Out of Print

# IMPACT OF DEMOGRAPHIC CHANGE ON INDUSTRY STRUCTURE IN AUSTRALIA

A joint study by the Department of Labor and Immigration and the Industries Assistance Commission
1st Floor, 608 St. Kilda Road, Melbourne, Victoria 3004, Australia. Area code 03 Telephone 51 8611

CONFIDENTIAL : Not for quotation without prior clearance from the author; comments welcome.

## REGIONAL VARIATIONS IN LABOUR FORCE PARTICIPATION RATES - AUSTRALIA 1971

by

Vince Manion

Industries Assistance Commission

Preliminary Working Paper No. BP-03 Melbourne July 1976

*The views expressed in this paper do not necessarily reflect the opinions of the participating agencies, nor of the Australian government.*

CONTENTS

# REGIONAL VARIATIONS IN LABOUR FORCE PARTICIPATION RATES - AUSTRALIA 1971*

by

Vince Manion

## 1 INTRODUCTION

This paper analyses the variations in age-sex-specific labour force participation rates[1] (ASPR) between twenty-one regions of Australia[2] in the 1971 Census of Population and Housing. The purpose of the analysis is to provide behavioural relationships explaining variations in participation rates, for use in the BACHUROO module of the IMPACT economic-demographic model.[3] A number of approaches

---

* A number of people provided considerable assistance in the preparation of this paper. Thanks are due to Ashok Tulpule, Ron Silberberg, John Leaper, Ellen Hope, Alan Powell, Vern Caddy and Allen Kelley. Of course all remaining faults lie with the author.

1. The labour force participation rate for any group is defined as the number of persons from that group in the workforce (employed or unemployed) divided by the population in that group.

2. For each state major urban (centres of more than 100,000), other urban (centres of more than 1,000), and rural; for the Northern Territory other urban and rural; and for the ACT major urban.

3. The BACHUROO module is part of the IMPACT model of the Australian economy which is being developed jointly by a number of Australian Government agencies. It analyses the main inter-relationships between demographic and economic variables such as population, education, labour supply and household income distribution. For a description of the BACHUROO module see A.H. Tulpule "Outline of an Australian Economic-Demographic Module - BACHUROO", Impact of Demographic Change on Industry Structure in Australia, Working Paper No. B-01, Industries Assistance Commission, Melbourne, February 1976. For a description of the IMPACT model see Alan A. Powell and Tony Lawson, "IMPACT: An Economic-Demographic Model of Australian Industry Structure", Impact of Demographic Change on Industry Structure in Australia Working Paper No. I-01, Industries Assistance Commission, Melbourne, September 1975.

are being taken to achieve this aim, including an analysis of changes in participation rates over time, but these are not discussed here. The regional analysis described here is to provide background information for the time series analysis currently being undertaken, in particular to provide insight into the strength and direction of influences of variables for which time series data is either not available or for which the most appropriate specification of the variable cannot be used. For example, no reasonably accurate estimates are available over time on the proportion of the population in each age/sex group who possess some form of educational qualifications. Hence cross sectional analysis using the detailed data available for census years is a means of estimating the influence of qualifications on participation rates.

There has been some work in Australia on explaining workforce participation rates over time, but to the author's knowledge no cross sectional studies have been published.[4] The time series studies have concentrated on the two opposing influences of changes in demand for labour (as measured by the unemployment rate) on participation rates. The first is the discouraged worker effect, which

---

4. Three Australian empirical studies of changes in participation rates over time are of relevance. They are J.B. Bowdler and C.I. Higgins, "Short term variation in labour force participation" Paper presented to second conference of economists, Sydney 1971; R.G. Gregory and P.J. Sheean, "The cyclical behaviour of the Australian labour market" Paper presented to the third conference of economists, Adelaide 1973; and B.D. Haig and M. Wood, "The participation of married women in the workforce", Flinders University of South Australia, Institute of Labour Studies, Working Paper Series, September 1973.

is the tendency as the unemployment rate rises for more persons to become discouraged from actively seeking employment. The countervailing influence is the additional worker effect, where higher unemployment may result in wives and/or dependants entering the workforce in an attempt to offset the fall in household income due to the unemployment or reduced working hours of a (usually) male household head.

Bowdler and Higgins, using a non-age-specific model (with explanatory variables to take account of changing age distribution of the population) found a discouraged worker effect of unemployment for males and married females, while for single females an initial additional worker effect was gradually offset by lagged decreases in participation rates following increases in unemployment rates. Gregory and Sheehan developed an age-specific model. For males in the 15-19 group a discouraged worker effect occurred in the February quarter (coinciding with the decision of whether or not to return to school), but in the longer term the additional worker effect predominated; in the 20-24 group a discouraged worker effect was also observed; in the prime ages (25-54) a significant but small additional worker effect was found; but no clear conclusion was reached in the 55 and over ages. For women some age groups showed discouraged and others additional worker effects, but no clear explainable pattern emerged to account for these changes.

Haig and Wood set out to explain movements in the participation rates of married women in Australia (not age-specific) over the period 1961 to 1972 and to distinguish the separate influences of structural and cyclical factors. The main postulated explanators were the male unemployment rate (the proxy for the tightness of the labour market) and industry structure. Their results indicated a

discouraged worker effect and an important positive influence on female participation rates of the change in industry structure towards industries which have traditionally been large employers of female labour.

In general, these studies have given only scant treatment to the secular influence of many economic and demographic variables on participation rates. Rather than attempting to explain trend movements in participation rates, they have accounted for these by proxies and concentrated on cyclical variations in the economy.[6]

There have been numerous overseas empirical studies (especially in the United States) examining workforce participation rates. The most comprehensive coverage of work in the field is by W.E. Bowen and T.A. Finegan[7] in which detailed census data at the individual and household level was analysed to provide estimates of the influence of a large number of variables on participation rates. A linear regression model was used with many more variables than were possible with the data available for the study herein. The results of Bowen and Finegan's work were too numerous to present here but for our purposes they can be used as a guide to the signs to be expected for certain explanatory variables. For example, in their cross sectional relationships they found that higher levels of schooling had a strong positive influence on participation for males and females of all age groups; marital status was a highly significant positive influence on male workforce participation and a negative one for women;

---

6. Work currently being done for the IMPACT project involves an analysis of changes in Australian participation rates over time using a number of socio-economic variables to explain both trends and cycles in participation rates. See R.J. Leaper and R. Silberberg "An analysis of labour force participation rates in Australia", Impact of Demographic Change on Industry Structure in Australia, Preliminary Working Paper BP-04, Industries Assistance Commission, Melbourne, forthcoming.
7. W.E. Bowen and T.A Finegan, The Economics of Labour Force Participation (Princeton University Press 1969).

a net discouraged worker was obtained for both males and females and, the expected highly significant negative influence of children on participation rates of married females was sustained.

This paper is divided into six sections. The following section briefly looks at some of the problems of defining the workforce and outlines the regional distribution of the workforce in Australia. Section three sets out the basic model and certain variations from it, indicating a rationale for the choice of variables and suggesting their expected influence on participation rates. Sections four and five analyse the results for females and males respectively. Some overall conclusions on the results and their usefulness are presented in section six.

## 2 DEFINITION, SIZE AND DISTRIBUTION OF WORKFORCE

### 2.1 Definition of Workforce

There is some controversy surrounding who should be considered members of the workforce at a particulat time. Clearly, those who at the time concerned have employment will be counted as in the workforce. The difficulty lies in splitting the number not in employment between those not working and not in the workforce and those not working but still in the workforce. Persons not in employment can be considered as at least three separate groups.

(a) Persons who given their present circumstances and current wage rates do not wish to work. People in this category will account for various degrees of potential future increase in the labour force. Some would enter the workforce if wages increased marginally or if subsidised child minding facilities were provided, others would need significantly greater incentives.

(b) Persons who are presently interested in finding work but are "doing nothing positive about it" (e.g. because they feel there is little chance of their finding a job). While we may wish to define these people to be in the workforce, the only difference between them and those in (a) is their state of mind as no observable difference exists in their behaviour from a workforce point of view.

(c) Those who are "actively seeking" employment.[8] For our purposes, this group is included in the workforce definition. Some persons apparently making active attempts to obtain work do not in fact wish to work but it is not possible to identify this group from genuine job seekers in the 1971 census figures.

For the 1971 census the workforce was defined as those who had a job in the week prior to the census (even if temporarily laid off or absent) or who looked for work in that week. This definition has some relevance to analysing the influence of unemployment on participation rates. Since to be counted as unemployed respondents needed to have actively sought work in the week prior to the census, some only moderately discouraged workers

---

8. There remains the problem of defining "actively seeking" as against those "doing nothing positive" to find work. For example looking for work once a week could be considered active whereas somewhat arbitrarily looking once a month could be considered "doing nothing".

would have been excluded from the workforce total. If this period was extended then for all regions unemployment rates and workforce size would be larger.

## 2.2 Size and Distribution of Workforce

The size and age distribution of the workforce varies considerably between the three types of regions (see Tables 1 and 2). For all age groups, the seven major urban areas are by far the most important, making up over 60 per cent of the workforce. Other urban areas average approximately 19 per cent and rural areas about 14 per cent of the total workforce. These figures reflect very large differences between regions with the extremes being New South Wales major urban (27 per cent of the national workforce) and Northern Territory rural (0.2 per cent).

TABLE 1 : FEMALE WORKFORCE BY REGION - JUNE 1971

| Age Group | Number ( '000 ) | | | | Proportion in each age group (%) | | | |
|---|---|---|---|---|---|---|---|---|
| | Major Urban | Other Urban | Rural | TOTAL | Major Urban | Other Urban | Rural | TOTAL |
| 15-19 | 191.8 | 61.9 | 28.3 | 282.0 | 15.79 | 20.51 | 16.30 | 16.69 |
| 20-24 | 235.9 | 54.7 | 24.7 | 315.3 | 19.42 | 18.11 | 14.24 | 18.65 |
| 25-34 | 237.5 | 56.0 | 33.5 | 327.0 | 19.55 | 18.58 | 19.25 | 19.35 |
| 35-44 | 235.2 | 57.5 | 35.6 | 328.3 | 19.36 | 19.05 | 20.48 | 19.42 |
| 45-54 | 207.8 | 46.3 | 30.9 | 285.0 | 17.10 | 15.33 | 17.76 | 16.86 |
| 55-59 | 61.4 | 14.3 | 10.2 | 85.9 | 5.06 | 4.74 | 5.86 | 5.08 |
| 60-64 | 28.8 | 6.8 | 5.4 | 41.0 | 2.37 | 2.25 | 3.13 | 2.43 |
| 65 + | 16.3 | 4.3 | 5.2 | 25.8 | 1.34 | 1.43 | 2.98 | 1.52 |
| TOTAL | 1214.7 | 301.8 | 173.8 | 1690.3 | 100.00 | 100.00 | 100.00 | 100.00 |

TABLE 2 : MALE WORKFORCE BY REGION - JUNE 1971

| Age Group | Number ( '000 ) | | | | Proportion in each age group (%) | | | |
|---|---|---|---|---|---|---|---|---|
| | Major Urban | Other Urban | Rural | TOTAL | Major Urban | Other Urban | Rural | TOTAL |
| 15-19 | 196.5 | 67.9 | 51.2 | 315.6 | 8.34 | 9.41 | 9.24 | 8.69 |
| 20-24 | 323.5 | 100.1 | 72.3 | 495.9 | 13.73 | 13.85 | 13.05 | 13.65 |
| 25-34 | 550.1 | 172.8 | 121.7 | 844.6 | 23.35 | 23.92 | 21.96 | 23.25 |
| 35-44 | 485.7 | 149.2 | 112.1 | 747.0 | 20.62 | 20.65 | 20.22 | 20.56 |
| 45-54 | 453.4 | 127.0 | 99.7 | 680.1 | 19.25 | 17.58 | 17.99 | 18.72 |
| 55-59 | 173.5 | 51.2 | 41.4 | 266.1 | 7.37 | 7.08 | 7.47 | 7.33 |
| 60-64 | 117.1 | 36.5 | 30.4 | 184.0 | 4.97 | 5.05 | 5.50 | 5.07 |
| 65 + | 55.9 | 17.8 | 25.4 | 99.1 | 2.37 | 2.46 | 4.57 | 2.73 |
| TOTAL | 2355.7 | 722.5 | 554.2 | 3632.4 | 100.00 | 100.00 | 100.00 | 100.00 |

Source: Derived by multiplying the populations of the respective age groups and regions by the workforce participation rates obtained from Australian Bureau of Statistics, 1971 Census of Population and Housing, Bulletin 5, Part 9 (Canberra, 1972).

It can be seen from Table 2 that for males it is of considerable importance to explain participation rates in the prime age groups which make up 63 per cent of the male workforce. The age distribution of the workforce is fairly consistent for each type of region with older males being slightly more important in rural areas and the young group (15-24) a little larger in other urban regions. The female workforce is more evenly spread over age groups with the young age groups having the largest workforce of any ten year cohort. For both males and females there have been substantial changes in participation rates in the young groups over the past ten years[9] and

9. See Leaper and Silberberg, op. cit.

explaining ASPR for these groups is important in understanding changes in the size of the total workforce. The older age groups are less significant in terms of size although changes in their workforce participation over time may be reasonably large (i.e. earlier retirement). Participation rates in this range are examined more for completeness than for the importance of the results although this situation may change in the fairly distant future if demographic trends predicted for Australia by some researchers are accurate.[10]

## 3 METHOD OF ANALYSIS AND VARIABLES USED

### 3.1 The Model

Labour force participation rates were obtained for the twenty-one regions for eight age groups[11] and were regressed against several independent variables, using the following linear models :

$$ASPRF_{j,i} = \alpha + a_1 u_i + a_2 I_{j.i} + a_3 M_{j,i} + a_4 Q_{j,i} + a_5 C_{j,i} + a_6 S_i \quad (1)^{12}$$

$$ASPRM_{j,i} = \alpha + a_1 u_i + a_2 I_{j,i} + a_3 M_{j,i} + a_4 Q_{j,i} + a_5 D \quad (2)$$

where :

$ASPRF_{j,i}$ = the workforce participation rate of females in age group $j$ in region $i$ ;

---

10. "Population and Australia - a demographic analysis and projection", Australian Government Population Inquiry, First Report, Australian Government Publishing Service, Canberra, 1975.

