020	-0.013	-0.015
23-24	-0.028	-0.018	-0.016
25-29	-0.010	-0.006	-0.006
30-34	0.007	0.004	0.004
35-39	0.018	0.011	0.010
40 PLUS	-0.068	-0.043	-0.043
FAMILY INCOME	0.007	0.004	0.004
NAGE	——	——	——
ATTITUDE TO WORK	0.016	0.010	0.010
DISTANCE	-0.0001	-0.0001	-0.001
OCCUPATIONAL GROUP A	0.029	0.018	0.017
B	0.068	0.043	0.040
C	0.043	0.027	0.027
D	0.021	0.013	0.013
E	——	——	——
UNEMPLOYMENT	0.001	0.001	0.005
CONSTANT	-0.653		-0.373
SCALED DEVIANCE	35840	35840	35840
SAMPLE SIZE	3093	3093	3093

CHAPTER SEVEN DOWNWARD OCCUPATION MOBILITY UPON RETURNING TO WORK AFTER THE BIRTH OF THE FIRST CHILD

INTRODUCTION

This Chapter takes the opportunity provided by the WES data to examine one of the possible consequencies of choosing to work part-time upon the first return to paid employment after the birth of the first child. This is done by comparing a woman's last occupation before the birth of her first child to her occupation upon returning to work for the first time after the birth of the first child. Some recent British analyses of the WES data have specifically identified the existence of downward occupational mobility between the last job before childbirth and first job after childbirth (Dex (1984b) and Martin and Roberts (1984). This Chapter builds upon these earlier findings; principally that returning to work upon the first return to work after the birth of the first child involves some downward occupational mobility. Further, downward occupational mobility has been linked to women's intermittent employment patterns by Stewart and Greenhalgh (1984) and Elias and Main (1983). Dex (1984b) suggests there may a link with part-time work, and this is examined more fully here.

Therefore, this Chapter examines the possible links

SECTION ONE

Downward Occupational Mobility and Previous Research

British studies touching on the occupational mobility of women workers have pointed to the downgrading which some women experience at various points in their lifecycle. Downgrading is observed when a woman's job upon returning to work is of a lower "grade" than the one she held before. If this is observed then downward occupational mobility is said to have occurred.

Joshi (1984), using the WES data, discovered that 18% of women whose highest occupational classification was in teaching were currently (or recently) in an occupation of lower ranking. The equivalent percentage of women whose highest occupation was nursing or intermediate non-manual work was 39%.

Elias and Main (1982) and Stewart and Greenhalgh (1982, 1984) have provided further evidence of downward occupational mobility. Stewart and Greenhalgh (1982) concluded that employment continuity tended to preserve a woman's occupational position (ie deterred downward occupational mobility); they associated breaks from employment with downward occupational mobility. For instance, their evidence suggests that 25% of women aged 45-54 years who had an uninterrupted work history were in managerial, professional or technical occupations; whereas only 13% of women of this age group who had experienced two or more breaks from employment were in these same occupations. Since most breaks from employment are associated with childbirth, research has tended to associate downward occupational mobility with childbirth and patterns with family formation.

Other recent British research in this area has used the WES data to specifically examine occupational changes between the last job before childbirth and the first job after; these include Dex (1984b), and Martin and Roberts (1984a). These studies have documented the existence of downward occupational mobility at this point in a woman's lifecycle; though Dex (1984a) has shown that women experience occupational mobility at other times in their lifecycle as well as over periods of family formation. As the number of employment breaks appears to be associated with downward occupational mobility, so too are the length of these breaks. The length of time not working over the first break for childbirth was found by Dex (1984b) and Martin and Roberts (1984a) to have some (positive) relationship with downward occupational mobility and longer durations of not working seem also to be associated though this has yet to be tested using a multivariate model. Furthermore, Martin and Roberts (1984a) show in their analysis that there is an association between downward occupational mobility and taking a part-time job upon returning to work after the birth of the first child.

Therefore, these studies point to a set of relationships whereby women workers experience downward occupational mobility through breaks in employment - associated largely with childbirth; the experience of downward occupational mobility appears to be associated with the length of time spent not working prior to re-entry into employment, and in particular, downward occupational mobility has a relationship with whether a woman worker returns to employment as a part-time worker.

The following sections extend these earlier analyses. A multivariate model is presented which provides the first steps in establishing and weighting the different factors which are thought to have some influence on downward occupational mobility.

SECTION TWO

THE MODEL

2.1 The Dependent Variable

Occupations in the WES have been classified using twelve categories. This classification is given in Table 7.1. A fuller description of this classification, with examples of occupations that fall into specific grades, is given in Appendix 8.

Table 7.1: Occupational Classification Used In WES

1.	Professional
2.	Teacher
3.	Nursing, Medical and Social Occupations
4.	Other Intermediate Non-manual
5.	Clerical
6.	Shop Assistant and Related Sales Occupations
7.	Skilled (manual)
8.	Child-care
9.	Semi-skilled Factory
10.	Semi-skilled Domestic
11.	Other Semi-skilled
12.	Unskilled

These twelve categories set a limit on the occupational movements that can be observed in these data. Joshi (1984) and Dex (1984b) have shown the WES twelve categories of occupations do not provide a clearly defined and precise ranking of occupations as they stand. They can be ordered, however, and Table 7.2 sets out the preferred rankings, which is used to develop the dependent variable. This ranking was developed separately by Joshi's (1984) analysis of the earnings of occupation groups and by Dex's (1984a) analysis of women's occupational mobility.

Table 7.2: Groupings Of Occupational Classifications Used In The WES.

A. Professional and Teacher
B. Nursing, Medical and Social Occupations
C. Other Intermediate Non-manual
D. Clerical
E. Skilled (manual)
F. Semi-skilled Factory
G. All Other Semi-skilled, Sales And Child-care and Unskilled Occupations

Any movement down the scale from A to G constitutes downward occupational mobility. Precisely, women who moved down this table over time, _ie_ between leaving employment before the birth of her first child (last job before the birth of the first child) and returning to employment (for the first time after the birth of the first child) experienced downward occupational mobility. Thus a comparison of occupations before and after the birth of the first child allows for the construction of a (dummy) binary-choice dependent variable which assumes the value one if downward occupational mobility took place and zero otherwise. Of course, women who were employed in the semi-skilled occupations (category G) could not, using the data available from the WES experience downward occupational mobility as, by definition, they belonged to the _lowest_ occupational group and could move no lower. Accordingly, women who were found employed in this category prior to the birth of their first child, were excluded from the estimation sample. This exclusion, of women who belonged to category G, from the estimation sample may involve some sample selection bias; this is because the sample used to estimate the behavioural relationship between downward occupational mobility and the set of explanatory variables described in the next section is no longer based on a randomly selected sample. Thus, women employed in category G prior to the birth of their first child are being "selected-out".

Sample selection bias was discussed at length in Chapter Four. In this earlier chapter it was possible to examine the effects of sample selection bais as applied to a model of the participation of women workers. Unfortunately, it is not so easy here to allow for the consequences of estimating this behavioural relationship from a non-randomly selected sample, as quite simply, the data does not lend itself readily to this type of examination. Nevertheless, an examination of some of the consequences involved, ie the parameter effects and overall fit of the model, when women who belonged to category G (Semi-skilled occupations) before the birth of the first child, are excluded from the sample, can be made. This is achieved in the following section - when the results of estimating a model of downward occupational mobility are presented - by including in the estimation sample these women workers. This is discussed further in Section Three.

2.2 The Explanatory Variables

A range of variables were considered in an attempt to model the determinants of downward occupational mobility and provide parameter estimates of the key variables concerned. The final, preferred, version is presented here. The variable codes used in the tables to follow are given in parenthesis.

(a) Returning to employment after the birth of the first child as a part-time worker (PART).

We are interested here in quantifying, in a multivariate model, the extent to which downward occupational mobility has resulted from returning to a part-time job after childbirth. Thus it is to be expected that women who return to part-time work after the birth of their first child, are more likely to experience downward occupational mobility.

Using respondent's own assessment of their part-time or full-time work status, this variable (PART) assumes the value one if a women's first job after the birth of the first child is part-time, and zero if it is full-time.

(b) Occupation group before childbirth (OCC1 - OCC5)

Five occupational groups described by five dummy variables were constructed. These are used to assess the influence that previous occupations exert on the likelihood of downward occ occupational mobility across childbirth. The occupational variables are set out in Table 7.3. If a woman belonged to OCC1 before the birth of her first child, she scored one, and zero otherwise; the same applies to OCC2 to OCC5.

Table 7.3: Occupational Categories Relating To The Last Occupation Before The Birth Of The First Child

OCC1	:	Professional or Teaching Occupations
OCC2	:	Nursing, Medical and Social Occupations
OCC3	:	Other Intermediate Non-manual Occupations
OCC4	:	Clerical Occupations
OCC5	:	Skilled Occupations

(c) Human Capital Variables

Human capital theory makes much of investments in human time. The more a woman invests in herself, through formal qualifications and labour market experience (such as building up experience before the birth of the first child) - we might expect that the more likely she is, *ceteris paribus*, not to experience downward occupational mobility. Furthermore, the build-up of human capital is likely to increase a woman's desire to maintain her present economic status (as given by occupation) or even to improve it. Thus, the inclusion of formal qualifications and labour market experience in the model will be of interest since they allow us to see what actually happens to occupational mobility once human capital has been built up.

The human capital variables included are

(i) Qualifications QUAL 1 - QUAL 3

- three dummy variables assuming the value one if positive, and zero otherwise.

QUAL 1	highest qualification	:	CSE
QUAL 2	highest qualification	:	O-level or equivalent
QUAL 3	highest qualification	:	A-level or above

However, because of problems of multicollinearity only QUAL 1 and 2 were included in the final model.

- note, these qualification variables are the same as those described fully in Appendix 3.

(ii) Time Spent Working Before The Birth Of The First Child

- a variable which records to the nearest year the length of time spent working before the birth of the first child. In effect this variable measures the extent to which human capital is built up prior to the birth of the first child. It is to be expected that any increase in the length of this variable will be reflected by a fall in the likelihood of downward occupational mobility.

A further variable is included in the model under the grouping of human capital variables. This variable:

(iii) The Time Spent Not Working Between The Birth Of The First Child And The Subsequent Return To Paid Employment (TIME)

measures in months the time spent away from employment. Human capital theory expects increasing amounts of investment in human capital to decrease the likelihood of downward occupational mobility. Similarly, any increase in the time spent away from paid employment (in this case due to childbirth) is likely to reduce the value of previous investments in human capital and increase the likelihood of downward mobility therefore. This is likely to be the case since, not only are new skills available from working not being learnt but old skills are often not being "exercised" and hence maintained. Therefore, the inclusion of TIME in the model allows for the deterioration of skills and human capital to enter into the determination of downward occupational mobility. As with the highest qualification variables (QUAL 1 to QUAL 3) it is anticipated that, *ceteris paribus*, a significant relationship exists between this human capital variable and downward occupational mobility.

(d) COHORT

COHORT, acts as a trend or generation variable made up by a nine point scale of age bands. Exactly, these are:

1.	16-19 years	6.	40-44 years
2.	20-24 years	7.	45-49 years
3.	25-29 years	8.	50-54 years
4.	30-34 years	9.	55-59 years
5.	35-39 years		

(e) Birth Patterns

A variable was constructed to reflect whether women waited until childbearing was over before returning to work, or returned to work between childbirths. A value one was attached to women who worked in between births and zero otherwise. It would be expected that women who scored one here would be likely to experience less downward occupational mobility than those scoring zero. The variable also measures motivation. Women who return to work after subsequent births are likely to be more motivated (to work) than those who return only after several births. This is still a human capital effect, though it is usually unmeasurable and is included here in recognition that there are variations in the way women structure their family formation.

(f) Women's Attitude To Mothers Of Pre-school Children Who Work (ATT)

Women who, at the time of the interview, said that mothers of pre-school children should stay at home to care for the children (child) and not work, scored one, and zero otherwise. This attitude variable (ATT) is the same as that included in Chapters Two to Four, and is included here to test whether a woman's attitude to "working mothers" has any bearing on the likelihood of downward occupational mobility. ATT, however, is recorded after the event in question - the birth of the first child - ie it is based on information and attitudes concurrent with the time of the interview, and not at the time of the birth of the first child (unless these two times happened to concur). Accordingly, some care needs to be exercised when interpreting the causal direction in which this variable operates; but it is included here because of its interest which has been developed by earlier chapters.

