No. **622**

DO BORDERS MATTER? A MODEL OF INTERREGIONAL MIGRATION IN AUSTRALASIA

by

JACQUES POOT

March 1995

THE UNIVERSITY OF TSUKUBA
Institute of Socio-Economic Planning
Tsukuba, Ibaraki 305, Japan

DO BORDERS MATTER? A MODEL OF INTERREGIONAL MIGRATION IN AUSTRALASIA

JACQUES POOT

16 March 1995

Tel. +81 298 535553; Fax +81 298 553849; E-mail poot@sakura.cc.tsukuba.ac.jp

Do Borders Matter? A Model of Interregional Migration in Australasia[1]

Jacques Poot
University of Tsukuba

This paper builds on extensive recent research on trans-Tasman migration, published in Carmichael (1993). Trans-Tasman migration is embedded in a matrix of gross interregional migration in Australasia. It is found that the largely free trans-Tasman movement fits in well, in a descriptive sense, in the patterns of interregional migration. There is a common labour market in that both trans-Tasman and intra-Australian migration flows respond to interregional differences in income and employment opportunities. However, there are statistically significant differences in coefficients of migration determinants between intra-Australian flows and trans-Tasman flows. Hence, borders do matter and trans-Tasman migration is not internal migration in an econometric sense. It is argued that these border effects are related, among other factors, to differences in tax and public expenditure policies between the two countries.

1 An earlier version of this paper was presented at the 17th Annual ANZRSA Conference at the University of New England, Armidale, 6-8 December 1993. Research for the paper was supported by Victoria University Research Grant RGNT/594/202 and by the Institute of Socio-Economic Planning of the University of Tsukuba. I would like to thank Vincenzo Cassino for research assistance, Martin Bell of the University of Queensland for supplying unpublished information on internal migration and Dan Hamermesh of the University of Texas for helpful suggestions.

Do Borders Matter? A Model of Interregional Migration in Australasia

INTRODUCTION

International migration is receiving increasing attention throughout the world. Following the end of the Cold War and the reinstatement of the freedom to leave in former East Block countries, Western European countries find themselves now as reluctant hosts of many new settlers. High unemployment in developing countries has generated temporary worker migration to high income countries in the Middle East and Asia. Furthermore, migration is also resulting from increasing economic integration (e.g. NAFTA, European Union, CER). Finally, civil wars and political upheaval are leading to growing numbers of refugees. In total, the estimated number of persons living outside their country of birth is about 100 million, of which 20 million are refugees (Castles and Miller, 1993, p.4).

Within these global trends, the movement of people between Australia and New Zealand may seem rather insignificant. However, trans-Tasman migration provides an interesting experiment for study of the migratory impact of economic integration and the removal of restrictions on international labour mobility. Under the Trans-Tasman Travel Agreement, citizens of Australia and New Zealand can settle freely in both countries. New Zealand even exempts other permanent residents of Australia from visa requirements. Given that both countries also share a common language, a similar legal system, and have strong historical and cultural ties, it is not surprising that trans-Tasman migration has been considered no different from the movement of people within either country (Brosnan and Poot, 1987a; McNicoll, 1993).

At the level of total population redistribution, Hicks' (1932) observation that "differences in net economic advantage" are the main cause of migration provides a good explanation for the long-term population "drifts" to Queensland and Western Australia within Australia, to the northern half of the North Island in New Zealand, but also to Australia from New Zealand. In all three cases, the net movement is towards regions with faster long-run economic growth.

This casual observation has been formally tested with models of internal migration in Australia (Langley, 1984); New Zealand (Poot, 1986) and trans-Tasman migration (Brosnan and Poot, 1987b). In all three cases, the impact of income on population flows is statistically significant and leads to a net movement, on average, from low to high income regions. There are of course also other important determinants of migration flows, such as population composition, regional characteristics and migration costs, but the determinants featuring in studies of internal and trans-Tasman migration are again largely the same. Apparently, therefore, there is no difference between the factors which lead to a household migrating from, say, South Australia to Queensland and a move from New Zealand to Queensland.