11. The age groups used were 15-19, 20-24, 25-34, 35-44, 45-54, 55-59, 60-64 and 65 and over.

12. This model was fitted for females in the age groups 15-54. The model for females over 55 excluded $C_{j,i}$ .

$ASPRM_{j,i}$ = the workforce participation rate of males in age group $j$ in region $i$ ;

$u_i$ = the total unemployment rate for all persons in region $i$ (i.e., total number unemployed in region $i$ divided by the total workforce in region $i$ ). This variable is not age/sex specific to the group being considered ;

$M_{j,i}$ = the proportion of the population of age group $j$ in region $i$ who are married ;

$Q_{j,i}$ = the proportion of the population of age group $j$ in region $i$ with educational qualifications ;[13]

$C_{j,i}$ = for region $i$ , the number of children under five with mothers in age group $j$ , per married woman in age group $j$ ;

$S_i$ = the proportion of total employment in region $i$ that is in service industries ;

D = an area dummy taking the value 1 for major urban and other urban areas, and 0 for rural areas .

3.2 The Variables

The reason for the inclusion of each of these variables and the a priori expectations regarding their influence on participation rates are as follows :

---

13. Qualified persons are fairly broadly defined to include all those with trade or technical level qualifications, university degrees and other tertiary qualifications, or who have completed certain short specialised courses. The inclusion of the latter persons makes the qualified group somewhat of a mixed bunch. However, they still represent less than twenty per cent of the female population in nearly all regions and age groups and less than forty per cent of the population for male groups.

Total unemployment rate. For prime aged males it is postulated that, if anything, the higher the rate of unemployment the greater are the number of persons discouraged from seeking employment and hence the lower is the workforce participation rate. However, it would not be surprising if no significant impact of unemployment was found as there are strong social and economic reasons for nearly all prime age males to be in the workforce and they would not easily be discouraged from remaining in it. For all females and males in the 15-19, 20-24, 55-59, 60-64 and 65 and over groups it is felt that for some persons the discouraged worker effect will operate, but for others the additional worker effect will predominate. Debate on the existence and relative size of these effects has continued for nearly half a century.[14] A concensus appears to have been reached concluding that for women it is the discouraged worker effect which dominates during periods of high unemployment,[15] but recent evidence suggests that this effect may proportionately decline as the labour force participation rate of women rises.[16]

It may be theoretically preferable to include age specific unemployment rates (rather than the rate for the workforce as a whole used in this model) on the assumption that there is not a single labour market but in fact a number of markets for different age groups with only limited scope for movement between them. For example,

---

14. See P.H. Douglas, Real Wages in the United States 1890-1926 (New York, A.M. Kelley, 1966, Reprints of economic classics series); W.S. Woytinsky, "Additional Workers and the Volume of Unemployment in the Depression," Social Sciences Research Council Pamphlet Series No. 1 (Washington, D.C., Government Printing Office, 1940).

15. J. Mincer, "Labour Force Participation and Unemployment, A Review of Recent Evidence," in R.A. Gordon and M.S. Gordon, (eds) Prosperity and Unemployment (New York, John Wiley and Sons, 1966), pp. 73-134.

16. See R.J. Leaper,"Female Labour Force Attachment : An Analysis of Unemployment Rates in the United States and Canada", Unpublished Ph.D. thesis, Department of Economics, Duke University, Durham, 1975.

total unemployment may be low, reflecting high demand for experienced workers but for young males unemployment could still be relatively high. However, age specific unemployment rates are not used, firstly because the figures are not available on a regional basis, and secondly because it is felt that the variation in age specific rates between regions follows approximately the same pattern as total unemployment.

Proportion of migrants. Here the hypothesis is that, for most age groups, migrants (particularly female migrants) tend to have higher participation rates than the Australian born population, hence regions and age groups with higher concentrations of migrants are expected to have higher participation rates. Migrants on arrival in Australia tend to have much lower capital resources (home, consumer durables, etc.), greater needs, lower earning power and perhaps a more acquisitive attitude, than the Australian population of the same age. All of these factors should lead to higher participation rates for the migrant population, at least in their initial years in Australia, and therefore it is expected that the higher the proportion of migrants in a region the higher will be the participation rates. There is some possibility that migrants may have difficulty in obtaining a job due to language problems and discrimination and hence be discouraged from remaining in, or seeking to enter, the workforce. This influence is likely to have been of minimal importance in 1971 in Australia due to a post-war history of acceptance of migrant labour in a predominantly low unemployment situation.

As the Australian born male population in the 25 to 54 age groups has very high participation rates, there is only limited scope for any influence of the male migrant population to be observed

in regional variations in participation rates.[17] Also, as the length of stay in Australia increases, the characteristics leading to higher participation rates will tend to lessen, and indeed the greater acquisitive drive of earlier years may cause greater asset accumulation and hence earlier retirement for migrants. In the case of women higher participation rates of migrants should be more easily detected by comparison with the relatively low participation rates of Australian women, although again the difference is expected to narrow and possibly even reverse, as length of stay increases (with migrant women possibly dropping out of the workforce earlier than Australian women).

The age group at which this narrowing of the gap between expected participation rates of migrants and local population occurs, with the consequent ambiguity of the expected sign on the immigration variable, is difficult to nominate. It is postulated that this change will occur in the 55-59 group as most migrants in this range will have been in Australia for a considerable time.[18, 19]

---

17. The main reasons for males in the 25-54 ages being outside the workforce are the existence of some permanent mental, physical or social disability. By the very nature of the decision to migrate to a somewhat antipodal country like Australia, migrants tend not to possess these characteristics and to be more enterprising than average and hence could be expected to have higher than native participation rates. Nevertheless, for both categories in these age groups, participation rates would be expected to be near unity.

18. An examination of figures on permanent immigration in the 1961 to 1971 period indicates that at a maximum only 19 per cent of migrants over 55 in 1971 had been in Australia less than ten years.

19. A migrant aged 55 in 1971 would have been in his mid-twenties during World War Two and hence the possibility arises of severe war experiences leading to mental illness and lower participation rates in the older migrant groups.

It is also possible that in the 15-19 group the participation rates of overseas born persons may be influenced by a greater desire of migrant parents from some countries for their children (particularly males) to remain in the education system. Hence there is some doubt on the expected sign of the immigration variable in the 15-19 age group. While not all children of migrant parents will have themselves been born overseas it is likely that there will be a close regional correlation between the proportion of 15-19 year olds born overseas (the variable used in the model) and the proportion of 15-19 year olds with parents born overseas.

Proportion married. The hypothesis here is that married males are marginally more likely to be in the workforce than those not married, and married females are much less likely to be in the workforce than unmarried women. Married men have a greater requirement for income than single men (home, children, etc.) and also those not married in the prime age group (25 to 54) have a greater likelihood of possessing characteristics that would keep them out of the workforce (e.g., physical and mental incapacities).

Married women will face social pressures discouraging workforce participation and have greater demands on their time (children, housework, etc.) leading to a higher shadow price on homework. The influence of children under five on the participation rates of their mothers should be accounted for by another variable outlined below but, even allowing for this, a higher proportion of married persons in a region is expected to cause a decrease in female participation rates because :

(1) Married women with no children are still likely to have higher shadow prices on homework than single women;

(2) The presence of older children, not considered in our variables, is also likely to decrease participation rates and the expected positive relationship between presence of older children and proportion married would show up as a negative sign on the marriage variable;[20]

(3) Because the "children" variable used here is not ideally specified, the influence of children under five on participation rates may not be fully accounted for and the proportion married may pick up some of this. Section 4 has a more detailed discussion of the deficiencies in the specification of the children variable.

Proportion qualified. It is postulated that those with some form of qualification will have higher participation rates. For men this is because those with qualifications are less likely to possess characteristics that will keep them out of the workforce. Also, their qualifications usually mean higher than average incomes available to them thus a greater than average cost of not being in the workforce. However, in later years the higher income previously earned due to their qualifications will lead to higher asset accumulation and non-wage income, and perhaps a greater likelihood of early retirement. In the case of women, qualifications are expected to have the same sort of effects as for men and also to lead to the delaying of

---

20. The supposed negative influence of presence of older children on their mothers' participation rates is by no means unequivocal. Some overseas evidence suggests that the presence of older children (14-17 years old) can encourage workforce participation of mothers, by providing help around the house, and in particular looking after younger children (see Bowen and Finegan, op. cit., pp. 96-100).

starting families, having smaller completed families and greater likelihood of returning to the workforce when the children reach school age. All of these factors engender the belief that qualified women will have higher participation rates.

Chidren under five. This variable is included in the equations for females in the age groups up to and including 45-54. For the latter group the percentage of mothers with children under five is small (about two per cent) but it is felt on balance the children variable should be included as it may have some influence on participation rates of the 45-49 group, where the children per married woman ratio is about four per cent, but for whom separate regional participation rate figures are not available. It is postulated here that on balance the presence of children under five decreases the participation rate of married women.

The presence of children under five will have two conflicting effects. First, it will tend to increase the income required by the family, hence encouraging a mother to enter the workforce. Second, it will considerably increase the demands on the mother's time, hence increasing the costs (social and monetary) of her entering the workforce. The latter considerations have in the past been by far the more important and therefore we would expect that the higher a region's children to married women ratio, the lower the participation rates.

Proportion of employment in service industries.[21] Essentially this variable is included to make some allowance for the influence of demand for female labour on the supply of that labour and hence is

---

21. Service industries (in terms of the 1971 census industry classification) were for our purposes defined as : wholesale and retail trade; transport and storage; finance and business services; communication; public administration and defence; community services; and entertainment and recreation. Total employment (i.e., both males and females) was used in calculating this ratio.

of a similar nature to the unemployment rate variable outlined above. But the unemployment rate only measures one part of the difference in regional demands for female labour. Regions with the same unemployment rate may have very different opportunities for female employment due to differences in the relative size of their service industries. It is anticipated that a sizeable percentage of women in most age groups are close to the margin of deciding to be in or out of the workforce, and therefore variations in demand for female labour are expected to influence significantly female participation. As the service industries have proportionately higher demands for female labour, regional variations in service employment are taken as indicators of differential demands for female labour. Unlike the unemployment variable, the expected direction of the influence of service employment on female participation is unambiguous. However, the causation may not be all one way, since service industries may be attracted to areas where women are more amenable to joining the workforce.

There is no similar reason to expect the relative size of the service sector to influence male participation rates and hence this variable is not included in the male equations. The demand for labour is expected to have only a minimal impact on participation rates in all but the youngest (15-19) and oldest (60-64, 65 + ) male age groups. What impact there is should adequately be allowed for by variations in the unemployment rate (one of the explanatory variables in the basic model) that would accompany changes in demand for labour.

Area dummy. The theory of carrying out a cross sectional analysis of this type requires us to assume for each age-sex group that the regions have identical likelihoods of workforce participation except for differences in the independent variables postulated. However, observation of the data indicates that, at least for some groups, there may be something inherent about individual regional types which influences participation rates. An equivalent assumption is implicitly made in time series analysis concerning the similarity of time periods except for the value of the explanators being considered. However, it seems more reasonable to assume this over relatively short time periods than between regions which may be at very different levels of social development and industry structure.

In an attempt to allow for such an influence on participation rates an area dummy was included in the basic model for males, taking the value of 1 for major urban and other urban areas and zero for rural areas. The regression constant will be centred on rural areas and raised by the coefficient of the area dummy when major and other urban areas are being considered. Hence it was assumed that major urban and other urban areas had a similar impact on participation rates but both had significantly different effects to rural areas. The type of influence is assumed to be the same for all age groups but the size will vary according to the value of the coefficient on the dummy variable.

The rationale for the use of regional dummies is that social and economic differences between types of regions may account independently of our postulated explanatory variables for some of the variations in participation rates. The hypothesis for males is

that rural areas will have higher participation rates (independent of other explanatory variables) due to the lack of facilities for those disabled in some way, lack of tertiary educational facilities (both of which would tend to induce migration of non-participants from the rural to urban regions) and the possible tendency for later retirement among rural workers. A negative sign is therefore postulated for the regional dummy.[22]

The area dummy is not included in the females basic model because the services variable is likely to allow for much of the influence of area lived in. One of the main impacts type of area will have on female participation rates is that differing industry structures will provide differential employment opportunities and this will be more precisely quantified by the continuously specified services to total employment variable than by the discretely specified area dummy. However the dummy is also expected to account for other economic and social influences of different region types and while partly overlapping the services variable it could still be argued as a separate explanator. These two variables are not included together in the females basic model because the data (only 21 observations) is not considered adequate to allow separation of their influences particularly given the number of other explanators used.

As a variation to the basic model the female equations are estimated with an area dummy alone and with both services and area

---

22. As other urban areas lie on the socio-economic spectrum somewhere between major urban and rural areas, an alternative specification of the area dummy to that used in our basic model was also tried giving major urban areas a value of one and rural and other urban areas zero. Results of this approach are presented in Section 5.

included. A positive coefficient is anticipated on the area dummy as economic conditions and social attitudes prevalent in rural areas should tend to keep participation rates lower than in urban areas.

Although we are modelling a type of labour supply concept (i.e., workforce participation rates) no wage or earnings variable is included in the analysis. Such a variable is clearly desirable as in economic theory the price of a good has traditionally been a key factor in explaining that good's demand or supply. However there is no data available on wage rates by the regions for which we have participation rates. This omission may not be too damaging for three reasons :

(1) Wages for any occupation are likely to be fairly stable between regions. There are certainly some variations in per capita income between States but these are probably more related to different occupational structures rather than different wage rates in individual occupations.

(2) The differing regional occupational structures, insofar as they affect earnings, may be reasonably accounted for by the proportion qualified variable. Areas with higher proportions qualified would be expected to have a greater concentration of higher paid occupations.

(3) For females a similar influence to that under (2) can also be postulated for the services to total employment variable, with areas in which services are more important being expected to have a relatively greater demand for female labour at any given wage rate.