2.3 The Sample

The sample on which the model is based is a sample of women who have returned to work after the birth of their first child. The sample size is 2466 which also allows for the exclusion from the estimation sample those women who belonging to occupational group G before the birth of their first child - and cannot therefore experience downward occupational mobility. When these women are included in the sample, the sample size rises to 3093.

The effect in terms of the overall fit of the model and alterations to parameter estimates are discussed in light of excluding from the sample these women in the next section.

2.4 Estimation

Because of the problems associated with estimating a (dummy) binary choice dependent variable by OLS, the model so far described is estimated by maximum likelihood techniques using logit. The results from this are given in Section Three which follows. For purposes of comparison, the results from an OLS estimation of the model are given also.

SECTION THREE

THE RESULTS

3.1 The Logit Results

The logit results, presented in column 3 of Table 7.4, show the overall fit of the model to be statistically significant, with a log likelihood ratio of -1471, and a scaled deviance term of 2,942. On the whole, the model performs well with most of the variables significant at the 5% level.[1]

(1) Though, as noted in Chapter 3, some care needs to be exercised when drawing conclusions about the significance of parameter estimates produced by the GLIM package, used to estimate these Logit parameters.

Some of the more interesting results to emerge are discussed below.

Following the work in Chapter Three, the raw logit results are adjusted in order to allow comparison with OLS estimates of the same model. Table 7.4 presents the adjusted logit results, adjusted by multiplying the raw logit results by 0.625 as described by Amemya (1981) and Madala (1983) which is discussed in Chapter Three. Amemya (1981) has argued that 0.625 provides a better approximation of the standard normal distribution than does the theoretically correct $3^{\frac{1}{2}}/\pi$ which was discussed in Chapter Three. The OLS parameters also have to be adjusted and these are multiplied by 2.5 and subtract 1.25 from the constant term.

(a) Part-time Employment

Being employed on a part-time basis upon returning to work for the first time after the birth of the first child, is likely to increase the likelihood of downward occupational mobility being experienced. The variable, PART, has a coefficient of 0.816, thus undertaking part-time work upon returning to employment after the birth of the first child increases the likelihood of downward occupational mobility by a factor of 0.816.

(b) Human Capital Variables

(i) Qualifications

As in the case of PART the two qualification variables included in the model have the expected sign. QUAL 1 and QUAL 2 are both negative and significant; they decrease the likelihood of downward occupational mobility; highest qualification is a CSE (QUAL 1) has an adjusted logit coefficien of -0.3 and highest qualification an O-level -0.096. Our a priori expectations about the human captial effects of qualifications, described earlier were confirmed; ie more qualified women are less likely to suffer from downward occupational mobility.

(ii) As for the two other 'human capital variables', EARLY, the length of time spent working before the birth of the first child - and TIME - the time spent (not working) between the birth of the first child and subsequent return to employment - both have the expected effect on downward occupational mobility.

Any increase in the length of time spent working before the birth of the first child has a small negative coefficient -0.005; thus, a building-up of work experience (as given by EARLY) reduces the likelihood of downward occupational mobility upon returning to work after the birth of the first child.

Furthermore, any increase in the length of time spent not working between the birth of the first child and the subsequent return to paid employment increases the chances of downward occupational mobility being experienced. The response, as given by the size of the estimation parameter, is however, small at -0.015.

It would appear that human capital theory can offer some insights into the extent of downward occupational mobility. The approach to downward occupational mobility offered by human capital theory appears to be symmetrical; any increase in the length of time spent building up and refining human capital - ie EARLY - pays dividends, in as much as it reduces the chances of downward occupational mobility being experienced. Similarly, any increase in the time spent not gaining new skills and developing human capital - through not being in employment - increases the likelihood of downward occupational mobility. The effect is small however in comparison with other effects.

Therefore, it would appear that, not only are employment breaks because of childbirth associated with the experience of downward occupational mobility, but also the duration of employment breaks have a bearing on downward occupational mobility. The results presented in Table 7.4 have quantified these effects.

(c) Last Occupation

A woman's last occupation - prior to the birth of her first child - was included as an explanatory (dummy) variable in the model; this set of variables performs reasonably well. Belonging to occupational groups OCC1 and OCC2 (respectively, "professional or teaching" occupation or, "nursing, medical or social occupations"[(1)] prior to the birth of the first child has the effect of reducing the likelihood of downward occupational mobility being experienced. OCC1 has an adjusted estimated coefficient of -0.886 and OCC2 one of -0.011.[(2)] The remaining three occupational groups produce positive parameter estimates, thus suggesting an increase in the incidence of downward occupational mobility taking place. Higher occupations therefore reduce the likelihood of downward occupation mobility - and may be operating within a human capital framework, since these occupations are likely to require greater degrees of skills and qualifications.

(d) Remaining Explanatory Variables

Throughout this thesis, much has been made of the effect children can have on a woman's labour supply. Here, using a birth pattern variable, the presence of children is once again (though indirectly) brought into consideration.

(1) See Table 7.3, Section 2; and Appendix 8 for a more complete description.
(2) Though there is some doubt over the significance of OCC2 as given by the t-test statistic in Column 1 Table 7.4.

It was to be expected that women who returned to work, in between births, rather than proceeding with a "bloc birth", would experience the lowest amount of downward occupational mobility out of the two. However, B1 has an estimated coefficient of 0.079, which suggests the opposite; <u>ie</u> that women who leave paid employment and subsequently have all of their children during one employment break, other things being equal, experience less downward occupational mobility than those who return to paid employment in between births.

As noted in Section Two, a variety of childbirth and work patterns exist; more work therefore is required in this area, if a more complete picture is to emerge of the likely consequences of different birth patterns on occupational mobility after other effects have been controlled.

A woman's attitude to working mothers (as given by ATTITUDE) and her generation (COHORT) both increase the likelihood of downward occupational mobility. However, COHORT proves to be insignificant. Believing that mothers of pre-school children should stay at home and look after the children, rather than working, (ATT) increasing the likelihood of downward occupational mobility, with an estimated coefficient of <u>0.063</u>. In part, this fits in, indirectly, with the human capital rationalisations that have echoed through this chapter. If these mothers (of pre-school children) should and indeed do stay at home to care for their children then there is likely to be a depreciation of their human capital (skills) and thus reducing their chances of developing new skills. Accordingly, this goes part of the way towards explaining the positive effect observed from Table 7.4.

Older women (ie successive cohorts) tend to experience an increased likelihood of downward occupational mobility, as shown by COHORT. Some question arises however over the significance of the COHORT variable which has a t-test statistic of 1.37 (1) when estimated by maximum likelihood (and 0.4 when when estimated by OLS). It appears, therefore, that women's chances of experiencing downward occupational mobility have not been increasing (or decreasing) significantly over time.

(e) A Summary Of Results

The maximum likelihood (logit) results presented in Table 7.4 show the model to have performed reasonably well, with most variables significant and producing the *a priori* effects on downward occupational mobility. The literature, summarised in Section 1, has identified a relationship between breaks from employment and downward occupational mobility, and also between part-time work (at the point of returning to work after the birth of the first child) and downward occupational mobility.

(1) The t-test statistics calculated by maximum likelihood are not reported in full here (though are available upon request) because of the problems associated with this statistic when estimated by the GLIM package as discussed in Chapter 3.

This chapter has confirmed these relationships; but more importantly, the opportunity has been taken to quantify these effects, using statistically more appropriate maximum likelihood logit estimation technique (statistically more appropriate as compared to the more conventional OLS method of estimation).

On the whole (ie except for the birth pattern variable) a human capital approach to the analysis of downward occupational mobility has provided much of the justification and fore-thought for the results. Clearly, as shown here, time spent in employment decreases the likelihood of the downward occupational mobility being observed; the reverse is true of time spent away from employment. The opportunity was also taken here to examine whether downward occupational mobility varied directly with the length of abreak from employment and the length of a period in employment. The results showed that downward occupational mobility varied directly with both. The quantifiable responses being reported in Table 7.4.

In order to complete the analysis, the next sub-section reviews, briefly, the OLS estimates of the model described so far, and compares them to those estimated by a maximum likelihood (logit) procedure.

3.2 The OLS Results

Column 1 in Table 4.2 presents the OLS estimated parameter of the same model described above.

From Table 7.4 it is possible to compare and contrast the transformed OLS and Logit parameter estimates by refering to columns 3 and 4. The raw logit parameters (column 2) have been transformed as described earlier by multiplying them by 0.625 and the raw OLS parameters have been transformed by multiplying them by 2.5 (except for the constant term - see Table 7.4).

Thus, comparing columns 3 and 4, it is quite clear that estimating the model by OLS severely affects the size of the parameter, though not the directional affect on downward occupational mobility. Whereas the coefficient of working part-time (upon returning to work for the first time after the birth of the first child) with respect to downward occupational mobility is 0.816 when estimated by logit; it is slightly less at 0.689 when estimated by OLS.

OLS also underestimates the effect of the qualification variables (QUAL 1 and QUAL 2) as the five occupational variables (OCC1 to OCC5) as compared to the coefficients produced when the model is estimated by OLS. On the other hand, OLS over-states, slightly, the impact ATT EARLY, B2 and TIME have on the experience of downward occupational mobility.

Accordingly, from a comparison of the transfored OLS and logit estimates of the same model of downward occupational mobility it is apparent that OLS produces largely biased results in the terms of parameter estimates.
What is reassuring, nevertheless, is the fact that in no instance does OLS suggest that a variable has a negative (positive) effect on downward occupational mobility when logit (maximum likelihood) suggests a positive (negative) response.

3.3 Sample Selection Bias

As described in Section 2 above, the results presented are based on a sample of women that excludes working women whose previous occupation was of the lowest grade - since these women could not, given the nature of the dependent variable, experience downward occupational mobility. In order to capture the effects of including these women in the sample, and therefore gauge the possible consequences of excluding them from the estimation sample, the model described in Section 2 is re-estimated, including these other women workers.

The overall fit of the re-estimated model is the same at 0.139 but based on a larger sample of 3093 workers the F ratio rises to 51.72 (compared to 30.34 in Table 7.4). The results are discussed here but they are not presented in Table 7.4 and they are available but some interesting findings emerge.

Based on the larger sample of 3093 observations, the coefficients associated with the PART variable is reduced to 0.303 compared to 0.816 as described in 3.2 above. On the whole, the coefficients of parameters tend to be smaller when based on the larger sample.

It is not strictly clear whether these differences, such as the different parameters on PART are attributable to sample selection bias - that is basing the model presented in Table 7.4 on a self-selected (and therefore non-randomly selected) sample; or whether it is because the larger sample just includes 627 observations (on women who belonged to the lowest occupational group) that really should not be included in the sample because, by definition, they cannot experience downward occupational mobility. Unlike Chapter Four which had the means available to gauge the impact of sample selection bias, this Chapter can only speculate on the true consequences of excluding these 627 observations.

In general the results based on the reduced sample (in Table 7.4) are probably more reliable, compared to those that include the extra observations, since they are based on a sample that in its entirety can experience <u>downward</u> occupational mobility. However, given the possible consequences associated with sample selection bias as discovered in Chapter Four, the results presented here need to be treated with some caution. Notwithstanding this, it is reassuring to know that including these extra observations in the sample does not alter the directional effect variables have on the dependent variable, rather only the magnitude of these effects.

SECTION FOUR

CONCLUSION

This Chapter has addressed itself to an investigation of one of the possible consequences of working part-time at the point in time when the take-up of part-time women is strongest amongst women. At this point, the first return to paid employment after the birth of their first child, some women have been observed to experience downward occupational mobility.

This Chapter constructed and tested a multivariate model of downward occupational mobility. The results have shown that working part-time upon returning to work for the first time after the birth of the first child increases the likelihood of downward occupational mobility being experienced by around 50%. As such it is the largest, single effect on women's chances of experiencing downward mobility at this time. Therefore quantifying what had previously been thought (see Dex (1984b)). Using statistically appropriate techniques (maximum likelihood), this chapter has quantified some of the principal determinants of downward occupational mobility amongst women workers. It has been shown that working part-time upon returning to work dominates the model of downward occupational mobility. This is likely to be the case because of the nature of part-time work in the UK ie being concentrated in poorly paid jobs. One could almost imagine that were part-time work available in more senior positions and higher paid jobs, then this effect may be reduced or even disappear.

