IMPACT OF DEMOGRAPHIC CHANGE ON INDUSTRY STRUCTURE IN AUSTRALIA

A joint study by the Australian Bureau of Statistics, the Department of Employment and Industrial Relations, the Department of Environment, Housing and Community Development, the Department of Industry and Commerce and the Industries Assistance Commission

A CROSS-SECTIONAL ANALYSIS OF INTER-OCCUPATIONAL MOBILITY IN AUSTRALIA

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Working Paper No. B-06 Melbourne February 1978

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1. INTRODUCTION

A medium term model of the impact of demographic, economic and social change on industry structure in Australia (known as IMPACT[1]) is being constructed in three modules : a macroeconomic module MACRO; an industry structure module ORANI[2]; and a labour supply module BACHUROO[3].

Each year the composition of the labour force varies with the addition of entrants and the departure of leavers. Entrants include overseas arrivals, leavers from educational institutions and persons

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* The authors would like to thank Alan Powell, Ron Silberberg and Brenda Jackson for comments and suggestions.

1. Alan A. Powell, The IMPACT Project : An Overview, March 1977 - - First Progress Report of the IMPACT Project, Volume 1 (Canberra : Australian Government Publishing Service, 1977), pp. xx + 182.
2. Peter B. Dixon, B. R. Parmenter, G. J. Ryland and John Sutton, ORANI, A General Equilibrium Model of the Australian Economy : Current Specification and Illustrations of Use for Policy Analysis - - First Progress Report of the IMPACT Project, Volume 2 (Canberra : Australian Government Publishing Service, 1977), pp. xii + 297.
3. Ashok H. Tulpulé and M. K. McIntosh, "BACHUROO - An Economic-Demographic Module for Australia," Impact of Demographic Change on Industry Structure in Australia, Working Paper B-02, Industries Assistance Commission, Melbourne, April 1976 (mimeo), pp. 37. (Also presented at the 47th ANZAAS Congress, Hobart, May 1976.)

returning after a period out of the labour force; departures include departures from Australia, deaths and retirements. Some restructuring within the labour force also occurs as people change occupations. This can be represented pictorially, as in Figure 1.

This paper gives a brief historical resumé concerning flows of persons into, out of and within the labour force, but is primarily concerned with developing a general model of inter-occupational mobility. This model is then estimated with the limited data available.

It should be noted that in the BACHUROO module, separate studies will deal with the behavioural aspects of migration, education and mortality. Work on labour force participation and family formation is in a comparatively advanced stage of development[1].

The remainder of this paper is structured as follows. In Section 2, details of the occupational groupings used are given. The overall occupational mobility of the labour force is then briefly considered in the light of statistics from the 1972 and 1976 Labour Mobility Surveys. Section 3 contains a brief review of some of the literature on labour mobility and identifies some important factors missing

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1. Vince Manion, "Regional Variation in Labour Force Participation Rates - Australia 1971," Impact of Demographic Change on Industry Structure in Australia, Preliminary Working Paper BP-03, Industries Assistance Commission, Melbourne, July 1976 (mimeo), pp. 67.

   J. Leaper and R. Silberberg, "An Analysis of Labour Force Participation Rates in Australia," Impact of Demographic Change on Industry Structure in Australia, Working Paper B-04, Industries Assistance Commission, Melbourne, September 1976 (mimeo), pp. 59.

   R. Filmer and R. Silberberg, "Fertility, Family Formation and Female Labour Force Participation in Australia," Impact of Demographic Change on Industry Structure in Australia, Preliminary Working Paper BP-08, Department of Environment, Housing and Community Development, Melbourne, December, 1977 (mimeo), pp. 86.

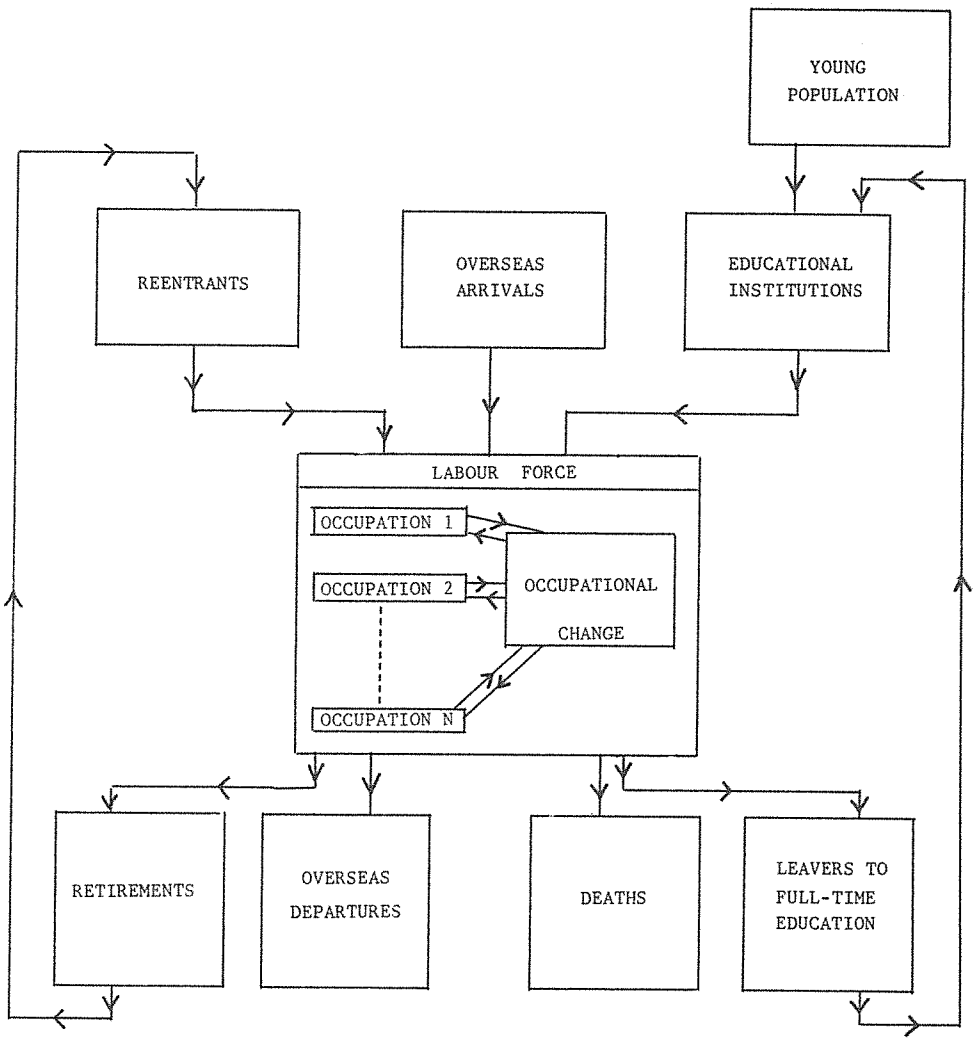
YOUNG POPULATION
REENTRANTS
OVERSEAS ARRIVALS
EDUCATIONAL INSTITUTIONS
LABOUR FORCE
OCCUPATION 1
OCCUPATION 2
OCCUPATIONAL CHANGE
OCCUPATION N
RETIREMENTS
OVERSEAS DEPARTURES
DEATHS
LEAVERS TO FULL-TIME EDUCATION

FIGURE 1

from this literature which are needed to describe occupational mobility in Australia. Section 4 is devoted to the discussion of an appropriate structural model to explain occupational mobility and concludes with a general statement of the reduced form estimating equation. The results of fitting this equation to the available data on occupational mobility are analysed in Section 5. Implications for future research arising from this study are summarized in the concluding section.

2. OCCUPATIONAL CLASSIFICATIONS

The key to defining a labour force structure lies in the occupational groupings into which people are allocated. For the IMPACT project these groupings have been classified into 10 major and 39 minor occupations so as best to reflect occupational rigidity, as well as a variety of other socio-economic factors such as income, social status and educational level.[1] Further, they are designed to overcome the problems encountered when using the 1971 Census of Population and Housing occupational groups.[2] The way in which the Census groups are defined results in some transfers between groups which do not necessarily in fact involve any occupational change (for example, a move from "Professional, Technical and Related Workers" to "Administrative, Executive and Managerial Workers"); conversely, other recorded movements within a Census group do represent occupational changes (for example, a move within "Tradesmen, Production Process Workers and Labourers n.e.c." could actually be an unskilled blue collar worker becoming a fitter and turner).

The IMPACT groupings were designed such that movements between them usually require some formal retraining and hence often would involve some delay between the time an individual leaves one occupational group and joins another.

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1. See Appendix 1.

2. Commonwealth Bureau of Census and Statistics, Classification and Classified List of Occupations, Revised, Canberra, June 1971.

Published data from the Labour Mobility Surveys have been supplemented with unpublished information supplied by the Australian Bureau of Statistics[1]. The tabulations of stocks and flows required for BACHUROO are by sex, age and occupation. Mobility data on the IMPACT occupational classifications were supplied by the ABS for November 1972 and February 1976, which are the only times surveys of occupational mobility were undertaken. The mobility covered in these surveys relates to the 12 months up to November 1972, and the corresponding period up to December 1975. Tables 1 to 6 present a summary of these data.[4]

For 1972, 957,000 people out of a total labour force of 5,564,000 (or 17.2%) were estimated to have changed jobs in the 12 months to November 1972. Of these, 294,000 (or 5.3% of the labour force) changed from one of the relevant 9 major IMPACT occupational groups[2] to another. That is, using the IMPACT classification, 31% of all movers changed occupations[3].

Analysis by sex shows that 208,900 or 5.6% of the male labour force (33% of male movers) and 85,400 or 4.6% of the female labour force (26% of female movers) changed occupations.

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1. Examples of mobility tables with explanations as to their derivation are in Appendix 2.

2. These 9 major IMPACT groups are not identical to those outlined in Appendix 1, due to ABS classification problems. The 9 groups correspond to the first 8 listed in Appendix 1, but "Lecturers and Teachers" have been separated out from groups 1 and 2, and amalgamated into a single group numbered 2. Previous groups 2 to 8 have been renumbered 3 to 9. Armed services are excluded because the ABS surveys relate only to the civilian labour force. The group "Others not elsewhere classified" has been pro rata-ed into the remaining 9 groups.

3. Occupational change will be used in this sense throughout this paper.

4. For estimates of the standard errors attached to the numbers in these tables, see the Technical Note in all ABS publications titled Labour Mobility (Ref. No. 6.43).

Net movement into any occupation is small with the most notable percentage gains being in the "Professional White Collar," "Lecturers and Teachers," and "Skilled White Collar" groups (2,210 or 1.2%, 1,547 or 0.8% and 4,018 or 0.7% respectively), and the most notable percentage losses being in the "Skilled Blue Collar, Metal and Electrical" and "Rural" groups (5,932 or 1.0% and 2,675 or 0.6% respectively).

Analysing net movement by sex for 1972 reveals that male and female mobility differed quite markedly. For males, apart from "Skilled Blue Collar, Metal and Electrical Workers" and "Rural Workers" (which experienced net decreases of 5,048 (or 0.9%) and 3,338 (or 0.8%) respectively), all occupations showed a net increase over the 12 month period, the largest of which was 2,431 (or 3.0%) in the "Lecturers and Teachers" group. For females, however, increases occurred in only four of the nine occupational groups (most notably in "Skilled White Collar Workers" and "Semi and Unskilled Blue Collar Workers"), while the decreases were fairly even across the remaining five, including the three "Skilled Blue Collar" groups.

Statistics were available for inter-occupational mobility for the 12 months to December 1975, but were not available for total job mobility at the time of writing this paper. Between December 1974 and December 1975, 245,000 people (or 4.3% of the labour force) changed occupations. Of these, 178,600 (or 4.5% of the male labour force) were male and 66,400 (or 3.1% of the female labour force) were female.

Not only was the size of the occupational mobility lower in 1975 than in 1972, but also the movements were of a different nature. Only three occupations showed a net increase. These were "Professional White

TABLE 1 - EMPLOYED PERSONS : NET MOVEMENT BETWEEN OCCUPATIONS , CURRENT

PREVIOUS OCCUPATION	Professional White Collar	Lecturers & Teachers	Skilled White Collar	Semi and Unskilled White Collar	Skilled Blue Collar - Metal and Electrical
Professional White Collar					
Lecturers & Teachers	- 221*				
Skilled White Collar	+ 663*	-			
Semi and Unskilled White Collar	+1326*	-	+3640		
Skilled Blue Collar - Metal and Electrical	-	+ 221*	+ 663*	+2111	
Skilled Blue Collar - Building	-	-	+ 849	+ 844	- 442*
Skilled Blue Collar - Other	-	- 221*	+ 221*	- 442*	-
Semi and Unskilled Blue Collar	+1221	+1105*	- 692	+2198	-2901
Rural	+ 221*	+ 221*	-	- 663*	-
Not Elsewhere Classified or no Previous Occupation	-	-	-	+ 849	+ 442*
Total Movement into Current Occupation	6188	6409	33986	67732	22727
Net Movers into Current Occupation	+2210	+1547	+4018	- 29	-5932

* derived numbers

SOURCE: ABS Labour Mobility November 1972 (Reference No. 6.43) and unpublished data sources made available by the ABS.

