



PARTICIPATION, EARNINGS AND EXCESS LABOUR SUPPLY

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ABSTRACT It is possible to characterise Australia's unemployment problem over the last quarter of a century as one of excess labour supply. Demand for labour has been strong over this period outpacing population growth by almost half a percentage point annually. Despite this, however, growth in labour demand has been overshadowed by even greater growth in labour supply, creating a state of permanent labour market disequilibrium. This phenomenon is not unique to Australia, but is characteristic of most western economies around the world.

1. INTRODUCTION

Economic theory suggests that disequilibrium in any market should be temporary with market forces bringing forth a solution. In the case of labour markets, excess supply of labour is a signal that real wages are too high. A reduction in real wages, brought about by market forces, should stimulate demand for labour, absorbing some of the unemployment pool. Simultaneously, other unemployed persons will leave the labour market as their reservation wage will exceed the lower expected wage.

An appreciation is required, therefore, of the demographic, economic, social and political changes that have given rise to the persistent and sustained level of excess labour supply, in order to better understand unemployment in Australia and produce appropriate policy responses. The aim of this paper is to examine the factors which impact on the participation decisions of individuals and how they have changed through time. The institutional and regulatory arrangements which prevent the labour market from clearing are addressed elsewhere.

Towards this end, the study begins with an overview of the broad trends in aggregate labour demand and supply and their impacts on participation and unemployment. Supply side characteristics of the individual participation decision are then examined. Section three presents a detailed model of labour supply, using unit record data from the 1991 and 1996 Censuses of Population and Housing, to estimate participation and earnings functions for Australia and Queensland. These data provide a particularly useful reference for these purposes. Not only does this source provide a large number of observations, but data contained within the census, such as family-type and the presence of non-

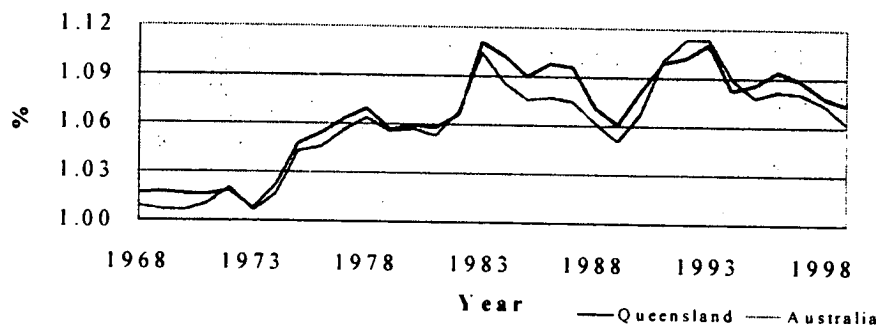


Figure 1. Excess Labour Supply: Queensland and Australia, 1968-1999

Source: ABS Unadjusted Series: Employment and Unemployment at August (Cat No. 6204.0 prior to 1978, Cat No.6202.0 from 1978); Vacancy data for 1968-1978 represent vacancies registered with the CES (Cat No. 6213.0); Vacancies 1978 onwards, Cat No. 6354.0

dependent family offspring allow specific attention to be focused upon important questions concerning the role of the family and the type of household structure upon participation decisions for both primary and secondary workers. The results from the estimation of these models will provide some insight into which factors are continuing to influence supply decisions in our changing social environment.

2. TRENDS IN DEMAND AND SUPPLY

At any point in time, aggregate labour demand and supply may be approximated by the following set of identities:

$$\text{Total Labour Demand (TLD)} \equiv \text{Employment} + \text{Vacancies} \quad (1)$$

$$\text{Total Labour Supply (TLS)} \equiv \text{Employment} + \text{Unemployment} \quad (2)$$

The ratio obtained by dividing TLS by TLD is the excess supply ratio. Figure 1 shows the excess labour supply ratio for Queensland and Australia from 1968 to 1999. This ratio closely mirrors the unemployment rate, as is expected, given that they are definitionally similar concepts. The excess supply ratio, however, will typically understate the unemployment rate, because it effectively nets off job vacancies from the unemployment pool.

It can be seen, using these measures of aggregate labour demand and supply, that full employment conditions have not existed in Australian and Queensland labour markets since 1974 when excess supply was last below 2 per cent. At this time, any unemployment that did exist could reasonably be described as frictional or search unemployment (Mangan, 1994).

Table 1. Labour Supply, Demand and Population Growth Rates

	Queensland	Australia
Compound Annual Growth rates, 1968 to 1999		
Population	2.38	1.52
Labour demand	2.94	1.86
Labour supply	3.12	2.03
Employment to Population Ratio		
1968	0.40	0.42
1999	0.46	0.46

Source. ABS Cat No's 3101.0, 6204.0, 6202.0, 6312.0 and 6354.0

Over the past three decades, employment growth has been quite strong, outpacing population growth. As shown in Table 1, the compound annual growth rate for employment in Australia, from 1968 to 1999, was 1.86 per cent, while population grew at only 1.52 per cent. Growth in Queensland has been much more rapid, although the pattern is similar, with growth rates for employment and population of 2.94 and 2.38 per cent respectively. The result of this strong employment performance has been a substantial increase in the employment to population ratio, which shows that in Australia in 1968, 42 out of every 100 persons were employed. By 1999, this had risen to 46 per 100 persons. The change in this ratio was more marked in Queensland, increasing from 40 to 46 employed persons per 100 over the same period.

On the basis of the growth rates reported in Table 1 it is difficult to argue, as some economists have, that unemployment is caused largely by a lack of aggregate demand. Despite the impressive employment generation, however, particularly in Queensland, labour demand growth has been overshadowed by labour supply, with growth of 2 per cent per annum for Australia as a whole and over 3 per cent in Queensland.