In choosing these variables the criterion used was that there was a priori, some expected significant relationship between the variable and participation rates, although it was not possible in all cases to specify the direction the influence was expected to take. Where an expected direction of influence could be specified a one tail test was used to test the level of significance of the regression coefficient for that variable. Two tail tests were applied for variables and age-sex groups for which no a priori directional expectation could be made.

The literature concerning studies of labour force participation rates (see Appendix C) provided a considerable number of variables that in theory may be significant. Of these, several have been omitted from this study either because of the current lack of suitable data or because they are not appropriate in this type of analysis. For example, husband's occupation has been put forward by some authors[23] as a significant explanator of the participation rate of married females; however, data limitations currently preclude an analysis of this possible relationship. Many problems of this nature may be overcome when detailed cross classifications of persons by various individual and household characteristics become available from the 1971 Census.

For the above factors to be shown significantly to explain changes in participation rates there will need to be reasonable variations in participation rates and in the explanatory variables between regions. Tables 9 and 10 (appendix A) show participation rates at the 1971 census for the twenty-one regions being examined. There are substantial variations in participation

---

23. W.E. Bowen and T.A. Finegan, op. cit.

rates between regions for all female age groups and for males in the 15-19, 60-64 and 65 and over groups. However, for males in the 20-59 age groups participation rates are very similar across regions and the possibility of obtaining significant explanatory relationships are commensurately reduced even though these equations may be expected to account for a substantial portion of the variation in regional participation rates.

### 3.3 Data

The means of obtaining the data used in this analysis are described in detail in Appendix B and only a brief outline is presented here. Data for participation rates for all regions came directly from the Australian Bureau of Statistics 1971 Census Bulletins (Bulletin 5, parts 1 to 9). Age-sex specific information on qualifications, marital status and birthplace were obtained from unpublished tabulations provided by the ABS, but were only available broken down on a capital city/rest of state basis. The procedure used to convert these to the twenty-one regions for which ASPR were available are set out in Appendix B. Regional unemployment rates were obtained by taking samples of Local Government Authorities for each region from the 1971 Census Bulletins 7 parts 1 to 8. Data on numbers of children under five by age of mother were obtained for each State from the ABS publication Demography, and the method of splitting this into regions is described in Appendix B. The initial data are excellent but the process of manipulation into the desired regional breakdown requires procedures that provide approximate estimates only. On the whole it is felt that these estimating procedures have sufficient merit to suggest that the resultant regional data are close to the actual figures.

# 4 RESULTS FOR FEMALES

The considerable variation in female participation rates between regions was pointed out in section three. It was expected that a substantial part of this variation might be accounted for in the results of the regression analysis. This expectation was borne out for most age groups although certain explanators consistently failed significance tests, while others varied in importance depending upon the age group being examined. Equations were estimated for eight age groups but, because of similarities in the workforce behaviour of a number of them, the results are discussed in three age ranges, namely, young (15-24), prime[24] age (25-54) and older (55 and over).

## 4.1 The Basic Model

The results obtained by fitting equation (1) are discussed below and set out in Table 3. A number of variations to the basic model are also briefly outlined.

### Young age groups

The substantial regional variations in participation rates in both age groups are explained reasonably well by the basic model. In the 15-19 age group the percentage of women married is small (around 10% to 15%) however the large variations in it (standard deviation of 6%) significantly accounted for regional changes in participation rates. Although the number of children under five per married woman is both large and

---

24. Although the expression "prime age" is derived from the behaviour of male participation rates, the terminology is continued here for simplicity since it refers to groups in the 25-54 age range in both cases.

TABLE 3 : BASIC MODEL REGRESSION RESULTS FOR FEMALES

| Age Group | Constant | Proportion of Immigrants | Proportion Married | Children under 5 per Married Woman | Proportion Qualified | Unemployment Rate | Service Employment to Total Employment | $R^2$ (%) and F-ratio |
|---|---|---|---|---|---|---|---|---|
| 15 to 19 | | | | | | | | |
| Co-efficient | -0.048 | 0.522* | -0.488Ψ | 0.351* | -0.921 | 0.012 | 0.268Ψ | 59.6% |
| Standard error | 0.224 | 0.240 | 0.219 | 0.139 | 0.735 | 0.034 | 0.122 | 3.44 |
| 20 to 24 | | | | | | | | |
| Co-efficient | 0.648** | 0.304Ψ | -0.125 | -0.174 | -0.109 | -0.044* | 0.371ΨΨ | 91.7% |
| Standard error | 0.170 | 0.121 | 0.152 | 0.142 | 0.268 | 0.020 | 0.080 | 25.81 |
| 25 to 34 | | | | | | | | |
| Co-efficient | 1.119** | 0.132Ψ | -0.647ΨΨ | -0.154Ψ | 0.221 | -0.043* | -0.060 | 90.7% |
| Standard error | 0.216 | 0.064 | 0.215 | 0.077 | 0.165 | 0.015 | 0.091 | 22.77 |
| 35 to 44 | | | | | | | | |
| Co-efficient | 0.897** | 0.232ΨΨ | -0.578Ψ | -0.017 | 0.649ΨΨ | -0.026* | -0.079 | 92.6% |
| Standard error | 0.246 | 0.055 | 0.234 | 0.064 | 0.199 | 0.012 | -0.096 | 29.39 |
| 45 to 54 | | | | | | | | |
| Co-efficient | 0.703** | 0.158Ψ | -0.444Ψ | 0.268 | 1.488ΨΨ | -0.036* | -0.147 | 93.0% |
| Standard error | 0.194 | 0.073 | 0.201 | 0.264 | 0.291 | 0.014 | 0.093 | 30.79 |
| 55 to 59 | | | | | | | | |
| Co-efficient | 0.387* | 0.049 | -0.183 | | 1.870ΨΨ | -0.020 | -0.214* | 87.1% |
| Standard error | 0.148 | 0.105 | 0.179 | | 0.403 | 0.018 | 0.099 | 20.31 |
| 60 to 64 | | | | | | | | |
| Co-efficient | 0.358** | -0.071 | -0.278ΨΨ | | 2.071ΨΨ | -0.003 | -0.312** | 83.0% |
| Standard error | 0.081 | 0.082 | 0.107 | | 0.362 | 0.014 | 0.071 | 14.61 |
| 65 + | | | | | | | | |
| Co-efficient | 0.063 | -0.088* | 0.078 | | 1.230ΨΨ | -0.001 | -0.176** | 90.4 |
| Standard error | 0.036 | 0.037 | 0.066 | | 0.213 | 0.006 | 0.024 | 28.34 |

Note : The coefficients are small because the dependent variable (participation rates) is expressed as a fraction of the population. Hence if half of an age group is in the workforce the participation rates is 0.5 .

* Significant at the 5 per cent level - two tail test

** Significant at the 1 per cent level - two tail test

Ψ Significant at the 5 per cent level - one tail test

ΨΨ Significant at the 1 per cent level - one tail test

Significant F at the 5 per cent level - for 15-19 to 45-54 age groups, inclusive 2.85

- for 55-59 and older 2.90

variable, only a small proportion of all women in these age groups have children. For the 20-24 age group this variable is not significant but rather surprisingly, for the 15-19 group it is both significant at the 5% level and has a positive sign (opposite to the a priori expectation). Two behavioural explanations of the positive sign could be :

(1) The need for income due to the presence of children under five is much stronger for mothers in the 15-19 group. Households with mothers in older age groups are likely to have accumulated a reasonable level of assets (home, durables) but those with mothers in the 15-19 ages could be expected to have few assets and hence a greater requirement for income.

(2) A higher proportion of mothers in this age group are likely to be living with their parents, both because a higher proportion of mothers in the 15-19 group are unmarried, and because mothers aged 15-19, both married and unmarried, are probably more likely to be living with their parents than are older mothers. These women will have access to free child minding by parents hence tending to encourage work-force participation by alleviating one of the main monetary costs for mothers of young children entering the workforce. However the income effect of (1) will be somewhat diminished for mothers living with their parents.

Service employment is significant in both age groups with the expected positive sign. For the young groups the proportion of women wanting to work is likely to be high in all regions, as a sizeable portion of the female population will have few restrictions on workforce

participation (no family ties, not attending educational institutions). In this situation the availability of ample employment opportunities is an important determinant of the proportion of women who actually remain in the workforce. Hence areas with relatively high demand for female labour are likely to have higher participation rates for the young age groups. This relationship will be accentuated by the ability of young unattached women wanting work to migrate to regions with a greater demand for female labour. On the other hand those not interested in working are much less likely to migrate, hence the participation rates in the regions with low demand for female labour will be depressed even further.

Proportion of immigrants is significant with the expected positive sign in both age groups. The possible negative effect of migrant parents on the participation rates of their 15 to 19 year old children appears to be unimportant. This is not surprising for females as investment in educating males tends to be valued more highly in a number of the large Australian migrant groups. A significant net discouraged worker effect of unemployment is found in the 20-24 group. The insignificance of unemployment for the 15-19 year olds may be due to the cancelling out of higher unemployment prompting some young women to leave school because of the unemployment of a parent, and at the same time discouraging others from entering or remaining in the workforce.

Prime ages

Regional participation rates for all age groups in this range are substantially accounted for by the regression equations (the $R^2$ is above .9 for all age groups). All the constant terms and more than half of the coefficients were significant and had the anticipated signs. The proportion of qualified persons variable first became significant in the 35-44 group and remains so for all further age

groups. As expected the sign is positive. Its failure to show up as a significant variable in the younger ages reflects the fact that, up to and including the 20-24 group, women were still obtaining qualifications. The most important influence of qualifications may be to encourage a woman to return to the workforce when her youngest child reaches school age and this is likely to be particularly significant when mothers are in the 35-44 and older age groups. Women with some form of qualifications are likely to have access to jobs that are more personally fulfilling, offer higher pay and allow some flexibility in working hours. All of these factors mean that the likelihood of a woman returning to the workforce after having children is greater if the woman has some form of qualification. Also qualified women on average may have fewer children than non-qualified and hence would be more likely to be in the workforce. While in theory any such tendency should show up as differences in the children per married woman variable, it may be that in our regressions the qualifications variable is picking up some of the influence on participation rates of related variations in children per married woman.

The immigrants variable is significant and has the expected positive sign in all three prime age groups, indicating the importance of higher participation rates of migrant women for variations in regional participation rates[25] (approximately 19.5% of all women in these age groups were born overseas, the percentage being similar for each age group). The proportion married variable is significant and has a negative influence on participation rates in all the prime age groups. This reflects the substantial differences in participation rates of married and unmarried women.

The unemployment rate is also significant in all prime age groups and the negative sign conforms with the results of other

---

25. Department of Labour, Women's Bureau, The Role of Women in the Economy, (Melbourne June 1973), pp. 12-14. Of overseas born females over 15 years of age 41.6% were in the workforce at June 30, 1971 compared to 35.8% of Australian born women.

researchers.[26] This indicates that for females the discouragement effect of higher unemployment rates tends to depress participation rates much more than any increased participation by non-heads seeking supplementary sources of income. This is not surprising as the additional worker effect will have its major influence on women whose husbands do not have a job. Assuming that lower availability of overtime coincides with higher unemployment (not necessarily a correct assumption in an inter-regional analysis) then there will also be some income effect on women, other than those with husbands out of work, to enter the workforce. On the other hand the discouraged worker effect will influence all women searching for a job or considering entering the workforce and given the high turnover of the female workforce (especially in the middle age ranges where unemployment is showing up as a significant variable) this will be a relatively large number of women. Another significant retardant to any added worker effects is that the earnings of a wife lessen the unemployment benefits her husband can obtain.

The service employment variable is not significant in any of the prime ages and develops an unexpected negative sign. For women with children, the more rigid conditions of work (relatively inflexible hours) in urban areas may offset the advantage of the greater demand for female labour that is generated by the abundance of service industries in those areas. The more informal work arrangements possible for some rural women may be more suitable to workforce

---

26. See Mincer op. cit.

participation of mothers.[27] The children under five variable is significant in the 25-34 age group, in this case having the predicted negative sign. Its insignificance in the 35-44 ages is a little surprising and this is considered further in section 4.3

Older age groups

For the older age groups (55 and over) the postulated explanatory variables slightly lose their ability to account for variations in participation rates. This may reflect the influence that retirement decisions of males have on workforce participation of their wives. The qualifications variable is significant in all three age groups, giving further evidence of the importance educational factors have on the likelihood of women being in the workforce. The marriage variable is only significant in the 55-59 group. An interesting development for older females is the emergence of service employment as a significant explanator with an unexpected negative sign. This may reflect a trend for women in rural (low service employment) areas to keep working beyond the normal retirement age and may be another result of the availability of more informal work arrangements (e.g. on farms) suiting women only wanting to work part time.[28]

---

27. It is possible that many women in these age groups would be interested in working but only if the hours and conditions fitted in to their household responsibilities. Hence not only the level of demand for female labour but also the nature of that demand will be relevant in influencing participation rates for the middle aged groups. Here there may be advantages in rural regions because of the greater ease in structuring a woman's work on a farm around household tasks. However the month a census is carried out (June) is not one of substantial activity on farms and hence many women in rural areas who work at some time in the year may not have been working in the week prior to the census.

28. There could also be some practical problems in the way rural women answered the census questions relating to participation in the workforce. Some women on family farms who did not actively participate in running the farm may still have answered yes to the question "Did this person do any work at all last week" because of the instruction to answer yes "even if this person was working part time or helping without pay in a family business". Quite possibly some women doing household type tasks (vegetable garden, tending a few animals) or who for tax purposes only, receive part of the profits from the farm, might see themselves as falling within this definition.

The unemployment rate is not significant in these groups, possibly because most women still working at this age are not re-entrants to the labour force or in the midst of changing jobs and hence are not discouraged by high unemployment unless they lose their own job. In times of high unemployment the latter possibility would be quite important for older women as they are likely to be amongst the first to be retrenched. However unemployment was quite low at the time of the 1971 Census. An interesting development in the two oldest age groups is the negative sign on the immigrants variable which is significant in the 65 and over group. The tradition of caring for aged parents that is prevalent among some ethnic groups is possibly important here.