Other variables have also been shown to influence the likelihood of downward occupational mobility such as the time spent working before the birth of the first child, and the time spent (not working) before returning to work after the birth of the first child. Furthermore, this chapter has shown that these variables also influence the extent of downward occupational mobility.

In essence, the results presented have indicated one of the possible consequences women may have to endure when working part-time. It is well established that women who work part-time tend to be concentrated in certain types of occupations which offer little scope for advancement, fringe benefits and other rewards - as discussed in Chapter 2. The choice made by many women who want to work part-time thus involves them in some costs - in the form of downward and occupational mobility (as discussed and estimated here and in other forms - such as unequal treatment in occupational pension schemes (see McGoldrick (1984)). Nevertheless, the choice is made. Part-time work, with all of its costs, is a form of employment that allows women to pursue and maintain their dual roles as mother and wife and as paid employees. The obvious benefits that many women associated with these complementary roles, approached with equal enthusiasm, thus outweighs the possible costs (consequences) associated with working part-time. This chapter has highlighted a further consequence of working part-time, in the form of downward occupational mobility which many women experience upon returning to work for the first time after the birth of their first child.

APPENDIX 7

Table 7.4 LOGIT AND OLS REGRESSION ESTIMATES OF THE DETERMINANTS OF DOWNWARD OCCUPATIONAL MOBILITY UPON RETURNING TO WORK FOR THE FIRST TIME AFTER THE BIRTH OF THE FIRST CHILD

Sample Of Women Who Returned To Work After The Birth Of Their First Child

VARIABLES	1 OLS		2 LOGIT	3 OLS x 2.5 **	4 LOGIT x 0.625
PART	0.275	(13.2)	1.306	0.689	0.816
QUAL 1 (CSE)	-0.131	(-4.5)	-0.600	-0.328	-0.375
QUAL 2 (O-level)	-0.96	(-3.5)	-0.452	-0.240	-0.266
OCC1	-0.251	(-6.0)	-1.417	-0.628	-0.886
OCC2	-0.051	(-1.3)*	-0.017	-0.128	-0.011
OCC3	0.163	(2.7)	0.749	0.408	0.468
OCC4	0.078	(3.2)	0.372	0.195	0.233
OCC5	0.073	(2.1)	0.371	0.183	0.232
ATTITUDE	0.028	(1.5)	0.100	0.070	0.063
COHORT	0.001	(0.4)*	0.040	0.003	0.250
EARLY	-0.006	(-2.5)	-0.021	-0.015	-0.013
B1	0.061	(2.9)	0.079	0.153	-0.049
TIME	-0.0004	(-4.6)	-0.005	0.001	0.003
CONSTANT	0.213	-1.711	-1.711	-1.038	-1.069
R^2	0.139		Scaled deviance = 2942	** Constant term is adjusted by subtracting 1.25	
N	2466				
F	30.341				

*: denotes insignificant, ie t-test statistic below 1.414

CHAPTER EIGHT

CONCLUSION

8.1 This Chapter has set out to examine the supply of women's part-time labour at different points in their lifecycle comparing and contrasting it to the supply of full-time labour. The aim has been to identify and quantify the key influences on the decision to supply part-time labour in comparison to full-time labour. Multivariate models of participation were estimated and were successful in identifying some of the key influences on this decision. Furthermore, the possible consequences of working part-time were examined in terms of occupational mobility. Recourse to <u>correct</u> statistical procedures was also made - in the form of maximum likelihood estimation techniques when the dependent variable is a binary choice (dichotomous) variable, and in the light of sample selection bias - so that statistically reliable and unbiased parameter estimates of the effect of these key influences on participation and the part-time versus full-time labour supply decision could be achieved. Some of the more interesting results to have emerged from previous chapters - which are quantified and commented upon more extensively in their relevant chapters - are discussed below.

8.1 The Dual Role

The Women and Employment Survey has a wealth of information on women's work histories and family formation patterns. It has been confirmed here using the Survey that the typical effect of childbearing has been to interrupt, rather than terminate the working lives of women. Women therefore, assume a dual role; a role as housewife and mother (the side of parenthood), and a role as paid employee. The effect children have on participation has been described at length throughout this thesis; it has been shown too, that breaks from employment largely for childbearing are often followed by part-time work. Thus, the decision to work on a part-time basis allows women to pursue and maintain their dual role as housewife and mother, and as paid employee. While the dual roles conflict, in as much as they impose constraints on a woman's time, they exist as complements. Women's strong commitment to both roles must be seen as fundamental to the decision they make when choosing part-time employment instead of full-time employment.

The multivariate models described, suggest that childbearing reduces subsequent participation. Furthermore, the evidence here shows that children affect differently the likelihood of working part-time compared to full-time. On the whole, young (dependent) children have the effect of increasing the likelihood of part-time employment being undertaken while decreasing the full-time equivalent. This is something that has received little attention in the literature.

The multivariate models described and estimated in earlier chapters have identified the existence of the dual role. Furthermore, they have quantified and therefore weighted the impact children of different ages and childrearing exert on the supply of labour and women's attainment in paid employment. The former, the effect children have on the supply of labour, is strongest the younger the age of the youngest child; younger children require greater attention, and therefore this is to be expected. Childbearing also has a part to play in determining the (occupational) attainment of women.

The penultimate chapter (Chapter Seven) described how women who experience breaks from employment, largely through childbearing activities, are likely to incur some downward occupational mobility as a consequence of working part-time. The evidence presented, showed that returning to work after an employment break would lead to an increased likelihood of downward occupational mobility if the job returned to was part-time. Thus, the dual role followed by many working mothers involves pecuniary costs. The price of parenthood and continued childcare, accepted by many women workers as a matter of course, is certainly greater than that faced by working men - and is approximated by women's experience of downward occupational mobility after an employment break.

Accordingly, the dual role of motherhood and paid employment and the strong commitment to both roles is facilitated by working on a part-time basis. In turn, part-time employment may present working mothers with additional costs of parenthood in the form of downward occupational mobility. Society has moved a long way from insisting that a woman's place be entirely in the home, but the existence of downward occupational mobility (as an example) suggests that the most is yet to be made of her skills in paid employment - this is especially the case if a woman works part-time.

8.3 Human Capital Effects

Historically at least, part-time employment in contrast to full-time employment tends to be concentrated in lower paid occupations with lower rewards (such as sickness insurance schemes and fringe benefits) and often outside of the protective cover of employment legislation. This is reflected by the type of women who work part-time, and those who work full-time. Women workers who have attained formal qualifications or gained some work experience training would generally involve themselves in some opportunity cost of lost income through working part-time. The extent of this opportunity cost has been portrayed at different points in this thesis - qualified women and women with some work experience or training are less likely to work part-time, and more likely to work full-time. Accordingly, a building-up of human capital decreases the chances of part-time work, which would appear to work through an opportunity cost mechanism.

This effect appears to be consistent during a woman's lifetime and also has a bearing on the extent of downward occupational mobility experienced; more qualified women tend to work less part-time and more full-time, and also tend to experience the least downward occupational mobility.

The work experience built up by working women also has a bearing on the supply of labour - part or full-time - and on the extent of downward occupational mobility. The degree of work experience incorporated into the models described in previous chapters is represented by the earning potential variable, as well as a variety of other variables (such as the time spent working before the birth of the first child in Chapter Seven). On the whole, the variables performed well and gave the expected results quantifying the direct effect work experience has on the supply of labour - in its part-time vs full-time form and in the form of hours of work. Clearly, the evidence on work experience fits neatly into a human capital framework: work experience is a form of investment in human capital, and higher levels of investment are associated with higher rewards from employment. This proves to the the case, with women working part-time in possession of less worthwhile work experience (as given by the formula used to derive the log of earnings potential) and with, for example, less time spent working before the birth of the first child when the area of concern in downward occupational mobility. Thus, the potential opportunity costs that can be associated by women with relevant work experience to part-time work has a bearing on whether a woman seeks to work part-time or full-time instead.

8.4 The Lifecycle

This thesis has made much use of the opportunity provided by the WES to examine the supply of labour - part-time vs full-time - at different stages in the lifecycle. Initially, in Chapter Three the participation decision, hours of work supplied and the supply of part-time vs full-time labour were examined; this was undertaken in the usual way as at the date of the interview. Chapter Five, on the other hand, draws attention to a lifetime perspective, examining the supply of labour over a woman's entire working life (up to the date of the Survey). A worthwhile exercise, the results showed that many of the determinants behind the (part-time vs full-time) labour supply decision uncovered in Chapter Three - such as the effect of children, previous work experience, qualifications and birth patterns - had an equally important part to play in determining the part-time vs full-time supply of labour decision over the entire length of a woman's working life. A similar picture emerged when the determinants of the part-time vs full-time supply of labour decision were examined at the point in a woman's lifetime when she returned work for the first time after the birth of the first child.

8.5 Sample Selection Bias

Two chapters (Chapters Four and Seven) took into account, when estimating models of labour supply, the estimation problems associated with using non-randomly selected samples. In particular, Chapter Four re-estimated some of the labour supply equations undertaken in Chapter Three allowing for the impact of sample selection bias. This was undertaken in the light of the second generation empirical work reported in Chapter Two.

The results presented suggest that estimating the part-time vs full-time labour supply decision from a sample population that excludes currently not working women - but who are currently looking for work or intend to look for work within a year - leads to inefficient parameter estimates. It was shown that parameter estimates estimated from the sample that excluded these "non-working" women were of a generally different magnitude to those that were based on the sample that included these women. However, and most important, the effect of excluding these "non-working" women from the sample had no effect on the signs of the estimated parameters.

The effect of sample selection bias in this instance amounted to an alteration of the size of the parameter estimates, but not on its direction of impact on the dependent variable. The effect of sample selection bias - in essence, the estimation of statistically inefficient parameters - appears to be more marked in the case of Chapter Seven.

In Chapter Seven, excluding women whose last occupation (before the birth of their first child) was in the lowest grading from the estimation sample,[1] appears to have more pronounced consequences, as measured by the size of the parameter estimates. Unfortunately, it was not possible, given the nature of the date used, to allow for sample selection bias in the way that was achieved when a model of part-time vs full-time labour supply was reassessed in Chapter Four. Accordingly, the effects of sample selection bias in this instance - although appearing to be pronounced - must be treated with some caution.

Notwithstanding this caution, Chapter Four, which devoted itself entirely to an appreciation of sample selection bias, provides some of the quantifiable consequences of estimating a behavioural relationship - in this instance the supply of labour from a non-randomly selected sample. With this in mind, the research undertaken is a continuation of the work belonging to the Second Generation empirical school as described in Chapter One.

1. since they could not, given the definition of the dependent variable, experience <u>downward</u> occupational mobility.

8.6 Estimation Technique

Because of the statistical problems associated with Ordinary Least Squares (OLS) as an estimation technique, when the dependent variable is a binary choice (dichotomous) variable, most of the models estimated in this thesis were estimated by maximum likelihood (ML). The use of logit and probit (maximum likelihood) gave interesting results when compared to OLS.

Estimating a single model by OLS and by ML and comparing the estimated parameters provided a means by which it was possible to gauge the effect of estimating a binary choice model of labour supply by OLS; statistical theory suggests that OLS will produce biased parameter estimates. On the whole this proved to be the case with logit and probit estimates of parameters being of a different magnitude to those estimated by OLS, but always of the same sign. Accordingly, the results presented have provided quantifiably the consequences of estimating a binary choice model by OLS - a technique that is frequently used in this type of research. OLS, nevertheless, has its merits as an estimation technique in that it is familiar to most and readily available to those interested, as well as (relative to ML) computationally inexpensive. However, ML, as shown here, gives slightly different parameter estimates, and therefore should generally be used as the estimation technique (when available) when a binary choice model is being estimated.

8.7 A Summary

The choice many women make between working part-time and full-time is a complex decision and an understanding of this choice has been the main aim of the research presented here. The trend towards the increased part-time employment of women in Britain is a well-documented phenomenon, but what influences a woman's decision to work part-time (instead of full-time) is little understood, and has received only scant attention in the literature. This thesis has taken the opportunity offered by the Women and Employment Survey to begin to fill this void.