The effective labour supply, at any point in time, is governed by the socio-demographic factors which determine the available working age population and the participation decisions of those people. Some of the factors that have contributed to the sustained period of excess labour supply may be seen by examining changes in the size and composition of the Australian civilian labour force over the past three decades:

- Between 1968 and 1999, the percentage of women participating in the labour force in Australia has increased by 15.5 percentage points, from 37.7 per cent to 53.2 per cent, taking the female proportion of total employed persons from 31.2 to 43.4 per cent.
- The participation rate for married females in 1968 was 31.6 per cent, almost 12 percentage points below the participation rate for non-married females. By 1999, married female participation had increased by 22.8 percentage points to 54.4 per cent, 2.5 percentage points above the non-married female rate.
- During the same period, the labour force participation rate of males actually declined, from 83.2 per cent to 72.0 per cent.

- The number of employed married females increased by 161 per cent, compared with 114 per cent for other females and only 42 per cent for males.
- Part-time employment accounted for 10 per cent of all jobs in 1968. By 1999, 26 per cent of workers were in part-time employment.
- The proportion of employed males working full-time declined from 96 per cent to 87 per cent.
- Participation by full-time students has risen dramatically in recent times. In 1999, 46 per cent of students aged 15-19 years were employed or seeking employment compared with only 30 per cent in 1986¹.

Some of the key social factors impacting on labour supply growth have been: declining fertility rates and family formation; changes in the economic role of women; increased demand for tertiary education amongst the young; and, earlier retirement options for older persons.

Today, relatively fewer Australians are living in family households than did so 30 years ago. This trend towards living alone and in non-family households is associated with delayed marriage among young adults, increased incidence of divorce, and higher numbers of widows and widowers due to increased longevity.

Census data show that Australian women today are bearing fewer children during their lives and are doing so later in their reproductive years. Consequently, average family sizes are falling. Single-parent families also are becoming more prevalent in Australia, and face additional pressures to balance work and family responsibilities, without the assistance of another parent in the home. In 1996, almost one in five children were living in sole-parent households. For those living in two-parent family households, the economic roles of parents have shifted significantly. Principally, there has been a move away from the traditional nuclear family roles of male breadwinner and female carer/nurturer, whose hours of home production remained unpaid. Today, parents can attain greater levels of real family income by becoming two-earner families and contracting out some of their previous non-market production, such as childcare, housekeeping and gardening. Also, women are increasingly establishing themselves in the labour market prior to marriage and having children. This prior attachment to the labour market, together with flexibility options, such as employer-provided maternity leave, job-sharing and telecommuting, increase the likelihood of returning to paid employment after childbirth (Hayghe, 1997).

Recent US research suggests that many married women enter the labour market primarily in response to women's rising labour market opportunities, not in response to declining job opportunities for their husbands (Winkler, 1998). Such opportunities are due to anti-discrimination and equal opportunity initiatives and are reflected in narrowing wage differentials by sex and race. It has also been increasingly recognised that, for many women, work means more than just a pay cheque, providing a sense of purpose and a social network.

¹ Data for this series are not available prior to 1986.

2.1 Participation and the Business Cycle

The work/leisure choice will also be influenced by prevailing economic conditions. For the unemployed and those not in the labour force, their labour force decisions will reflect not only the prevailing real wage rate, but also their perceived probability of finding work. During recessions and periods of economic contraction, many unemployed workers who find it impossible to find jobs simply give up trying (the discouraged worker effect), thus reducing the participation rate. Conversely, during expansionary periods, individuals are attracted into the labour market as the perceived probability of finding employment has improved (the encouraged worker effect). A related hypothesis, the added worker effect, has a countercyclical trend. Under this hypothesis, secondary workers (predominantly married females or youths) enter the labour market during recessionary periods where the main breadwinner has become unemployed or faces reduced hours and/or wage cuts. Secondary workers seek employment to supplement the family income.

The relative strengths of these effects have important implications in terms of measuring aggregate unemployment rates. For example, if an unemployed person becomes discouraged and leaves the labour force, he or she will no longer be actively seeking work and will therefore no longer be counted among the unemployed. As a result, the official unemployment rate will be understated. Most empirical research on this issue has focused on the relative strengths of the added worker and discouraged worker effects, with much less consideration given to the encouraged worker effect. The general consensus is that the discouraged worker effect dominates the added worker effect (see for example, Mincer (1966) and Lundberg (1985)). However, a recent study by Wildie (1998), using Queensland data, showed conclusively that the encouraged worker effect dominates the discouraged worker effect.

This study also found the encouraged worker effect to be a more significant explainer of labour supply in Queensland than real wages. This result may, in fact, imply that the encouraged worker effect is really a proxy for social change and that labour supply is being driven more by social factors than business cycles.

3. THE PARTICIPATION AND INCOME MODELS

Labour supply models, developed over the past three decades, have identified a number of personal and family characteristics as key determinants of the decision to seek employment. Given the patterns of social change identified above, this next section estimates a model for predicting participation decisions, using micro data, to assess the continued relevance of these key determinants.

It is assumed that the decision to participate in the workforce is the result of utility maximising behaviour, which involves the choice between participation in the market (paid work) or job search and recognises the role of social security payments and non-market activities such as leisure and/or domestic activities. Following Kottis and Dimelis (1992), the main factors that are expected to

influence a person's decision to participate in the labour market are:

- potential earnings, which are a positive function of the market wage for each level of qualification and a negative function of job-search costs, and
- the value of time in non-market activities, which is the reservation wage and will be a function of various factors such as the earnings of the spouse or partner, sources of non-wage income and family composition and responsibilities.