There are some opposing views. For example, Carmichael (1993) states that "whether New Zealanders look to Australia and Australians to New Zealand for work in quite the way that Australians look interstate, is doubtful" (p.334). Moreover, the Economic Monitoring Group (1986) rejects the notion of a "common labour market" for Australia and New Zealand, if such a market has the feature of generating equality of earnings for persons with comparable qualifications and experience. Since average real earnings have been persistently higher in Australia since the early 1970s, there is no common labour market in this sense.[2] However, Brosnan and Poot (1987a) note that a weaker definition of a common market is one with free access, even with persistent wage differences, as long as net migration is at least in the direction of the regions with higher wages. Given the "drift west" noted above, trans-Tasman migration fits in with this weaker concept of the common market.

This paper provides a more formal test of both propositions, i.e. that the migration is internal and that it takes place in a common labour market. A matrix is constructed of 1981-86 migration flows between regions of Australasia. Next, the flows are explained by means of a conventional regression model of gross interregional migration. Many different regression models have been estimated in the literature and this paper does not purport to provide yet another alternative specification. Instead, a fairly common single-equation specification is used and the focus is on the role of the trans-Tasman flows in this model. It is found that a simple gravity-type model already fits the data quite well. This confirms that trans-Tasman migration fits in well, in a descriptive sense at least, in the internal migration patterns in Australasia. Moreover, in a model with economic variables, migration is positively related to a real income differential between regions. Hence, there is a common labour market in the weaker sense defined above. However, a test of parameter constancy shows that there is a significant difference between intra-Australian and trans-Tasman migration. Thus, if we define an internal migration system in an econometric sense as one in which the best possibly specified model has identical coefficients for all regions, trans-Tasman migration is not internal migration. A range of reasons are put forward. These include trans-Tasman differences in taxation and public expenditure policies.

The next section provides a brief discussion of interregional migration in Australasia. Section 3 outlines a popular theory of labour migration, which has guided the model specification. The results are discussed and interpreted in section 4. The final section draws conclusions and suggests avenues for further work.

---

[2] It is unlikely that the difference in average real earnings, as computed by Brosnan and Poot (1987a), is entirely due to composition effects. For example, rates of return to education are higher in Australia (see Poot, 1993).

2. MIGRATION IN AUSTRALASIA

The number of New Zealanders and Australians who make long-distance moves within their country is not insignificant. This point can be well illustrated by means of 1986 census data. Of the 1981 population of Australia, 5.7 percent had moved to their 1986 residence from a different State or Territory. In New Zealand, about 9.4 percent had moved between Statistical Areas and 2.4 percent moved between the North Island and South Island between 1981 and 1986.

However, there is also a considerable population movement between the two countries. Among 1986 residents of Australia, there were 70,591 persons who lived in New Zealand in 1981. Hence, 2.2 percent of the 1981 New Zealand population ended up in Australia in 1986. In contrast, only 0.3 percent of the 1981 population resident in Australia lived in New Zealand five years later. The difference is not just due to the Australian population being about five times the size of the New Zealand population, there was also a net 1981-86 movement from New Zealand to Australia of 28,468 persons. Trans-Tasman migration is primarily a New Zealand phenomenon: about two thirds of the migrants from Australia to New Zealand are New Zealand-born persons returning home (Carmichael, 1993, p.328). Australian-born migrants, when they are not partners or children of New Zealanders, are primarily transferees of multinational firms, contract workers and persons on working holidays, rather than new long-term or permanent settlers (Poot, 1993).

The net redistribution from New Zealand to Australia has been a noticeable feature of recent decades. It has led to the New Zealanders becoming a population group of increasing numerical importance in Australia. By 1991, 264,094 New Zealand born persons were resident of Australia and an additional 167,249 were second generation New Zealanders (i.e. they had one or both parents born in New Zealand). Hence, about 11.1 percent of the New Zealand population of Australasia lived in Australia in 1991. This percentage would not have changed much since then.

The characteristics, causes and consequences of this trans-Tasman migration have now been studied extensively, most recently in the study sponsored by the Australian Bureau of Immigration and Population Research and the New Zealand Immigration Service. A wealth of detail can be found in the resulting report edited by Carmichael (1993). Guest (1993) discusses in Chapter 7 of this report the distribution and mobility of the New Zealand born in Australia. He finds, for example, that the New Zealand born are more mobile than their Australian born counterparts, primarily due to differences in age structure and average migratory experience. However, the patterns of gross interregional migration in Australasia have not yet received much attention, except for a brief descriptive discussion in chapter 9 of the Carmichael report (Poot, 1993).