AUSTRALIA, TWELVE MONTHS PRECEDING NOVEMBER, 1972

OCCUPATION

Skilled Blue Collar - Building	Skilled Blue Collar - Other	Semi and Unskilled Blue Collar	Rural	Not Elsewhere Classified	Total Movement out of Previous Occupation
					3978
					4862
					29968
					67761
					28659
					18546
- 221*					14365
+ 378	- 541				95361
+ 442*	+ 221*	+2233			27804
+ 442*	-	+1291	-		3024
18296	14708	99153	25129	-	294328
- 250	+ 343	+3792	-2675		

NOTE: All numbers below 4000 have been derived by the authors and have no official status with the ABS. They are subject to very high sampling variability and should not be considered as statistics in their own right.

TABLE 2 - EMPLOYED MALES : NET MOVEMENT BETWEEN OCCUPATIONS , CURRENT

PREVIOUS OCCUPATION	Professional White Collar	Lecturers & Teachers	Skilled White Collar	Semi and Unskilled White Collar	Skilled Blue Collar - Metal and Electrical
Professional White Collar					
Lecturers & Teachers	-				
Skilled White Collar	+ 663*	+ 221*			
Semi and Unskilled White Collar	+ 663*	+ 884*	+3268		
Skilled Blue Collar - Metal and Electrical	-	+ 221*	+ 663*	+2111	
Skilled Blue Collar - Building	-	-	+ 849	+ 211	- 211*
Skilled Blue Collar - Other	-	-	+ 442*	- 663*	- 211*
Semi and Unskilled Blue Collar	-	+1105*	- 913	+3338	-2053
Rural	+ 221*	-	- 442*	-	-
Not Elsewhere Classified or no Previous Occupation	-	-	-	+ 849	+ 442*
Total Movement into Current Occupation	4862	3536	23704	37166	21622
Net Movers into Current Occupation	+1547	+2431	+2983	+1041	-5048

* derived numbers

SOURCE: ABS Labour Mobility November 1972 (Reference No. 6.43) and unpublished data sources made available by the ABS.

AUSTRALIA, TWELVE MONTHS PRECEDING NOVEMBER, 1972

OCCUPATION

Skilled Blue Collar - Building	Skilled Blue Collar - Other	Semi and Unskilled Blue Collar	Rural	Not Elsewhere Classified	Total Movement out of Previous Occupation
					3315
					1105
					20721
					36125
					26670
					17441
- 221*					7735
+ 599	- 99				67854
+ 442*	+ 221*	+2896			24931
+ 442*	-	+1291	-		3024
17854	8520	70064	21593	-	208921
+ 413	+ 785	+2210	-3338	-3024	

NOTE: All numbers below 4000 have been derived by the authors and have no official status with the ABS. They are subject to very high sampling variability and should not be considered as statistics in their own right.

TABLE 3 - EMPLOYED FEMALES : NET MOVEMENT BETWEEN OCCUPATIONS , CURRENT

PREVIOUS OCCUPATION	Professional White Collar	Lecturers & Teachers	Skilled White Collar	Semi and Unskilled White Collar	Skilled Blue Collar - Metal and Electrical
Professional White Collar					
Lecturers & Teachers	- 221*				
Skilled White Collar	-	- 221*			
Semi and Unskilled White Collar	+ 663*	- 884*	+ 372		
Skilled Blue Collar - Metal and Electrical	-	-	-	-	
Skilled Blue Collar - Building	-	-	-	+ 663*	- 221*
Skilled Blue Collar - Other	-	- 221*	- 221*	+ 221*	+ 221*
Semi and Unskilled Blue Collar	+ 221*	-	+ 221*	-1140	- 884*
Rural	-	- 221*	+ 442*	- 663*	-
Not Elsewhere Classified or no Previous Occupation	-	-	-	-	-
Total Movement into Current Occupation	4420	16940	31327	168733	1326
Net Movers into Current Occupation	+ 663	- 884	+1035	-1070	- 884

* derived numbers

SOURCE: ABS Labour Mobility November 1972 (Reference No. 6.43) and unpublished data sources made available by the ABS.

AUSTRALIA , TWELVE MONTHS PRECEDING NOVEMBER, 1972

OCCUPATION

Skilled Blue Collar - Building	Skilled Blue Collar - Other	Semi and Unskilled Blue Collar	Rural	Not Elsewhere Classified	Total Movement out of Previous Occupation
					663
					3757
					9247
					31636
					1989
					1105
-					6630
- 221*	- 442*				27507
-	-	- 663*			2873
-	-	-	-		-
663	8840	85256	7194	-	85407
- 663	- 442	+1582	+ 663	-	

NOTE : All numbers below 4000 have been derived by the authors and have no official status with the ABS. They are subject to very high sampling variability and should not be considered as statistics in their own right.

TABLE 4 - EMPLOYED PERSONS : NET MOVEMENT BETWEEN OCCUPATIONS ,

CURRENT

PREVIOUS OCCUPATION	Professional White Collar	Lecturers & Teachers	Skilled White Collar	Semi and Unskilled White Collar	Skilled Blue Collar - Metal and Electrical
Professional White Collar					
Lecturers & Teachers	- 690*				
Skilled White Collar	+1657	-1150*			
Semi and Unskilled White Collar	+2043	- 805	+ 949		
Skilled Blue Collar - Metal and Electrical	+ 690*	+ 460*	+1098	- 11	
Skilled Blue Collar - Building	+ 230*	+ 230*	+ 460*	+ 671	- 230*
Skilled Blue Collar - Other	-	+ 230*	+ 460*	+ 690*	- 460*
Semi and Unskilled Blue Collar	+1223	- 690*	+3760	+ 210	- 961
Rural	+ 230*	- 230*	- 236	+ 475	+ 679
Not Elsewhere Classified or no Previous Occupation	-	-	+ 230*	-	-
Total Movement into Current Occupation	9753	4881	31395	56684	18783
Net Movers into Current Occupation	+5383	-1266	+6214	- 149	-3211

* derived numbers

SOURCE: ABS Labour Mobility February 1976 (Reference No. 6.43), and unpublished data sources made available by the ABS.

AUSTRALIA , TWELVE MONTHS PRECEDING DECEMBER , 1975

OCCUPATION

Skilled Blue Collar - Building	Skilled Blue Collar - Other	Semi and Unskilled Blue Collar	Rural	Not Elsewhere Classified	Total Movement out of Previous Occupation
					4370
					6147
					25181
					56833
					21994
					14682
-					10818
- 660*	+1882				78204
+ 460*	- 969	+4013			24098
+ 230*	- 230*	+1965	-		2655
13351	10581	79418	19676	460	244982
-1331	- 237	+1214	-4422	-2195	

NOTE: All numbers below 4000 have been derived by the authors and have no official status with the ABS. They are subject to very high sampling variability and should not be considered as statistics in their own right.

TABLE 5 - EMPLOYED MALES : NET MOVEMENT BETWEEN OCCUPATIONS ,

CURRENT

PREVIOUS OCCUPATION	Professional White Collar	Lecturers & Teachers	Skilled White Collar	Semi and Unskilled White Collar	Skilled Blue Collar - Metal and Electrical
Professional White Collar					
Lecturers & Teachers	- 230*				
Skilled White Collar	+1197	- 460*			
Semi and Unskilled White Collar	+1813	- 460*	- 187		
Skilled Blue Collar - Metal and Electrical	+ 460*	+ 460*	+ 868	- 239	
Skilled Blue Collar - Building	+ 230*	+ 230*	+ 460*	+ 671	- 230*
Skilled Blue Collar - Other	-	-	+ 460*	+ 460*	-
Semi and Unskilled Blue Collar	+1223	- 230*	+3313	+ 491	- 271
Rural	+ 230*	-	- 6	+ 194	+ 679
Not Elsewhere Classified or no Previous Occupation	-	-	+ 230*	+ 230*	-
Total Movement into Current Occupation	7913	2070	22593	32441	18323
Net Movers into Current Occupation	+4923	- 230	+4401	+ 641	-1371

* derived numbers

SOURCE: ABS Labour Mobility February 1976 (Reference No. 6.43), and unpublished data sources made available by the ABS.

AUSTRALIA , TWELVE MONTHS PRECEDING DECEMBER , 1975

OCCUPATION

Skilled Blue Collar - Building	Skilled Blue Collar - Other	Semi and Unskilled Blue Collar	Rural	Not Elsewhere Classified	Total Movement out of Previous Occupation
					2990
					2300
					18192
					31800
					19694
					14682
-					8058
- 890*	+ 919				56948
+ 460*	- 739	+3513			21247
+ 230*	- 230*	+1965	-		2655
13121	7088	57871	16916	230	178566
-1561	- 970	+ 923	-4331	-2425	

NOTE: All numbers below 4000 have been derived by the authors and have no official status with the ABS. They are subject to very high sampling variability and should not be considered as statistics in their own right.

TABLE 6 - EMPLOYED FEMALES : NET MOVEMENT BETWEEN OCCUPATIONS, CURRENT

PREVIOUS OCCUPATION	Professional White Collar	Lecturers & Teachers	Skilled White Collar	Semi and Unskilled White Collar	Skilled Blue Collar - Metal and Electrical
Professional White Collar					
Lecturers & Teachers	- 460*				
Skilled White Collar	+ 460*	- 690*			
Semi and Unskilled White Collar	+ 230*	- 346	+1136		
Skilled Blue Collar - Metal and Electrical	+ 230*	-	+ 230*	+ 230*	
Skilled Blue Collar - Building	-	-	-	-	-
Skilled Blue Collar - Other	-	+ 230*	-	+ 230*	- 460*
Semi and Unskilled Blue Collar	-	- 460*	+ 447	- 281	- 690*
Rural	-	- 230*	- 230*	+ 281	-
Not Elsewhere Classified or no Previous Occupation	-	-	-	- 230*	-
Total Movement into Current Occupation	1840	2811	8802	24243	460
Net Movers into Current Occupation	+ 460	-1036	+1813	- 790	-1840

* derived numbers

SOURCE: ABS Labour Mobility February 1976 (Reference No. 6.43), and unpublished data sources made available by the ABS.

AUSTRALIA , TWELVE MONTHS PRECEDING DECEMBER, 1975

OCCUPATION

Skilled Blue Collar - Building	Skilled Blue Collar - Other	Semi and Unskilled Blue Collar	Rural	Not Elsewhere Classified	Total Movement out of Previous Occupation
					1380
					3847
					6989
					25033
					2300
					-
-					2760
+ 230*	+ 963				21256
-	- 230*	+ 500			2851
-	-	-	-		-
230	3493	21547	2760	230	66416
+ 230	+ 733	+ 291	- 91	+ 230	

NOTE: All numbers below 4000 have been derived by the authors and have no official status with the ABS. They are subject to very high sampling variability and should not be considered as statistics in their own right.

Collar Workers" (5,400 or 2.3%), "Skilled White Collar Workers" (6,200 or 0.9%), and "Semi and Unskilled Blue Collar Workers" (1,200 or 0.1%). Comparing these movements with those of 1972 show that the "Professional White Collar Workers" group increased by almost twice the percentage during 1975 than during 1972. The "Skilled White Collar Workers" group experienced similar movements in both years. "Lecturers and Teachers," a group which showed an increase in 1972, showed a decrease in 1975, perhaps because, with decreased opportunity for teachers as a result of the increased number qualifying, many of this group moved into more promising fields. This is partly borne out by the large movements of this group into the "Semi and Unskilled White Collar" group, an occupational change requiring no retraining.

Of the six remaining occupations, the "Rural Workers" group showed the largest decrease. This is understandable in that farmers have experienced increased difficulties in the between-sample years, so many opted out of farming and into fields included in the "Semi and Unskilled Blue Collar" group and to a lesser extent the "Semi and Unskilled White Collar" group.

The two occupational groups which showed major marked changes between 1972 and 1975 were the "Skilled Blue Collar, Building" and the "Skilled Blue Collar, Other" groups. The "Skilled Blue Collar, Building" group experienced a net decrease of 0.5% in 1975 compared with a net decrease of 0.1% in 1972. Corresponding figures for the "Skilled Blue Collar, Other" group were + 0.2% and - 0.2%. Neither of these changes was surprising. The building industry experienced a marked downturn from

1972, while the "Other" group included the textile tradesmen, whose industry suffered even more than that of building. Changes for males were even more pronounced than for total persons, as expected.

The change in mobility patterns between 1972 and 1975 persists when analysing the sex disaggregation. The most notable moves for males in 1975 were a net decrease of 4,460 (or 2.3%) in the "Professional White Collar" groups and a net increase of 4,330 (or 1.2%) in the "Rural" group compared to almost directly opposite movements during 1972. Similarly, the largest female net movements in 1975 were a fall of 2,040 (or 1.0%) in the "Skilled White Collar" group and an increase of over 1,000 (or just under 1.0%) in the "Lecturers and Teachers" group, both of which experienced movements in the opposite direction during 1972.