The technique used to explain participation decisions and the earnings function is a two-step procedure attributable to Heckman (1974), in which a probit regression is used to explain the participation decision and ordinary least squares (OLS) analysis is used to estimate the earnings function. In the latter case, the inverse Mills ratio, obtained as an output from the probit estimation, is added as a correction factor to allow for the selectivity bias that appears because of the fact that earnings are observed only for those employed. As an extension of the work by Hagan and Mangan (1996), the present study employs the ordered probit specification in order to analyse the different characteristics of full and part-time participation.

Using this model, labour force participation is presented as a discrete variable Y , taking the value of one if the person is participating part-time, two if they are participating full-time and zero if they are not in the labour market. That is:

$$Y_i^* = \alpha'Z_i + \varepsilon_i \quad (1)$$

where Y_i^* is an unobservable variable reflecting the gap between market wages and reservation wages. Participation occurs if this gap is positive. The observed counterpart of Y_i^* is Y_i with observed values:

$$\begin{aligned} Y &= 0 \text{ if } Y_i^* \leq 0, \\ &= 1 \text{ if } 0 < Y_i^* \leq \mu, \\ &= 2 \text{ if } \mu < Y_i^* \end{aligned} \quad (2)$$

Further, it is assumed that Y_i^* depends linearly on a set of Z characteristics (e.g., income, qualifications, dependent children) that influence the participation decision. α is a vector of parameters and ε represents a normally distributed error term with zero mean and unit variance. The threshold parameter μ is an unknown parameter to be estimated along with the α 's.

Under the ordered probit specification we estimate the following probabilities:

$$\begin{aligned} \text{Prob}(Y = 0) &= F(-\alpha'Z) \\ \text{Prob}(Y = 1) &= F(\mu - \alpha'Z) - F(-\alpha'Z) \\ \text{Prob}(Y = 2) &= 1 - F(\mu - \alpha'Z) \end{aligned} \quad (3)$$

where F is the cumulative normal distribution. For these three probabilities, the marginal effects of changes in the regressors are:

$$\begin{aligned}\frac{\partial \text{Prob}(Y=0)}{\partial Z} &= -f(\alpha'Z)\alpha \\ \frac{\partial \text{Prob}(Y=1)}{\partial Z} &= [f(-\alpha'Z) - f(\mu - \alpha'Z)]\alpha \\ \frac{\partial \text{Prob}(Y=2)}{\partial Z} &= f(\mu - \alpha'Z)\alpha\end{aligned}\quad (4)$$

where $f(\cdot)$ is the density function of the standard normal distribution and is evaluated at the sample means of all Z variables. The coefficient vector, α , and the threshold parameter, μ , are estimated through maximum likelihood methods under the assumption that all of the slopes are zero.

The second stage of the procedure uses OLS regression to estimate the income function, which takes the form:

$$\ln W = \beta'X + v \quad (5)$$

where $\ln W$ is observed if $Y^* > 0$, W stands for income, X is a vector of factors that determine income, β is a vector of parameters and v symbolises the error term with zero mean and unit variance.

However, as the objective is to study the labour supply behaviour of all persons, sample selection bias will arise if analysis of equation (5) extends to only those who have observed values for income and hours worked. To overcome this selectivity bias, Heckman (1974), Lee (1976) and Kottis and Dimelis (1992) have shown that, the estimation of the income function requires the addition of a term reflecting the inverse Mills ratio of the standard normal density function. This term is obtained as an output from the ordered probit estimation. The income function then becomes:

$$\ln W = \beta'X + \delta\lambda + v \quad (6)$$

where λ is the inverse Mills ratio of the standard normal density function.

3.1 Data Sources and Variables Used

The data used in this study were obtained from the 1991 and 1996 Censuses of Population and Housing Household Sample files. These files represent a one per cent sample, containing unit record information, of persons in private households and non-private dwellings at census time. A number of the variables used, as detailed below, were re-coded to aggregate classification ranges, while 'not stated' classifications were excluded from the analysis. The sample files were further truncated to exclude all persons under 15 years of age. The exogenous variables that enter into the labour force participation and/or the income equations may be broadly grouped as *financial* (personal income, other family income), *family structure* (dependent offspring, non-dependent offspring, marital status, family type), *human capital* (highest qualification, proficiency in English) and *demographic* (age, sex, and birthplace).

For the participation equation, the dependent variable, labour force status, was re-coded to a discrete choice variable by combining the Census labour force status variable and the hours worked variable from the unit record file. Those with an *employed* labour force status classification and who worked less than 35 hours and those classified as *unemployed looking for part-time work* were coded as '1'. Those classified as *employed* and working 35 hours or greater and those *unemployed looking for full-time work* were coded as '2'. Persons classified as *not in the labour force* were coded as '0'. The explanatory variables chosen for the participation equation were as follows:

- **Personal Income:** Represents the gross earnings per annum of the individual. This variable was re-coded to numerical values by taking the mid-point of each income bracket. Participation is assumed to be positively related to the level of earnings.
- **Other Family Income:** A derived variable using *family income* less *personal income*, and includes all wage and non-wage income of the spouse and non-dependent children. Higher amounts of other income coming into the household reduce the relative contribution of the individual's wage and may, therefore, reduce the propensity to participate for financial reasons. On the other hand, the presence of substantial other family income may indicate a strong work ethic within the whole family and be positively related to participation. This variable is in keeping with that area of inquiry starting with Bowen and Finegan (1969), Ashenfelter and Heckman (1974) and Drolet and Morissette (1997) that emphasises the individual participation decision as being made in relation to the family or household conditions.
- **Dependent Offspring:** Two variables were used, the first representing the number of dependent children (up to 14 years of age) and the second capturing the number of students (aged 15 to 24) who are dependent, fully or in part, upon the individual. Included are dependent offspring present on Census night and those temporarily absent. Nakamura and Nakamura (1985), in their study of work patterns of Canadian women, found the presence of young children to be the most important determinant of a woman's decision to participate in the labour market and of the number of hours she was prepared to work. On the basis of this and other previous studies (e.g., Killingsworth and Heckman, 1986) this variable is expected to be inversely related to female participation but directly related to male participation.
- **Non-Dependent Offspring:** The number of non-financially dependent offspring that are normally resident in the household, including those present on Census night and those temporarily absent. This variable was only available from the 1991 Census. The impact of this variable needs to be empirically determined as there appears to have been little research done into the impact of this component of family structure on participation. In one sense, the presence of older children may stimulate participation by assisting parents in caring for younger children. On the other hand, if these older children are working and paying rent, it will reduce the financial need for both parents to participate.

- **Marital Status:** This variable represents the registered marital status of the individual and is classified into: never married; separated; divorced; widowed; or married. Bowen and Finegan (1969), in their pioneering study of 1960 US census data, found that marital status was the most important factor in determining the labour force status of males. This result reflected the normal social and family responsibilities associated with being a married male at this period in time (Sapsford and Tzannatos, 1993). However, even in the different social setting of the 1990s, being married should still be positively related to participation for males. For females, the issue is less clear, with the need for a two-income family exerting a positive influence and family responsibilities exerting influence in the opposite direction.
- **Age:** Age in years, persons aged 15 years and over. This variable is included to account for life-cycle variation in participation but is likely to be of greater significance in the income equation. Most earnings and human capital studies have found the existence of a significant age-earnings profile (Psccharopoulos and Layard, 1979; Sapsford and Tzannatos, 1993) up until middle age.
- **Place of Birth:** Country of birth of the individual. This dummy variable is designed to test for differences in participation, between Australian, taking the value one, and overseas born, taking the value zero. Differences in participation behaviour, particularly for females, by country of origin and ethnic group have been found in numerous studies including: Bowen and Finegan (1969); Greenhalgh (1977); and Kottis and Dimelis (1992).
- **Highest Qualification:** This variable is a proxy designed to test for the impact of human capital on participation. This variable records the highest level of qualification obtained by a person since leaving school. This ordered variable takes values from '1' = higher degree to '10' = not applicable.
- **Proficiency in English:** A variable designed to test the relationship between ability in the dominant language and participation decisions. It takes the value 1, 2, 3 or 4 with 1 corresponding to 'speaks English only' to 4 'not at all'. English proficiency is expected to influence participation decisions whereby those who are proficient in English may be better positioned to take advantage of a wider range of job opportunities, or because they may be considered to be more acceptable to Australian employers (Evans, 1987).

The income equations include only those exogenous variables that are thought to exert an impact on earnings distinct from their impact on the decision to participate in the labour market. Inclusion of all exogenous variables in both the decision and income equations can introduce collinearity problems in the second stage of the estimation procedure (Nakosteen and Zimmer, 1980). The additional variables entering into the income equations are:

- **Hours Worked:** Represents the number of hours worked in the main job held by employed persons during the week before Census night.
- **Industry Sector:** This variable describes the industries in which employed people aged 15 years and over work. Classifications relate to government versus private sector.
- **Age Left School:** Age in years.

Table 2. Mean and Standard Deviations^(a) of Participation and Earnings Variables

	Australia				Queensland			
	1991		1996		1991		1996	
	Females	Males	Females	Males	Females	Males	Females	Males
Participation rate	0.559 (0.50)	0.761 (0.43)	0.543 (0.50)	0.725 (0.45)	0.532 (0.50)	0.744 (0.44)	0.543 (0.50)	0.718 (0.45)
Labour force status	0.881 (0.87)	1.410 (0.85)	0.841 (0.85)	1.323 (0.88)	0.837 (0.86)	1.379 (0.86)	0.837 (0.85)	1.307 (0.88)
Income (log)	2.180 (1.01)	2.750 (0.95)	2.323 (1.09)	2.838 (1.08)	2.104 (1.00)	2.689 (0.94)	2.304 (1.07)	2.799 (1.06)
Other family income (log)	2.290 (1.60)	1.911 (1.57)	2.336 (1.66)	2.060 (1.57)	2.137 (1.58)	1.724 (1.53)	2.209 (1.64)	1.899 (1.55)
Dependent children 0-14	0.534 (0.97)	0.497 (0.96)	0.525 (0.96)	0.469 (0.93)	0.540 (0.98)	0.491 (0.96)	0.523 (0.97)	0.460 (0.93)
Dependent students 15-24	0.122 (0.40)	0.110 (0.39)	0.099 (0.37)	0.090 (0.35)	0.114 (0.39)	0.099 (0.36)	0.087 (0.34)	0.077 (0.32)
Non-dependent offspring	0.156 (0.46)	0.139 (0.45)	0.140 (0.43)	0.118 (0.40)	0.131 (0.41)	0.120 (0.40)	0.122 (0.40)	0.102 (0.37)
Registered marital status	3.652 (1.72)	3.507 (1.84)	3.435 (1.77)	3.432 (1.85)	3.644 (1.72)	3.509 (1.84)	3.462 (1.77)	3.458 (1.84)
Age	27.283 (4.88)	27.042 (4.70)	27.532 (4.83)	27.302 (4.68)	27.140 (4.98)	27.027 (4.79)	27.389 (4.85)	27.305 (4.71)
Country of birth	0.746 (0.44)	0.726 (0.45)	0.736 (0.44)	0.724 (0.45)	0.807 (0.39)	0.798 (0.40)	0.793 (0.41)	0.785 (0.41)
Highest qualification	8.699 (2.41)	8.106 (2.55)	8.459 (2.63)	7.868 (2.71)	8.918 (2.23)	8.266 (2.41)	8.643 (2.49)	8.031 (2.58)
English proficiency	1.179 (0.49)	1.178 (0.46)	1.118 (0.45)	1.103 (0.40)	1.077 (0.32)	1.079 (0.31)	1.042 (0.26)	1.040 (0.24)
Hours worked	2.786 (2.23)	4.212 (2.70)	2.756 (2.24)	4.143 (2.76)	2.733 (2.26)	4.206 (2.74)	2.754 (2.26)	4.120 (2.79)
Age left school	15.204 (3.56)	15.319 (3.55)	15.258 (3.61)	15.348 (3.60)	15.018 (3.39)	15.075 (3.40)	15.152 (3.36)	15.245 (3.26)
Industry sector	4.732 (1.44)	4.348 (1.42)	4.802 (1.36)	4.466 (1.32)	4.815 (1.41)	4.390 (1.41)	4.821 (1.34)	4.482 (1.32)
Number of observations	53778	54287	57651	55456	9475	9502	10872	10569