Part-time work is a convenient form of employment for many working mothers in that it allows them to pursue and maintain a dual role, of parent and paid employee. Children, particularly the age of the youngest child, plays an important role in determining the extent of work undertaken - part or full-time. Other dependent children have a very much reduced role to play in determining the type of work sought. The role qualifications and work experience have to play in determining the part-time vs full-time labour supply decision has been quantified and, as with with the children variables, appears to remain consistent over the lifecycle. This is true also of some of the other key determinants of this decision mechanism, ie age, the presence of an adult dependent and family income. However, it would appear that part-time work is bought at a cost. Women who work part-time (upon returning to work for the first time after the birth of their first child) are more likely, than those working full-time, to experience downward occupational mobility.

The results have shown that second generation research is correct in believing that estimation technique matters; clearly, using maximum likelihood as an estimation technique has provided different parameter estimates to those biased by OLS. In addition, an awareness of sample selection as a form of bias also also pays dividends in terms of the effects on parameter estimates.

The results presented have quantified some of the key influences on the part-time vs full-time labour supply decision, in particular, as well as on the more general participation and hours of work labour supply decisions. What appears to have emerged that is most interesting is that estimating a single labour supply equation which pools into one sample both part-time and full-time women workers often hides the opposing effects effects particular key variables have on the supply of part-time labour in comparison to the supply of full-time labour. For example, having experienced training while at work or having gained formal qualifications increases the likelihood of participation, yet, within this, the same variables increase the likelihood of working full-time while simultaneously decreasing the likelihood of part-time employment. This type of effect has received previously little attention in the literature but has to an extent been put right here.

APPENDIX 8

Table 8.1: MEANS AND STANDARD DEIVATIONS OF REGRESSION ESTIMATES OF WOMEN'S PARTICIPATION

DEPENDENT VARIABLE IS: ACTIVE

VARIABLES		SAMPLE All Women Workers Mean	All Women Workers SD	Married Women Mean	Married Women SD	Women With Children Mean	Women With Children SD
Youngest Child Aged	0	0.047	0.212	0.051	0.211	0.062	0.242
	1-2	0.082	0.275	0.095	0.276	0.108	0.311
	3-4	0.063	0.243	0.077	0.266	0.083	0.276
	5	0.031	0.173	0.071	0.301	0.041	0.200
	6-10	0.135	0.342	0.113	0.390	0.177	0.381
	11-15Yrs	0.133	0.340	0.177	0.370	0.174	0.379
Age of Second Youngest Child	0-2	0.017	0.128	0.032	0.247	0.022	0.147
	3-4	0.037	0.189	0.050	0.207	0.049	0.216
	5-10	0.103	0.304	0.180	0.348	0.137	0.343
	11-15Yrs	0.132	0.339	0.076	0.199	0.176	0.380
Age of Second Youngest Child Family Incomplete	0-2	0.062	0.242	0.077	0.301	0.082	0.275
	3-4	0.002	0.041	0.006	0.051	0.002	0.048
	5-10	0.005	0.073	0.007	0.080	0.007	0.081
	11-15	0.004	0.020	0.003	0.027	0.001	0.022
No. Children Over 16 Years		0.888	1.382	1.071	1.343	1.167	1.482
Age at First Birth	15-19	0.060	0.238	0.070	0.206	0.030	0.170
	20-22	0.084	0.277	0.078	0.266	0.074	0.260
	23-24	0.061	0.239	0.070	0.233	0.058	0.234
	25-29	0.268	0.443	0.264	0.443	0.306	0.463
	30-34	0.176	0.381	0.183	0.349	0.205	0.404
	35-39	0.075	0.264	0.080	0.312	0.807	0.283
	40plus	0.066	0.249	0.070	0.137	0.023	0.153
Age		0.023	0.021	0.020	0.019	0.025	0.200
Age Squared		23.044	13.715	24.601	13.091	25.618	13.000
Earnings Potential		0.615	0.657	0.615	0.656	0.577	0.494
Family Income		3.770	2.065	3.875	2.187	4.135	1.910
Dependent Adult		0.136	0.343	0.146	0.355	0.147	0.354
Region	North	0.070	0.256	0.071	0.266	0.071	0.257
	E.Mid.	0.076	0.263	0.078	0.268	0.077	0.266
	E.Ang.	0.031	0.173	0.033	0.180	0.031	0.173
	GLC	0.111	0.315	0.123	0.331	0.103	0.304
	S.West	0.182	0.386	0.188	0.464	0.188	0.391
	Scotland	0.054	0.227	0.061	0.261	0.057	0.232
	Wales	0.074	0.263	0.069	0.187	0.072	0.259

Continued .....

Qualified: A-level	0.164	0.345	0.165	0.355	0.138	0.345
O-level	0.182	0.389	0.178	0.401	0.401	0.357
CSE	0.370	0.133	0.133	0.369	0.130	0.336
Own Mother Worked	0.485	0.500	0.464	0.488	0.451	0.500
Attitude to Work	0.597	0.491	0.599	0.503	0.577	0.490
Husband Helps At Home	0.357	0.480	0.361	0.431	0.412	0.492
Experienced Training	0.216	0.310	0.217	0.301	0.171	0.301
Unemployed As First Event						
Birth Pattern B1	0.240	0.427	0.240	0.420	0.319	0.466
B2	0.117	0.321	0.111	0.330	0.155	0.362
Time Spent Working Before First Birth	51.912	46.107	48.176	36.113	50.106	35.266
Dependent Variable	0.691	0.462	0.667	0.503	0.615	0.487

Table 8.2: MEANS AND STANDARD DEVIATIONS OF REGRESSION ESTIMATES OF WOMEN'S PARTICIPATION

DEPENDENT VARIABLE IS: ACTFULL

VARIABLES		SAMPLE All Women Workers Mean	All Women Workers SD	Married Women Mean	Married Women SD	Women With Children Mean	Women With Children SD
Youngest Child Aged	0	0.047	0.212	0.058	0.365	0.062	0.242
	1-2	0.082	0.275	0.100	0.300	0.108	0.311
	3-4	0.063	0.243	0.074	0.262	0.083	0.276
	5	0.031	0.173	0.035	0.185	0.041	0.198
	6-10	I.135	0.342	0.156	0.363	0.177	0.381
	11-15Yrs	0.133	0.340	0.157	0.363	0.174	0.379
Age of Second Youngest Child							
	0-2	0.017	0.128	0.021	0.147	0.022	0.147
	3-4	0.037	0.189	0.046	0.210	0.049	0.216
	5-10	0.103	0.304	0.124	0.330	0.137	0.343
	11-15Yrs	0.132	0.334	0.159	0.365	0.176	0.380
Age of Second Youngest Child Family Incomplete							
	0-2	0.062	0.242	0.076	0.266	0.082	0.275
	3-4	0.002	0.041	0.002	0.039	0.002	0.048
	5-10	0.005	0.073	0.006	0.075	0.007	0.081
	11-15	0.004	0.020	0.001	0.022	0.001	0.022
No. Children Over 16 Years		0.888	1.383	0.982	1.396	1.167	1.482
Age at First Birth	15-19	0.060	0.238	0.018	0.132	0.030	0.170
	20-22	0.083	0.277	0.069	0.253	0.074	0.262
	23-24	0.061	0.239	0.067	0.242	0.058	0.234
	25-29	0.268	0.443	0.260	0.401	0.306	0.461
	30-34	0.176	0.381	0.200	0.400	0.205	0.404
	35-39	0.075	0.264	0.083	0.275	0.087	0.281
	40plus	0.066	0.249	0.053	0.225	0.023	0.151
Age		0.023	0.021	0.024	0.020	0.025	0.020
Age Squared		23.044	13.715	24.414	12.887	25.618	13.000
Earnings Potential		0.615	0.657	0.544	0.574	0.577	0.605
Family Income		3.770	2.065	4.596	1.600	4.135	1.911
Dependent Adult		0.136	0.343	0.149	0.356	0.147	0.354
Region	North	0.071	0.256	0.070	0.255	0.071	0.257
	E.Mid.	0.076	0.266	0.078	0.269	0.077	0.266
	E.Ang.	0.034	0.315	0.033	0.180	0.031	0.173
	GLC	0.111	0.171	0.100	0.300	0.103	0.304
	S.West	0.182	0.386	0.191	0.393	0.188	0.391
	Scotland	0.054	0.227	0.056	0.230	0.057	0.232
	Wales	0.074	0.262	0.076	0.264	0.072	0.259

Continued .....

Qualified A-level	0.164	0.370	0.158	0.365	0.138	0.345
O-level	0.186	0.389	0.168	0.373	0.150	0.357
CSE	0.138	0.345	0.134	0.340	0.130	0.336
Own Mother Worked	0.485	0.500	0.465	0.499	0.451	0.500
Attitude to Work	0.597	0.491	0.583	0.493	0.577	0.494
Husband Helps At Home	0.357	0.479	0.464	0.499	0.412	0.492
Experienced Training	0.254	0.436	0.239	0.359	0.253	0.435
Unemployed As First Event	0.182	0.381	0.170	0.289	0.180	0.268
Birth Pattern B1	0.240	0.427	0.278	0.448	0.319	0.466
B2	0.117	0.321	0.135	0.342	0.155	0.362
Time Spent Working Before First Birth	60.181	50.581	58.160	45.810	56.889	47.131
Dependent Variable	0.355	0.479	0.267	0.443	0.215	0.411

Table 8.3: MEANS AND STANDARD DEVIATIONS OF REGRESSION ESTIMATES OF WOMEN'S PARTICIPATION

DEPENDENT VARIABLE IS: PART

VARIABLES		SAMPLE All Women Workers Mean	SD	Married Women Mean	SD	Women With Children Mean	SD
Youngest Child Aged	0	0.010	0.100	0.012	0.111	0.015	0.122
	1-2	0.028	0.166	0.036	0.187	0.042	0.202
	3-4	0.043	0.204	0.054	0.226	0.065	0.246
	5	0.024	0.154	0.030	0.170	0.036	0.187
	6-10	0.140	0.347	0.173	0.379	0.206	0.405
	11-15Yrs	0.160	0.367	0.203	0.402	0.207	0.435
Age of Second Youngest Child	0-2	0.003	0.055	0.004	0.C61	0.005	0.067
	3-4	0.011	0.105	0.015	0.120	0.017	0.128
	5-10	0.073	0.261	0.094	0.292	0.110	0.313
	11-15Yrs	0.159	0.346	0.177	0.382	0.208	0.406
Age of Second Youngest Child Family Incomplete	0-2	0.024	0.152	0.030	0.170	0.035	0.185
	3-4	0.001	0.035	0.001	0.135	0.002	0.042
	5-10	0.005	0.071	0.005	0.073	0.007	0.082
	11-15						
No. Children Over 16 Years		0.897	1.336	1.060	1.377	1.332	1.442
Age at First Birth	15-19	0.067	0.250	0.015	0.123	0.019	0.136
	20-22	0.086	0.281	0.065	0.247	0.071	0.257
	23-24	0.062	0.242	0.065	0.247	0.057	0.232
	25-29	0.264	0.441	0.307	0.461	0.316	0.465
	30-34	0.170	0.376	0.200	0.400	0.213	0.410
	35-39	0.069	0.253	0.076	0.265	0.084	0.278
	40plus	0.070	0.255	0.057	0.232	0.019	0.137
Age		0.026	0.022	0.029	0.021	0.031	0.020
Age Squared		23.100	13.381	25.338	12.200	27.640	11.684
Earnings Potential		0.487	0.632	0.381	0.509	0.365	0.494
Family Income		3.604	2.083	4.575	1.576	4.126	1.877
Dependent Adult		0.126	0.332	0.145	0.351	0.142	0.350
Region	North	0.070	0.254	0.067	0.249	0.071	0.256
	E.Mid.	0.077	0.267	0.078	0.268	0.076	0.265
	E.Ang.	0.025	0.157	0.029	0.167	0.023	0.151
	GLC	0.122	0.327	0.106	0.307	0.111	0.314
	S.West	0.183	0.386	0.192	0.394	0.189	0.392
	Scotland	0.046	0.209	0.048	0.213	0.043	0.213
	Wales	0.074	0.262	0.074	0.263	0.070	0.255

Continued .....