In addition to the net trans-Tasman migration to Australia, there are also significant imbalances in migration between the States and Territories in Australia. Given the role of economic factors confirmed by many migration studies (see the surveys by Greenwood, 1985; Shields and Shields, 1989), it appears plausible that such imbalances are, inter alia, associated with a growing interregional income disparity in Australia. Recent studies have found that regional disparities in household disposable income have widened (EPAC, 1991; Maxwell and Hite, 1993). Table 1, replicated from Poot (1993), shows net interstate migration in Australia for June years 1982-89 and puts trans-Tasman net migration alongside.[3] In the remainder of the paper, the Australian States and Territories, and New Zealand, will be referred to as the nine regions of Australasia. The table shows that there are pronounced imbalances in net interregional migration in Australasia.

Table 1 about here

Table 1 shows clearly that Queensland, Western Australia and the Australian Capital Territory have persistently gained population through internal migration. It can be shown that these are also the regions (with Northern Territory) which increased their share of Gross Domestic Product, i.e. which have grown faster than the other regions (see EPAC, 1991). New Zealand shares the experience of persisting net outflows with New South Wales and Victoria, but in most years New Zealand has had the greatest net outflow. Net migration in Victoria, Tasmania and New Zealand are rather correlated over time, with the lowest levels of net outflow occurring in the mid 1980s. The similarity in net internal migration between New Zealand and Victoria is particularly interesting. Victoria has traditionally been Australia's State with the largest share of manufacturing employment, although it has now been overtaken in this respect by New South Wales. Low productivity and the removal of subsidies and trade barriers led in both countries to a loss of manufacturing jobs, although this loss has, until now, been much more dramatic in New Zealand than in Australia (Willis, 1993). However, the loss of manufacturing jobs in Australia has been most strongly felt in Victoria.

A demographic stock-flow accounting system for the period 1981-86 is given in Table 2. Rows refer to the "destinations" of the 1981 regional populations, while along columns we read the "origins" of the 1986 regional populations. The table was constructed by pooling the 1981 and 1986 census data of both countries with the external migration statistics. The compilation of this table exploited the fact that the population census in Australia and New Zealand is taken in the same years, and only about three months apart.

Table 2 about here

[3] The net gain through immigration from New Zealand is based on arrival and departure statistics and has been apportioned in Table 1 over the receiving states on the basis of the interregional migration matrix in Table 2. Hence the total across rows is zero in each year (except for a rounding effect).

The table shows, for example, that the population usually resident in New South Wales in 1986 was 5,380,516. Table 2 shows that of these persons, 407,388 were not yet born at the time of the 1981 census; 104,436 did not state the location of their 1981 residence; 24,869 migrated from New Zealand; and 179,004 migrated from elsewhere in the world. By comparison, adding over the other regions, it can be easily seen that 166,998 persons migrated to New South Wales from elsewhere in Australia.

The net internal migration flows which can be computed from Table 2 are in the bottom row and show again that Queensland, Western Australia and the two Territories gained population through internal migration, while the other regions, including New Zealand, experienced a net outflow. Table 2 also permits a region by region comparison. For example, 52,189 persons migrated from Queensland to New South Wales between 1981 and 1986. The reverse flow was 103,119, resulting in a net gain of 50,930 for Queensland. All regions experienced a net gain in population exchange with New Zealand, with the greatest net inflows going into New South Wales and Queensland.

Since the table provides a complete description of 1981-86 flows for persons resident in Australasia in 1981, migration "transition probabilities" can be computed.[4] These are reported in Table 3. Several conclusions emerge. First, the interregional mobility rate of New Zealanders is lower than of residents of the regions of Australia: 90.50 percent of New Zealanders stayed within New Zealand over 1981-86, as compared with 88.32 percent of those in New South Wales and less than 75 percent for the highly mobile populations of the Australian Capital Territory and the Northern Territory. The lower mobility of New Zealanders demonstrates the presence of barriers to migration, despite the freedom of movement between the two countries. The separation from the Australian continent by water is unlikely to be the most significant barrier: Table 3 shows that the "stayer" probability in Tasmania is less, rather than more, than in the eastern States of the continent. Alternative reasons for the lower mobility are put forward in section four.