(a) Standard deviations in parentheses

The model was run using data for Australia and Queensland with analysis undertaken by sex, and by full-time/part-time status. Summary statistics for the participation variables are presented in Table 2.

Table 3. Ordered Probit Results, Participation in Australia, 1991

	Females					Males				
	Coeff	t-ratio	Marginal Effects			Coeff	t-ratio	Marginal Effects		
			Y=0	Y=1	Y=2			Y=0	Y=1	Y=2
Constant	2.539	48.33	-0.991	0.216	0.775	2.032	36.21	-0.504	-0.221	0.724
Income (log)	0.899	171.16	-0.351	0.077	0.274	0.867	144.97	-0.215	-0.094	0.309
Other family income (log)	0.045	11.81	-0.018	0.004	0.014	-0.028	-6.68	0.007	0.003	-0.010
Dependent children 0-14	-0.087	-14.81	0.034	-0.007	-0.027	0.196	26.66	-0.049	-0.021	0.070
Dependent students 15-24	0.169	12.81	-0.066	0.014	0.052	0.267	16.14	-0.066	-0.029	0.095
Non-dependent offspring	0.163	13.24	-0.063	0.014	0.050	0.258	17.82	-0.064	-0.028	0.092
Marital status	0.082	18.21	-0.032	0.007	0.025	0.025	5.20	-0.006	-0.003	0.009
Age	-0.156	-92.25	0.061	-0.013	-0.048	-0.126	-72.07	0.031	0.014	-0.045
Birthplace of individual	-0.080	-5.45	0.031	-0.007	-0.025	-0.056	-3.61	0.014	0.006	-0.020
Highest qualification	-0.037	-15.50	0.015	-0.003	-0.011	-0.015	-5.65	0.004	0.002	-0.005
English proficiency	-0.044	-3.48	0.017	-0.004	-0.013	-0.066	-4.56	0.016	0.007	-0.023
μ	0.943	130.80				0.500	79.61			
N	53778					54287				
$\chi^2(10)$	31541.5					24603.9				
ZM-R ²	0.803					0.813				

The results for the ordered probit models of male and female labour force participation for Australia and Queensland are presented in Tables 3 to 7. Overall, the results reveal significant differences in the determinants of participation between males and females, including their preferences for full-time versus part-time participation, and highlight the role played by family variables in determining these preferences. The χ^2 statistic for each equation indicates decisively that the variables included in the model are jointly significant in explaining participation decisions. The pseudo R² statistic, due to Zavoina-McElvey (1975), exceeded 0.80 for all ordered probit equations which is considered to be an extremely good fit for this type of model. Most of the explanatory variables were significant at the 1 per cent or 5 per cent level, which is, perhaps, not surprising given the large number of observations and the theoretical foundations of most of these variables.

Table 4. Ordered Probit Results, Participation in Australia, 1996

	Females					Males				
	Coeff	t-ratio	Marginal Effects			Coeff	t-ratio	Marginal Effects		
			Y=0	Y=1	Y=2			Y=0	Y=1	Y=2
Constant	2.349	46.97	-0.928	0.282	0.646	2.267	41.60	-0.631	-0.234	0.865
Income (log)	0.898	198.24	-0.355	0.108	0.247	0.821	168.67	-0.229	-0.085	0.313
Other family income (log)	0.060	16.11	-0.024	0.007	0.016	-0.023	-5.55	0.006	0.002	-0.009
Dependent children 0-14	-0.201	-34.59	0.080	-0.024	-0.055	0.190	27.02	-0.053	-0.020	0.072
Dependent students 15-24	0.185	13.02	-0.073	0.022	0.051	0.299	16.68	-0.083	-0.031	0.114
Non-dependent offspring	0.110	8.53	-0.043	0.013	0.030	0.242	15.35	-0.067	-0.025	0.092
Marital status	0.104	25.17	-0.041	0.013	0.029	0.063	13.87	-0.018	-0.007	0.024
Age	-0.151	-93.84	0.060	-0.018	-0.042	-0.135	-78.78	0.038	0.014	-0.052
Birthplace of individual	-0.051	-3.75	0.020	-0.006	-0.014	0.022	1.51	-0.006	-0.002	0.008
Highest qualification	-0.046	-21.61	0.018	-0.006	-0.013	-0.029	-12.31	0.008	0.003	-0.011
English proficiency	-0.111	-8.63	0.044	-0.013	-0.030	-0.144	-9.42	0.040	0.015	-0.055
μ	1.004	138.37				0.550	87.05			
N	57651					55456				
χ^2 (10)	35191.1					28442.9				
ZM-R ²	0.808					0.825				

However, in judging the nature of the results, some caution is required, particularly in relation to interpretation of marginal effects estimated within the ordered probit model. In the present model, where Y can take on only three values, 0, 1 or 2, the sign of a particular coefficient can be associated with an unambiguous change in the predicted probability of the extreme values only (i.e., for $\text{prob}(Y=0)$ and $\text{prob}(Y=2)$). What happens in the middle case, that is, for part-time participation, is ambiguous and will depend on the shape of the density functions.