Qualified A-level	0.185	0.388	0.171	0.377	0.148	0.356
O-level	0.198	0.399	0.166	0.372	0.146	0.354
CSE	0.149	0.386	0.139	0.346	0.178	0.345
Own Mother Worked	0.505	0.500	0.543	0.498	0.453	0.500
Attitude to Work	0.569	0.495	0.520	0.500	0.472	0.500
Husband Helps At Home	0.378	0.485	0.356	0.471	0.472	0.500
Experienced Training	0.402	0.490	0.433	0.500	0.450	0.49[illegible]
Unemployed As First Event	0.188	0.391	0.144	0.351	0.122	0.32[illegible]
Birth Pattern B1	0.301	0.458	0.371	0.483	0.450	0.49[illegible]
B2	0.124	0.330	0.154	0.361	0.185	0.38[illegible]
Time Spent Working Before First Birth	58.460	37.198	71.636	33.431	87.429	48.57[illegible]
Dependent Variable	0.440	0.497	0.554	0.497	0.617	0.48[illegible]

Table 8.4 : MEANS AND STANDARD DEVIATIONS OF REGRESSION ESTIMATES OF WOMEN'S PARTICIPATION

DEPENDENT VARIABLE IS: ACTPART

VARIABLES		SAMPLE All Women Workers		Married Women		Women With Children	
		Mean	SD	Mean	SD	Mean	SD
Youngest Child Aged	0	0.047	0.212	0.051	0.207	0.062	0.242
	1-2	0.082	0.275	0.096	0.302	0.108	0.312
	3-4	0.063	0.243	0.073	0.255	0.083	0.276
	5	0.308	0.173	0.051	0.127	0.041	0.198
	6-10	0.135	0.342	0.137	0.368	0.177	0.381
	11-15Yrs	0.133	0.340	0.161	0.370	0.174	0.379
Age of Second Youngest Child							
	0-2	0.017	0.128	0.020	0.130	0.022	0.142
	3-4	0.037	0.189	0.041	0.177	0.049	0.216
	5-10	0.103	0.304	0.101	0.336	0.136	0.343
	11-15Yrs	0.132	0.339	0.142	0.402	0.175	0.380
Age of Second Youngest Child Family Incomplete							
	0-2	0.062	0.242	0.070	0.301		
	3-4	0.002	0.041	0.001	0.010	0.082	0.275
	5-10	0.005	0.073	0.002	0.080	0.002	0.048
	11-15	0.001	0.200	0.006	0.107	0.007	0.081
No. Children Over 16 Years		0.888	1.382	1.061	1.601	1.167	1.482
Age at First Birth	15-19	0.060	0.218	0.071	0.901	0.030	0.955
	20-22	0.084	0.277	0.076	0.108	0.030	0.170
	23-24	0.061	0.238	0.060	0.260	0.074	0.262
	25-29	0.268	0.443	0.103	0.235	0.058	0.234
	30-34	0.176	0.381	0.271	0.301	0.306	0.461
	35-39	0.075	0.264	0.207	0.411	0.205	0.404
	40plus	0.066	0.249	0.068	0.301	0.087	0.281
Age		0.020	0.021	0.021	0.018	0.025	0.020
Age Squared		23.044	13.715	22.014	11.187	25.620	12.955
Earnings Potential		0.615	0.657	0.518	0.660	0.577	0.605
Family Income		3.770	2.065	3.819	1.901	4.135	1.911
Dependent Adult		0.136	0.343	3.306	1.911	4.135	1.911
Region	North	0.070	0.256	0.072	0.261	0.071	0.257
	E.Mid.	0.076	0.266	0.077	0.206	0.077	0.266
	E.Ang.	0.031	0.173	0.030	0.177	0.031	0.173
	GLC	0.111	0.315	0.106	0.322	0.103	0.304
	S.West	0.182	0.386	0.189	0.391	0.188	0.391
	Scotland	0.054	0.227	0.057	0.281	0.057	0.232
	Wales	0.074	0.262	0.077	0.278	0.072	0.259

Continued .....

Qualified A-level	0.164	0.370	0.141	0.370	0.138	0.345
O-level	0.186	0.389	0.158	0.306	0.151	0.357
CSE	0.138	0.345	0.136	0.360	0.130	0.336
Own Mother Worked	0.485	0.500	0.458	0.487	0.451	0.500
Attitude to Work	0.597	0.491	0.586	0.446	0.577	0.494
Husband Helps At Home	0.357	0.479	0.358	0.480	0.412	0.492
Experienced Training	0.253	0.418	0.281	0.401	0.210	0.307
Unemployed As First Event	0.192	0.103	0.163	0.207	0.208	0.171
Birth Pattern B1	0.117	0.321	0.218	0.404	0.319	0.466
B2	0.117	0.321	0.158	0.301	0.155	0.362
Time Spent Working Before First Birth	12.061	3.123	11.196	2.713	13.307	3.107
Dependent Variable	0.279	0.449	0.319	0.442	0.347	0.476

Table8.5 : MEANS AND STANDARD DEVIATIONS OF REGRESSION ESTIMATES OF WOMEN'S PARTICIPATION

DEPENDENT VARIABLE IS: WORKING

VARIABLES		SAMPLE: All Women Workers Mean	SD	Married Women Mean	SD	Women With Children Mean	SD
Youngest Child Aged	0	0.047	0.212	0.058	0.234	0.062	0.242
	1-2	0.082	0.275	0.100	0.300	0.108	0.311
	3-4	0.063	0.242	0.070	0.262	0.083	0.276
	5	0.031	0.173	0.035	0.185	0.041	0.198
	6-10	0.135	0.342	0.156	0.363	0.176	0.381
	11-15Yrs	0.133	0.340	0.157	0.363	0.174	0.379
Age of Second Youngest Child	0-2	0.017	0.128	0.021	0.143	0.022	0.147
	3-4	0.037	0.189	0.046	0.210	0.049	0.216
	5-10	0.103	0.303	0.125	0.330	0.137	0.344
	11-15Yrs	0.132	0.339	0.159	0.365	0.176	0.380
Age of Second Youngest Child Family Incomplete	0-2	0.062	0.242	0.076	0.266	0.034	0.275
	3-4	0.002	0.041	0.002	0.039	0.002	0.048
	5-10	0.005	0.073	0.006	0.075	0.007	0.081
	11-15	0.004	0.200	0.001	0.022	0.001	0.022
No. Children Over 16 Years		0.888	1.382	0.159	0.365	1.167	1.482
Age at First Birth	15-19	0.060	0.238	0.018	0.134	0.030	0.169
	20-22	0.084	0.277	0.069	0.253	0.074	0.262
	23-24	0.061	0.239	0.063	0.242	0.058	0.234
	25-29	0.268	0.443	0.301	0.459	0.306	0.460
	30-34	0.176	0.381	0.200	0.398	0.208	0.404
	35-39	0.075	0.264	0.083	0.271	0.087	0.281
	40plus	0.066	0.249	0.053	0.225	0.087	0.282
Age		0.023	0.021	0.024	0.020	0.025	0.020
Age Squared		23.042	13.715	24.414	12.887	25.618	12.955
Earnings Potential		0.615	0.656	0.544	0.574	0.577	0.605
Family Income		3.770	2.065	4.596	1.600	4.135	1.911
Dependent Adult		0.136	0.343	0.149	0.356	0.147	0.354
Region	North	0.070	0.256	0.070	0.255	0.071	0.257
	E.Mid.	0.076	0.266	0.078	0.269	0.033	0.173
	E.Ang.	0.031	0.173	0.033	0.180	0.031	0.170
	GLC	0.111	0.315	0.100	0.300	0.103	0.304
	S.West	0.182	0.386	0.191	0.393	0.188	0.391
	Scotland	0.054	0.227	0.560	0.230	0.057	0.232
	Wales	0.074	0.262	0.076	0.264	0.072	0.259

Continued .....

Qualified A-level	0.164	0.370	0.158	0.365	0.138	0.343
O-level	0.186	0.389	0.167	0.373	0.150	0.357
CSE	0.138	0.345	0.134	0.340	0.130	0.386
Own Mother Worked	0.485	0.500	0.465	0.500	0.451	0.500
Attitude to Work	0.600	0.491	0.583	0.493	0.577	0.494
Husband Helps At Home	0.357	0.479	0.464	0.500	0.412	0.492
Experienced Training	0.193	0.437	0.199	0.434	0.185	0.433
Unemployed As First Event	0.241	0.407	0.161	0.307	0.178	0.361
Birth Pattern B1	0.240	0.427	0.278	0.448	0.319	0.466
B2	0.117	0.321	0.135	0.342	0.155	0.362
Time Spent Working Before First Birth	62.921	55.841	73.494	53.850	63.713	51.318
Dependent Variable	0.634	0.482	0.599	0.490	0.562	0.496

Table 8.6 : MEANS AND STANDARD DEVIATIONS OF OLS REGRESSION ESTIMATES OF WOMEN'S HOURS OF WORK

HOURS OF WORK OF BOTH FULL-TIME AND PART-TIME WOMEN WORKERS.

VARIABLES		SAMPLE All Women Workers		Married Women		Women With Children	
		Mean	SD	Mean	SD	Mean	SD
Youngest Child Aged	0	0.015	0.123	0.012	0.111	0.015	0.122
	1-2	0.045	0.207	0.036	0.183	0.042	0.202
	3-4	0.066	0.249	0.054	0.226	0.065	0.246
	5	0.410	0.180	0.030	0.170	0.036	0.187
	6-10	0.211	0.408	0.173	0.379	0.206	0.405
	11-15Yrs	0.247	0.431	0.203	0.402	0.237	0.425
Age of Second Youngest Child							
	0-2	0.005	0.068	0.004	0.061	0.005	0.067
	3-4	0.018	0.132	0.015	0.120	0.017	0.128
	5-10	0.116	0.320	0.094	0.292	0.110	0.313
	11-15Yrs	0.218	0.413	0.177	0.382	0.208	0.406
Age of Second Youngest Child Family Incomplete							
	0-2	0.037	0.188	0.030	0.170	0.035	0.185
	3-4	0.002	0.039	0.001	0.035	0.002	0.042
	5-10	0.006	0.078	0.005	0.073	0.007	0.082
	11-15						
No. Children Over 16 Years		1.298	1.422	1.060	1.377	1.332	1.442
Age at First Birth	15-19	0.017	0.129	0.015	0.123	0.019	0.136
	20-22	0.064	0.244	0.065	0.246	0.071	0.257
	23-24	0.060	0.237	0.065	0.246	0.057	0.232
	25-29	0.320	0.467	0.307	0.461	0.316	0.465
	30-34	0.218	0.413	0.200	0.400	0.213	0.410
	35-39	0.079	0.270	0.076	0.265	0.084	0.278
	40plus	0.020	0.140	0.057	0.232	0.019	0.137
Age		0.031	0.019	0.029	0.021	0.031	0.020
Age Squared		27.290	11.390	25.338	12.197	27.640	11.684
Earnings Potential		0.370	0.488	0.381	0.509	0.365	0.494
Family Income		4.551	1.577	4.565	1.577	4.126	1.877
Dependent Adult		0.149	0.356	0.144	0.351	0.142	0.350
Region	North	0.067	0.250	0.067	0.249	0.071	0.256
	E.Mid.	0.080	0.271	0.078	0.268	0.076	0.265
	E.Ang.	0.025	0.158	0.029	0.167	0.023	0.156
	GLC	0.103	0.304	0.106	0.307	0.111	0.314
	S.West	0.190	0.393	0.193	0.395	0.189	0.392
	Scotland	0.047	0.211	0.048	0.213	0.048	0.213
	Wales	0.070	0.256	0.074	0.263	0.070	0.256

Continued .....