The somewhat lower $R^2$ and the loss of significance of a number of variables in the older age groups reflects the need to include a number of household variables explaining permanent retirement. The relevant factors here include household assets, access to pensions, superannuation provisions, property income and whether a woman's husband is still in the workforce. Data on these variables are not available by the regions used in this model.

Effect of Significant Variables

So far the discussion of results has concentrated upon the significance or otherwise of the various explanatory variables. It is appropriate to now briefly discuss the size of the effect upon participation rates of those variables which were found to be significant explanators. Tables 4 sets out percentage changes in participation rates from their mean values as a result of 10 per cent changes in

given explanators, with other explanators held constant.[29, 30] These proportional changes are referred to as participation multipliers.

TABLE 4 : EFFECT[a] OF A TEN PER CENT CHANGE IN THE MEAN VALUE OF A SINGLE EXPLANATORY VARIABLE[d]

(Percentage)

| Age Group | Proportion of immigrants | Proportion married | Children per married woman | Proportion qualified | Unemployment rate | Service employment |
|---|---|---|---|---|---|---|
| 15-19 | 1.02 | 6.39 | 8.66 | b | b | 2.70 |
| 20-24 | 0.96 | b | b | b | 1.48 | 3.66 |
| 25-34 | 0.74 | 16.45 | 4.28 | b | 2.12 | b |
| 35-44 | 1.13 | 12.68 | b | 2.05 | 1.09 | b |
| 45-54 | 0.79 | 10.07 | b | 4.03 | 1.67 | b |
| 55-59 | b | b | c | 5.79 | b | 4.03 |
| 60-64 | b | 11.74 | c | 9.93 | b | 10.38 |
| 65+ | 3.37 | b | c | 12.30 | b | 17.88 |

a Proportion change in mean participation rates.

b Insignificant coefficient at the 5 per cent level.

c Variable not specified for this age group.

d An increase from .2 to .22 is an example of a 10 per cent change, as opposed to a 10 percentage points change (not considered here) from .2 to .3 .

29. A 10 per cent change from the mean is a fairly large one for estimating a point elasticity type concept. Over this range of values of the explanatory variable the impact multiplier at any point would be somewhat different from that measured from the mean value but the difference will be quite small. Using the 10 per cent range is convenient in that it produces impact multipliers of an easily understandable size compared to the very small (1/10 of those shown in Table 4) multipliers resulting from a 1 per cent change.

30. As the participation rate change is being compared to the mean level of participation rates it is implicitly assumed that the other explanators are being held constant at their mean values.

Most of the multipliers are less than 10 per cent, hence at mean values of most variables changes in participation rates are proportionately less than changes in the variables explaining them. The proportion married variable is an exception and 10 per cent changes in it cause quite large variations in participation rates in a number of age groups. However the maximum variation observed in the regional data is only 10 per cent above the mean value. The magnitude of the participation multipliers for proportion married are therefore the result of assuming unusually large changes in that variable. For all other variables a 10 per cent change is quite small, representing less than one standard deviation from the mean value.

The relative influence of qualifications on participation rates increases with age indicating that qualified women tend to remain in the workforce longer than other women. Also qualifications probably increase the likelihood of a woman returning to the workforce as her children grow older. The importance of this influence increases in the older groups where fewer women have young children. The multipliers for the immigrants variable are small but as 50 per cent variations in the proportion of immigrants are common, a 10 per cent change is by no means large. The multiplier for children per married woman shows that not only does this variable behave in the opposite direction to that expected for the 15-19 group but also it has a reasonably large impact on participation rates. An increase of 10 per cent in this ratio leads to an 8.66 per cent increase in participation rates.

The multipliers for unemployment are also small and the regional variations are less than for most other variables (mean of 1.7352 and a standard deviation of .3831). However while most variables have not had

changes over time as large as their 1971 regional variations, the unemployment rate has. In recent years the unemployment rate has varied by over one hundred per cent. It therefore would be useful to have estimates of the effect of proportionately much larger changes in unemployment rates between regions but the range of variation for the 1971 data does not permit this to be done with confidence. The services variable has small participation multipliers in the young groups but these increase substantially in the two oldest age groups where the sign is the reverse of our initial expectations.

## 4.2 Modifications

The main alternative specification considered for the female model was the replacement of the service employment variable by an area dummy taking the value one for major and other urban areas and zero for rural areas. As indicated in section three the dummy is wider in concept as it is included to allow for social,cultural and economic influences of regional type, but the services variable is more likely to be successful in reflecting the narrower influences it directly relates to (i.e. industry structure) due to its continuous nature.

The results of this alternative approach (Table 5) are fairly similar to those of the basic model. The area dummy is significant in both the young age groups with a positive sign. The difference in participation rates between types of area is quite substantial with the area dummy coefficients indicating that ceterus paribus, female participation rates in urban areas are .100 and .116 higher than in rural areas for the 15-19 and 20-24 age groups respectively. Given the greater participation in education in urban areas, these higher workforce participation rates would reflect both very different attitudes to women entering the workforce after leaving school and the greater availability of work for females in urban areas.

TABLE 5 : REGRESSION RESULTS FOR FEMALES - AREA DUMMY INCLUDED

| Age Group | Constant | Proportion of Immigrants | Proportion Married | Children under 5 per Married Woman | Proportion Qualified | Unemployment rate | Area | $R^2$ (%) and F-ratio |
|---|---|---|---|---|---|---|---|---|
| 15 to 19 | | | | | | | | |
| Co-efficient | 0.145 | 0.311 | -0.344 | 0.276* | -0.572 | -0.011 | 0.100ΨΨ | 65.5% |
| Standard error | 0.190 | 0.279 | 0.202 | 0.120 | 0.665 | 0.034 | 0.035 | 4.43 |
| 20 to 24 | | | | | | | | |
| Co-efficient | 0.893** | 0.200 | -0.012 | -0.321 | -0.174 | -0.059 | 0.116ΨΨ | 87.2% |
| Standard error | 0.216 | 0.175 | 0.209 | 0.192 | 0.349 | 0.030 | 0.039 | 15.95 |
| 25 to 34 | | | | | | | | |
| Co-efficient | 1.152** | 0.190ΨΨ | -0.787ΨΨ | -0.107 | 0.254Ψ | -0.026 | 0.046Ψ | 92.7% |
| Standard error | 0.126 | 0.061 | 0.161 | 0.071 | 0.117 | 0.015 | 0.021 | 29.84 |
| 35 to 44 | | | | | | | | |
| Co-efficient | 0.796** | 0.242ΨΨ | -0.485Ψ | -0.027 | 0.543ΨΨ | -0.027 | -0.011 | 92.4% |
| Standard error | 0.212 | 0.061 | 0.209 | 0.073 | 0.141 | 0.015 | 0.027 | 28.32 |
| 45 to 54 | | | | | | | | |
| Co-efficient | 0.494** | 0.174Ψ | -0.230 | 0.273 | 1.172ΨΨ | -0.043* | -0.010 | 91.8% |
| Standard error | 0.160 | 0.087 | 0.175 | 0.320 | 0.219 | 0.015 | 0.024 | 26.15 |
| 55 to 59 | | | | | | | | |
| Co-efficient | 0.126 | 0.056 | 0.139 | | 1.299ΨΨ | -0.045* | -0.000 | 83.1% |
| Standard error | 0.109 | 0.132 | 0.137 | | 0.349 | 0.019 | 0.023 | 14.80 |
| 60 to 64 | | | | | | | | |
| Co-efficient | 0.133 | 0.002 | -0.013 | | 1.224ΨΨ | -0.020 | -0.040 | 67.9% |
| Standard error | 0.078 | 0.121 | 0.108 | | 0.412 | 0.019 | 0.022 | 6.35 |
| 65 + | | | | | | | | |
| Co-efficient | -0.003 | -0.044 | 0.125 | | 0.807Ψ | 0.002 | -0.042** | 76.9% |
| Standard error | 0.052 | 0.064 | 0.107 | | 0.346 | 0.009 | 0.012 | 9.96 |

* Significant at the 5 per cent level - two tail test

** Significant at the 1 per cent level - two tail test

Ψ Significant at the 5 per cent level - one tail test

ΨΨ Significant at the 1 per cent level - one tail test

Significant F at the 5 per cent level - for 15-19 to 45-54 age groups, inclusive 2.85

- for 55-59 and older 2.90

TABLE 6 : REGRESSION RESULTS FOR FEMALES - AREA DUMMY AND SERVICES BOTH INCLUDED

| Age Group | Constant | Proportion of Immigrants | Proportion Married | Children under 5 per Married Woman | Proportion Qualified | Unemployment Rate | Area | Service Employment to Total Employment | $R^2$(%) & F-ratio |
|---|---|---|---|---|---|---|---|---|---|
| 15 to 19 | | | | | | | | | |
| Coefficient | 0.138 | 0.314 | -0.348 | 0.279 | -0.584 | -0.011 | 0.098 | 0.009 | 65.5% |
| Standard error | 0.249 | 0.299 | 0.230 | 0.142 | 0.740 | 0.036 | 0.066 | 0.209 | 3.52 |
| 20 to 24 | | | | | | | | | |
| Coefficient | 0.685** | 0.269Ψ | -0.089 | -0.207 | -0.147 | -0.049 | 0.021 | 0.331ΨΨ | 91.8% |
| Standard error | 0.195 | 0.147 | 0.176 | 0.165 | 0.290 | 0.025 | 0.048 | 0.122 | 20.88 |
| 25 to 34 | | | | | | | | | |
| Coefficient | 1.134** | 0.192ΨΨ | -0.773ΨΨ | -0.106 | 0.243 | -0.026 | -0.047 | 0.011 | 92.8% |
| Standard error | 0.198 | 0.067 | 0.208 | 0.075 | 0.151 | 0.016 | 0.024 | 0.091 | 23.78 |
| 35 to 44 | | | | | | | | | |
| Coefficient | 0.917** | 0.237ΨΨ | -0.600Ψ | -0.023 | 0.646ΨΨ | -0.025 | -0.005 | -0.073 | 92.7% |
| Standard error | 0.277 | 0.063 | 0.270 | 0.074 | 0.206 | 0.015 | 0.029 | 0.105 | 23.46 |
| 45 to 54 | | | | | | | | | |
| Coefficient | 0.693** | 0.140 | -0.427Ψ | 0.332 | 1.529ΨΨ | -0.037* | 0.012 | -0.173 | 93.1% |
| Standard error | 0.201 | 0.086 | 0.211 | 0.308 | 0.314 | 0.015 | 0.027 | 0.114 | 24.90 |
| 55 to 59 | | | | | | | | | |
| Coefficient | 0.546** | -0.120 | -0.321Ψ | | 2.504ΨΨ | -0.021 | 0.067ΨΨ | -0.460** | 91.6% |
| Standard error | 0.137 | 0.107 | 0.157 | | 0.408 | 0.015 | 0.024 | 0.122 | 25.61 |
| 60 to 64 | | | | | | | | | |
| Coefficient | 0.401** | -0.118 | -0.310ΨΨ | | 2.265ΨΨ | -0.006 | 0.024 | -0.391** | 84.2% |
| Standard error | 0.090 | 0.093 | 0.111 | | 0.405 | 0.014 | 0.023 | 0.103 | 12.45 |
| 65 + | | | | | | | | | |
| Coefficient | 0.065 | -0.070 | 0.057 | | 1.142ΨΨ | 0.003 | -0.009 | -0.156** | 91.0% |
| Standard error | 0.037 | 0.042 | 0.071 | | 0.235 | 0.006 | 0.010 | 0.033 | 23.49 |

* Significant at the 5 per cent level - two tail test
** Significant at the 1 per cent level - two tail test

Ψ Significant at the 5 per cent level - one tail test
ΨΨ Significant at the 1 per cent level - one tail test

Significant F at the 5 per cent level - for 15-19 to 45-54 age groups inclusive 2.83
- for 55-59 and older 2.85

The area dummy is significant for the 25-34 ages but with a much lower coefficient and then loses significance and develops a negative sign for the prime and older age groups. It is again significant (negative sign) in the 65 and over age group with a very large coefficient (.042) considering the low level of participation rates in this age group (mean of .050). As with the services variable this change in sign would appear to reflect older women continuing to work on farms. The similarity in the sign and significance of the services variable and area dummy indicates that the former seems to move broadly in line with the non-economic differences the area dummy encompasses or at least reflects them as accurately as the dummy can. In terms of estimating future female participation rates, the results for the area variable have some relevance. There is considerable scope for social and economic change in rural and other urban areas to lead to increasing participation rates in those regions as well as for a population drift to urban areas with higher participation rates.[31] The model indicates that the 15-24 ages are those in which a substantial influence on participation rates could be expected.

The pattern of other coefficients for the two models is broadly similar, however a number of coefficients lose their significance when the area dummy replaces service employment. This indicates that women's workforce decisions are sensitive to the availability of suitable employment opportunities and failure to adequately take account of this (i.e. excluding the services variable) may lead to some distortion of the relationship between participation rates and other explanators.

---

31. At the 1971 census 13.4% of the female population was located in rural areas and 21.1% in other urban areas.

For completeness the model was also estimated with both the area dummy and service employment included and the results are presented in Table 6. Given the differences in the influences these two variables are expected to account for, the theoretically preferable model would include them both. However to do so in this case represents a substantial increase in explanators (and decrease in degrees of freedom) when only 21 observations are available. Comparing Tables 3 and 6 shows loss of significance for a number of explanators when both variables are included, but it is felt this has arisen due to insufficient observations rather than any major mis-specification in the basic model reported in Table 3. Many of the losses in significance are only marginal and due to higher standard errors of coefficients when the extra variable is added.

A minor alternative to the inclusion of the area dummy is to change the specification of the dummy. As other urban areas lie between major urban and rural regions on the socio-economic spectrum, rural and other urban areas are combined and given a zero value with major urban areas taking the value one. This specification assumes that the behaviour of female participation rates in other urban and rural areas are similar but are inherently different from major urban areas. This approach leads to a drop in explanatory power in most age groups and results in insignificance of the area dummy in all ages (see Appendix A, Table 11). In terms of influence on female participation rates, other urban areas are clearly more identifiable with major urban rather than rural areas.