Care must also be taken with the way in which the census data are presented. For example, the qualification variable was ordered in such a way that the lowest value on the qualification scale coincided with the highest level of qualification. In this case, a negative sign on the qualification variable implies a positive relationship between participation and educational qualifications. As expected, differences emerged between males and females in terms of variable significance and their marginal contributions to the participation decisions.

The results for the *financial variables* indicate that personal income is the most significant variable in the participation decisions of both males and females, accounting for approximately one third of all movements into full-time employment.

The presence of 'other family income' was shown to be a significant factor in reducing the probability of male participation in 1996, however, this variable was insignificant for the 1991 sample. For females, across both census years, this variable is positively related to participation. From Table 2, it can be seen that, for males, mean 'other family income' is significantly less than their own incomes, suggesting that as other family income increases there appears to be a modest substitution effect away from paid work to leisure/non-market activities. For females, the converse is true, with incremental rises in other family income associated with marginal increases in female participation of around 2 per cent. This 'wealth effect' is consistent with what we might expect to observe given the trend towards two-income families, whereby the additional income allows work traditionally done by stay-at-home mothers to be 'contracted out' to third parties (such as child care, housekeeping, take-away meals, etc.).

All of the variables designated as *family structure* exerted some influence on participation decisions, especially for females. The likelihood of female participation is significantly and inversely related to the number of dependent children. In 1991, the probability of female full-time participation declined by 2.7 per cent with each additional dependent child. This result is in line with most other studies (Kottis and Dimelis, 1992) and of much the same level of marginal contribution. However, this probability had risen to 5.5 per cent by 1996, which is of particular interest given the decline in the average number of dependent children between 1991 and 1996 as indicated in Table 2. Given declining fertility rates, smaller family sizes, and the increased availability of child care facilities prevalent in Australia today, the significance of this variable was expected to decline over the intercensal period. This result is, however, consistent with the findings of Nakamura and Nakamura (1985) who found the presence of dependent children to be the most significant factor in the participation decisions of females. The significance of this variable, relative to other explanatory variables, increases further when the sample is truncated by age. As shown in Table 5, for all working age females (15-64 years), an additional child reduces full-time participation by 8 per cent and part-time participation by 4.2 per cent. For females aged 15-44 years, the likelihood of full-time participation reduces by 13.7 per cent with an additional child, while part-time participation increases by 1.6 per cent.

For males, the presence of dependent children is significant and positively related to participation which is consistent with other studies (e.g., Killingsworth and Heckman, 1986) and with *a priori* expectations. The presence of dependent students in the family has an even greater propensity to increase male participation, increasing the probability of full-time participation by around 11 per cent.

Table 5. Marginal Effects of Dependent Children on Female Labour Force Status, 1996

Age Group	Marginal Effects		
	Y=0	Y=1	Y=2
15 years +	0.080	-0.024	-0.055
15 – 64 years	0.083	-0.004	-0.079
15 – 44 years	0.120	0.016	-0.137

Female participation is also positively related to the presence of dependent students and non-dependent children. A number of factors have been suggested for this. Rising cost of higher education may increase the need for a second income. Older children are able to supervise younger siblings and in this way may enable adults with dependent children to participate in the workforce. As well, the presence of non-dependent children in the home points to that stage in the life cycle where those who may have temporarily withdrawn from the workforce are returning. For these reasons, it might be expected that the presence of both dependent students and non-dependent children is closely correlated with increased participation.

Marital status results suggest that, by becoming married, males and females increase their probability of participating full-time by around 3 per cent. For males, this result is as expected and in accordance with previous studies. With regard to females, past studies have shown this relationship to be negative, largely due to the presence of children. However, as noted earlier, couples with no children has become the norm, which would account for the positive sign on this coefficient. For example, 60 per cent of married couples in the 1996 census sample file had no dependent children.

With regard to the *human capital* and *demographic* variables, all performed in accordance with *a priori* expectations. The high significance of the qualification variable for both males and females again displays the strong positive influence that formal educational qualifications exert upon participation decisions. The significance of this variable has increased considerably over the intercensal period, which is to be expected given the general rise in level of formal qualifications by both males and females as reported in Table 2.