Mobility appears to depend on the state of the economy at the time, which in turn influences both male and female employment patterns. Whether the predominant influences affecting such patterns are cyclical or secular - - i.e., related to structural adjustment - - is an open question at this stage.

It should be noted that somewhere between the 4% to 5% of the labour force who changed occupations according to the above definition and the approximate 17% of the labour force who changed jobs, would have changed occupations at the most detailed level of disaggregation. This is a larger adjustment process than, for example, immigration and new entrants from the education system who comprise about 1% and 3% of the labour force respectively.

Finally, it should be noted that it is difficult to determine with a great deal of certainty, movements between groups of occupations, particularly when the data base is a household-based survey of approximately 30,000 households embracing approximately 60,000 persons aged 15 years and over. The standard errors in a survey of this size are estimated by the ABS to vary from 800 persons for cells containing 4,000 persons to 10,000 persons for cells containing 2,000,000 persons. The ABS does not publish cells containing less than 4,000 persons because of the very large standard errors in such estimates. Where cells of smaller sizes have been estimated for this study (see Appendix 2), they should be recognized as having little reliability and should not be used to infer relationships which cannot be supported because of the large standard errors.

3. THEORETICAL BACKGROUND

3.1 A Brief Survey of Inter-Occupational Mobility Studies

The majority of studies on labour mobility are primarily qualitative. If they do consider quantifiable relationships at all, these are generally of the single equation reduced form type, and no justification or explanation of the underlying structural form is given. That is, no attempt is made to provide an explanation of the relevant supply and demand relationships, and their relative roles.

Examples of qualitative studies include[1] Rottenburg (1956), OECD (1965), Parnes (1970), Cities Commission (1975), Fraenkel et al. (1975), Byrne (1975) and Freeman (1976). Those incorporating reduced

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1. Rottenburg, S., "On Choice in Labor Markets," Industrial and Labor Relations Review, January 1956.

   Parnes, H. S., "Labor Force Participation and Labor Mobility," Review of Industrial Relations Research, Volume 1, May 1970.

   Organization for Economic Co-operation and Development, Wages and Labour Mobility, Paris, OECD, July 1965.

   Cities Commission, Studies in Australian Internal Migration, 1966-1971, Canberra 1975.

   Fraenkel, L. M., et al., "Employment Structure, Income Distribution and Internal Migration in Brazil," World Employment Programme Research, Population and Employment, Working Paper No. 18, Geneva, May 1975.

   Byrne, J. J., "Occupational Mobility of Workers," Monthly Labor Review, February 1975.

   Freeman, R. B., "Individual Mobility and Union Voice in the Labor Market," Harvard Institute of Economic Research, Harvard University, Cambridge, Mass., Discussion Paper No. 452, January 1976.

form estimates include[1] Galloway (1967), Parnes and Spitz (1969), Burton and Parker (1969) and Vanderkamp (1973 and 1977).

There also exist a group of studies based on Markov Chain Theory. Transition probability matrices representing movements between occupations/industries/regions are applied to current stocks to determine the amount and direction of movement expected to take place. At best, this type of analysis yields an estimate as to the magnitude of mobility, but not an explanation as to why the movements are of these sizes. Two studies which adopt this approach are those by[2] Denton, Feaver and Robb (1976) and Toikka (1976).

A factor causing major differences in previous studies that are both quantitative and explanatory is the type of data available. The best longitudinal survey information providing detailed data for extended

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1. Galloway, L. E. , Geographic Labor Mobility in the United States 1957-1960, US Department of Education and Welfare, Social Security Administration Office of Research and Statistics, Research Report No. 28.

   Parnes, H. S. and Spitz, R. S., "A Conceptual Framework for Studying Labor Mobility," Monthly Labor Review, November 1969.

   Burton, J. F. and Parker J. E., Inter-industry Variations in Voluntary Labor Mobility," Industrial and Labor Relations Review, January 1969.

   Vanderkamp, J., Mobility Behaviour in the Canadian Labour Force, Special Study No. 16, Economic Council of Canada, Ottawa : Information Canada, 1973.

   Vanderkamp, J., "Industrial Mobility : Some Further Results," The Canadian Journal of Economics, August 1977.

2. Denton, F. T., Feaver, C. H. and Robb, A. L., The Short Run Dynamics of the Canadian Labour Market, Economic Council of Canada, Minister of Supply and Services, Canada 1976.

   Toikka, R.S., "A Markovian Model of Labor Market Decisions by Workers," American Economic Review, December 1976.

time periods is available for the United States economy (see Bartel and Borjas (1977) and Borjas and Mincer (1976))[1]. Thus it is possible to construct time series models for each occupation/industry/region. Canadian data is now also starting to become available in this form (see Vanderkamp (1977)).

At the other end of the scale are studies for those countries in which only intermittent surveys relating to labour mobility have been undertaken. One example is Australia where limited data has been collected by the ABS for 1972 and 1975. That is, data is only available for the total number of workers transferring between designated source occupations i and destination occupations j at two non-contiguous points of time. Thus any analysis is of necessity restricted to cross-section methods where an equation aimed at capturing the essential factors affecting mobility is estimated.

The above cited studies list many of the factors which influence a person's decision on whether or not to change occupations. It is likely that the peculiarities of the Australian labour market and the overall socio-economic system will make some of the variables less than ideal, while there are other explanators of Australian mobility which are not mentioned.

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1. Bartel, A. P. and Borjas, G. J., "Middle-Age Job Mobility : Its Determinants and Consequences," National Bureau of Economic Research, Working Paper No. 161, January 1977.

   Borjas, G. J. and Mincer, J., "The Distribution of Earnings Profiles in Longitudinal Data," National Bureau of Economic Research, Working Paper No. 143, August 1976.

It is argued in this study that there are incentives encouraging a worker to change occupations and disincentives discouraging him from changing, as well as rigidities in the socio-economic system which limit the opportunities a worker has to move, and which impose barriers which he must overcome to effect the movement. In order to define a model of occupational mobility, each of these groups of factors must be defined in detail, and variables and forms selected which reflect their influence.

3.2 A General Discussion of Variables Influencing the Decision to Change Occupations

3.2.1 Incentives to change occupations

1. Wages : When a worker is considering a change in occupation, one of the major factors influencing him is whether or not the change will effect an improvement in current or future income. The change in current income may be conceived simply as the difference between some representative income in the current occupation and the possible future occupation. The future improvement in income could conceptually be visualized in terms of net present values of expected future earnings in the two occupations.

The difference between the incomes expected in the occupations could be measured in several ways, using, for example, means, medians or more complex statistics. It was felt that the difference between the means is the best simple indicator, because an individual's perceptions would seem to be influenced by a few people on high incomes - the trend or attitude leaders - as much as by large numbers on middle and low incomes. This is reflected in the mean more than, for example,

the median, which would give a very low income earner equal weight to a very high income earner in forming an impression of the rewards to be gained from the occupation. To assess the real impact of trend leaders, it would be feasible to include the median income as indicative of the most likely income the mover will achieve and the mean income for the top decile in the occupation as a measure of what the mover may aspire to. Regression would then weight the measures appropriately. However, the sparse data on mobility and incomes in Australia are unlikely to support such refinements, so that, at least in the first instance, only the mean will be used. The variable representing this difference in mean wages has been labelled Wage Pull and is represented diagrammatically in Figure 2.

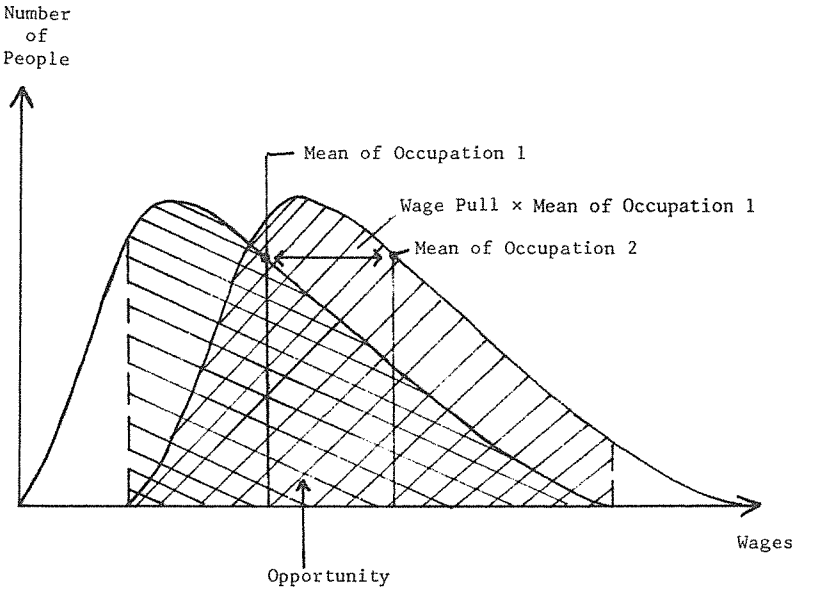

FIGURE 2

Hence, Wage Pull from occupation i to occupation j is expressed as

$$\text{WAGE PULL}_{ij} = \frac{\text{MEAN WAGE IN OCCUPATION j - MEAN WAGE IN OCCUPATION i}}{\text{MEAN WAGE IN OCCUPATION i}} .$$

Because Wage Pull is a ratio of wages, and the concept underlying it is of relative wage advantage, there is no need to consider a deflationary index to give real wages.

The Wage Pull variable is based on unpublished data supplied by the ABS, and collected by them in relation to their publications Income Distribution 1968-69 (Reference No. 17.17) and Income Distribution 1973-74 (Reference No. 17.6). These wage data are the only figures available at the necessary level of occupational disaggregation. The 1968-69 data were used with the 1972 mobility figures and the 1973-74 data with the 1975 mobility figures. Although there exists a three to four year discrepancy in each case, this is rationalized on the grounds that the differentials in wages between 1969 and 1974 (hopefully) should reflect changes in the economy in a similar manner to differentials in mobility between 1972 and 1975.

2. Unemployment : The unemployment rate in the worker's current occupation is important in that the worker is more likely to become unemployed or to seek to change occupations as the unemployment rate in his occupation rises. This is particularly so if, coupled with this increasing rate, the unemployment rate in the occupation to which the worker is considering entrance is lower and/or growing less rapidly.

Hence, a variable which measures the variation between the unemployment rate of the occupation the worker presently fills and that

of the occupation to which the worker may endeavour to change is required.

As discussed in relation to the wage incentive, several variations of variables may be established to reflect the unemployment incentive. The number of unemployed persons in the source occupation as a fraction of the total number of workers in that occupation should capture the exit pressure excited by the prospect of unemployment. Relative pressure generated by differential unemployment between different occupations could be measured by the difference (or ratio) between unemployment rates in any two occupations.

The relative unemployment rate between occupations i and j was calculated as follows :

$$U_{ij} = \frac{U_j - U_i}{U_i} \quad ,$$

where

$$U_i = \frac{\text{UNEMPLOYMENT IN OCCUPATION i}}{\text{TOTAL LABOUR FORCE IN OCCUPATION i}} \quad .$$

The unemployment figures used were taken from unpublished data supplied by the ABS from their survey relating to the publication, The Labour Force (Reference No. 6.22) for May 1972 and May 1975. May 1972 and May 1975 figures were used to be comparable with the mobility figures, which were only available for those two years.

3. Status : Occupations are perceived to have "status," which is only partly related to income. Thus, in recent years in Australia, "white collar" jobs have been preferred to "blue collar" jobs by school

leavers and married women re-entering the workforce even though in many areas they are not paid as well.

Rankings or scores of the status of occupations are difficult to derive because, for example, the order varies according to the position on the scale of the respondent to questions on status, and because the concept is necessarily ill-defined.

The ranking to be used for this study is that of Congalton[1]. The individual occupations are weighted to derive status measures for the IMPACT occupational groups[2].

3.2.2 Disincentives to change occupations

1. Unemployment : As well as being an incentive, unemployment could be a disincentive to change occupations since, if the unemployment rate in the occupation the worker seeks to enter rises, the worker is less likely to find a job in it and is more likely to stay in his present employment, even if he would otherwise seek to leave it.

Also, if the unemployment rate is high in the occupation in which the worker is currently employed, he may decide to persevere with his job with the thought that, if he gives it up, he may end up with no job at all.

The relative measure described above, which is being incorporated to measure a person's incentive to change occupations, would also reflect the possible disincentive to move as it measures one occupation's unemployment rate relative to the other.

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1. Congalton, A.A., Status and Prestige in Australia, Melbourne, 1969, (F. W. Cheshire Publishing Pty. Ltd.).
2. McIntosh, M.K. and Granek, C.B., "A Socio-Economic Index for Occupations," Impact of Demographic Change on Industry Structure in Australia, Research Memorandum (BACHUROO Module), Industries Assistance Commission, Melbourne, December 1976 (mimeo), pp. 17.