In a further modification the two Northern Territory regions were omitted as extreme observations and it could be argued that these regions represent atypical observations. There is a substantial aboriginal population in the rural Northern Territory, and Darwin, which makes up most of the other urban region, has a significant transient population (e.g. public servants on temporary transfer to Darwin). Even though two

degrees of freedom are lost, the reliability of the model may be improved if the Northern Territory observations are in fact atypical. This expectation is partly borne out in a number of age groups with reasonable increases in already high explanatory power of the model in the 20-24 and 60-64 age groups. The significance of most coefficients remains fairly similar to the basic model with an interesting change being the loss of significance of the children variable in the 15-19 age group. The rather difficult to explain positive sign on this variable in the results based on the complete data set could simply result from the unusual nature (mentioned above) of the population in the two small Northern Territory regions.

The very small relative size of the Northern Territory regions reflects the fact that although in our model each observation (i.e. region) is given equal weight, there is a wide disparity between the regional population sizes. Consequently the mean value of each of the variables does not equal the mean value of that variable for Australia as a whole. This means that even for 1971 the basic model would not correctly predict Australian participation rates.[32] It should therefore be remembered that the regional model developed here is not intended to be a predictive model but rather its purpose is to give indications as to the size and strength of coefficients and their variations across age groups.

## 4.3 Conclusions from the Basic Model

The initial regression results are certainly not inconsistent with some of our *a priori* hypotheses as to the likely causes of regional differences in participation rates. The estimated equations for all ages

---

32. The problem would not arise if the relationship between the explanatory variables and participation rates was the same for all regions for any given age - sex group. This is of course implicitly assumed in the model as the coefficients are the same regardless of region. The extent to which the assumption is vitiated is measured to some extent by $(1-R^2)$.

except the 15-19 group, consistently account for 80% or more of variations in participation rates. The variables that prove to be significant often differ between age groups, but this was not unexpected.

The immigration variable is significant in the young and prime ages but reverses sign for older women, possibly reflecting the lessening influence of migrant status as many migrant women start adopting Australian customs. Also Southern European traditions may contribute to a trend for migrant mothers to retire from the workforce once their children begin employment.

Unemployment is not a significant variable in the 15-19 age group perhaps reflecting the greater need and determination of younger women to obtain work. They are likely to be unmarried which would lessen the tendency to give up looking for a job when confronted with a slack labour market. Younger people may also be more mobile and may react to higher than average unemployment by moving to another location rather than dropping out of the workforce. For the age groups 20-24 to 45-54 unemployment proved to be a significant explanator of participation rates. This may indicate a lower perceived need to obtain a job and hence a greater susceptability to being discouraged by high unemployment.

Qualifications become significant in the 35-44 age group and beyond, indicating a positive effect of education on the likelihood of women returning to the workforce as their children grow older.

The main surprise of these initial runs is the fact that the children variable was significant with a negative sign in only one case : the 25-34 group. While the influence of some of the other explanatory varaibles on an individual's likelihood of participating in the workforce can be questioned, there is little doubt that presence of young children in a household has a significant dampening effect on the probability of workforce participation by the mother. For the 15-19 and 45-54 age groups the influence of children may be small because the number of women in

these ages with children under five is small. However for the 20-24 and 35-44 age groups it is difficult to believe that the presence of children has no significant effect on participation rates as is indicated by the results of the basic model. At least two reasons can be advanced for the lack of explanatory power :

(1) It can be seen from Appendix B that the estimates of the number of children by age of mother were made on the basis of a number of assumptions (more than were required for the estimation of other explanators). It is possible that the errors inherent in the estimation procedure obscured a significant relationship between participation rates and children per married woman. Potentially the most important difficulty here is that the main incidence of differing regional ratios of children under five per married woman, may occur in particular age groups. But such a situation is not allowed for by our assumption that the regional differentials in this ratio in any one State are uniform across all ages of mother.[33] For example, it may be that in rural and other urban areas the ratio of children under five to married women is much greater than in major urban areas for the 15-19 and 20-24 groups but fairly similar in later ages. In other words, women in rural and other urban areas may tend to be younger when they start their families. Using the estimation procedure outlined in Appendix B this higher ratio would be spread equally over all age groups, hence limiting the chance that a significant relationship would be found between workforce participation and presence of children.

---

33. See Appendix B. This assumption was the only means by which total State ratios of children per married women in each age group could be split into regional estimates of these ratios.

(2) The variable specified is not the ideal one for examining the influence of children on participation rates. What we really want to know is the proportion of women in each age group and region who have at least one child under five in their family. This is a significantly different concept from the children to married women ratio used in our analysis, when the proportion of families with more than one child under five varies between regions. For example, consider two regions both having .8 children under five per married woman in the 25-34 age group. However, Region A has 30% of married women in this age group with no children under five, 60% with one child, and 10% with two children. On the other hand Region B has 20% with no children under five, 80% with one child and none with two children. We would expect that Region A would ceterus paribus, have higher female workforce participation rates than B. This is because the presence of the first child under five is a more significant deterrent to workforce participation than the addition of second young child. Hence, in terms of probability of workforce participation, the positive effect of the higher percentage of women with no children more than offsets the negative effect of the higher percentage of women with two children. The children per married woman variable used in our analysis would not discern between the two situations. No alternative specification of the variable to overcome this problem is possible with currently available data.

The explanatory power of the model is not as high in the 15-19 group. The reason for this is probably that differences in workforce participation rates mainly represent differences in the proportion

of this group attending educational institutions. For this reason we should be trying to explain participation in education by such factors as family income and background (for which we have little data at present) rather than the variables used in our analysis. Similarly with the older age groups we should be explaining permanent retirements directly rather than workforce participation itself; household variables are again relevant here. The model is reasonably successful without such variables although there is some decrease in explanatory power in the 55-59 and 60-64 groups, compared to other ages.

The importance of demand factors in influencing the supply of female labour is indicated by the significance of service employment in five age groups with unemployment being significant in the remaining groups. For many women the decision to be in the workforce is a fairly tenuous one which is easily influenced by both the overall state of the labour market and the availability of jobs particularly suited to women.

## 5 RESULTS FOR MALES

As the results of the male equations are very similar for all age groups, the individual age group analysis followed in Section four will not be used here. Instead, the results will be discussed in general with reference to specific age groups where appropriate.

### 5.1 The Basic Model

There is an almost complete lack of significant coefficients on all postulated explanators except the marriage variable. For prime age males this simply reflects the consistently high and stable participation rates in all regions (the constant term being significant at the 1% level for all age groups up to and including 45-54). The model accounts for a reasonable proportion of variations in participation rates in the

TABLE 7 : BASIC MODEL REGRESSION RESULTS FOR MALES

| Age Group | Constant | Proportion of immigrants | Proportion married | Proportion Qualified | Unemployment rate | Area | $R^2$ (%) and F-ratio |
|---|---|---|---|---|---|---|---|
| 15 to 19 | | | | | | | |
| Co-efficient | 0.512** | -0.137 | 5.307 | 3.357 | -0.020 | -0.085 | 53.6% |
| Standard Error | 0.082 | 0.277 | 3.294 | 2.296 | 0.040 | 0.058 | 3.47 |
| 20 to 24 | | | | | | | |
| Co-efficient | 0.829** | -0.025 | 0.338 | -0.118 | -0.007 | -0.001 | 32.4% |
| Standard Error | 0.097 | 0.142 | 0.232 | 0.215 | 0.026 | 0.039 | 1.44 |
| 25 to 34 | | | | | | | |
| Co-efficient | 0.813** | 0.031 | 0.197ΨΨ | -0.077 | -0.002 | 0.008 | 80.8% |
| Standard Error | 0.022 | 0.025 | 0.026 | 0.044 | 0.006 | 0.009 | 12.64 |
| 35 to 44 | | | | | | | |
| Co-efficient | 0.600** | 0.013 | 0.420ΨΨ | -0.044 | 0.001 | 0.006 | 78.1% |
| Standard Error | 0.049 | 0.033 | 0.060 | 0.055 | 0.083 | 0.013 | 10.72 |
| 45 to 54 | | | | | | | |
| Co-efficient | 0.447** | 0.113 | 0.586ΨΨ | -0.087 | -0.008 | -0.001 | 65.6% |
| Standard Error | 0.097 | 0.069 | 0.119 | 0.101 | 0.014 | 0.021 | 5.73 |
| 55 to 59 | | | | | | | |
| Co-efficient | 0.227 | 0.252 | 0.814ΨΨ | -0.169 | -0.016 | -0.007 | 70.9% |
| Standard Error | 0.126 | 0.115 | 0.151 | 0.164 | 0.018 | 0.024 | 7.31 |
| 60 to 64 | | | | | | | |
| Co-efficient | 0.174 | 0.107 | 0.833ΨΨ | 0.121 | -0.061 | -0.040 | 59.3% |
| Standard Error | 0.203 | 0.164 | 0.248 | 0.280 | 0.030 | 0.041 | 4.37 |
| 65 + | | | | | | | |
| Co-efficient | 0.176 | 0.123 | 0.247 | 0.337 | -0.025 | -0.203ΨΨ | 75.2% |
| Standard Error | 0.211 | 0.139 | 0.314 | 0.339 | 0.037 | 0.047 | 9.08 |

* Significant at the 5 per cent level - two tail test

** Significant at the 1 per cent level - two tail test

Ψ Significant at the 5 per cent level - one tail test

ΨΨ Significant at the 1 per cent level - one tail test

Significant F at the 5 per cent level - 2.90

prime and older age groups ($R^2$ of between .593 and .808) but is less successful in the younger ages, particularly the 20-24 group ($R^2$=.324) where participation rates are high but vary considerably more than in older groups. As noted when discussing the results for females, the relatively low explanatory power of the basic model in the younger age groups reflects the need initially to model the decision to remain in the education system and them attempt to explain the workforce participation rates of those not in full time education.

In the prime ages the quite substantial variations that occur in a number of the independent variables individually have no apparent influence on participation rates. Almost all males in these age groups have jobs or are looking for work and those not in the workforce are usually in that situation for reasons not related to most of our explanatory variables (e.g. ill health). However the proportion married may be a useful indicator of the prevalence in a region of males with these special reasons for not working, and this may explain its consistent showing as a highly significant explanator of participation rates (significant at the 1% level for age groups 25-34 to 60-64 inclusive).

The area dummy is only significant in the 65 and over group and has the expected negative sign. Its significance reflects the relative lack of institutional barriers to retirement in rural areas. The coefficient of the area dummy is very high and indicates that, ceteris paribus, participation rates of males 65 and over are 20.3 percentage points lower in urban than in rural areas (roughly 15% versus 35%).

The unemployment rate displayed a negative sign in all age groups, giving some very limited support to the view that for males there is a tendency towards a discouraged worker effect of unemployment. The failure of the coefficient for the unemployment variable to be as

significant in the prime age groups as for some time series studies suggests that any discouraged worker effect may be a time rather than space phenomenon in those groups. That is, variations in unemployment rates over time from unemployment normally experienced may influence workforce behaviour much more than do variations in unemployment across regions. Prime age males when confronted with difficulty in obtaining a job are likely to migrate to other regions with more employment opportunities rather than drop out of the workforce. However if unemployment increases in all regions over time the option to migrate will not alleviate the difficulty in finding work and hence leaving the workforce is a stronger possibility. The one age group in which the unemployment rate is almost significant is the 60-64 group. This tends to suggest that those near retirement are more easily discouraged from looking for a job by greater difficulty in finding work both due to their attitudes and the greater strength of the option to retire. Also those near retirement age are likely to be the first laid off when unemployment is higher.[33]

The only participation multipliers to be calculated for males are those for proportion married and these are shown in Table 8.

TABLE 8 : THE PERCENTAGE EFFECT ON PARTICIPATION RATES OF A TEN PERCENT CHANGE IN THE PROPORTION OF THE POPULATION WHICH IS MARRIED

| | 25-34 | 35-44 | 45-54 | 55-59 | 60-64 |
|---|---|---|---|---|---|
| Change as a porportion of mean participation rates | 1.59% | 3.73% | 5.29% | 7.63% | 8.80% |

33. When considering the results for the unemployment rate it is worth remembering that the lagged effects of recent (last six to twelve months) unemployment rates may also be important in influencing current participation rates. Hence if recent levels and patterns or regional unemployment are substantially different from the present ones it is possible that a cross sectional analysis will fail to uncover a significant relationship between unemployment and labour force participation. This is unlikely to happen when using 1971 census data because the twelve months preceding the census was a period of consistently low unemployment rates.

Both the absolute and relative influences of regional differences in proportion married on participation rate increase for older age groups. Presumably, as well as the influence of the correlation between failure to marry and the existence of some work inhibiting disability, there is also a tendency for unmarried men to retire earlier. This may be due to an ability to save more in earlier years (no family commitments) and lower income requirements during retirement.

## 5.2 Modifications

Two alternative specifications of the model are considered here. First, the area dummy is defined so that other urban and rural areas take the value zero and major urban areas one. As previously a negative sign is expected on the area dummy. This experiment brings rather mixed results with the area dummy now becoming significant in the 20-24 and 25-34 age groups (with accompanying substantial increases in $R^2$) but losing its significance in the 65 + group[34] (accompanied by a large decrease in $R^2$). It is difficult from this to conclude which specification of the area dummy is in some sense the most appropriate. Clearly an approach which varied the dummy depending on the age group being considered would maximize $R^2$ and significance of coefficients, but there is no theoretical merit in such a procedure. Indeed the case for including an area dummy at all is more

---

34. Two changes occur in the significance of other coefficients. The immigration variable is now significant in the 25-34, 45-54, and 55-59 age groups with the expected positive sign. This seems to indicate that the proportion of immigrants tends to vary in an other urban/rural vs major urban pattern and only when the area dummy is specified to allow for this type of variation (i.e. other urban and rural area grouped as one area type) does the influence of migration become significant (although this does not explain the lack of significance in the 35-44 group). The other change is that a discouraged worker effect of unemployment is now apparent for the 60-64 and 65 + ages. This tendency exists in the basic model but only becomes significant with the changed specification of the area dummy.

commonsense than theoretical and is simply based on the observation that the different types of area seem to be very different in nature and it is quite possible that the other explanatory variables will not adequately allow for this.