Proficiency in English was selected as a human capital variable, as it is often the lack of fluency in English that reduces the real value of human capital. This variable is correlated to the birthplace of the individual. In this regard, immigrants who were born in a mainly English-speaking country will have a culture and work practices similar to those of the Australian born, making it easier for them to adapt to the Australian labour market (Le and Miller, 1999, p.32). As expected, this variable was significant and negatively related to participation for both males and females. The birthplace variable also indicates a lower propensity to participate for both males and females, although the variable

Table 6. Ordered Probit Results, Participation in Queensland, 1991

	Females						Males					
	Coeff	t-ratio	Marginal Effects			Coeff	t-ratio	Marginal Effects				
			Y=0	Y=1	Y=2			Y=0	Y=1	Y=2		
Constant	2.647	20.10	-1.049	0.274	0.776	2.045	15.13	-0.543	-0.200	0.744		
Income (log)	0.891	71.29	-0.353	0.092	0.261	0.873	60.02	-0.232	-0.086	0.317		
Other family income (log)	0.068	7.40	-0.027	0.007	0.020	-0.008	-0.75	0.002	0.001	-0.003		
Dependent children 0-14	-0.094	-6.86	0.037	-0.010	-0.028	0.182	10.82	-0.048	-0.018	0.066		
Dependent students 15-24	0.179	5.13	-0.071	0.019	0.052	0.323	7.26	-0.086	-0.032	0.118		
Non-dependent offspring	0.165	4.94	-0.065	0.017	0.048	0.279	6.84	-0.074	-0.027	0.101		
Marital status	0.096	8.90	-0.038	0.010	0.028	0.046	4.04	-0.012	-0.005	0.017		
Age	-0.158	-39.21	0.063	-0.016	-0.046	-0.129	-31.17	0.034	0.013	-0.047		
Birthplace of individual	-0.031	-0.86	0.012	-0.003	-0.009	-0.055	-1.39	0.015	0.005	-0.020		
Highest qualification	-0.042	-6.72	0.017	-0.004	-0.012	-0.015	-2.37	0.004	0.002	-0.006		
English proficiency	-0.199	-4.43	0.079	-0.021	-0.058	-0.121	-2.71	0.032	0.012	-0.044		
μ	0.900	53.55				0.471	32.97					
N	9475					9502						
χ^2 (10)	5379.9					4331.5						
ZM-R ²	0.798					0.813						

was insignificant for males in the 1996 sample².

3.2 Spatial Differences

Hagan and Mangan (1996) identified a number of spatial differences at the Queensland sub-state level, in terms of participation and earnings behaviour. Queensland is the most decentralised of all the Australian States in terms of population distribution and, given the State's absolute size and diversity in regional economic activity, similar spatial differences might have been expected when comparing this State to Australia. In terms of the means of all regressors, however, the data for Queensland closely resemble the national averages (refer Table 2). Incomes, the level of formal qualifications and the number of

² It is expected that the significance level attached to the birthplace variable could be improved by a more detailed ordering of this variable, in order to separately identify countries of mainly English speaking from non-English speaking background.

Table 7. Ordered Probit Results, Participation in Queensland, 1996

	Females						Males					
	Coeff	t-ratio	Marginal Effects			Coeff	t-ratio	Marginal Effects				
			Y=0	Y=1	Y=2			Y=0	Y=1	Y=2		
Constant	2.317	19.47	-0.916	0.272	0.644	2.446	18.90	-0.709	-0.235	0.944		
Income (log)	0.875	83.64	-0.346	0.103	0.243	0.783	71.92	-0.227	-0.075	0.302		
Other family income (log)	0.064	7.53	-0.026	0.008	0.018	-0.010	-1.01	0.003	0.001	-0.004		
Dependent children 0-14	-0.212	-15.92	0.084	-0.025	-0.059	0.153	10.19	-0.044	-0.0146	0.059		
Dependent students 15-24	0.219	6.25	-0.086	0.026	0.061	0.295	6.35	-0.086	-0.028	0.114		
Non-dependent offspring	0.122	3.88	-0.048	0.014	0.034	0.236	6.36	-0.068	-0.023	0.091		
Marital status	0.098	10.30	-0.039	0.012	0.027	0.078	7.64	-0.023	-0.008	0.030		
Age	-0.147	-40.06	0.058	-0.017	-0.041	-0.138	-36.24	0.040	0.013	-0.053		
Birthplace of individual	-0.041	-1.27	0.016	-0.005	-0.011	0.024	0.72	-0.007	-0.002	0.009		
Highest qualification	-0.040	-7.67	0.016	-0.005	-0.011	-0.033	-5.90	0.009	0.003	-0.013		
English proficiency	-0.182	-3.95	0.072	-0.021	-0.051	-0.186	-3.71	0.054	0.018	-0.072		
μ	0.984	60.49				0.541	38.57					
N	10872					10569						
χ^2 (10)	6178.4					5121.3						
ZM-R ²	0.797					0.817						

dependent students were marginally lower in Queensland, while the State had a higher proportion of Australian born residents and, subsequently a higher degree of English proficiency.

Inspection of the Queensland participation equations listed in Tables 6 and 7 shows little difference in the determinants of male or female participation when compared with the Australian estimates. The insignificance of the other family income variable for Queensland males may be attributed to the lower levels of income in the State, reducing the size of the substitution effect observed at the national level. Similarly, the higher proportion of Australian born residents in Queensland would account for the insignificance of the birthplace variable. Overall, though some regional differences exist in participation decisions by both males and females, differences by sex are more pronounced than differences by region.