3.2.3 Inclinations and opportunities

1. Sex : Males tend to be more mobile within the labour force than females. The male is usually the family breadwinner and hence is considered to have more incentive to seek improvement in his employment. Females' movements are often out of and into the labour force rather than between occupations.

2. Age : It is generally agreed that occupational mobility is higher amongst younger workers than older workers as the former are not tied to a job by such things as seniority and superannuation benefits, and are less restricted by family responsibilities, house mortgages and similar considerations which make older persons less willing to accept the risks inherent in an occupational change. Young workers are usually on low incomes, and therefore have more scope to move without loss of income or status.

Both sex and age can be incorporated into a model of occupational mobility most simply on the left hand side of the behavioural equations. That is, the model would be set up to estimate mobility from one occupation to another specifically for each sex and age group. Alternatively, some commonality of parameters between different groups could be handled by an appropriate choice of dummy variables.

3. The Availability of Jobs : A worker who is actively in search of a change in occupation will be discouraged from looking if the economy is depressed and there are few jobs available. Conversely, mobility will increase if there are many vacant jobs.

An obvious measure of the availability of jobs is the number of unfilled job vacancies. The difference between the vacancy rate in the destination occupation and the vacancy rate in the originating

occupation, all as a proportion of the latter, would measure whether or not the decision to change occupations is coupled with relative opportunities.

Measures of job vacancies (registrations with the Commonwealth Employment Service (CES), counts of newspaper advertisements, or surveys of employers) are invariably incomplete and subject to large errors of collection and interpretation. Using the well-known inverse relationship between vacancies and unemployment, unemployment could be expected to proxy for job opportunities. However, unemployment has other more direct effects as discussed above so that it would be quite unsuitable as a proxy.

The amount of overtime worked in an occupation is likely to be directly related to shortage of labour. It is a reasonably reliable statistic and will be modelled in the IMPACT framework as part of the labour supply module and to calculate actual wage income. Overtime hours are available from the ABS publication, Survey of Earnings and Hours (Reference No. 6.1) and may be included as an availability variable as

$$\frac{\text{total overtime hours in occupation } i}{\text{total normal hours in occupation } i} \quad .$$

4. Occupations with Overlapping Skills : A measure of the overlap of the income in the source and possible destination occupations was used because it was considered that, when people change occupations, they tend to do so without a dramatic change in income. In part, this is because the wage negotiation system in Australia is such that the wage level reflects skill or expertise as well as supply and demand.

For example, an individual in the "Semi and Unskilled Blue Collar Workers" group is more likely to be able to move from the top of his own group, within which he is expected to have a relatively high wage to match his comparatively high skill, to the bottom of the "Professional White Collar Workers" group, within which he is expected to have a relatively low wage to match his comparatively low skill. His actual wage would stay about the same despite the relative change within the groups. The overlap of wages is thus indicative of the overlap of skills and experience and hence of potential mobility.

In Figure 2 above the shaded area shows the overlap of incomes of each pair of occupations, as follows :

Persons able to move from 1 to 2 without change in wages 

Positions available for movers from 1 to 2 without change in wages 

Overlap of potential movers from 1 to 2 for whom positions could be available 

Key to Figure 2

We propose to measure Opportunity by the overlapping area.

Therefore,

$$\text{OPPORTUNITY}_{ij} = \frac{\text{OVERLAP}_{ij}}{\text{TOTAL WAGES}_i}$$

where $\text{OVERLAP}_{ij} \stackrel{\cdot}{=} \sum_{\text{all ranges}}$ {(midpoint of wage range) times the minimum of (number of people in range in occupation i, number of people in range in occupation j)}

$$\text{TOTAL WAGES}_i \stackrel{\cdot}{=} \sum_{\text{all ranges}_i} \{\text{(mid-point of wage range) times (people in range)}\}$$

It is also unlikely that an individual would elect to change occupations if the move entailed a massive drop in wages (i.e., from outside the overlap in the higher paid occupation to outside the overlap in the lower paid occupation), although a small group of persons becoming ill, injured or partially retired might do so (e.g., a retired engineer might take a light job driving the school bus, or a female teacher might take on light clerical duties initially after the birth of a child, both being recorded as occupational changes within 1 year).

Similarly, changes involving a large increase in wages are unlikely, at least without extensive retraining. (This would prevent the case being counted in this model as a simple change of occupation within a 12 month period. Instead it would be handled through the

education sub-module as a move out of the labour force into education, and then into the new occupation after the appropriate number of years.) Exceptions to this generalization might be persons going from salaried positions to jobs with an entrepreneurial aspect, although, within the space of one year, the income change in such cases may be more likely to be negative.

Data for Opportunity, as with Wage Pull, were obtained from unpublished ABS data relating to the publications Income Distribution 1968-69 (Reference No. 17.17) and Income Distribution 1973-74 (Reference No. 17.6).

3.2.4 Barriers to movement

1. Cost of Regional Movement : If an occupational move requires a change of residence, the individual will weigh up whether or not the cost of moving is more than compensated for by increased job satisfaction and/or improved income. Even if it is, the individual simply may not be able to afford the initial cost of the move, which will then become a barrier to the move.

If the employer or some other agency covers the cost of relocation, then the worker is more likely to contemplate moving. (The Labour Mobility Survey carried out in February 1976 by the Australian Bureau of Statistics asks whether or not the new job entailed relocation and, if so, who covered the resulting cost. When this information becomes available it will be incorporated in the model of inter-occupational mobility.) Even if the payment is in the form of a loan

which must be repaid by the worker, it may be of major importance in his decision because he may not have been able to move within his own resources.

2. Cost of Retraining : As with the cost of regional movement, the worker is only going to offer himself for retraining if he feels that the long term benefits are going to outweigh the short term costs. Full-time retraining of more than one year's duration will not affect occupational mobility as defined in this sub-module because the worker would have to leave the labour force and enter the education system to undertake it. For short duration and part-time retraining, mobility will increase if the employer is willing to cover the cost of retraining and/or that cost is not too substantial.

As a barrier to occupational mobility, training may act through its direct costs (tuition fees, books, etc.) and its opportunity costs (wages foregone while undergoing training). Although the ultimate benefits (discounted to present value) may far outweigh the costs of the training, the individual may have insufficient current cash flows to support his other responsibilities, and hence may have to forego the training unless he can be helped over the barrier. Arguments for a loan scheme to cover fees and living costs for University students, for example, rely heavily on this "barrier" argument.

The height of the barrier imposed by retraining costs may be defined more usefully as the ratio of the mean cost of retraining to the mean weekly wage in the source occupation.

This removes effects such as inflation and, if the retraining costs are dominated by wages foregone during the training period, reduces to a simple measure of the duration of the training. The effect of subsidization of the training can be included by subtraction of the subsidy from the cost.

Answers to the questions in the 1976 Labour Mobility Survey covering such things as who covered the cost of training will, when appropriately cross-classified, enable resolution of the importance of this influence.

3. Intangible Personal Cost of Change : If an individual is a member of a family group, a large part of the decision to shift residences in order to take up a new position will be made on the basis of whether or not the family wishes to move.

The personal costs of such a move include such things as disruption to schooling of children, abandonment and subsequent re-establishment of a circle of friends, and even finding out where to shop and catch public transport at the new location.

There are personal costs for an individual even without a relocation. Possibility of criticism from his peer group, possibility of failure in the new job, establishment of a new work-social group and just general uncertainty can be seen as real deterrents to mobility. Clearly young people, who learn and adapt more rapidly than do older people, and who have had at least one recent major transition (namely, that from school to employment), are less affected by such personal costs and are more mobile.

Because of their intangible nature, it is difficult to include personal costs in a numerical model. Presumably they are considered to be covered to some extent by the regression constants when mentioned at all. Alternatively they can be thought of as being the residual costs after modelling the more direct costs and benefits.

At this stage, the data will not support any estimation of intangible personal costs.

4. GENERAL FORM OF THE PROPOSED MODEL

4.1 Theoretical Outline

Labour markets are traditionally of the disequilibrium variety. The distribution of the work force demanding jobs in specific occupations and/or industries in a given region rarely, if ever, matches the supply of same. Even if equilibrium is achieved at any one point in time, factors such as changes in economic conditions, changes in government policy, new developments in technology and changes in consumer purchase patterns would soon alter labour requirements, thus affecting employment, skill mix and relative wages, and pushing the labour market into disequilibrium again. The essential feature that differentiates the labour market from other types of markets is that the price mechanism (in this case relative wage rates) does not adjust so as to cause the market to clear. Institutional factors prevent wages from varying freely in both directions, thus the tendency for a labour market to move towards equilibrium in the short to medium term may be seriously attenuated. Labour mobility[1] is one factor that operates to reduce the extent of this disequilibrium.

It is hypothesised that mobility is a function of both the demand for and supply of labour of the various occupation types. Each demand function is determined by the firms, and the supply functions by the employees. Some variables enter as arguments in both functions, which may result in a complex translation from the reduced form estimating equation back to the structural form of the model.

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1. This does not imply that mobility is purely a disequilibrium phenomenon. Labour movement can occur within the work force even if relative wage rates have reached their equilibrium levels.

Further, it is obviously impossible to treat the mobility sub-sector in isolation to other sources of labour supply, such as entrants from the immigration and education sectors. It is therefore necessary (at least at the theoretical level) to consider demand and supply equations for all these sub-sectors, and their inter-relationships, before a reduced form can be derived to explain job changes that actually take place.

At the highest level of aggregation (the economy as a whole), it is hypothesised that mobility will vary according to whether the labour market is in a situation of excess supply or excess demand. It is assumed this also holds for movements between specific occupational groupings. If employers' demand for certain occupations is greater than the supply of persons available, then the labour market will be supply determined - the employees' supply of labour function will be the dominant one in determining how much mobility occurs. Alternatively, if employees' supply of labour is greater than the demand for labour, then the firms will have the upper hand.

Total mobility (the variable to be explained in this case) is defined as a function of both demand and supply variables, their relative importance being determined by an independent[1] estimate of the state of the labour market.

In order to illustrate the approach, consider a very simple theoretical structural form.

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1. 'Independent' in the sense that this estimate is derived from data other than that used in determining the demand and supply functions, so that unscrambling problems in going from the reduced to the structural form of the model are reduced.

Define

Q_{ij} = total actual movement from occupation i to occupation j ;

D_{ij} = a function representing the proportion of demand by firms for employees of occupation j type that will be filled by people switching from occupation i ;

S_{ij} = a function representing the workers' demand to shift from occupation i to occupation j .

As hypothesized, suppose

$$Q_{ij} = \Theta D_{ij} + (1 - \Theta) S_{ij} \quad , \tag{1}$$

where Θ is the weighting factor previously referred to. Suppose, also, that at a very simple level of analysis, both the demand and supply functions are linear in relative wages (W_{ij}) and the costs of retraining (Y_{ij}) , these being the only two explanatory variables.

Thus,

$$D_{ij} = a_1 + a_2 W_{ij} + a_3 Y_{ij} \tag{2}$$

$$S_{ij} = b_1 + b_2 W_{ij} + b_3 Y_{ij} \quad , \tag{3}$$

where a_k, b_k $(k = 1, \ldots, 3)$ are constants, and a priori it is expected that $a_2, b_3 < 0$; $a_3, b_2 > 0$.

Substituting equations (2) and (3) into (1) yields the following reduced form :

$$Q_{ij} = [\theta a_1 + (1 - \theta)b_1] + [\theta a_2 + (1 - \theta)b_2]W_{ij} + [\theta a_3 + (1 - \theta)b_3]Y_{ij} \quad . \qquad (4)$$

Examination of equation (4) shows that, even at this simple level of analysis, derivation of the structural form from the reduced form estimates is not possible unless some relationship between the various structural form coefficients is assumed. Further, it shows that both the magnitude and signs of the reduced form coefficients will vary according to the values of the weighting factor and the structural form coefficients. Thus there is no a priori general expectation with respect to the signs and magnitudes of the reduced form coefficients which would be applicable at all points of time.

4.2 General Form of the Proposed Model in this Exercise

The reduced form of a model incorporating the influences outlined in Section 3 would be of the form

$$M(\text{sex,age})_{ij} = f(W_{ij}, U_{ij}, O_{ij}, E_{ij}, S_{ij}, T_{ij}) \qquad (5)$$

where

$$M_{ij} = \frac{m_{ij}}{L_i}$$

m_{ij} = net number of movers from occupation i to occupation j , $i \neq j$;

L_i = the total labour force in occupation i ;

$$W_{ij} = \frac{W_j - W_i}{W_i}$$

W_i = mean wage in occupation i ;

$$U_{ij} = \frac{U_j - U_i}{U_i}$$

U_i = unemployment rate in occupation i ;

O_{ij} = income-persons overlap between occupations i and j ;

$$E_{ij} = \frac{E_j - E_i}{E_i}$$

E_i = overtime hours/normal hours for occupation i ;

$$S_{ij} = \frac{S_j - S_i}{S_i}$$

S_i = socio-economic index of occupation i ;

T_{ij} = retraining barrier

$$= \frac{C_{ij} - B_{ij}}{W_i}$$

C_{ij} = cost (wages foregone) in retraining from occupation i to j ;

B_{ij} = subsidy for the retraining .