An alternative approach to those outlined here is to put rural regions in the intercept and have separate dummies for each of the two types of urban regions. This was not tried because of the associated loss of degrees of freedom, especially as the dummy has a significant impact in only a few age groups. The specification of combining rural and other urban areas is possibly the more desirable as it performs better in all the prime age groups and this is where the majority of workers are to be found. However, the procedure of choosing the specification of the dummy variable based on goodness-or-fit rather than on a priori reasoning is of dubious value.

The other variation to the basic model is to exclude the Northern Territory observations on the grounds that they may represent atypical regions. As with the area dummy experiment the results here are somewhat of a mixture and hence difficult to interpret. There is a large increase in explanatory power in the 45-54 and older groups. For both males and females it appears that the two Northern Territory areas are more unusual in the older age groups where regional participation rates fluctuate quite a deal. But unlike the results for females there are age groups where explanatory power drops substantially as a result of omitting the Northern Territory, namely 25-34 and 35-44. These are accompanied by a fall in the significance of the proportion married variable because the Northern Territory rural region is one where relative participation rates and the proportion married are both very low for males in these two age groups.

This ambiguous result makes an assessment of leaving out the Northern Territory observations very difficult.

## 5.3 Conclusions on Equations for Males

The basic model has reasonable success in accounting for regional variation in participation rates in all but the 20-24 age group. The fact that all of the postulated explanators except the marriage vairable are insignificant reflects the persistently high participation rates of males in the prime age groups with little variation to be explained. In the age groups where greater variation occurred the lack of significance indicates the need to include variables specifically related to the decisions for the young groups to remain in the education system and for the oldest groups to retire permanently.

The importance of the marriage variable seems due to at least two influences. First, as postulated in Section three, married men will have a greater requirement for income than otherwise equivalent (in terms of our other explanatory variables) single men and hence are more likely to be in the workforce. Second, married men are less likely to possess mental and physical disabilities that will automatically keep a person out of the workforce. As people with such disabilities are likely to congregate in regions where facilities are available for them (i.e. urban areas) it is likely that they will show up in regional variations in proportion married and accompanying variations in participation rates.

The failure of most independent variables to have a significant influence on regional participation rates gives some support for the view that changes in these variables over time will not affect male workforce participation rates. However, as discussed at length in section six, some of these variables may have a greater impact over time than they do across regions. The emergence of a number of explanators as significant in

certain age groups when the two refinements to the basic model are tried, suggests that these variables should not be ignored in time series work.

## 6 SUMMARY AND CONCLUSION

The results of the basic model are reasonable for most age-sex groups in terms of explanatory power and significance and signs of coefficients. For prime aged males, a high and significant constant term was the main 'explanator' with the proportion married being the only significant independent variable. The less satisfactory results for younger males indicate the need for alternative variables directed toward an explanation of participation in education.

The results for females were encouraging with more than two-thirds of the variations being explained for all age groups, with several variables significant in a manner consistent with our a priori expectations (the one exception being the children variable in the 15-19 group).

For both males and females the similarity of results for each of the age groups in the prime ages indicates that it may be acceptable to combine these age groups when estimating behavioural relationships. This conclusion, if supported by time series analysis, would be of value for forecasting and modelling purposes since it reduces the number of separate estimations necessary. The same conclusion appears warranted for the older age groups, with the 55-59 and 60-64 groups showing similarities, although the 65 and over group has somewhat different results to the other older ages. Nevertheless, its relative numerical insignificance in the workforce could justify its inclusion with the other two older males groups. The results for the basic model are fairly poor for males in the 15-19 and 20-24 ages (low $R^2$ no individually significant variables) and no conclusions can be drawn about the possibility of combining these age groups. However, a priori, such a

procedure would appear to be dubious because of the particular importance participation in education has for workforce participation in the 15-19 group.

As mentioned earlier the main purpose of the regional analysis described in this paper is to provide guidelines for estimating future participation rates in Australia under various alternative sets of conditions. But while significant inter-regional relationships between workforce participation and certain explanatory variables have been indicated there are a number of reasons why these cannot be simply translated into a time series analysis, these being:

(a) The causal relationships claimed to exist between variations in an explanatory variable and participation rates across regions may not exist over time. For example, the proportion married showed up as a significant positive influence on regional participation rates for prime age males, probably reflecting that those not married in these age groups are more likely to possess characteristics going against workforce participation. On the other hand, changes over time in proportions married may reflect changing social attitudes which, while they may have the same type of influence on participation, will represent a completely different causal relationship to that observed across regions. Hence the use of the observed cross sectional relationship to predict changes over time may be of limited value.

(b) Even if the relationships postulated for the cross sectional analysis also exist over time, their nature may change as time passes. This is, of course, a problem faced in all forecasting exercises, even when relationships estimated from

time series data are used. There is no guarantee that a relationship observed in the past will continue unchanged into the future. Of particular interest here is the possibility that the extent of various influences on workforce participation may vary with the level of participation rates. For example, the influence of the level of unemployment on female participation rates in the United States and Canada appears to have decreased as participation rates have risen.[35]

(c) Factors which have considerable influence on participation rates over time do not show up in a cross sectional analysis, or at least not as significantly as their effect over time would suggest. This situation is particularly evident in age-sex groups which have shown a consistent secular trend. These trends are often more related to changing social patterns than the type of variables appropriate to a cross section analysis and hence such an analysis will fail to predict adequately trends of this sort.

Nevertheless, with these limitations in mind, the above analysis may still indicate the variables likely to influence participation rates significantly over time and may suggest the direction and range of values of these effects. The significance of the area dummy in the young and old females groups suggests that any change in the urban/rural distribution of the population in these age groups will have a perceptible effect on participation rates.

The relatively poor results for some of the young and old groups (especially in terms of lack of individually significant variables)

---

35. Leaper, op. cit.

suggests it is necessary to include other variables more relevant to the situation of the young and old (i.e., related to education and retirement respectively). These groups have fairly large regional variations in participation rates which have not been well accounted for by the explanatory variables used. Detailed census data will enable an analysis, at both the regional and individual levels, of the influence of household variables on participation rates.

The use of two data points would also be valuable in that it would enable a comparison of coefficients at different times in order to indicate their degree of stability. The influence of some explanatory variables may be affected by the level of other explanators or may change as a result of broad economic and social changes. For example, the influence of a given number of children on female participation rates may decrease as the proportion of mothers with some form of qualification rises as the higher wages these women could obtain enable them to more easily afford child minding facilities. Alternatively, the inhibiting influence of children may also decline because of changing social attitudes to workforce participation of mothers. A comparison of the results of cross sectional analyses of the 1966 census data with the above results using 1971 census information would give an indication of the combined size of each of these influences.

The behavioural relationships in the model take the form of the variables designated as explanators influencing participation rates, while themselves being determined exogenously to the model. However in practice decisions affecting these variables will be inter-related and the direction of causation between them and participation rates may be two way. For example with improved birth control methods the decision for a woman to be in the workforce may precede the decision to have children rather than

the reverse process hypothesized in our model. This difficulty in determining the direction of causation suggests that a model in which all of the variables are determined simultaneously would be preferable to the single equation approach outlined in this paper. However current data limitations largely preclude the use of more sophisticated models for the type of regional analysis presented here.

# APPENDIX A

## Regional participation rates and regression results

Table

Table 9 Female labour force participation rates : Australia, June 30, 1971

| State & Region \ Age | 15-19 | 20-24 | 25-34 | 35-44 | 45-54 | 55-59 | 60-64 | 65 + | TOTAL |
|---|---|---|---|---|---|---|---|---|---|
| NEW SOUTH WALES | | | | | | | | | |
| Major Urban | 52.2 | 64.1 | 43.7 | 47.7 | 43.7 | 31.7 | 18.4 | 4.2 | 40.2 |
| Other Urban | 47.9 | 51.3 | 34.3 | 40.6 | 34.0 | 22.1 | 11.5 | 3.0 | 31.4 |
| Rural | 39.2 | 40.3 | 28.8 | 34.5 | 32.4 | 24.9 | 16.7 | 8.6 | 29.5 |
| Total | 50.0 | 59.8 | 40.5 | 45.0 | 40.8 | 29.0 | 16.7 | 4.3 | 37.5 |
| VICTORIA | | | | | | | | | |
| Major Urban | 51.0 | 64.3 | 43.5 | 49.5 | 45.5 | 32.8 | 18.5 | 4.1 | 40.8 |
| Other Urban | 50.2 | 52.1 | 32.8 | 41.1 | 35.6 | 23.9 | 12.6 | 3.3 | 32.2 |
| Rural | 38.5 | 45.7 | 31.4 | 36.9 | 35.6 | 27.6 | 19.2 | 9.5 | 31.8 |
| Total | 49.5 | 60.8 | 40.6 | 46.8 | 42.9 | 30.7 | 17.6 | 4.5 | 38.5 |
| QUEENSLAND | | | | | | | | | |
| Major Urban | 59.3 | 62.3 | 37.9 | 40.9 | 35.6 | 25.2 | 14.7 | 3.4 | 36.2 |
| Other Urban | 61.0 | 52.1 | 32.3 | 35.5 | 29.2 | 19.1 | 10.4 | 2.9 | 31.0 |
| Rural | 52.1 | 37.3 | 27.8 | 33.3 | 31.1 | 25.4 | 17.5 | 8.5 | 30.6 |
| Total | 58.8 | 54.5 | 33.9 | 37.5 | 32.7 | 23.0 | 13.5 | 3.8 | 33.4 |
| SOUTH AUSTRALIA | | | | | | | | | |
| Major Urban | 54.7 | 63.5 | 40.4 | 47.8 | 40.8 | 27.0 | 13.1 | 2.8 | 38.2 |
| Other Urban | 57.7 | 49.2 | 31.2 | 39.6 | 34.0 | 23.3 | 10.6 | 2.9 | 32.9 |
| Rural | 48.5 | 44.5 | 31.9 | 39.6 | 37.5 | 31.2 | 19.1 | 8.6 | 34.3 |
| Total | 54.4 | 58.9 | 37.7 | 45.4 | 39.4 | 27.1 | 13.5 | 3.4 | 36.9 |
| WESTERN AUSTRALIA | | | | | | | | | |
| Major Urban | 57.8 | 61.5 | 39.5 | 47.0 | 42.0 | 28.2 | 14.6 | 3.3 | 39.3 |
| Other Urban | 54.1 | 43.7 | 30.8 | 38.6 | 33.8 | 22.0 | 10.7 | 3.7 | 33.1 |
| Rural | 51.2 | 38.4 | 30.5 | 38.4 | 37.6 | 30.1 | 19.0 | 8.6 | 33.8 |
| Total | 56.3 | 54.5 | 36.2 | 44.1 | 40.0 | 27.4 | 14.6 | 3.9 | 37.4 |
| TASMANIA | | | | | | | | | |
| Major Urban | 49.2 | 58.4 | 38.4 | 46.5 | 41.2 | 29.9 | 17.1 | 4.1 | 37.6 |
| Other Urban | 53.6 | 48.7 | 33.3 | 42.0 | 36.0 | 27.3 | 12.9 | 3.0 | 34.1 |
| Rural | 47.6 | 35.1 | 25.9 | 30.9 | 27.8 | 20.9 | 12.9 | 5.9 | 26.9 |
| Total | 50.7 | 49.3 | 33.1 | 40.8 | 35.8 | 26.6 | 14.3 | 4.0 | 33.6 |
| NORTHERN TERRITORY | | | | | | | | | |
| Other Urban | 52.1 | 60.0 | 44.3 | 48.9 | 46.2 | 34.7 | 20.1 | 7.0 | 47.5 |
| Rural | 34.7 | 46.0 | 37.9 | 36.9 | 34.0 | 19.4 | 8.2 | 3.1 | 34.2 |
| Total | 45.0 | 56.0 | 42.4 | 44.7 | 41.3 | 28.0 | 14.7 | 5.2 | 33.6 |
| AUSTRALIAN CAPITAL TERRITORY | | | | | | | | | |
| Major Urban | 46.9 | 64.5 | 42.3 | 52.3 | 52.9 | 39.9 | 23.2 | 4.6 | 47.4 |
| AUSTRALIA | | | | | | | | | |
| Major Urban | 53.2 | 63.6 | 42.4 | 47.7 | 43.1 | 30.6 | 17.2 | 3.9 | 39.8 |
| Other Urban | 52.9 | 51.0 | 33.3 | 39.5 | 33.5 | 22.2 | 11.5 | 3.1 | 32.1 |
| Rural | 44.0 | 41.0 | 29.7 | 35.6 | 33.7 | 26.4 | 17.6 | 8.6 | 31.1 |
| Total | 52.1 | 58.6 | 38.9 | 44.4 | 40.0 | 28.3 | 16.0 | 4.2 | 37.1 |
| Mean of Participation Rates | 50.452 | 51.586 | 35.186 | 41.357 | 37.452 | 26.981 | 15.290 | 5.005 | |
| Standard Deviation | 6.697 | 9.836 | 5.605 | 5.925 | 6.138 | 5.286 | 3.980 | 2.387 | |

Source : 1971 Census of Population and Housing Bulletin 5 parts 1 to 9 (Canberra, December 1972).