3.3 The Earnings Equations

As noted earlier, the earnings functions were estimated using OLS, with a correction for the sample selection bias that exists when observing the earnings

Table 8. The Earnings Equations, Australia, 1991 and 1996

	1991				1996			
	Females		Males		Females		Males	
	Coeff.	t-ratio	Coeff.	t-ratio	Coeff.	t-ratio	Coeff.	t-ratio
Constant	0.692	16.14	5.701	7.25	5.814	7.13	7.204	5.79
Dependent children 0-14	-0.081	-18.91	1.239	19.40	-0.366	-4.50	1.034	10.26
Dependent students 15-24	-0.029	-3.41	1.817	11.55	-0.378	-2.08	2.773	10.39
Hours worked	0.243	112.57	1.943	53.11	3.200	66.72	2.905	49.56
Industry sector	-0.072	-21.43	-1.859	-30.86	-1.234	-15.85	-2.504	-23.30
Age	0.038	37.11	0.813	43.59	0.638	29.46	1.020	33.56
Highest qualification	-0.042	-31.27	-1.616	-62.52	-1.349	-50.51	-2.060	-53.98
Age left school	0.061	37.91	0.537	19.30	0.325	11.61	0.496	11.49
Proficiency in English	0.011	1.26	-2.319	-15.08	-2.179	-9.10	-4.591	-14.12
Selectivity correction (λ)	-0.257	-51.35	0.840	8.14	-0.694	-6.98	1.966	12.58
N	30084		41312		31316		40196	

Table 9. The Earnings Equations, Queensland, 1991 and 1996

	1991				1996			
	Females		Males		Females		Males	
	Coeff.	t-ratio	Coeff.	t-ratio	Coeff.	t-ratio	Coeff.	t-ratio
Constant	5.605	4.00	4.072	2.21	6.351	3.16	7.264	2.44
Dependent children 0-14	-0.715	-5.19	1.104	7.41	-0.028	-0.15	1.162	5.04
Dependent students 15-24	-0.463	-1.54	0.775	2.00	-0.492	-1.10	2.003	3.03
Hours worked	2.225	28.41	1.708	20.15	2.783	25.51	2.660	20.18
Industry sector	-0.995	-8.12	-1.935	-13.44	-1.063	-5.77	-2.552	-10.22
Age	0.467	13.43	0.789	18.55	0.611	12.72	0.972	14.68
Highest qualification	-1.112	-21.34	-1.391	-21.94	-1.332	-20.64	-1.838	-20.23
Age left school	0.395	7.79	0.604	8.63	0.371	5.45	0.478	4.67
Proficiency in English	-0.898	-1.80	-1.986	-3.71	-1.953	-2.13	-2.770	-2.38
Selectivity correction (λ)	-1.215	-6.89	0.498	2.05	-1.135	-4.89	1.075	3.01
N	5041		7067		5907		7593	

only of workers in paid jobs. The OLS estimates of the regression coefficients for Australia and Queensland, corrected for sample selection bias, are presented in Tables 8 and 9 respectively.

In terms of the earnings equations, the variables that dominate for both males and females are: hours worked; age; the level of formal qualifications; and age left school. These findings are in accordance with *a priori* expectations based on theoretical considerations. Income is shown to have a strong age profile. The negative coefficient on the industry sector variable highlights the different working conditions and earnings patterns between the public and private sectors. This result shows that employment in the private sector, largely due to the higher incidence of casual and part-time employment opportunities, leads to lower average expected earnings.

The selectivity variable is also significant which is a normal feature of these types of equations and reflects the necessity of recognising the censored nature of the data. Important sex differences also occur within the income equations. The presence of dependent children and students both reduce expected female earnings. These variables are correlated with hours worked and this result reflects the preference for part-time and more flexible working arrangements by working mothers. The coefficient of the highest qualification variable indicates that the returns from investment in obtaining formal qualifications are higher for males than females, although this difference has narrowed considerably between 1991 and 1996. In Queensland, this sex differential on the qualification variable was somewhat less pronounced.

Overall, these results indicate that females are subject to more structural and institutional influences within labour markets than males. For example, the participation behaviour of females is more sensitive to family-structure variables than males and less sensitive to human capital and financial variables. The one area where this does not appear to hold in 1996, when compared to earlier periods, is marital status where being married influences both males and females in a positive way.

4. CONCLUSIONS

The Australian labour market has been in a state of persistent excess supply for the past quarter of a century. This excess supply appears to be as much a function of social and demographic change as economic factors such as the state of the business cycle. As a result, the composition of the labour market has changed, seemingly irrevocably. There has been a shift away from male full-time employment while significant growth in part-time, mainly female, jobs has occurred.

Despite this change in the demographics of the labour force, family structure variables are still very dominant in the labour supply decisions of families. Some variables, such as the presence of dependent children, continue to influence participation decisions in accordance with traditional models, that is, positively related to male participation and inversely related to female participation. However, other variables such as marital status, while still significant, exert an

influence in the opposite direction to previous findings, reflecting the major cultural shift towards the two-income family norm.

These social trends have significant implications for unemployment policy. Specifically, they suggest that social policy initiatives should not take place in a vacuum but rather with at least a partial regard to their potential labour market implications. Policies designed to achieve more equitable outcomes for target groups (primarily for women) have been effective in increasing the expected market wage, and the probability of obtaining employment for these groups, relative to the reservation wage. At the same time, numerous other social and demographic changes have increased the non-pecuniary appeal of work and, as a result, have lowered the effective reservation wage. Examples include: smaller family sizes; wealth effects, whereby families can increase their real family incomes by becoming dual-earner families; and employer-provided flexible work arrangements, such as job-sharing, paid maternity leave and telecommuting. It is arguable that the joint effects of these policies have been to constrain labour market adjustment and maintain excess labour supply even during periods of high unemployment.

The consequence of the relative reduction in the reservation wage has resulted in a rapid increase in aggregate labour supply, posing serious challenges for policy makers in terms of setting unemployment targets. Labour demand has been strong in Australia, relative to population growth, as evident from the employment to population ratio. This growth, however, has been insufficient to absorb the excess supply. As the employment to population ratio continues to rise, empirical research is needed to determine whether there exists an optimum level for this ratio, from both an economic and social perspective. Arguably, it is the sustainable level of this ratio that will determine how realistic our unemployment targets are or whether persistent high levels of unemployment are a necessary consequence of continuing social change.

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