Qualified A-level	0.148	0.355	0.171	0.377	0.148	0.355
O-level	0.147	0.354	0.166	0.373	0.146	0.354
CSE	0.139	0.346	0.139	0.346	0.138	0.344
Own Mother Worked	0.450	0.498	0.477	0.500	0.453	0.498
Attitude to Work	0.524	0.500	0.543	0.498	0.528	0.500
Husband Helps At Home	0.536	0.499	0.520	0.500	0.472	0.500
Experienced Training	0.450	0.498	0.433	0.496	0.450	0.498
Unemployed As First Event	0.122	0.328	0.144	0.351	0.122	0.327
Birth Pattern B1	0.457	0.498	0.371	0.483	0.450	0.498
B2	0.189	0.392	0.154	0.360	0.185	0.389
Time Spent Working Before First Birth	81.105	48.274	71.636	55.451	87.429	48.577
Dependent Variable	28.420	19.202	29.910	18.614	28.833	19.031

Table 8.7 : MEANS AND STANDARD DEVIATIONS OF OLS REGRESSION ESTIMATES OF WOMEN'S HOURS OF WORK

HOURS OF WORK OF PART-TIME WORKING WOMEN, USING THE DE DEFINITION OF PART-TIME WORK

VARIABLES		SAMPLE All Women Workers		Married Women		Women With Children	
		Mean	SD	Mean	SD	Mean	SD
Youngest Child Aged	0	0.016	0.127	0.077	0.130	0.018	0.132
	1-2	0.048	0.213	0.051	0.261	0.052	0.222
	3-4	0.075	0.264	0.087	0.275	0.082	0.274
	5	0.045	0.208	0.061	0.201	0.049	0.217
	6-10	0.228	0.420	0.301	0.401	0.245	0.430
	11-15Yrs	0.205	0.404	0.198	0.400	0.220	0.414
Age of Second Youngest Child							
	0-2	0.005	0.067	0.005	0.067	0.005	0.070
	3-4	0.023	0.150	0.028	0.151	0.025	0.156
	5-10	0.143	0.351	0.106	0.307	0.156	0.363
	11-15Yrs	0.210	0.407	0.209	0.427	0.228	0.420
Age of Second Youngest Child. Family Incomplete							
	0-2	0.033	0.180	0.033	0.181	0.036	0.187
	3-4	0.003	0.054	0.006	0.058	0.003	0.057
	5-10	0.007	0.082	0.006	0.083	0.007	0.080
	11-15						
No. Children Over 16 Years		1.101	1.413	1.161	1.443	1.193	1.434
Age at First Birth	15-19	0.018	0.132	0.016	0.118	0.014	0.116
	20-22	0.068	0.252	0.101	0.260	0.073	0.259
	23-24	0.041	0.198	0.046	0.200	0.044	0.204
	25-29	0.301	0.458	0.332	0.501	0.311	0.463
	30-34	0.216	0.411	0.226	0.478	0.221	0.415
	35-39	0.085	0.279	0.086	0.269	0.085	0.279
	40plus	0.047	0.211	0.046	0.106	0.022	0.146
Age		0.028	0.020	0.027	0.018	0.028	0.019
Age Squared		26.165	11.987	23.116	12.011	25.561	11.794
Earnings Potential		0.456	0.539	0.443	0.506	0.475	0.505
Family Income		4.195	1.835	5.101	1.610	4.227	1.798
Dependent Adult		0.158	0.364	0.156	0.361	0.152	0.359
Region	North	0.073	0.260	0.069	0.233	0.076	0.265
	E.Mid.	0.071	0.258	0.071	0.222	0.074	0.262
	E.Ang.	0.029	0.168	0.030	0.177	0.026	0.160
	GLC	0.097	0.297	0.100	0.306	0.096	0.295
	S.West	0.196	0.397	0.209	0.403	0.196	0.397
	Scotland	0.047	0.211	0.053	0.209	0.043	0.203
	Wales	0.072	0.259	0.076	0.261	0.074	0.262

Continued .....

Qualified A-level	0.159	0.366	0.160	0.333	0.140	0.347
O-level	0.129	0.335	0.129	0.335	0.129	0.336
CSE	0.128	0.334	0.126	0.310	0.131	0.337
Own Mother Worked	0.479	0.500	0.466	0.503	0.465	0.500
Attitude to Work	0.539	0.500	0.538	0.500	0.531	0.500
Husband Helps At Home	0.421	0.494	0.411	0.461	0.439	0.496
Experienced Training	0.522	0.500	0.524	0.501	0.519	0.500
Unemployed As First Event	0.113	0.317	0.113	0.613	0.106	0.308
Birth Pattern B1	0.444	0.497	0.416	0.500	0.482	0.500
B2	0.166	0.373	0.186	0.336	0.181	0.385
Time Spent Working Before First Birth	82.161	51.925	83.697	51.611	89.817	47.789
Dependent Variable	17.334	6.736	17.116	6.181	17.053	6.610

The means and standard deviations of the above variables are similar (to two decimal places) to those for the sample of part-time women workers using respondants own assessment of their work status and accordingly not reported here.

Table 8.8: MEANS AND STANDARD DEVIATIONS OF OLS REGRESSION ESTIMATI OF WOMEN'S HOURS OF WORK.

HOURS OF WORK OF FULL-TIME WOMEN WORKERS, USING THE DE DEFINITION OF FULL-TIME WORK.

VARIABLES		SAMPLE All Women Workers		Married Women		Women With Children	
		Mean	SD	Mean	SD	Mean	SD
Youngest Child Aged	0	0.007	0.083	0.009	0.100	0.015	0.12[illegible]
	1-2	0.012	0.108	0.019	0.135	0.026	0.15[illegible]
	3-4	0.020	0.139	0.025	0.156	0.043	0.20[illegible]
	5	0.010	0.010	0.012	0.109	0.021	0.14[illegible]
	6-10	0.068	0.251	0.098	0.298	0.146	0.353
	11-15Yrs	0.118	0.323	0.180	0.384	0.255	0.436
Age of Second Youngest Child							
	0-2	0.001	0.033	0.001	0.030	0.002	0.048
	3-4	0.003	0.057	0.005	0.068	00.007	0.083
	5-10	0.023	0.150	0.031	0.172	0.050	0.218
	11-15Yrs	0.085	0.279	0.132	0.378	0.185	0.389
Age of Second Youngest Child Family Incomplete							
	0-2	0.016	0.123	0.023	0.151	0.034	0.181
	3-4						
	5-10	0.004	0.061	0.004	0.061	0.007	0.083
	11-15						
No. Children Over 16 Years		0.694	1.221	0.982	1.364	1.506	1.434
Age at First Birth	15-19	0.109	0.311	0.018	0.132	0.028	0.165
	20-22	0.100	0.300	0.070	0.254	0.071	0.257
	23-24	0.078	0.267	0.089	0.285	0.076	0.265
	25-29	0.231	0.422	0.295	0.456	0.314	0.464
	30-34	0.136	0.343	0.180	0.384	0.206	0.405
	35-39	0.056	0.236	0.068	0.251	0.084	0.277
	40plus	0.091	0.289	0.077	0.268	0.015	0.122
Age		0.024	0.024	0.029	0.022	0.035	0.021
Age Squared		20.444	13.886	24.209	12.823	29.271	11.454
Earnings Potential		0.450	0.712	0.278	0.513	0.182	0.444
Family Income		3.102	2.1414	4.600	1.565	3.938	1.970
Dependent Adult		0.106	0.308	0.128	0.334	0.140	0.347
Region	North	0.068	0.251	0.063	0.243	0.068	0.251
	E.Mid.	0.079	0.270	0.077	0.266	0.075	0.363
	E.Ang.	0.020	0.139	0.022	0.148	0.014	0.118
	GLC	0.139	0.346	0.120	0.325	0.132	0.338
	S.West	0.167	0.373	0.135	0.380	0.167	0.373
	Scotland	0.047	0.212	0.053	0.224	0.055	0.278
	Wales	0.071	0.258	0.074	0.058	0.058	0.234

Continued .....

Qualified A-level	0.231	0.421	0.230	0.421	0.189	0.
O-level	0.245	0.430	0.200	0.400	0.162	0.
CSE	0.160	0.367	0.134	0.341	0.138	0.
Own Mother Worked	0.530	0.500	0.469	0.499	0.434	0.
Attitude to Work	0.586	0.493	0.542	0.489	0.513	0.
Husband Helps At Home	0.337	0.473	0.578	0.491	0.521	0.5
Experienced Training	0.317	0.466	0.345	0.476	0.356	0.4
Unemployed As First Event	0.261	0.434	0.177	0.381	0.133	0.3
Birth Pattern B1	0.181	0.390	0.272	0.444	0.409	0.4
B2	0.083	0.275	0.120	0.325	0.181	0.3
Time Spent Working Before First Birth	38.079	53.302	54.283	56.091	83.259	49.5
Dependent Variable	39.965	11.755	39.255	12.460	39.344	12.9

The means and standard deviations of the above variables are similar (to two decimal places) to those for the sample of full-time women workers using respondants own assessment of their work status and accordingly not reported here.

Table 8.9: MEAN AND STANDARD DEVIATION OF REGRESSION ESTIMATES OF THE SUPPLY OF LABOUR

REGRESSORS	Workers & Non-Workers Of All Ages		Workers & Non-Workers Aged 20-40 Years		Workers & Non-Workers Aged 40-60 Years	
	MEAN	SD	MEAN	SD	MEAN	SD
Youngest Child Aged 0	0.010	0.100	0.021	0.142	0.001	0.026
1-2	0.028	0.166	0.060	0.237	0.001	0.026
3-4	0.043	0.204	0.089	0.285	0.004	0.062
5	0.024	0.154	0.046	0.208	0.007	0.081
6-10	0.140	0.347	0.222	0.416	0.079	0.270
11-15	0.160	0.367	0.124	0.330	0.224	0.417
Age of Second Youngest Child 0-2	0.003	0.055	0.006	0.076	0.007	0.026
3-4	0.011	0.105	0.024	0.152	-	-
5-10	0.079	0.261	0.144	0.351	0.014	0.116
11-15	0.139	0.346	0.206	0.404	0.094	0.292
Age of Youngest Child Family Incomplete 0-2	0.024	0.152	0.049	0.217	-	-
3-4	0.001	0.034	0.003	0.051	-	-
5-10	0.005	0.071	0.011	0.104	-	-
11-15	-	-	-	-	-	-
No. Children Aged Over 16 Years	0.897	0.336	0.164	0.526	1.789	1.463
Age At First Birth 15-19	0.067	0.250	0.200	0:140	0.005	0.072
20-22	0.086	0.281	0.158	0.365	0.027	0.163
23-24	0.062	0.242	0.103	0.303	0.032	0.176
25-29	0.264	0.441	0.329	0.470	0.241	0.428
30-34	0.170	0.376	0.121	0.326	0.249	0.433
35-39	0.069	0.254	0.035	0.183	0.115	0.320
40 Plus	0.070	0.255	-	-	0.151	0.358
Age	0.017	0.017	0.006	0.005	0.031	0.015
Age Squared	23.100	13.381	13.779	5.003	35.479	8.193
Earnings Potential	0.497	0.305	0.375	0.226	0.584	0.248
Family Income	3.604	2.083	3.721	2.101	3.882	1.954
Dependent Adult			0.075	0.263	0.198	0.395

Table Continued ....