Table 10 Male labour force participation rates : Australia, June 30, 1971

| State & Region \ Age | 15-19 | 20-24 | 25-34 | 35-44 | 45-54 | 55-59 | 60-64 | 65 + | TOTAL |
|---|---|---|---|---|---|---|---|---|---|
| NEW SOUTH WALES | | | | | | | | | |
| Major Urban | 54.1 | 89.0 | 94.8 | 94.9 | 93.4 | 89.5 | 76.9 | 22.6 | 81.5 |
| Other Urban | 55.0 | 90.5 | 95.0 | 94.3 | 90.3 | 83.1 | 62.8 | 15.4 | 75.7 |
| Rural | 57.6 | 92.2 | 95.3 | 93.0 | 93.0 | 88.1 | 76.5 | 38.2 | 82.0 |
| Total | | | | | | | | | |
| VICTORIA | | | | | | | | | |
| Major Urban | 50.9 | 87.0 | 95.0 | 95.1 | 94.0 | 90.2 | 80.0 | 22.8 | 80.7 |
| Other Urban | 51.1 | 91.4 | 94.9 | 94.3 | 91.1 | 85.2 | 72.2 | 17.8 | 76.5 |
| Rural | 53.8 | 92.8 | 96.4 | 96.5 | 95.0 | 91.7 | 82.1 | 42.8 | 83.3 |
| Total | | | | | | | | | |
| QUEENSLAND | | | | | | | | | |
| Major Urban | 60.1 | 88.3 | 94.7 | 94.8 | 92.1 | 87.5 | 74.8 | 15.8 | 78.7 |
| Other Urban | 63.9 | 93.4 | 95.1 | 94.5 | 90.4 | 82.3 | 65.0 | 14.2 | 76.6 |
| Rural | 69.9 | 93.6 | 95.7 | 95.6 | 93.2 | 87.4 | 77.4 | 35.2 | 84.3 |
| Total | | | | | | | | | |
| SOUTH AUSTRALIA | | | | | | | | | |
| Major Urban | 51.1 | 86.9 | 94.9 | 95.6 | 94.1 | 90.0 | 78.8 | 16.4 | 79.0 |
| Other Urban | 61.6 | 94.8 | 95.3 | 95.1 | 93.9 | 89.0 | 76.2 | 17.2 | 81.1 |
| Rural | 60.1 | 93.6 | 96.1 | 96.3 | 95.3 | 92.1 | 83.1 | 39.6 | 84.7 |
| Total | | | | | | | | | |
| WESTERN AUSTRALIA | | | | | | | | | |
| Major Urban | 59.1 | 87.0 | 94.3 | 95.3 | 93.6 | 89.0 | 75.0 | 17.7 | 79.5 |
| Other Urban | 68.2 | 92.8 | 95.1 | 95.5 | 93.1 | 88.1 | 70.4 | 17.9 | 83.4 |
| Rural | 69.9 | 92.5 | 94.8 | 95.2 | 93.8 | 89.8 | 79.6 | 36.4 | 85.6 |
| Total | | | | | | | | | |
| TASMANIA | | | | | | | | | |
| Major Urban | 51.6 | 81.6 | 93.4 | 95.4 | 92.9 | 89.3 | 79.7 | 17.6 | 78.0 |
| Other Urban | 60.8 | 93.9 | 95.6 | 95.1 | 92.6 | 86.9 | 78.1 | 18.6 | 81.3 |
| Rural | 66.9 | 94.5 | 95.6 | 95.8 | 93.2 | 88.2 | 77.5 | 31.1 | 82.6 |
| Total | | | | | | | | | |
| NORTHERN TERRITORY | | | | | | | | | |
| Other Urban | 62.1 | 92.9 | 94.8 | 93.6 | 92.2 | 86.0 | 72.4 | 24.5 | 88.8 |
| Rural | 65.7 | 86.8 | 88.6 | 86.2 | 81.1 | 74.4 | 64.5 | 18.2 | 79.0 |
| Total | | | | | | | | | |
| AUSTRALIAN CAPITAL TERRITORY | | | | | | | | | |
| Major Urban | 45.5 | 84.9 | 94.9 | 96.7 | 95.8 | 92.4 | 82.0 | 28.4 | 84.6 |
| AUSTRALIA | | | | | | | | | |
| Major Urban | 53.7 | 87.8 | 94.8 | 95.1 | 93.6 | 89.6 | 77.7 | 20.8 | 80.6 |
| Other Urban | 58.1 | 92.1 | 95.0 | 94.5 | 91.1 | 84.3 | 67.5 | 16.0 | 77.6 |
| Rural | 61.3 | 92.8 | 95.5 | 95.6 | 93.7 | 89.2 | 78.9 | 38.1 | 83.4 |
| Total | 55.7 | 89.1 | 94.8 | 94.9 | 93.0 | 88.4 | 75.6 | 22.2 | 80.3 |
| Mean of Participation Rates | 59.000 | 90.495 | 94.777 | 94.814 | 92.632 | 87.629 | 75.416 | 24.210 | |
| Standard Deviation | 6.972 | 3.651 | 1.508 | 2.107 | 2.927 | 4.001 | 5.774 | 9.248 | |

Source : 1971 Census of Population and Housing Bulletin 5 parts 1 to 9 (Canberra, December 1972)

TABLE 11 : REGRESSION RESULTS FOR FEMALES - VARIATION IN AREA DUMMY

| Age Group | Constant | Proportion of Immigrants | Proportion Married | Children under 5 per Married Woman | Proportion Qualified | Unemployment Rate | Area | $R^2$ (%) and F-rati |
|---|---|---|---|---|---|---|---|---|
| 15 to 19 | | | | | | | | |
| Co-efficient | 0.105 | 0.655 | -0.383 | 0.259 | -0.674 | 0.044 | 0.019 | 46.3% |
| Standard error | 0.257 | 0.317 | 0.264 | 0.160 | 0.852 | 0.037 | 0.045 | 2.01 |
| 20 to 24 | | | | | | | | |
| Co-efficient | 0.445 | 0.381$^{\Psi}$ | -0.052 | -0.040 | 0.353 | -0.002 | 0.080 | 82.7% |
| Standard error | 0.298 | 0.181 | 0.267 | 0.205 | 0.376 | 0.033 | 0.047 | 11.13 |
| 25 to 34 | | | | | | | | |
| Co-efficient | 0.986$^{**}$ | 0.132$^{\Psi}$ | -0.528$^{\Psi\Psi}$ | -0.139 | -0.149 | -0.046$^{**}$ | 0.003 | 90.4% |
| Standard error | 0.133 | 0.071 | 0.121 | 0.094 | 0.123 | 0.014 | 0.017 | 22.07 |
| 35 to 44 | | | | | | | | |
| Co-efficient | 0.695$^{**}$ | 0.222$^{\Psi\Psi}$ | -0.385$^{\Psi\Psi}$ | 0.002 | 0.523$^{\Psi\Psi}$ | -0.027 | 0.006 | 92.4% |
| Standard error | 0.156 | 0.061 | 0.135 | 0.076 | 0.138 | 0.015 | 0.016 | 28.21 |
| 45 to 54 | | | | | | | | |
| Co-efficient | 0.353$^{*}$ | 0.133 | -0.077 | 0.534 | 1.103$^{\Psi\Psi}$ | -0.038$^{*}$ | 0.018 | 92.3% |
| Standard error | 0.141 | 0.080 | 0.141 | 0.329 | 0.215 | 0.015 | 0.017 | 28.02 |
| 55 to 59 | | | | | | | | |
| Co-efficient | 0.129 | 0.056 | 0.134 | | 1.318$^{\Psi\Psi}$ | -0.045$^{*}$ | -0.002 | 83.2% |
| Standard error | 0.102 | 0.120 | 0.122 | | 0.379 | 0.016 | 0.018 | 14.82 |
| 60 to 64 | | | | | | | | |
| Co-efficient | 0.105 | -0.079 | 0.062 | | 1.286$^{\Psi}$ | -0.039$^{*}$ | -0.010 | 61.3% |
| Standard error | 0.085 | 0.124 | 0.115 | | 0.514 | 0.018 | 0.021 | 4.76 |
| 65 + | | | | | | | | |
| Co-efficient | -0.076 | -0.153 | 0.331$^{*}$ | | 1.144$^{\Psi}$ | -0.013 | -0.007 | 57.8% |
| Standard error | 0.071 | 0.078 | 0.137 | | 0.450 | 0.012 | 0.013 | 4.10 |

$^{*}$ Significant at the 5 per cent level - two tail test

$^{**}$ Significant at the 1 per cent level - two tail test

$^{\Psi}$ Significant at the 5 per cent level - one tail test

$^{\Psi\Psi}$ Significant at the 1 per cent level - one tail test

Significant F at the 5 per cent level - for 15-19 to 45-54 age groups, inclusive 2.85

- for 55-59 and older groups 2.90

TABLE 12 : REGRESSION RESULTS FOR FEMALES - OMITTING NORTHERN TERRITORY OBSERVATIONS

| Age Group | Constant | Proportion of Immigrants | Proportion Married | Children under 5 per Married Woman | Proportion Qualified | Unemployment Rate | Service Employment to Total Employment | $R^2$ (%) and F-ratio |
|---|---|---|---|---|---|---|---|---|
| 15 to 19 | | | | | | | | |
| Coefficient | 0.183 | 0.463 | 1.414 | 0.059 | -1.933 | -0.029 | 0.398$^{\Psi\Psi}$ | 59.8% |
| Standard error | 0.275 | 0.265 | 1.260 | 0.253 | 0.943 | 0.037 | 0.127 | 2.97 |
| 20 to 24 | | | | | | | | |
| Coefficient | 1.111$^{**}$ | 0.192$^{\Psi}$ | -0.814 | -0.093 | -0.042 | -0.026 | 0.152$^{\Psi}$ | 96.8% |
| Standard error | 0.150 | 0.087 | 0.184 | 0.097 | 0.175 | 0.016 | 0.071 | 60.88 |
| 25 to 34 | | | | | | | | |
| Coefficient | 0.877$^{**}$ | 0.171$^{\Psi\Psi}$ | -0.389$^{\Psi}$ | -0.193$^{\Psi\Psi}$ | 0.222 | -0.030$^{*}$ | -0.030 | 93.3% |
| Standard error | 0.204 | 0.056 | 0.205 | 0.068 | 0.150 | 0.014 | 0.081 | 27.91 |
| 35 to 44 | | | | | | | | |
| Coefficient | 0.883$^{**}$ | 0.215$^{\Psi\Psi}$ | -0.487$^{\Psi}$ | -0.303 | 0.641$^{\Psi\Psi}$ | -0.026 | -0.073 | 92.9% |
| Standard error | 0.247 | 0.059 | 0.248 | 0.223 | 0.225 | 0.015 | 0.103 | 26.21 |
| 45 to 54 | | | | | | | | |
| Coefficient | 0.742$^{**}$ | 0.133 | -0.413$^{\Psi}$ | -3.764 | 1.478$^{\Psi\Psi}$ | -0.033 | -0.165 | 92.9% |
| Standard error | 0.207 | 0.079 | 0.213 | 3.442 | 0.302 | 0.016 | 0.097 | 25.98 |
| 55 to 59 | | | | | | | | |
| Coefficient | 0.616$^{**}$ | -0.081 | -0.419$^{\Psi}$ | | 1.916$^{\Psi\Psi}$ | -0.032$^{*}$ | -0.238$^{**}$ | 91.9% |
| Standard error | 0.149 | 0.088 | 0.169 | | 0.309 | 0.014 | 0.078 | 29.32 |
| 60 to 64 | | | | | | | | |
| Coefficient | 0.374$^{**}$ | -0.150$^{*}$ | -0.266$^{\Psi\Psi}$ | | 1.905$^{\Psi\Psi}$ | -0.019 | -0.253$^{**}$ | 92.4% |
| Standard error | 0.073 | 0.055 | 0.088 | | 0.243 | 0.010 | 0.047 | 31.50 |
| 65 + | | | | | | | | |
| Coefficient | 0.065 | -0.087$^{*}$ | 0.083 | | 1.138$^{\Psi\Psi}$ | -0.001 | -0.167$^{**}$ | 90.0% |
| Standard error | 0.039 | 0.039 | 0.072 | | 0.277 | 0.074 | 0.030 | 23.40 |

$^{*}$ Significant at the 5 per cent level - two tail test
$^{**}$ Significant at the 1 per cent level - two tail test

$^{\Psi}$ Significant at the 5 per cent level - one tail test
$^{\Psi\Psi}$ Significant at the 1 per cent level - one tail test

Significant F at the 5 per cent level - for 15-19 to 45-54 inclusive 3.00
- for 55-59 and older 3.03

TABLE 13 : REGRESSION RESULTS FOR MALES - VARIATION IN AREA DUMMY

| Age Group | Constant | Proportion of Immigrants | Proportion Married | Proportion Qualified | Unemployment rate | Area | $R^2$ (%) and F-ratio |
|---|---|---|---|---|---|---|---|
| 15 to 19 | | | | | | | |
| Co-efficient | 0.579** | -0.202 | 5.131 | 1.472 | -0.045 | -0.052 | 52.3% |
| Standard Error | 0.082 | 0.263 | 3.467 | 1.692 | 0.039 | 0.040 | 3.29 |
| 20 to 24 | | | | | | | |
| Co-efficient | 0.817** | 0.131 | 0.339Ψ | -0.026 | -0.019 | -0.065ΨΨ | 76.8% |
| Standard Error | 0.050 | 0.085 | 0.135 | 0.087 | 0.015 | 0.012 | 9.94 |
| 25 to 34 | | | | | | | |
| Co-efficient | 0.791** | 0.048Ψ | 0.215ΨΨ | -0.012 | -0.005 | -0.015ΨΨ | 88.5% |
| Standard Error | 0.016 | 0.020 | 0.020 | 0.024 | 0.004 | 0.004 | 23.15 |
| 35 to 44 | | | | | | | |
| Co-efficient | 0.576** | 0.027 | 0.440ΨΨ | -0.001 | -0.001 | -0.011 | 80.0% |
| Standard Error | 0.050 | 0.032 | 0.060 | 0.043 | 0.007 | 0.009 | 11.96 |
| 45 to 54 | | | | | | | |
| Co-efficient | 0.385** | 0.123Ψ | 0.656ΨΨ | -0.017 | -0.014 | -0.023 | 70.1% |
| Standard Error | 0.099 | 0.065 | 0.119 | 0.084 | 0.012 | 0.016 | 7.03 |
| 55 to 59 | | | | | | | |
| Co-efficient | 0.220 | 0.253* | 0.830ΨΨ | -0.183 | -0.020 | -0.004 | 70.8% |
| Standard Error | 0.143 | 0.118 | 0.170 | 0.156 | 0.016 | 0.021 | 7.27 |
| 60 to 64 | | | | | | | |
| Co-efficient | 0.267 | 0.117 | 0.767Ψ | -0.141 | -0.073* | 0.020 | 57.4% |
| Standard Error | 0.248 | 0.169 | 0.301 | 0.301 | 0.028 | 0.041 | 4.04 |
| 65 + | | | | | | | |
| Co-efficient | 0.055 | 0.073 | 0.669 | -0.354 | -0.119* | -0.053 | 47.1% |
| Standard Error | 0.329 | 0.202 | 0.476 | 0.491 | 0.048 | 0.064 | 2.67 |