5. EMPIRICAL ESTIMATES

At the time of this study, the only data available were from the 1972 and 1976 Labour Mobility Surveys and were classified according to the 9 major IMPACT occupational groups. The total stock of data thus involves occupational transitions at only two points in time, so the broad specification given in Section 3.4 is too loose to have much hope of successful empirical implementation. Therefore it was decided to use the existing data in an experimental fashion to explore various particularizations of equation (5) which were parsimonious in the use of parameters and which made as much use as possible of cross-sectional information across occupations. The experimentation was performed on data relating to male occupational mobility.

5.1 Initial Testing and Respecification

The starting point was the loosely specified equation (5) with all variables for which data were currently available included. The nature of the data and the potential seriousness of the degrees of freedom problem dictated that the model be specified using one single equation with the 36 lower triangular observations listed in Tables 7 and 8.

Due to problems of missing or unsuitable data, some of the available data had to be excluded, while other variables had to be replaced by appropriate proxies. Equation (5) was thus respecified as

$$M(sex)_{ij} = f(W_{ij}, U_{ij}, O_{ij}, S_{ij}, Y_{ij}, TR_{ij}, FR_{ij})^{1} \quad , \qquad (6)$$

---

1. The data tables for both dependent and independent variables are presented as Tables 7 - 14 in Appendix 2.

where W_{ij}, U_{ij}, O_{ij} and S_{ij} are as previously specified ,

and

Y_{ij} = the number of years training required to move from occupation i to occupation j ;

TR_{ij} = a dummy variable representing movements to the Rural occupational group

$$= \begin{cases} 1 & \text{if } m_{ij} < 0 \text{ , } i = 9 \text{ ,} \\ 0 & \text{otherwise ;} \end{cases}$$

FR_{ij} = a dummy variable representing movements from the Rural occupational group

$$= \begin{cases} 1 & \text{if } m_{ij} > 0 \text{ , } i = 9 \text{ ,} \\ 0 & \text{otherwise .} \end{cases}$$

A plot of the raw data suggested the need to take account of heteroskedacity. Equation (6) was therefore estimated linearly using an OLS procedure with each observation weighted by a factor reflecting the magnitude of the net flow taking place. Actual weights used were $\frac{L_i}{\sqrt{m_{ij}}}$ and were derived in the following manner :

Let $M_{ij} = \frac{m_{ij}}{L_i}$ = the proportion of workers in occupation i leaving i to go to occupation j .

Now $E(M_{ij}|\chi_{ij}) = \mu_{ij}(\chi_{ij})$, $\qquad (0 \leq \mu_{ij} \leq 1)$,

where

χ_{ij} = the set of exogenous variables relevant to explaining moves from i to j ;

μ_{ij} = the population proportion parameter for given χ_{ij} .

So M_{ij} is a sample estimate of the corresponding (unknown) population proportion μ_{ij} , with variance

$$\text{Var}(M_{ij}) = \frac{\mu_{ij}(1 - \mu_{ij})}{L_i}$$

for fixed χ_{ij} .

Since $0 \leq \mu_{ij} \leq 1$, $\frac{\mu_{ij}^2}{L_i} \geq 0$, which implies

$$\text{Var}(M_{ij}) \doteq \frac{\mu_{ij}}{L_i} .$$

Since only sample estimates are available for the μ_{ij} , we estimate these variances by

$$\widehat{\text{Var}(M_{ij})} = \frac{\hat{\mu}_{ij}}{L_i} = \frac{M_{ij}}{L_i} = \frac{m_{ij}}{L_i^2} ,$$

with standard deviations estimated by

$$\widehat{\text{s.d.}(M_{ij})} = \sqrt{\frac{m_{ij}}{L_i^2}} = \frac{\sqrt{m_{ij}}}{L_i} .$$

The appropriate GLS weighting factors to correct for heteroskedasticity on the model are therefore $\frac{L_i}{\sqrt{m_{ij}}}$.

Let $\ell_{ij} = \frac{L_i}{\sqrt{m_{ij}}}$. Assuming a linear functional form to be the appropriate one, the equation actually estimated is

$$\ell_{ij} M_{ij} = \ell_{ij} C + \ell_{ij} \beta_1 W_{ij} + \ell_{ij} \beta_2 U_{ij} + \ell_{ij} \beta_3 O_{ij} + \ell_{ij} \beta_4 S_{ij} + \ell_{ij} \beta_5 Y_{ij} + \ell_{ij} \beta_6 TR_{ij} + \ell_{ij} \beta_7 FR_{ij} . \quad (7)$$

5.2 Results

Ordinary least squares was applied to equation (7) (equivalent to GLS on a linear specification of equation (6)) for 1972 and 1975, yielding the following results for males (t-values are in brackets[1]) :

1972

$$M_{ij} = \underset{(1.2636)}{0.0013} - \underset{(-1.2135)}{0.0019}\, W_{ij} + \underset{(0.1601)}{0.0002}\, U_{ij} + \underset{(0.7411)}{0.0008}\, O_{ij} - \underset{(-1.5620)}{0.0060}\, S_{ij}$$

$$- \underset{(-2.6168)}{0.0005}\, Y_{ij} - \underset{(-0.5075)}{0.0008}\, TR_{ij} + \underset{(3.5793)}{0.0042}\, FR_{ij} \qquad \bar{R}^2 = 0.5798$$

1975

$$M_{ij} = \underset{(0.0929)}{0.0001} + \underset{(1.9064)}{0.0035}\, W_{ij} - \underset{(-0.6559)}{0.0005}\, U_{ij} - \underset{(-0.1671)}{0.0001}\, O_{ij} + \underset{(1.6707)}{0.0056}\, S_{ij}$$

$$+ \underset{(0.1328)}{0.0000}\, Y_{ij} - \underset{(-1.9428)}{0.0017}\, TR_{ij} - \underset{(-0.3812)}{0.0004}\, FR_{ij} \qquad \bar{R}^2 = 0.1456$$

The estimated equations are interpreted against a set of *a priori* expected coefficients based on the assumption that the reduced form for net mobility (as theoretically derived in Section 4.1) is supply dominated.

---

1. The critical one-ended value for the t-distribution with 28 degrees of freedom at the 5% level of significance is approximately 1.645, the corresponding value at the 1% level of significance is 2.326.

Comparisons of the values of coefficients for each variable across the two equations indicates a complete lack of consistency, suggesting the underlying structure of the labour market was very different as between 1972 and 1975.

Although the signs of the 1972 coefficients are - with the exception of that pertaining to relative wages and unemployment - as would be expected on a priori grounds, the years of training variable is the only significant one. If the results are taken at face value, they suggest that net movement in 1972 was in the direction of lower wages, higher unemployment, greater wage opportunity, higher social status and away from occupations requiring extensive retraining.

The negative coefficient on relative wages can be explained by reference to the proposed underlying structural form presented in Section 4.1; given that this reduced form coefficient is an amalgam of structural form coefficients for both the demand and supply equations for job changes, and a weighting factor reflecting the current state of the labour market, it is possible that the negative demand coefficient dominated at this point in time.

Analysis of the correlation matrix suggests that another reason causing the insignificance of most of the explanatory variables is the existence of high multicollinearity. For example, correlation between the wage-pull and socio-economic index is - 0.81, while that between unemployment and the socio-economic index is + 0.84. Correlation is also relatively high between the wage-pull and unemployment variables, and the constant term[1] and all variables except the rural dummies and net mobility.

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1. In the transformed equation (i.e., equation (7)), the constant column of units (whose coefficient in (6) is the regression constant) is replaced by the variable ℓ_{ij} .

That multicollinearity is having a significant effect on the final results is further borne out by the fact that all the simple correlations between net mobility and the explanatory variables are of the a priori expected sign.

The empirical results for 1975 are very poor. Although the wage pull and the 'to-rural-sector' dummy variables are both significant and of the expected sign, the overall explanatory power of the equation has fallen to 14.56%. Further, there has been a sign reversal on all coefficients except that associated with the 'to-rural-sector' dummy.

Examining the correlation matrix again shows the existence of strong multicollinearity between several of the explanatory variables. Further, the simple correlations between net mobility and the wage pull, unemployment, wage-opportunity and socio-economic index variables are not of the expected signs or orders of magnitude.

These results further emphasize the need to specify adequately the underlying structure of the model, allowing a more realistic interpretation to be given to the model itself, such that it incorporates changes in the labour market between various points in time.

Running the same regressions on data for females gave the following results :

1972

$$M_{ij} = -0.0019 - 0.0002\ W_{ij} + 0.0006\ U_{ij} - 0.0007\ O_{ij} - 0.0025\ S_{ij}$$
$$(-0.7059)\quad (-0.8964)\quad (0.6502)\quad (-0.3512)\quad (-1.5657)$$
$$+ 0.0001\ Y_{ij} - 0.0043\ TR_{ij} + 0.0082\ FR_{ij} \qquad \bar{R}^2 = 0.4320$$
$$(0.3756)\quad (-1.7277)\quad (1.8654)$$

1975

$$M_{ij} = -0.0020 - 0.0058\ W_{ij} - 0.0006\ U_{ij} + 0.0009\ O_{ij} - 0.0091\ S_{ij}$$
$$(-1.2132)\quad (-4.7156)\quad (-3.9227)\quad (0.7008)\quad (-3.6507)$$
$$+ 0.0007\ Y_{ij} - 0.0024\ TR_{ij} + 0.0090\ FR_{ij} \qquad \bar{R}^2 = 0.5654$$
$$(1.9719)\quad (-1.4677)\quad (3.5766)$$

Again, very little stability is shown between the coefficients for 1972 and 1975. The only variables displaying consistency are the constant term and the 'from-rural-sector' dummy. Further, the socio-economic index variable and the two rural dummies are of the a priori expected signs in both years. The wage-pull and years of training variables both have signs opposite to those expected, with the coefficients becoming significant in 1975. Unemployment moves from being of the expected sign but insignificant to being significant with a reversed sign.

The 1972 $\bar{R}^2$ value is slightly lower than that for the males' equation (43.20% as compared to 57.98%) but is significantly higher for 1975 (56.54% against 14.56%). An analysis of the correlation matrix once more shows multicollinearity existing in both years.

Thus again the lack of a properly specified structure plus the existence of multicollinearity may contribute to the poor estimates.

The results for females, however, are not directly comparable with those obtained for males for a number of reasons. Firstly, great changes occurred in the market for female labour between the two data points, such as the effect on wages of the introduction of equal pay for equal work in 1972; secondly, aggregate rates of mobility for females are generally lower than those for males, thus making it more difficult to form precise relationships; and thirdly, it is arguable that the female labour force should be divided into married and not married groups, as the relevant explanatory variables with respect to determining mobility are likely to be different.

5.3 Tentative Conclusions and Implications for Future Research

A general model of the form described in this paper is best suited to a time series analysis. However, data was only available for two occupational transitions (1972 and 1975). Hence analysis is restricted to cross-section methods.

Results for both male and female mobility are generally unsatisfactory, with coefficients between the two corresponding sex-specific equations being highly unstable, changing both in magnitude and sign.

Until extensive respecification and testing is undertaken, it is difficult to say whether the lack of an adequate structural form or the existence of multicollinearity between the explanatory variables or some combination of both or neither is the major reason for the poor empirical results.

If nothing else, the analysis in this paper has shown that a simple linear formulation involving all the explanatory variables considered important in determining net movement from occupation i to occupation j fails to capture the important elements involved in this decision making process.

The next stage in the study of occupational mobility will attempt to impose some sort of structure into the model by specifying movement as a two stage process - the decision to move out of a source occupation into a common pool, followed by the decision to move to a particular destination occupation. At the first stage, it is hypothesized that movement out of a given occupation is determined by the rate of unemployment in that occupation relative to the rest of the labour market. Then, given that one is jobless, the desired destination occupation will be determined by a comparison of factors such as wages, social status and training required for a particular occupation relative to the rest of the labour market.

Obviously, this approach is also only an intermediate step in analysing what is basically a simultaneous equation system. The foundations of this type of analysis are given in Section 4.1, and are to be developed more fully at a later date.

Appendix 1 THE OCCUPATIONAL GROUPING FOR IMPACT

by

M. K. McIntosh*

INTRODUCTION

At the heart of any description of the labour force is a set of occupations into which persons are to be grouped.

In the first instance, the problem is to devise an occupational code which effectively combines a wide range of legal, regional, industry-specific and slang terms into a single list of individual occupations. This in itself is an impossible goal because occupations overlap and change in time with respect to work done and titles may be created or abolished.

The second problem is to group together the many thousands of individual occupations to form aggregates at various levels. There may be a range of criteria for performing the grouping, some of which may be in conflict for any one grouping.