	MEAN	SD	MEAN	SD	MEAN	SD
Region:						
North	0.070	0.254	0.069	0.254	0.068	0.252
E.Mid	0.077	0.267	0.076	0.268	0.072	0.259
E.Ang	0.025	0.157	0.024	0.148	0.027	0.161
GLC	0.183	0.387	0.190	0.392	0.184	0.388
S.West	0.122	0.327	0.128	0.334	0.117	0.322
Scot.	0.074	0.262	0.047	0.211	0.045	0.207
Wales	0.046	0.209	0.076	0.264	0.070	0.255
Qualified:						
A-level	0.185	0.356	0.244	0.430	0.147	0.355
O-level	0.138	0.399	0.230	0.421	0.117	0.322
CSE	0.149	0.388	0.161	0.368	0.117	0.321
Own Mother Worked	0.505	0.500	0.584	0.493	0.384	0.487
Attitude To Work	0.569	0.495	0.456	0.498	0.660	0.474
Husband Helps At Home	0.378	0.485	0.416	0.493	0.400	0.490
Experienced Training			0.147	0.354		
Unemployed As First Event	58.460	57.198	39.558	44.682	87.102	57.866
Birth Patterns						
B1	0.301	0.459	0.235	0.424	0.417	0.493
B2	0.124	6.330	0.135	0.342	0.133	0.340
Time Spent Working Before First Birth						
Dependent Variable	0.440	0.497	0.422	0.494	0.528	0.499

Table 8.10: MEAN AND STANDARD DEVIATION OF REGRESSION ESTIMATES OF THE SUPPLY OF LABOUR

REGRESSORS	Workers & Non-Workers Of All Ages		Workers & Non-Workers Aged 20-40 Years		Workers & Non-Workers Aged 40-60 Years	
	MEAN	SD	MEAN	SD	MEAN	SD
Youngest Child Aged 0	0.016	0.127	0.030	0.170	0.006	0.247
1-2	0.038	0.192	0.078	0.268	0.006	0.247
3-4	0.051	0.219	0.100	0.300	0.061	0.147
5	0.028	0.164	0.051	0.220	0.007	0.779
6-10	0.136	0.343	0.212	0.409	0.073	0.085
11-15	0.061	0.132	0.119	0.324	0.224	0.417
Age of Second Youngest Child						
0-2	0.005	0.071	0.060	0.238	0.006	0.025
3-4	0.014	0.116	0.004	0.063	0.006	0.025
5-10	0.081	0.273	0.011	0.103	0.014	0.118
11-15	0.155	0.363	0.001	0.024	0.096	0.294
Age of Youngest Child Family Incomplete						
0-2	0.031	0.172	0.008	0.914		
3-4	0.002	0.043	0.028	0.165		
5-10	0.005	0.071	0.157	0.364		
11-15	0.001	0.061	0.199	0.400		
No. Children Aged Over 16 Years	0.864	1.326	0.161	0.523		
Age At First Birth 15-19	0.075	0.268	0.025	0.157	0.005	0.070
20-22	0.089	0.285	0.162	0.369	0.026	0.180
23-24	0.061	0.240	0.099	0.300	0.031	0.174
25-29	0.261	0.439	0.323	0.468	0.241	0.428
30-34	0.167	0.373	0.121	0.367	0.248	0.432
35-39	0.068	0.251	0.032	0.176	0.119	0.324
40 Plus	0.067	0.250	-	-	0.150	0.357
Age	0.016	0.017	0.006	0.005	0.034	0.015
Age Squared	22.568	13.856	13.642	4.954	35.434	8.235
Earnings Potential	0.467	0.310	0.349	0.226	0.661	0.254
Family Income	3.584	2.081	3.700	2.087	3.884	1.958
Dependent Adult	0.127	0.330	0.176	0.337	0.194	0.396

Table Continued ......

	MEAN	SD	MEAN	SD	MEAN	SD
Region:						
North	0.069	0.254	0.068	0.252	0.068	0.254
E.Mid	0.077	0.267	0.079	0.270	0.073	0.261
E.Ang	0.026	0.158	0.024	0.154	0.026	0.158
GLC	0.179	0.384	0.181	0.385	0.186	0.389
S.West	0.120	0.325	0.126	0.332	0.117	0.321
Scot.	0.046	0.209	0.071	0.256	0.045	0.207
Wales	0.072	0.258	0.048	0.213	0.700	0.254
Qualified:						
A-level	0.177	0.381	0.154	0.361	0.115	0.319
O-level	0.196	0.397	0.224	0.417	0.120	0.325
CSE	0.144	0.351	0.229	0.421	0.115	0.319
Own Mother Worked	0.514	0.500	0.591	0.492	0.387	0.487
Attitude To Work	0.563	0.496	0.451	0.500	0.658	0.465
Husband Helps At Home	0.367	0.482	0.405	0.491	0.387	0.487
Experienced Training						
Unemployed As First Event	0.165	0.371	0.153	0.360		
Birth Patterns						
B1	0.285	0.371	0.220	0.414	0.408	0.492
B2	0.125	0.331	0.140	0.347	0.132	0.339
Time Spent Working Before First Birth	58.136	56.731	41.326	40.032	86.877	57.852
Dependent Variable	0.459	0.500	0.447	0.453	0.551	0.500

Table 8.11: MEAN AND STANDARD DEVIATION OF REGRESSION ESTIMATES OF THE FRACTION OF TIME SPENT WORKING

REGRESSORS		MEAN	SD
Youngest Child			
Aged	0	0.046	0.210
	1-2	0.082	0.275
	3-4	0.063	0.243
	5	0.031	0.174
	6-10	0.137	0.344
	11-15	0.135	0.342
Age of Second Youngest Child			
	0-2	0.016	0.124
	3-4	0.037	0.189
	5-10	0.103	0.304
	11-15	0.134	0.341
Age of Youngest Child Family Incomplete			
	0-2	0.062	0.240
	3-4	0.002	0.044
	5-10	0.005	0.073
	11-15	0.001	0.020
No. Children Aged Over 16 Years		0.892	1.383
Age At First Birth	15-19	0.055	0.229
	20-22	0.084	0.277
	23-24	0.061	0.239
	25-29	0.270	0.444
	30-34	0.177	0.382
	35-39	0.076	0.264
	40 Plus	0.066	0.248
Age		0.023	0.021
Age Squared		23.135	13.651
Earnings Potential		0.587	0.621
Family Income		3.786	2.061
Dependent Adult		0.136	0.342

Table Continued .....

	MEAN	SD
Region:		
North	0.070	0.255
E.Mid	0.076	0.265
E.Ang	0.031	0.174
GLC	0.110	0.313
S.West	0.183	0.387
Scot.	0.054	0.227
Wales	0.074	0.262
Qualified:		
A-level	0.167	0.373
O-level	0.187	0.390
CSE	0.140	0.347
Own Mother Worked	0.487	0.500
Attitude To Work	0.596	0.491
Husband Helps At Home	0.359	0.470
Experienced Training	0.257	0.437
Unemployed As First Event	0.177	0.382
Birth Patterns		
B1	0.243	0.429
B2	0.119	0.323
Time Spent Working Before First Birth	63.737	50.744
Dependent Variable	0.126	0.176
Fraction of Time Spent Working		
Part-time	0.126	0.176
Full-time	0.528	0.290
Part and Full-time	0.654	0.252

Table 8.12 MEAN AND STANDARD DEVIATIONS OF THE DETERMINANTS OF DOWNWARD OCCUPATIONAL MOBILITY

Regressions	Mean	SD
PART	0.662	0.473
TIME	59.242	131.393
OCC1	0.051	0.220
OCC2	0.065	0.246
OCC3	0.025	0.157
OCC4	0.391	0.488
OCC5	0.097	0.297
QUAL 1	0.143	0.350
QUAL 2	0.160	0.367
EARLY	6.805	4.201
FAM	0.399	0.490
COHORT	4.263	2.100
ATT	0.545	0.499
DEPENDENT VARIABLE	0.408	0.491

OCCUPATION CODES

Women's occupations at the time of the interview were coded according to the following classification with the proviso that anyone who is a trainee is coded to the same occupation as if they had completed the training.

Professional occupations 1

Barristers, solicitors, chartered and certified accountants, university teachers, doctors, dentists, physicists, chemists, social scientists, pharmacists, dispensing opticians, qualified engineers, architects, town planners, civil servants - Assistant Secretary level and above.

Teachers 2

Primary and secondary school teachers, teachers in further and higher education (not universities), head teachers, nursery teachers, vocational and industrial trainers.

Nursing, medical and social occupations 3

SRN, SEN, nursing auxilliary, midwife, health visitor, children's nurse, matron/superintendent, dental nurse, dietician, radiographer, physiotherapist, chiropodist, dispenser, medical technician, houseparents, welfare occupations (including social workers), occupational therapist.

Other intermediate non-manual occupations 4

Civil Servants - Executive Officer to Senior Principal level and equivalent in central and local government, computer programmer, systems analyst, O & M analyst, librarian, surveyor, personnel officer, managers, self-employed farmers, shopkeepers publicans, hoteliers, buyer, company secretary, author, writer, journalist, artist, designer, window dresser, entertainer, musician, actress.

Clerical occupation 5

Typist, secretary, shorthand writers, clerk, receptionist, personal assistant, cashier (not retail), telephonist receptionist, office machine operator, computer operator, punch card operator, data processor, draughtswoman, tracer, market research interviewer, debt collector.

Shop assistant and related sales occupations 6

People selling goods in wholesale or retail establishments, cashiers in retail shops, check-out and cash and wrap operators, petrol pump attendant, sales representative, demonstrator, theatre/cinema usherette, programme seller, insurance agent.

Skilled occupations 7

Hairdresser, manicurist, beautician, make-up artist, cook, domestic and institution housekeeper, nursery nurse, travel stewardess, ambulance woman, van driver and deliveries, baker, weaver, knitter, mender, darner, tailoress and dressmaker (whole garment), clothing cutting, milliner, upholsterer, bookbinder, precision instrument maker and repairer, instrument assemblers, laboratory assistant, driving instructor, policewoman.

Childcare occupations 8

Childminder, school meals and playgroup supervisor or leader, nanny, au pair, people doing housework in addition to childcare (NB exclude nursing and teaching).

Semi-skilled factory work 9

Assembler, packer, labeller, grader, sorter, inspector, machinist, machine operator, people wrapping, filling or sealing containers, spinner, doubler, twister, winder, reeler.

Semi-skilled domestic work 10

Waitress, barmaid, canteen assistant, people serving food at tables or counters, serving school meals, home help, care attendant, ward orderly, housemaid, domestic worker.

Other semi-skilled occupations 11

Agricultural worker, groom, kennel maid, shelf filler, bus conductress, ticket collector, post woman, mail sorter, laundre laundress, dry cleaner, presser, mail order and catalogue agent, market and street trader, collector saleswoman, traffic warden, telephone operator, photographer.

Unskilled occupations 12

Cleaner, char woman, kitchen hand, labourer, messenger.

INDUSTRY CODES

The industry women were working in at the time of the interview were coded according to the following categories:

MANUFACTURING INDUSTRIES

Food, drink and tobacco processing 1

Processing or manufacture of all food, drink and tobacco products

not production of the raw materials

not retail or wholesale distribution.

Textiles, clothing, footwear, leather goods 2

Manufacture of all textiles (eg wool, rope, carpet, synthetic fibres), clothing, footwear, leather goods, fur

not retail or wholesale distribution

not upholstery and bedding.

Engineering, metal goods, metal manufacture 3

Mechanical, instrument, electrical, shipbuilding and marine engineering, manufacture of vehicles and all types of metal goods (excluding toys), metal manufacture (from raw materials)

not civil engineering.

Other manufacturing industries 4

Manufacture and processing of coal and petroleum products (including oil refining), manufacture of chemicals (eg paint, soap, fertilisers), plastics, pharmaceuticals, rubber, bricks, pottery, cement, glass (and goods made of these materials), timber, furniture and other wooden goods, upholstery and bedding, paper, printing and publishing, toys, games, sports equipment, musical instruments.

SERVICING INDUSTRIES

Distributive trades.......................................5

Wholesale and retail distribution of all goods (all shops including sub-post offices), pre-packing of food when no processing involved

not road haulage and transport

not filling stations, main post offices, cafes, pubs.etc, dry cleaners.

Professional and scientific services 6

Accountancy, schools (including nursery schools), other educational establishments (including school meals service and educational administration), legal services, hospitals and other medical, dental, research and development services, day nurseries and creches, local authority health and social services (eg social workers, people working in L.A. homes and centres for handicapped), religious organisations.

Insurance, public and local government administration 7

Insurance, banking and other financial institutions, estate agents, property companies, advertising, market research, typing, duplicating, copying services, employment agencies (not government), computer services and other business services, office cleaning, security firms (not transport), management consultants, Civil Service, armed forces, police, fire service, other local government services not included elsewhere

not hospitals, schools, building and civil engineering establishments, training services.

Other services ....

Construction and civil engineering, gas, electricity, water, road haulage, transport, postal services and telecommunicati packing and despatch of goods (without processing or distribution), travel agents, school crossings, hotels, pubs, restaurants, entertainment and sports services, personal services (eg hairdressing, private domestic service, child-minding, home helps), laundries, dry cleaners, filling statio shoe repairers, motor repairers, welfare and charitable servi old people's homes, playgroups, museums, art galleries, trade unions, employers organisations.

PRIMARY INDUSTRIES

Agriculture, forestry, fishing, mining, quarrying ....