* Significant at the 5 per cent level - two tail test

** Significant at the 1 per cent level - two tail test

Ψ Significant at the 5 per cent level - one tail test

ΨΨ Significant at the 1 per cent level - one tail test

Significant F at the 5 per cent level - 2.90

TABLE 14 : REGRESSION RESULTS FOR MALES - OMITTING NORTHERN TERRITORY OBSERVATIONS

| Age Group | Constant | Proportion of Immigrants | Proportion Married | Proportion Qualified | Unemployment rate | Area | $R^2$ (%) and F-ratio |
|---|---|---|---|---|---|---|---|
| 15 to 19 | | | | | | | |
| Co-efficient | 0.430** | 0.097 | 11.159Ψ | 3.696 | -0.040 | -0.092 | 56.1% |
| Standard Error | 0.107 | 0.341 | 5.662 | 2.376 | 0.044 | 0.059 | 3.33 |
| 20 to 24 | | | | | | | |
| Co-efficient | 0.935** | -0.123 | 0.091 | -0.158 | -0.000 | 0.003 | 37.7% |
| Standard Error | 0.146 | 0.161 | 0.355 | 0.216 | 0.027 | 0.039 | 1.57 |
| 25 to 34 | | | | | | | |
| Co-efficient | 0.916** | 0.009 | 0.069 | -0.054 | -0.003 | 0.004 | 53.4% |
| Standard Error | 0.034 | 0.017 | 0.043 | 0.031 | 0.004 | 0.007 | 2.98 |
| 35 to 44 | | | | | | | |
| Co-efficient | 0.849** | 0.013 | 0.129Ψ | 0.009 | -0.003 | -0.010 | 65.6% |
| Standard Error | 0.047 | 0.014 | 0.056 | 0.025 | 0.003 | 0.006 | 4.96 |
| 45 to 54 | | | | | | | |
| Co-efficient | 0.752** | 0.076ΨΨ | 0.241Ψ | -0.010 | -0.015ΨΨ | -0.016Ψ | 81.9% |
| Standard Error | 0.076 | 0.026 | 0.093 | 0.042 | 0.005 | 0.009 | 11.76 |
| 55 to 59 | | | | | | | |
| Co-efficient | 0.549** | 0.148 | 0.451Ψ | -0.020 | -0.027* | -0.025 | 77.3% |
| Standard Error | 0.168 | 0.076 | 0.202 | 0.109 | 0.011 | 0.016 | 8.84 |
| 60 to 64 | | | | | | | |
| Co-efficient | -0.028 | -0.023 | 1.123Ψ | 0.193 | -0.070* | 0.044 | 74.7% |
| Standard Error | 0.382 | 0.138 | 0.468 | 0.239 | 0.024 | 0.032 | 7.68 |
| 65 + | | | | | | | |
| Co-efficient | 0.342 | -0.009 | 0.096 | 0.411Ψ | -0.044* | -0.216ΨΨ | 94.0% |
| Standard Error | 0.304 | 0.076 | 0.447 | 0.210 | 0.020 | 0.026 | 40.71 |

* Significant at the 5 per cent level. - two tail test

** Significant at the 1 per cent level. - two tail test

Ψ Significant at the 5 per cent level - one tail test

ΨΨ Significant at the 1 per cent level - one tail test

Significant F at the 5 per cent level - 3.03

# APPENDIX B

## Data Collection and Adjustment Procedures

In obtaining age, sex and regional specific data for the variables being considered in explaining ASPR two main problems arose these being :

(1) There was no data currently available that exactly gave the information required at any geographic level. It was consequently necessary to improvise, using relatively crude methods, in order to obtain the data required and to further distribute it by regions. The extent to which such estimation was taken was decided by a trade off between the desire to have as many potentially significant explanatory variables as possible and the inability to obtain data to which reasonable estimation procedures could be applied to give regional, age/sex specific estimates of the variable concerned. In fact only one variable was estimated for which no exactly equivalent data was available (namely number of children under five by age of mother).

(2) Although some data was available the geographic breakdown was not sufficient. Labour force participation rates were available from the 1971 census for twenty-one regions and it was felt that in order to fully utilise this information, every effort needed to be made to estimate the data on proposed explanatory variables for the same regions. To have any less than twenty-one observations would have lead to progressively lower confidence in the resulting regression equations. Of course by resorting to estimating procedures in order to obtain data for all regions there was a compensating loss of confidence in the data which was not allowed for in our statistical measures. However on balance (albeit a value judgement balance) it was considered better to make the necessary estimates in order to obtain more observations.

Essentially, the validity of this value judgement depends on the degree of confidence in the estimating procedures. Hence these procedures are described in some detail in this Appendix.

Those Married as a percentage of the total population in an age/sex/region group

ABS provided age/sex specific figures of the proportion married for each State by a capital city/rest of State breakdown; for the Northern Territory by proposed greater Darwin/rest of N.T.; and a Canberra Statistical District/other ACT for the ACT (the other ACT figure was not used because of the small population).

For each State the capital city statistical division was taken to represent major urban. While this was not strictly correct (especially in NSW and Victoria where there are other centres of over 100,000) it was a sufficiently accurate estimate for our purposes. Hence age/sex specific proportion married figures were read directly from the ABS data.

This left other urban and rural making up the total rest of State figure. As there was no age specific (or total) proportion married data available separately for major urban and rural it was necessary to devise a means of allocating the rest of State figures into these two regions. This was done by using 1971 census data published by ABS for individual Local Government Authorities (Bulletin 7, parts 1 to 8). From a sample[1] of Local Authorities classified as (totally or

---

1. The samples could not be called random but are likely to be representative (especially for other urban) as they covered a considerable proportion of persons in the region. For other urban there were always a sufficient number of large, totally other urban, Local Authorities to enable easy coverage of most of the other urban population. However rural areas created a problem because there were very many Local Authorities which had a majority of their population rural but also contained a significant other urban sector. Such Local Authorities contained a substantial proportion of the rural population which quite possibly would have different characteristics to purely rural Local Authorities. Some of these 'mixed' but rural dominated Local Authorities were included in the sample and hence some other urban residents were included in the rural sample.

mainly) either rural or other urban, non-age specific figures for proportion married were obtained for each of rural and other urban regions in all States (age specific figures were not available for individual LGA's). The ratio of each of these regional total proportion (of the over 15's) married to the total 'rest of State' proportions married gave a factor which was applied to age/sex specific proportions married for total 'rest of State" to give age/sex specific estimates of proportions married for each of rural and other urban areas. For example if the sample of Local Authorities gave a total proportion of rural men over 15 who were married that was 1.1 times that proportion for the total rest of the State it was assumed that proportion of rural males married in each age group was 1.1 times that of the 'rest of State' figure for that age group. A similar approach was applied to the Northern Territory except that there were only two regions (other urban and rural). As the ACT population is almost entirely classified as major urban the age specific proportions married could be taken directly from the ABS data (rural ACT was ignored because of its very small size).

There are at least three deficiencies in this approach. Firstly as only a sample is taken the results are subject to chance error. As the sample was not random it was not possible to determine the probability of the sample result being significantly different from the true figure. However for other urban areas the samples were large enough to support the belief that they would provide something close to the correct result. For rural areas the sample was not as substantial (relative to the total population) and hence confidence in the results was lower.[36] Secondly because few Local Authorities are purely other urban or purely rural the samples were hybrids. Again this problem was minimal for other urban areas but of more significance for rural regions.

---

36. For other urban regions the percentage of a region's over 15 population included in the sample of Local Authorities ranged from 35 to 82 per cent and from 18 to 52 per cent for rural regions. The sampling fractions tended to be larger, the smaller the population in the region concerned.

Thirdly, and most significantly the sample results are not age specific and it was thus necessary to assume that the ratio of a regions percentage married to total (for that State) other urban and rural percentage married was the same for all groups. It was not possible to test the validity of this assumption but it would be expected that there would be some variance in the ratio between age groups.

It can be seen that the assumptions necessary to convert the available data into the form required decreased the validity of the behavioral relationships resulting from use of this data. However the problems should not be overrated as the assumptions seem sufficiently reasonable so as not to obscure any significant inter-regional variations in figures on age/sex specific proportions married or create significant variations that did not in fact exist.

Proportion qualified and proportion of immigrants

The procedures followed in obtaining age/sex specific estimates of these variables for our twenty-one regions were the same as those used for the proportion married figures. The same sample of Local Authorities was taken.

Unemployment rates

As total unemployment rates rather than age specific rates were used in this analysis it was possible to go directly to the figures for individual Local Authorities. For each capital city total unemployment rates were available and these were used as unemployment rates for major urban regions in each State and the ACT. For other urban and rural areas the same samples of Local Authorities used for proportion married calculations were taken, and these provided estimates of unemployment rates for each region.

Children under five per married women in each age/sex/regional group

No 1971 census data was available on children by age of mother. Instead approximations of these figures were built up by using data from the ABS publication Demography. This provided annual figures of births by age of mother (in single years) for each State and Territory. Taking the 1967 to 1971 figures and applying appropriate age specific death rates provided an estimate of the number of Australian born children under five at 31st December 1971. Net immigration of children under five was ignored as their numbers were small and they could not easily be allocated by age of mother.

Having obtained State figures for children under five by mother's age it was necessary to convert these into regional age specific figures of children per married women. This was achieved by using the ratios approach outlined above when describing the calculation of proportion married figures. The only difference here was that there was no information on children by age of mother for major urban areas, hence the ratios method had to be used for these areas as well as for other urban and rural regions.

Service Industry Employment to Total Employment

As age specific figures were not required it was possible to obtain employment by sex and industry for the twenty-one regions directly from ABS unpublished tabulations.

## APPENDIX C

## Bibliography


BARTH, P.S., "A cross sectional analysis of labour force participation rates in Michigan", Industrial and Labour Relations Review, Vol.20, No.2, January 1967, pp.234-49.

BARTH, P.S., "Unemployment and labour force participation", Southern Economic Journal, Vol.34, No.3, January 1968, pp.375-382.

BOWDLER, J.B. & HIGGINS C.I., "Short term variation in labour force participation", Paper presented to the second conference of economists, Sydney 1971.

BOWEN, W.G. & FINEGAN, T.A., The economics of labour force participation (Princeton: Princeton University Press, 1969).

BOWEN, W.G. & FINEGAN, T.A., "Educational attainment and labour force participation", American Economic Review, Vol.56, No.2, May 1966,pp.567-8

BOWEN, W.G. & FINEGAN, T.A., "Labour force participation and unemployment", in, A.M. Ross (ed), Employment Policy and the labour market (University of California Press, 1965), pp.115-61.

CAIN, G.C., Married women in the labour force: : An economic analysis (Chicago: Chicago University Press, 1966).

CAIN, G.C., "Unemployment and the labour force participation of secondary workers", Industrial and Labour Relations Review, Vol.20, No.2, January 1967, pp.275 - 97.

DENTI, E., "Sex-age patterns of labour force participation by urban and rural populations", International Labour Review, Vol.98, No.6, December 1968 pp.525 - 50.

DERNBERG, T. & STRAND, K., "Hidden unemployment 1953-62 : A quantitative analysis by age and sex", American Economic Review, Vol.56, No.1, March 1966, pp.71-95.

DOUGLAS, P.H., Real Wages in the United States 1890-1926. (New York: A.M. Kelley, 1966, Reprints of economic classics series).

GREGORY, R.G. & SHEEHAN, P.J., "The cyclical sensitivity of labour force participation rates", Australian Economic Review, No.2, 1973, pp.9-20.

GREGORY, R.G. & SHEEHAN, P.J., "The cyclical behaviour of the Australian labour market", Paper presented to the third conference of economists, Adelaide 1973.

HAIG, B.D. & WOOD, M., "The participation of married women in the workforce", Flinders University of South Australia, Institute of Labour Studies, Working Paper Series, September 1973.

LABOUR AND IMMIGRATION, DEPARTMENT OF, WOMEN'S BUREAU, The role of women in the economy, (Canberra: Australian Government Publishing Service, 1974).

LEAPER, R.J.,"Female Labor Force Attachment : An Analysis of Unemployment Rates in the United States and Canada", Unpublished Ph.D. thesis, Department of Economics, Duke University, Durham, 1975.

MINCER, J., "Labour force participation of married women", in, National Bureau of Economic Research, Aspects of Labour Economics (Princeton: Princeton University Press, 1962).

MINCER, J., "Labour force participation and unemployment, a review of recent evidence", in, Gordon, R.A. & Gordon M.S., (eds), Prosperity and Unemployment (New York: John Wiley & Sons, 1966), pp.73-134.

MAHONEY, T., "Factors determining the labour force participation of married women", Industrial and Labour Relations Review, Vol.14, No.4, July 1961, pp 563-77

RICHMOND, K.,"The workforce participation of married women in Australia", in, D. Edgar (ed) Social change in Australia (Melbourne:Cheshire, 1974), pp.267-305.

SCHWEITZER, W.O. & SMITH, R.E., "The persistence of the discouraged worker effect", Industrial and Labour Relations Review, Vol.27 No.2, January 1974, pp.249-60.

SMITH, R.E., "The discouraged worker in a full employment economy" Urban Institute, Working Paper, No.350-62, Washington, Dec.1973.

SWEET, J.A., "Family composition and the labour force activity of American Wives", Demography, Vol.7, No.2, May 1970, pp.195-209.

TELLA, A., "The relation of labour force to employment", Industrial and Labour Relations Review, Vol.17, No.3, April 1964, pp.454-69.

TELLA, A., "Labour force sensitivity to employment by Age, Sex", Industrial Relations, Vol 4, No.2, Feb. 1965, pp.69-83.

UHLER, R.S. & KUNIN, R., "A theory of labour force participation" Industrial Relations, Vol.11, Feb. 1972, pp.107-114.

WOYTINSKY, W.S., "Additional workers and the volume of unemployment in the Depression", Social Sciences Research Council, Pamphlet Series No.1 (Washington D.C., Government Printing Office 1940).