Despite the problems, an occupational classification must ultimately be devised. In this case, the basic classification was that used for the 1971 Census of Population and Housing and, since the original coding of respondents to an occupation could not be reviewed, the problem was to group occupations in the most meaningful way for an economic-demographic model of Australia.

Although not described in this note, it was important to select a grouping which could also be derived from other major occupational

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* The author would like to thank Professor Richard Blandy for his major part in the formulation of the 10 main groups and officers of the Department of Employment and Industrial Relations for their reviewing of the classification.

classifications. Of particular concern was the Commonwealth Employment Service code, which is used for classifying unemployed persons and vacancies.

Because of institutional rigidities of many kinds, changes in an individual's occupation can often be effected only by an extensive period of retraining. Indeed it can be argued that, if a large proportion of persons are interchangeable between two occupations without retraining, the separation of the occupations is artificial with respect to labour market consequences. In a model of labour market behaviour, the grouping of occupations should be such as to minimise overlap and mobility without retraining between groups.

The model for which this classification was derived is being built to simulate the impact of demographic change on the Australian economy. As such it deals with the population, education, the labour force, immigration, wages and income, and household formation and structure. In all of these aspects, the occupations in which people can and do work are of vital importance. Conversely, it is important to choose an occupational classification which reflects the need of the model to account for these phenomena.

CRITERIA FOR GROUPING OCCUPATIONS

The criterion most commonly used to group occupations is work content. That is, occupations are placed together where they use similar materials and equipment and work in similar environments. In itself this is a very general concept, which is difficult to translate into decision rules. It is invariably supplemented by other factors, which are important in their own right, as well as to distinguish difficult cases.

The grouping described here is based much more on skill level as the major explanator of economic and social differences, but uses a hierarchy of criteria as follows :

Major Considerations

(a) Skill level. This is the dominant determinant of the major groups, which are based on professional, skilled and semi and unskilled categories. It reflects as much as possible the institutional barriers placed on upgrading of recognised skills.

(b) Skill specialization. Within the levels, areas with particular skill specialization may be delineated. At the major group level this differentiates white and blue collar categories, while at the minor group level it distinguishes, for example, metal trades from electrical trades. The specialization is based on similar techniques applied to similar materials to obtain similar products, and includes implicitly considerations of technology.

Minor Considerations

(c) Income. Income is often closely related to skill level in the first instance and skill specialization. As far as possible, occupations with similar patterns of income distribution have been placed together, and this has been used as an additional consideration in separating otherwise undecided occupations.

(d) Qualifications. The categories based on skill are closely related to the qualifications normally required to practise in the occupaction. However, occupations and qualifications are separate, albeit related, issues so that while qualifications have been a guide, they have not been a dominant consideration.

(e) Ease of transfer within and between categories. The delineation by skill level and specialization act to group together those occupations within which people may do a range of jobs and between which mobility is restricted by training or aptitude

barriers. This concept of ease of mobility has been used as an indicator in otherwise undecided cases.

(f) Social associativity. Social and economic status within society are closely related to occupation. Such status also plays a large part in such events as the nature and level of education of children, the selection of a marriage partner and the pattern of consumption of goods and services. Hence, occupations have been grouped and ordered with respect to socio-economic status where they would not otherwise conflict. The relatively low importance of this criterion has made the impossible task of defining an absolute socio-economic ranking unnecessary.

SOME COMMENTS ON THE GROUPS

Many of the groupings are obvious and are unlikely to be the source of much confusion. Such groups as scientists, metal tradesmen and farm workers fall into this category. Others are more contentious, both because of the inclusion or exclusion of a single occupation or because of the whole grouping. Some of the more controversial cases are discussed below.

Engineers are considered to include ships' officers because of the nature of the work they do, the training required and the professional managerial nature of the task.

Aircraft pilots, however, are skilled rather than professional because of the shorter training period and the "hands-on" nature of their work, which could even be considered as blue collar. While this may create an anomaly in terms of socio-economic status and income (especially for the

minority group of Qantas pilots!), there is little chance of a displaced pilot being mobile into any of the other professional categories.

The "Societal" group was created to cover those occupations oriented towards serving people or society directly. To a certain extent it also serves as a "dump group" for professionals who do not fit into the more technical areas or teaching, although clearly all the professional groups have high potential mobility into teaching.

Tertiary and secondary teachers have been considered professional because they normally require a degree and, in many cases, a diploma as well, to practise. Technical teachers are often ex-trades people and primary teachers require only a teaching diploma, which does not make them capable of moving into any of the professional categories other than teaching, so that both have been made skilled. This is probably also a reflection of relative wage levels for the two groups.

The "Creative" group may include some highly qualified persons, but qualifications are not a prerequisite for entry or success. The inclusion of religious workers of various types in this category reflects their mixture of skills, which has a sufficient bias towards no formal skills for them to be ineligible for the "Societal" group.

The "Government" and "Employers" groups are a mixture of skills of all kinds, which cannot be separated more definitively. They have been classified as Skilled White Collar as some estimate of their average.

In the "Skilled Blue Collar" areas, occupations have been included only where they require an apprenticeship in most states of Australia, or at least in the most populous states. Occupations with mixtures of skilled and unskilled persons have been grouped according to their majority.

In the "Miners" group, some of the occupations are skilled, but they have been difficult to separate from those requiring very little training.

"Professional" Athletes and Sportsmen have been placed in the "Services" group, partly because of the nature of their work in entertaining the public and partly because of their lack of any specific skills which would place them in another group.

An attempt has been made to separate "Rural Workers" into those with a managerial and entrepreneural content and those who are employees.

CRITERIA FOR GROUPING QUALIFICATIONS

As described above, skill, which is measured to a great extent by qualifications, is the major consideration in the occupational grouping. Similarly, the grouping of qualifications and courses has been made to interface as far as possible with the occupational grouping. That is, emphasis has been placed entirely on the vocational or labour market consequences of formal courses of training.

Clearly not all courses have direct relationships with single occupations or groups of occupations. Many are designed to be quite general while persons trained in the most specialised courses often elect or are forced to enter employment in quite unrelated areas. Hence the relationship between, say, the Bachelor of Science qualification and employment as a scientist is obvious, but is not 1 to 1. This has been borne in mind in the IMPACT model when using qualifications to estimate occupations of new graduates or re-entrants to the labour force, and should be an equally important limitation for other users.

CONCLUSION

While this classification is far from perfect, it is considered to reflect more nearly the needs of a demographic-economic analysis of Australia than others currently in use.

SUMMARY OF OCCUPATIONS

A PROFESSIONAL WHITE COLLAR

1 Scientists
2 Engineers
3 Medical
4 Societal
5 Tertiary Teachers
6 Secondary Teachers

B SKILLED WHITE COLLAR

7 Technical Teachers
8 Primary Teachers
9 Para-medical
10 Technicians
11 Creative
12 Government
13 Employers

C SEMI AND UNSKILLED WHITE COLLAR

14 Clerical
15 Sales
16 Semi-skilled medical
17 Audio Visual

D SKILLED BLUE COLLAR, METAL AND ELECTRICAL

18 Metal trades
19 Electrical trades
20 Instrument trades

E SKILLED BLUE COLLAR, BUILDING

21 Wood trades
22 Brick, Stone and Glass trades
23 Painters

F SKILLED BLUE COLLAR, OTHER

24 Food trades
25 Textile trades
26 Printing trades

G SEMI AND UNSKILLED BLUE COLLAR

27 Semi Skilled metal and electrical
28 Building
29 Miners
30 Drivers
31 Protective Services
32 Production
33 Services
34 Labourers

H RURAL WORKERS

35 Farmers
36 Farm workers

I ARMED SERVICES

37 Officers
38 Other Ranks

J OTHER

39 Other (nec)

REGROUPED 1971 CENSUS OCCUPATION CODES

	MAJOR GROUPS	CODES
1.	Professional White Collar	1-10, 13-17, 20-22, 25, 26, 35, 36, 41-49, 53, 54, 58, 59, 64, 82-87, 91, 500, 501
2.	Skilled White Collar	30-32, 37-40, 50-52, 55-57, 62, 63, 65-68, 70-81, 88-90, 100-106, 110-119, 510
3.	Semi-skilled and Unskilled White Collar	33, 34, 150, 155, 160-163, 200, 201, 205, 210-217, 545-547, 548, 549, 668, 840, 851
4.	Skilled Blue Collar, Metal and Electrical	629, 630, 636-640, 642-648, 650-658 660-667, 669
5.	Skilled Blue Collar, Building	675, 676, 678-680, 687, 688, 691-696, 711
6.	Skilled Blue Collar, Other	602, 603, 609, 610, 614, 621, 703, 706, 707, 721, 724, 807
7.	Semi-skilled and Unskilled Blue Collar	400-411, 420-421, 425, 505, 515-517, 520-524, 530, 535-540, 555-557, 560-562, 600, 601, 604-606, 611-613, 615-617, 622, 623, 627, 628, 631, 649, 659, 670-674, 677, 681-685, 697, 698, 704, 705, 708, 712-716, 720, 722, 723, 725-728, 735-737, 739, 743-750, 754, 757-763, 766-768, 772, 774-785, 800-802, 805, 806, 808-811, 815, 816, 820, 821, 825, 835, 845, 850, 852
8.	Rural Workers	300-316, 320-335, 340, 345, 346, 355, 356
9.	Armed Services	855-862
10.	Other (N.E.C.)	865

MINOR GROUPS	CODES
1. Scientists	13-17, 20-22
2. Engineers	1-10, 500, 501
3. Medical	25, 26, 35, 36
4. Societal	64, 82-87, 91
5. Tertiary Teachers	41-49
6. Secondary Teachers	53, 54, 58, 59
7. Technical Teachers	50-52
8. Primary Teachers	55-57
9. Para-medical	30-32, 37-40
10. Technicians	70-81, 88, 89, 510
11. Creative	62, 63, 65-68, 90
12. Government	100-106
13. Employers	110-119
14. Clerical	150, 155, 160-163, 545-547
15. Sales	200, 201, 205, 210-217
16. Semi-skilled Medical	33, 34, 851
17. Audio Visual	548, 549, 668, 840
18. Metal Trades	629, 630, 642-648, 650-658
19. Electrical Trades	660-667, 669
20. Instrument Trades	636-640
21. Wood Trades	675, 676, 678-680
22. Brick, Stone and Glass Trades	691-696, 711
23. Painter	687, 688
24. Food Trades	721, 724, 807
25. Textile Trades	602, 603, 609, 610, 614, 621
26. Printing Trades	703, 706, 707

MINOR GROUPS		CODES
27.	Semi-skilled Metal and Electrical	627, 628, 631, 649, 659, 670-674, 757-763
28.	Building	677, 681-685, 697, 698
29.	Miners	400-411, 420, 421, 425
30.	Drivers	505, 515-517, 520-524, 530, 535-540, 555-557, 560-562, 766-768
31.	Protective Services	800-802
32.	Production and Process	600, 601, 604-606, 611-613, 615-617, 622, 623, 704, 705, 708, 712-716, 720, 722, 723, 725-728, 735-737, 739, 743-750, 754
33.	Services	805, 806, 808-811, 815, 816, 820, 821, 825, 835, 845, 850, 852
34.	Labourers	772, 774-785
35.	Farmers	300-316
36.	Farm Workers	320-335, 340, 345, 346, 355, 356
37.	Officers	855, 857, 859, 861
38.	Other Ranks	856, 858, 860, 862
39.	Other	865

REGROUPED 1966 CENSUS OCCUPATION CODES

MAJOR GROUPS

1.	Professional White Collar	1-9, 13-17, 20-22, 25, 26, 35, 36, 45, 47, 48, 75-79, 82, 500, 501
2.	Skilled White Collar	30, 37-40, 46-48, 50, 55, 56, 65-68, 81, 100-106, 110-118
3.	Semi-skilled & Unskilled White Collar	150, 155, 160-163, 200, 201, 205, 210-214, 545-548, 840, 851
4.	Skilled Blue Collar, Metal & Electrical	629, 630, 636-639, 642-655, 659-665
5.	Skilled Blue Collar, Building	675-679, 687, 688, 691-696, 711
6.	Skilled Blue Collar, Other	602, 603, 609, 610, 614, 621, 703, 706, 707, 721, 807
7.	Semi-skilled & Unskilled Blue Collar	400-411, 420, 421, 425, 505, 515, 516, 520-524, 530, 535-539, 555-557, 560, 561, 600, 601, 604-606, 611-613, 615-617, 622-624, 627, 628, 631, 656, 668-672, 681-684, 697, 698, 704, 705, 708, 712-717, 720, 722-727, 735, 736, 739, 743-750, 754, 757-763, 772, 774-785, 800, 801, 805, 806, 808-811, 815, 816, 820, 821, 825, 830, 835, 845, 850, 852
8.	Rural Workers	300-316, 320-329, 335, 340, 345-349, 355, 356
9.	Armed Services	855
10.	Other (N.E.C.)	865