Farming, horticulture, mining and quarrying of coal, stone, slate; extraction of chalk, sand, gravel, gas, oil.

A Note On The Imputed Earnings Variable

The imputed earnings variable (log of earnings potential) used in Chapters Three, Four and Five, is derived from Joshi (1984) as described in Appendix 2. However, after the paper from which the imputed earnings variable was derived was published, the author discovered that an apparently small number had been mistranscribed during the research work. The resulting error has very minor repercussions for Joshi's 1984 report, and the results presented in this thesis. In the formula for imputing earnings potential in Appendix 2, -0.0026 should have read -0.026, as the coefficient on (Age x time spent working) x 10,000.

This error was unfortunately incorporated by Joshi in the imputation of the earnings potential for the participation regressions. It was also, therefore, incorporated into the participation regressions described in Chapters Three to Five.

Joshi re-estimated her participation equations using the corrected earnings potential formula, and their substantive findings are largely unchanged. The same was done in this thesis and similarly, the substantive finds remaining largely unaltered. As with Joshi's re-estimation, the coefficient on the corrected term and its explanatory power are reduced by around 20%, but the effects on other variables - such as the presence of children - are unchanged, with the exception of the age term whose effect is also reduced. The revisions to the log of earnings potential and age term variables bring the 'wage' and 'age' effects on participation close to those anticipated, as described in other sources[1] with the other conclusions drawn from the effect of children on participation and the effect training and qualifications have on participation remaining unaltered.

(1) See Layard, Barton & Zabalaza (1980), Greenhalgh (1980), Joshi, Layard and Owen (1981) and Zabalza (1982)

REFERENCES

ABBOT, M. and ASHENFELTER, M. (1976)
"Labour Supply and Commodity Demand and the Allocation of Time", Review of Economic Studies 43, October, 389-411

AMEMYA, T. (1981)
"Qualitative Response Models: A Survey", Journal of Economic Literature, Vol. X1X, December, 1483-1536

ASHENFELTER, M. and HECKMAN, J. (1974)
"Estimating Labour Supply Functions" in "Income, Maintenance and Labour Supply", Cain and Watts (eds.(1973))

ASHWORTH, J. and ULPH, D. (1977)
"Estimating Labour Supply with a Piecewise Linear Budget Constraint", University of Sterling, mimes.

BALLARD, B. (1984)
"Women Part-time Workers: Evidence from the 1980 Women and Employment Survey", Department of Employment Gazette, Vol. 92:9 September, 409-416

BECKER, G. (1980)
"Altruism in the Family and Selfishness in the Market Place", Centre for Labour Economics, London School of Economics, Discussion Paper No. 73, May.

BORJAS, G. and HECKMAN, J. (1979),
"Labour Supply Estimates for Public Policy Evaluation", Proceedings of the Thirty-First Annual Meeting of the Industrial Relations Research ASsociation, 320-331.

BROWN, A. and Deaton, A, (1972),
"Models of Consumer Behaviour: A Survey", Economic Journal 82, December, 1145-1236.

BRUEGEL, I. (1979)
"Women as a Reserve Army of Labour: A Note on Recent British Experience", Feminist Review, 3, 12-23.

CAIN, G. and WATTS, H. (1973) (Eds),
"Income Maintenance and Labour Supply", Chicago: Markham.

CLARK, G. (1982),
"Working Patterns - Part-Time Work, Job Sharing and Self-Employment", Manpower Intelligence and Planning, Paper MSC.

DANKERT, C. MANN, F and NORTHRUP, H. (1963 (Eds), "Hours of Work", Harper and Row Inc.

Department of Employment Gazette, (1983), February 1983, Vol 91:2, 62.

<u>References</u> Continued .....

Department of Employment Gazette, (1981),
February 1981, Vol. 89:2, 61

DEX, S. (1984a),
"Women's Work Histories: An Analysis of the Women and Employment Survey",
Department of Employment Research, Paper No. 46.

DEX, S. (1984b),
"Women's Occupational Profiles",
Department of Employment Gazette, December. Vol. 92:12.

DEX, S. and PERRY, S. (1984),
"Women's Employment Changes in the 1970s",
Department of Employment Gazette, April 1984, 151-164.

EHRENBERG, R. (1980) (Ed),
"Research in Labour Economics",
Vol.4, Greenwich, Connecticut: JAI Press.

ELIAS, P. (1981),
"Labour Supply in Great Britain: Theory and Evidence - A Comment",
in Horstein et al, 1981.

ELIAS, R. and MAIN, B. (1982),
"Women's Working Lives: Evidence from the National Training Survey", Institute for Employment Research, University of Warwick.

EOC (1981),
"Research Bulletin No.51 - Spring"
Survey carried out by Industrial Facts and Forecasting Ltd.

GREENHALGH, C. (1979),
"Participation and Hours of Work for Married Women in Great Britain",
Economica Vol.44, No. 175, 249-265.

GREENHALGH, C. (1980),
"Participation and Hours of Work for Married Women in Great Britain",
O.E. Papers Vol. 32(2), July 1980, 296-318.

GREENHALGH, C. and MAYHEW, K. (1981),
"Labour Supply in Great Britain: Theory and Evidence",
in Horstein Z. et al (1981).

GREENHALGH, C. and STEWART, M. (1982)
"Occupational Status and Mobility of Men and Women",
Warwick Economic Research Papers, No. 211.

References Continued .....

GREENHALGH, C. and STEWART, M. (1984),
"Work History Patterns and the Occupational Attainment of Women",
The Economic Journal 94 (375), September, 493-519.

HALLAIRE, J. (1968),
"Part-time Employment - its Extents and Problems",
O.E.C.D. Pams.

HECKMAN, J. (1974),
"Shadow Prices, Market Wages and Labour Supply",
Econometrica 42, July, 679-694.

HECKMAN, J. (1976),
"The Common Structure of Statistical Models of Truncation, Sample Selection, and Limited Dependent Variables and a Simple Estimator for such Models",
Annals of Economic and Social Measurements 5, Fall, 475-492.

HECKMAN, J. (1978),
"Dummy Endogenous Variables in a Simultaneous Equation System",
Econometrica 46, July, 431-961.

HECKMAN, J. (1980),
"Sample Selection Bias as a Specification Error",
in Smith, ed (1980).

HECKMAN, J. KILLINGSWORTH, M. and MACURDY, M. (1981),
"Empirical Evidence on Static Labour Supply Models: A Survey of Recent Developments",
in Hornstein, Z., Grice, J. and Webb, A. (1981) (Eds).

HECKMAN, J. and MACURDY, T. (1980a),
"A Life Cycle Model of Female Labour Supply",
Review of Economic Studies, 47.

HECKMAN, J. and MACURDY, T. (1980b),
"Recent Developments in Labour Supply: A Survey with Special Reference to Statistical and Dynamic Issues",
in Ehrenberg, R. ed. 1980.

HORNSTEIN, Z. GRICE, J. and WEBB, A. (1981) (Eds),
"The Economics of the Labour Market",
HMSO, London.

HURD, M. (1976),
"The Estimation of Non-Linear Labour Supply Functions with Taxes from a Truncated Sample",
Research Memorandum No. 36, Centre for the Study of Welfare Policy, Stanford Research Institute.

References Continued .....

HURSTFIELD, J. (1980),
"Part-time Pittance",
Low Pay Review 2, June.

JOSHI, H. (1979),
"Employment Flows and Fertility of Married Women in Great Britain 1970-1974",
Mimeo. Centre for Overseas Population Studies.

JOSHI, H. (1984),
"Women's Participation in Paid Work: Further Analysis of the Women and Employment Survey",
Department of Employment Research Paper, No. 45.

JOSHI, H. and OWEN, S. (1981),
"Demographic Predictors of Women's Work Participation in Post-War Britain",
Centre for Population Studies Working Paper, No. 81-3, London School of Hygiene.

JOSHI, H. LAYARD, R. OWEN, S. (1981),
"Female Labour-Supply in Post-War Britain: a cohort approach",
Centre for Labour Economics, Discussion Paper, No. 79,
London School of Economics,
Now published as:

JOSHI, H. LAYARD, R. and OWEN, S. (1984),
"Why are More Women Working in Britain?",
Journal of Labour Economics, Special Issue, September.

KILLINGSWORTH, M. (1980),
"A Survey of Labour Supply Models: Theoretical Propositions and Empirical Problems",
in EHRENBERG, R. (1980), (Ed).

KILLINGSWORTH, M. (1981),
"Neoclassical Labour Supply Models",
Cambridge: Cambridge University Press.

LAYARD, R. BARTON, M. and ZABALZA, A. (1980),
"Married Women's Participation and Hours",
Economica, 47, 51-72.

LEICESTER, C. (1982),
"Towards a Fully Part-time Britain",
Personal Management, June, 1982.

LESLIE, D. (1978),
"A Supply and Demand Analysis of the Structure of Hours of Work for UK Production Industries",
Mimeo.

References Continued .....

LEWIS, H. (1962) (Ed),
"Aspects of Labour Economics",
Princeton University Press, Princeton.

MADALA, G. (1983),
"Limited Dependent and Qualitative Variables in Econometrics",
Cambridge University Press, London.

MALLIER, A. and ROSSER, M. (1980),
"Part-time Workers and the Firm",
International Journal of Management, 1 (4).

MALLIER, A. and ROSSER, M. (1980),
"Part-time Workers and the Economy",
International Journal of Manpower, 1,
No. 2, 2-7.

MANPOWER SERVICES, (1971),
"Hostels",
Department of Employment,
Manpower Studies, No. 11.

MARTIN, J. and ROBERTS, C. (1984a),
"Women and Employment: A Lifetime Perspective",
London HMSO.

MARTIN, J. and ROBERTS, C. (1984b),
"Women's Employment in the 1980s. Evidence from the Women and Employment Survey",
Department of Employment Gazette, May, 199-209.

MEYERS, F. (1965),
"The Economics of Overtime",
in Dankert, C. Mann, F. and Northrup, H. (1965) (Eds).

MCGOLDRICK, A. (1983),
"Older Employees: The Choice Between Work and Retirement",
The Training Officer, October, 293-296.

MINCER, J. (1962),
"Labour Force Participation of Married Women: A Study of Labour Supply",
in Lewis, H. (1962.

PERLMAN, R. (1966),
"Observations on Overtime and Moonlighting",
Southern Economic Journal 35, July, 82-84.

PERLMAN, R. (1969),
"Labour Theory",
New York, John Wiley and Sons Inc.

RIMMER, L. (1981),
"Focus on the Family",
Department of Employment Gazette, September.

References Continued .....

ROBERTSON, J. BRIGGS, J. (1979),
"Part-time Working in Great Britain",
Department of Employment Gazette, July, 671-677.

ROBINSON,O. and WALLACE,J. 1984,
"Growth and Utilisation of Part-time Labour in Great Britain",
Department of Employment Gazette,
Vol. 92, No.9, September, 391-397.

SCHULTZ, (1980),
"Estimating Labour Supply Functions for Married Women",
in Smith, ed (1980),

SHOENBERG, E. and DOUGLAS, P. (1937),
"Studies in the Supply Curve of Labour: The Relation Between Average Earnings in American Cities and the Proportion Seeking Employment",
Journal of Political Economy 45,
February, 45-62.

SMITH, J. (1980) ed.
"Female Labour Supply: Theory and Estimation",
Princeton: Princeton University Press.

STEWART, J. (1979),
"Understanding Econometrics",
Hutchinson University Library, London.

WILKS, S. (1962),
"Mathematical Statistics",
John Wiley and Sons Inc. London.

ZABALZA, A. (1981),
"The CES Utility Function, Non-linear Budget Constraints and Labour Supply. Results on Female Participation and Hours",
Centre for Labour Economics, Discussion Paper No. 101, July,
London School of Economics.

ZABALZA, A. PISSARIDES, C. PIACHAUD, D. and BARTON, M. (1979),
"Social Security and the Choice Between Full-time, Part-time Work and Retirement",
Paper presented at NBER-SSRC, Conference
Conference on Econometric Studies in Public Finance.

ZABALZA, A. (1981),
"Social Security and the Elderly. A Simulation of Policy Changes",
Centre for Labour Economics, London School of Economics,
Working Paper, No. 297.