MINOR GROUPS	CODES
1. Scientists	13-17, 20-22
2. Engineers	1-9, 500, 501
3. Medical	25, 26, 35, 36
4. Societal	60, 75-79, 82
5. Tertiary Teachers	45
6. Secondary Teachers	47, 48
7. Technical Teachers	47, 48
8. Primary Teachers	46-48, 50
9. Para-medical	30, 37-40
10. Technicians	70-72, 80, 510
11. Creative	55, 56, 65-68, 81
12. Government	100-106
13. Employers	110-118
14. Clerical	150, 155, 160-163, 545-547
15. Sales	200, 201, 205, 210-214
16. Semi-skilled Medical	851
17. Audio Visual	548, 840
18. Metal Trades	629, 630, 642-655
19. Electrical Trades	659-665
20. Instrument Trades	636-639
21. Wood Trades	675-679
22. Brick, Stone & Glass Trades	691-696, 711
23. Painter	687, 688
24. Food Trades	721, 807
25. Textile Trades	602, 603, 609, 610, 614, 621
26. Printing Trades	703, 706, 707

MINOR GROUPS	CODES
27. Semi-skilled Metal & Electrical	627, 628, 631, 656, 668-672, 757-763
28. Building	681-684, 697, 698
29. Miners	400-411, 420, 421, 425
30. Drivers	505, 515, 516, 520-524, 530, 535-539, 555-557, 560, 561, 766-768
31. Protective Services	800-801
32. Production and Process	600, 601, 604-606, 611-613, 615-617, 622-624, 704, 705, 708, 712-717, 720, 722-727, 735, 736, 739, 743-750, 754
33. Services	805, 806, 808-811, 815, 816, 820, 821, 825, 830, 835, 845, 850, 852
34. Labourers	772, 774-785
35. Farmers	300-316
36. Farm Workers	320-329, 335, 340, 345-349, 355, 356
37. & 38 Officers & Other Ranks	855
39. Other	860

SUMMARY OF QUALIFICATIONS

A HIGHER DEGREE

1 Higher Degree

B FIRST DEGREE

2 Science Degree
3 Engineering Degree
4 Medical Degree
5 Societal Degree
6 Teaching Degree
7 Non-vocational and other Degree

C DIPLOMAS AND OTHER NON-DEGREE TERTIARY

8 Teaching Diploma
9 Para-medical Diploma
10 Technician Diploma
11 Creative Diploma
12 Business Diploma
13 Other and non-vocational Diploma

D TRADE LEVEL

14 Metal Trade
15 Electrical Trade
16 Building, wood Trade
17 Building, other Trade
18 Food Trade
19 Textile Trade
20 Printing Trade
21 Other (nec) Trade

E HIGHER SCHOOL CERTIFICATE

22 Higher School Certificate or equivalent

F SCHOOL CERTIFICATE

23 School Certificate or equivalent

G NO QUALIFICATION

24 No qualification

H NOT CLASSIFIED

25 Not classified

REGROUPED 1971 CENSUS QUALIFICATION CODES

MAJOR GROUPS	CODES
1. Higher Degree	56
2. First Degree	31, 35, 38-53, 55
3. Diplomas	10-30, 32-34, 36, 37, 54
4. Trades	2-9
5. No Qualifications	1
6. Not Classified	57-60

MINOR GROUPS	
1. Higher Degree	56
2. Science	39, 43
3. Engineering	40-42
4. Medical	52, 53
5. Societal	31, 35, 44, 45, 48
6. Teaching (Degree)	49-51
7. Other, Not Vocational	38, 46, 47, 55
8. Teaching (Non-degree)	33
9. Para-medical	19, 20, 34
10. Technician	10-17, 24-29
11. Creative	21, 32, 36, 54
12. Business	18, 30
13. Other, not vocational	22, 23, 37
14. Metal Trades	3, 5
15. Electrical Trades	4
16. Building Trades	6
17. Food Trades	-
18. Textile Trades	8
19. Printing Trades	7
20. Other Trades (incl. nec.)	2, 9
21. No Qualifications	1
22. Not Classified	57-60

Appendix 2 : DATA TABLES FOR MOBILITY RATES AND EXOGENOUS VARIABLES, NOVEMBER 1972 AND DECEMBER 1975

In November 1972 and February 1976 sample surveys of labour mobility were conducted by the Australian Bureau of Statistics (ABS). By using information derived from those surveys, some of which was published in the ABS publications Labour Mobility (Reference No. 6.43) and by making appropriate estimates where necessary, it has been possible to construct tables of job mobility by sex and occupation. Net changes between occupations for the twelve months prior to November 1972 and December 1975 were derived from these and appear as Table 1 - 6 in the body of the text. Figures less than 4000 shown in the tables were not provided by the ABS because of the high sampling variability associated with very small estimates obtained from the survey, but have been estimated by the authors. Where no other means were available such figures have been estimated by apportioning an equal share to each "empty space" to make up the required numbers in the "From Occupation" group and adjusting these until they added to the correct totals in both the "From Occupation" and "To Occupation" groups. These estimated numbers are marked with an asterisk and, while the estimations were necessary to complete the table for computer purposes, they should be treated with appropriate caution.

Note: The figures derived by this method are estimates to complete the table for the purposes of this analysis only. They have no official status with either the Australian Bureau of Statistics or the IMPACT project. The large standard errors attached to the estimates make them highly unreliable for assessments of individual occupations or for other purposes.

TABLE 7 : EMPLOYED MALES AND FEMALES, MOBILITY RATES FOR

CURRENT

PREVIOUS OCCUPATION		Professional White Collar	Lecturers and Teachers	Skilled White Collar	Semi and Unskilled White Collar
Professional White Collar					
Lecturers and Teachers	M	-			
	F	0.00219094*			
Skilled White Collar	M	0.00153151*	0.00051050*		
	F	-	-0.00131677*		
Semi and Unskilled White Collar	M	0.00118707*	0.00158275*	0.00585118	
	F	0.00077658*	-0.00103544*	0.00043573	
Skilled Blue Collar - Metal and Electrical	M	-	0.00039649*	0.00189472*	0.00378729
	F	-	-	-	-
Skilled Blue Collar - Building	M	-	-	0.00330434	0.00082122
	F	-	-	-	0.17632979*
Skilled Blue Collar - Other	M	-	-	0.00433525*	-0.00650287*
	F	-	-0.00443152*	-0.00443152*	0.00443152*
Semi and Unskilled Blue Collar	M	-	0.00100182*	-0.00082775	0.00302631
	F	0.00045552*	-	0.00045552*	-0.00234972
Rural	M	0.00054314*	-	-0.00108629*	-
	F	-	-0.00338749*	0.00677485*	-0.01016248*

* the M_{ij} values for these cells are based on estimated derived by the authors.

$$M_{ij}(\text{sex}) = \frac{m_{ij}(\text{sex})}{L_i(\text{sex})}$$

where m_{ij} = net number of movers from occupation i to occupation j, $i \neq j$;

L_i = the total labour force in occupation i as at May 1972.

NET MOVEMENT BETWEEN OCCUPATIONS, AUSTRALIA, NOVEMBER 1972

O C C U P A T I O N

Skilled Blue Collar - Metal and Electrical	Skilled Blue Collar - Building	Skilled Blue Collar - Other	Semi and Unskilled Blue Collar	Rural
-0.00086014* -0.05877660*				
-0.00216762* 0.00443152*	-0.00216762* -			
-0.00186130 -0.00182206*	0.00054307 -0.00045552*	-0.00008976 -0.00091103*		
- -	0.00108629* -	0.00054314* -	0.00711740 -0.01016248*	

SOURCE: Tables 2 and 3 of the text.
ABS The Labour Force 1972 (Reference No. 6.22) Canberra, 1974.

TABLE 8 : EMPLOYED MALES AND FEMALES, MOBILITY RATES FOR

CURRENT OCCUPATION

PREVIOUS OCCUPATION		Professional White Collar	Lecturers and Teachers	Skilled White Collar	Semi and Unskilled White Collar
Professional White Collar					
Lecturers and Teachers	M	-0.00240478*			
	F	-0.00363783*			
Skilled White Collar	M	0.00243549	-0.00093594*		
	F	0.00109968*	-0.00329905*		
Semi and Unskilled White Collar	M	0.00302545	-0.00076763*	-0.00031206	
	F	0.00020897*	-0.00031437	0.00103214	
Skilled Blue Collar - Metal and Electrical	M	0.00077698*	0.00077698*	0.00146612	-0.00040369
	F	0.02143723*	-	0.02143723*	0.02143723*
Skilled Blue Collar - Building	M	0.00083938*	0.00083938*	0.00167876*	0.00244880
	F	-	-	-	-
Skilled Blue Collar - Other	M	-	-	0.00430071*	0.00430071*
	F	-	0.00510533*	-	0.00510533*
Semi and Unskilled Blue Collar	M	0.00099202	-0.00018656*	0.00268728	0.00039827
	F	-	-0.00084192*	0.00081813	-0.00051430
Rural	M	0.00063312*	-	-0.00001652	0.00053402
	F	-	-0.00332389*	-0.00332389*	0.00406093

* the M_{ij} values for these cells are based on estimates derived by the authors.

$$M_{ij}(\text{sex}) = \frac{m_{ij}(\text{sex})}{L_i(\text{sex})}$$

where m_{ij} = net number of movers from occupation i to occupation j, $i \neq j$;

L_i = the total labour force in occupation i as at December 1975.

NET MOVEMENT BETWEEN OCCUPATION, AUSTRALIA, DECEMBER 1975

O C C U P A T I O N

Skilled Blue Collar - Metal and Electrical	Skilled Blue Collar - Building	Skilled Blue Collar - Other	Semi and Unskilled Blue Collar	Rural
-0.00083938*				
-	-			
-0.01021065*	-			
-0.00021982	-0.00072191*	0.00074543		
-0.00126288*	0.00042096*	0.00176254		
0.00186908	0.00126624*	-0.00203424	0.00967020	
-	-	-0.00332389*	0.00722585	

SOURCE: Tables 5 and 6 of the text.

ABS Labour Mobility, February 1976 (Reference No. 6.43) Canberra, 1976.

TABLE 9 : RELATIVE WAGES BETWEEN OCCUPATIONS

CURRENT

PREVIOUS OCCUPATION

		Professional White Collar	Lecturers and Teachers	Skilled White Collar	Semi and Unskilled White Collar
Professional White Collar					
Lecturers and Teachers	M69	0.573823			
	F69	0.372863			
	M74	0.275825			
	F74	0.162630			
Skilled White Collar	M69	0.386261	-0.119176		
	F69	0 422118	0.035878		
	M74	0.266824	-0.007055		
	F74	0.482937	0.275503		
Semi and Unskilled White Collar	M69	1.150815	0.366618	0.551522	
	F69	0.974672	0.438361	0.388543	
	M74	0.849163	0.449386	0.459684	
	F74	0.942303	0.670612	0.309767	
Skilled Blue Collar - Metal and Electrical	M69	1.114625	0.343623	0.525416	-0.016826
	F69	1.117720	0.542558	0.489131	0.072441
	M74	0.848246	0.448668	0.458960	-0.000496
	F74	0.825234	0.569918	0.230823	-0.060274
Skilled Blue Collar - Building	M69	1.266151	0.439902	0.634721	0.053624
	F69	1.002107	0.458345	0.407835	0.013893
	M74	1.006074	0.572375	0.583546	0.084856
	F74	1.350371	1.021599	0.584943	0.210095
Skilled Blue Collar - Other	M69	1.209697	0.404032	0.593998	0.027377
	F69	1.236903	0.629371	0.572938	0.132797
	M74	1.168746	0.699878	0.711955	0.172826
	F74	0.974028	0.697899	0.331160	0.016333
Semi and Unskilled Blue Collar	M69	1.433686	0.546353	0.755575	0.131518
	F69	1.445249	0.781132	0.719442	0.238306
	M74	1.046975	0.604433	0.615832	0.106974
	F74	1.286182	0.966389	0.541658	0.177047
Rural	M69	1.329423	0.480105	0.680363	0.083042
	F69	0.855519	0.351569	0.304757	-0.060341
	M74	0.990825	0.560422	0.571509	0.076609
	F74	1.019782	0.737253	0.362014	0.039890

The values in this table are based on working estimates supplied by the ABS for research purposes only. As such, the data need not conform to the usual standards of reliability set by the ABS in its publications and care should be taken in applying them to uses other than those for which they were intended.

$$W_{ij} = \frac{W_j - W_i}{W_i}$$ where W_i = the mean wage in occupation i

BY SEX, AUSTRALIA, 1968-69 AND 1973-74

O C C U P A T I O N

Skilled Blue Collar - Metal and Electrical	Skilled Blue Collar - Building	Skilled Blue Collar - Other	Semi and Unskilled Blue Collar	Rural
0.071656				
-0.054593				
0.085393				
0.287710				
0.044960	-0.024912			
0.056279	0.117275			
0.173407	0.081089			
0.081520	-0.160121			
0.150883	0.073930	0.101366		
0.154661	0.221338	0.093140		
0.107523	0.020388	-0.056148		
0.252543	-0.027310	0.158131		
0.101577	0.027920	0.054182	-0.042842	
-0.123813	-0.073217	-0.170497	-0.241174	
0.077143	-0.007601	-0.082038	-0.027430	
0.106588	-0.140654	0.023178	-0.116526	

SOURCE: unpublished data from ABS Income Distribution Surveys, 1968-69 and 1973-74, (Reference No. 17.17 and 17.6) Canberra, 1969 and 1974.

TABLE 10 : RELATIVE UNEMPLOYMENT BETWEEN

CURRENT

PREVIOUS OCCUPATION		Professional White Collar	Lecturers and Teachers	Skilled White Collar	Semi and Unskilled White Collar
Professional White Collar					
Lecturers and Teachers	M72	1.374661			
	F72	3.898980			
	M75	-0.513012			
	F75	-0.541648			
Skilled White Collar	M72	0.178281	-0.503811		
	F72	2.260515	-0.334450		
	M75	-0.820856	-0.632139		
	F75	-0.566795	-0.054864		
Semi and Unskilled White Collar	M72	-0.438225	-0.763430	-0.523225	
	F72	0.844495	-0.623494	-0.434293	
	M75	-0.873931	-0.741126	-0.296272	
	F75	-0.745884	-0.445588	-0.413406	
Skilled Blue Collar - Metal and Electrical	M72	-0.316831	-0.712309	-0.420199	0.216090
	F72	-0.591549	-0.916625	-0.874728	-0.778557
	M75	-0.863249	-0.719190	-0.236641	0.084736
	F75	-0.922234	-0.830336	-0.820487	-0.693975
Skilled Blue Collar - Building	M72	-0.441101	-0.764641	-0.525666	-0.005120
	F72	-0.634774	-0.925449	-0.887985	-0.801991
	M75	-0.935811	-0.868191	-0.641688	-0.490837
	F75	-0.947865	-0.886256	-0.879653	-0.794839
Skilled Blue Collar - Other	M72	-0.722499	-0.883141	-0.764486	-0.506028
	F72	-0.031180	-0.802241	-0.702863	-0.474751
	M75	-0.891079	-0.776337	-0.391991	-0.136017
	F75	-0.673462	-0.287582	-0.246228	0.284997
Semi and Unskilled Blue Collar	M72	-0.669840	-0.860966	-0.719795	-0.412292
	F72	0.304148	-0.733792	-0.600018	-0.292951
	M75	-0.932980	-0.862379	-0.625890	-0.468388
	F75	-0.740512	-0.433868	-0.401004	0.021141
Rural	M72	-0.393986	-0.744800	-0.485679	0.078749
	F72	0.584264	-0.676613	-0.514106	-0.141085
	M75	-0.912432	-0.820184	-0.511184	-0.305391
	F75	-0.665593	-0.270415	-0.228063	0.315963

The values in this table are based on working estimates supplied by the ABS for research purposes only. As such, the data need not conform to the usual standards of reliability set by the ABS in its publications and care should be taken in applying them to uses other than those for which they were intended.

$U_{ij} = \frac{U_j - U_i}{U_i}$ where U_i = the unemployment rate in occupation i .

OCCUPATIONS BY SEX, AUSTRALIA, 1972 AND 1975

O C C U P A T I O N

Skilled Blue Collar - Metal and Electrical	Skilled Blue Collar - Building	Skilled Blue Collar - Other	Semi and Unskilled Blue Collar	Rural
-0.181902 -0.105826 -0.530611 -0.329593				
-0.593803 1.371938 -0.203508 3.198993	-0.503486 1.652660 0.696870 5.263351			
-0.516723 2.192914 -0.509916 2.336788	-0.409267 2.570799 0.044091 3.977258	0.189760 0.346120 -0.384696 -0.205336		
-0.112936 2.878716 -0.359652 3.300181	0.084300 3.337766 0.364217 5.414285	1.183826 0.635252 -0.196039 0.024098	0.835518 0.214789 0.306608 0.288719	

SOURCE: unpublished data from ABS The Labour Force 1972 and 1975, (Reference No. 6.22) Canberra, 1974 and 1976.

TABLE 11 : RELATIVE WAGE OPPORTUNITY BETWEEN

CURRENT OCCUPATION

PREVIOUS OCCUPATION

Professional White Collar		Professional White Collar	Lecturers and Teachers	Skilled White Collar	Semi and Unskilled White Collar
Lecturers and Teachers	M69	0.951644			
	F69	0.194923			
	M74	0.990306			
	F74	0.296042			
Skilled White Collar	M69	0.481493	0.156809		
	F69	0.142936	0.628058		
	M74	0.485844	0.195352		
	F74	0.220654	0.592579		
Semi and Unskilled White Collar	M69	0.297404	0.182569	0.681990	
	F69	0.036003	0.184703	0.240062	
	M74	0.350116	0.244686	0.746116	
	F74	0.057256	0.170750	0.259481	
Skilled Blue Collar - Metal and Electrical	M69	0.266768	0.184950	0.664577	0.959468
	F69	0.667034	1	1	1
	M74	0.299419	0.233813	0.664056	0.899821
	F74	0.862519	1	1	1
Skilled Blue Collar - Building	M69	0.363263	0.342189	0.869134	1
	F69	1	1	1	1
	M74	0.395414	0.351424	0.878074	0.997021
	F74	1	1	1	1
Skilled Blue Collar - Other	M69	0.856458	0.779875	1	1
	F69	0.364954	0.887890	1	1
	M74	0.520121	0.493568	0.998335	1
	F74	0.538176	0.983664	1	1
Semi and Unskilled Blue Collar	M69	0.144394	0.096702	0.352126	0.516242
	F69	0.057249	0.245474	0.366382	1
	M74	0.180972	0.128850	0.403436	0.517723
	F74	0.087154	0.209866	0.407105	1
Rural	M69	0.516798	0.267864	0.807946	0.782418
	F69	0.326752	0.781980	0.890739	0.957697
	M74	0.563534	0.416340	0.813423	0.875201
	F74	0.634179	0.866181	1	1

O_{ij} = income - persons overlap between occupations i and j .

OCCUPATIONS BY SEX, AUSTRALIA, 1968-69 AND 1973-74

O C C U P A T I O N

Skilled Blue Collar - Metal and Electrical	Skilled Blue Collar - Building	Skilled Blue Collar - Other	Semi and Unskilled Blue Collar	Rural
1 0.783784 1 1				
1 0.219708 1 0.330391	1 0.067937 1 0.036018			
0.518401 0.023674 0.549540 0.032946	0.229293 0.007320 0.226226 0.003291	0.051120 0.104687 0.087296 0.091374		
0.720825 0.136807 0.854266 0.250458	0.546265 0.042303 0.608227 0.025019	0.141602 0.553153 0.282655 0.564429	0.836507 0.799127 0.889768 0.876737	

SOURCE: unpublished data from ABS Income Distribution Surveys, 1968-69 and 1973-74, (Reference No. 17.17 and 17.6) Canberra, 1969 and 1974.

TABLE 12 : RELATIVE SOCIO-ECONOMIC INDEX BETWEEN OCCUPATIONS, AUSTRALIA, 1969.

PREVIOUS OCCUPATION	CURRENT: Professional White Collar	Lecturers and Teachers	Skilled White Collar	Semi and Unskilled White Collar
Professional White Collar				
Lecturers and Teachers	-0.315220 0			
Skilled White Collar	-0.403570 1	-0.129021 3		
Semi and Unskilled White Collar	-0.567952 3	-0.369070 3	-0.275609 3	
Skilled Blue Collar - Metal and Electrical	-0.539861 3	-0.328048 3	-0.228510 3	0.065018 0
Skilled Blue Collar - Building	-0.553008 3	-0.347248 3	-0.250554 3	0.034588 0
Skilled Blue Collar - Other	-0.610958 3	-0.431874 3	-0.347716 3	-0.099541 0
Semi and Unskilled Blue Collar	-0.614062 3	-0.436405 3	-0.352919 3	-0.106724 1
Rural	-0.472607 3	-0.229837 3	-0.115750 3	0.220680 0

$S_{ij} = \frac{S_j - S_i}{S_i}$ where S_i = socio-economic index for occupation i.

Y_i = years of training required for occupation i.

YEARS OF TRAINING REQUIRED FOR EACH OCCUPATION, AUSTRALIA, 1976

O C C U P A T I O N

Skilled Blue Collar - Metal and Electrical	Skilled Blue Collar - Building	Skilled Blue Collar - Other	Semi and Unskilled Blue Collar	Rural
-0.028572 5				
-0.154513 5	-0.129645 5			
-0.161257 5	-0.136588 5	-0.007977 5		
0.146159 5	0.179870 5	0.355620 5	0.366520 0	

SOURCES: S_{ij} : McIntosh, M.K. and Granek, C.B. A Socio-Economic Index for Occupations, Research Memorandum, BACHUROO Module, December 1976, (mimeo), pp.17.

Y_i : Naphtali, J.A. unpublished work.

TABLE 13 : RELATIVE 'TO-RURAL'SECTOR' AND 'FROM-RURAL-SECTOR'

PREVIOUS OCCUPATION		CURRENT: Professional White Collar	Lecturers and Teachers	Skilled White Collar	Semi and Unskilled White Collar
Professional White Collar					
Lecturers and Teachers	M				
	F				
	M				
	F				
Skilled White Collar	M				
	F				
	M				
	F				
Semi and Unskilled White Collar	M				
	F				
	M				
	F				
Skilled Blue Collar - Metal and Electrical	M				
	F				
	M				
	F				
Skilled Blue Collar - Building	M				
	F				
	M				
	F				
Skilled Blue Collar - Other	M				
	F				
	M				
	F				
Semi and Unskilled Blue Collar	M				
	F				
	M				
	F				
Rural	M	0	0	1	0
	F	1	0	0	0
	M	0	1	0	1
	F	0	0	1	0

$$TR_{ij} = \begin{cases} 1 & \text{if } m_{ij} < 0, \quad i = 9 \\ 0 & \text{otherwise} \end{cases}$$

$$FR_{ij} = \begin{cases} 1 & \text{if } m_{ij} > 0, \quad i = 9 \\ 0 & \text{otherwise} \end{cases}$$

DUMMY VARIABLES BY SEX, AUSTRALIA, NOVEMBER 1972

O C C U P A T I O N

Skilled Blue Collar - Metal and Electrical	Skilled Blue Collar - Building	Skilled Blue Collar - Other	Semi and Unskilled Blue Collar	Rural
0	0	0	0	
0	1	1	1	
0	0	0	1	
0	0	0	0	

SOURCE: Net Mobility Rates, Table 7, Appendix 2 of this paper.

TABLE 14 : RELATIVE 'TO-RURAL-SECTOR' AND 'FROM-RURAL-SECTOR'

PREVIOUS OCCUPATION		CURRENT: Professional White Collar	Lecturers and Teachers	Skilled White Collar	Semi and Unskilled White Collar
Professional White Collar					
Lecturers and Teachers	M				
	F				
	M				
	F				
Skilled White Collar	M				
	F				
	M				
	F				
Semi and Unskilled White Collar	M				
	F				
	M				
	F				
Skilled Blue Collar - Metal and Electrical	M				
	F				
	M				
	F				
Skilled Blue Collar - Building	M				
	F				
	M				
	F				
Skilled Blue Collar - Other	M				
	F				
	M				
	F				
Semi and Unskilled Blue Collar	M				
	F				
	M				
	F				
Rural	M	0	0	1	0
	F	1	0	0	1
	M	0	1	1	0
	F	0	0	0	1

$$TR_{ij} = \begin{cases} 1 & \text{if } m_{ij} < 0, \quad i = 9 \\ 0 & \text{otherwise} \end{cases}$$

$$FR_{ij} = \begin{cases} 1 & \text{if } m_{ij} > 0, \quad i = 9 \\ 0 & \text{otherwise} \end{cases}$$

DUMMY VARIABLES BY SEX, AUSTRALIA, DECEMBER 1975

O C C U P A T I O N

Skilled Blue Collar - Metal and Electrical	Skilled Blue Collar - Building	Skilled Blue Collar - Other	Semi and Unskilled Blue Collar	Rural
0	0	1	0	
1	1	0	1	
0	0	1	0	
0	0	0	1	

SOURCE: Net Mobility Rates, Table 8, Appendix 2 of this paper.

To derive the net mobility rate series required for the empirical analysis, the net figures were divided by the number in the labour force in the appropriate occupation. Given that we are investigating movement that occurred over a period of time, the relevant labour force numbers should be those at the mid-point of the time period concerned. Estimates of the occupational distribution of the labour force are available for May 1972 from the Labour Force 1972 (Reference No. 6.22) results. However, at the time of writing this paper, the corresponding estimates for 1975 were not available, so mobility rates are defined as a proportion of the occupational distribution of the work force at December 1975, as estimated from Labour Mobility, February 1976 (Reference No. 6.43).

Sources of all exogenous variables used appear at the foot of each table.