Generally, the probability that a New Zealander migrates to a region of Australia is greater than the probability of movement in the opposite direction. The exceptions are South Australia and Western Australia. Table 3 also reports "absorption probabilities" in the one but last column. These are the sum of crude death and emigration rates. While a split between these two at state level was not possible with the available information, Table 2 can be used to illustrate that "Australia matters more to New Zealand than vice versa". The probability that a New Zealand resident moved to Australia between 1981 and 1986 was 2.24 percent, but the probability that an Australian resident moved to New Zealand was only 0.29 percent. Using additional information on total emigration, it can

---

[4] While these probabilities may be interpreted as describing a Markov process of interregional mobility, such probabilities do tend to change over time (Poot, 1984) and this renders the Markov chain interpretation as less useful.

be shown that New Zealanders also had a greater probability to move outside Australasia, 2.05 percent versus 1.52 percent respectively.

Table 3 about here

3. THEORETICAL CONSIDERATIONS

During the last three decades, migration has been a fertile field for social science research. While migration may result from life cycle-related, social, political and other factors, economic research has demonstrated the importance of the labour market in migration processes. Sjaastad (1962) was the first to point out that, from the worker's point of view, migration is an investment. People consider from time to time the income gain and other benefits with may result from a move and compare such benefits with pecuniary and non-pecuniary costs of the move. A household would be expected to make a move when the present value of the benefits exceeds the costs and when there are no institutional or other barriers to migration (see also Molho, 1986; Brosnan and Poot, 1987a). Moreover, such migration of human capital to where it is most productive and receives the highest reward, may increase welfare overall.

While research during the 1960s and 1970s was primarily concerned with finding the correlates of aggregate gross internal migration flows and mobility rates (see e.g. the surveys by Greenwood, 1975 and Shaw, 1975), many further insights were obtained by micro-level studies of survey data (reviewed by, for example, Greenwood, 1985). During the last decade, the focus of research shifted to international migration (Greenwood and McDowell, 1986; Borjas, 1987). Nonetheless, the role of income and employment opportunities has remained the dominant theme as is clear, for example, from the analysis of East-West migration by Layard et al. (1992). Hence, we shall follow this tradition here also and specify a model of interregional migration in Australasia based on a microeconomic theory of labour migration formulated by Borjas (1987, 1989). However, because the observations on Australasian migration are limited to aggregate flows, the micro theory cannot be formally tested here but is used simply to provide guidance about the specification of the regression equations.

Some notation will be helpful. It is assumed that there are R regions, indexed by r,s=1,2,...,R. The size of the total labour force in region r is L_r and each worker in region r is indexed by n_r =1,2,...,L_r. It is further assumed, following the standard neoclassical model of human capital, that the earnings of a person in any region will be a function of observable characteristics such as education and age. There are K such human capital characteristics indexed by k=1,2,...,K. The value of the kth human capital characteristic of person n_r is denoted by $X^k_{n_r}$. Again, using the standard neoclassical earnings function approach, the earnings of a resident n_r in region r (r=1,2,...,R) can be explained by

$$\ln(w_{n_r r}) = \sum_{k=1}^{K} x_{n_r}^k \delta_{kr} + \varepsilon_{n_r r} \qquad n_r = 1,2,\ldots,L_r \quad r = 1,2,\ldots,R \tag{1}$$

where $w_{n_r r}$ is the actual level of earnings of individual n_r, δ_{kr} the rate of return to a unit of human capital attribute k in region r, and $\varepsilon_{n_r r}$ the n_r th realisation of the random variable ε_r. The latter is introduced to account for unobserved ability, luck, or perhaps certain demand factors in specific labour markets. It is assumed to be normally distributed with zero mean (so that earnings have the commonly observed log-normal distribution) and variance σ_r^2. Across regions, the random variables ε_r and ε_s have correlation coefficient ρ_{rs}. When ρ_{rs} is high, unobserved ability is valued similarly in both regions.

What would induce a person to migrate? Let us first consider the simplest case in which one particular individual n_r in region r obtains one job offer from a firm in region s. The pay offered is

$$\ln(w_{n_r s}) = \sum_{k=1}^{K} x_{n_r}^k \delta_{ks} + \varepsilon_{n_r s} \tag{2}$$

Following the conventional economic theory of migration, the decision to migrate will be based on the comparison of $w_{n_r r}$ and $w_{n_r s}$.[5] It should be noted that when there are price differences between regions, the relevant comparison of $w_{n_r r}$ and $w_{n_r s}$ requires a conversion of wages into purchasing power terms. Assuming such an adjustment has been made, an individual n_r in r who receives a job offer with wage $w_{n_r s}$ from a firm in s, will decide to migrate when $w_{n_r s} > w_{n_r r} + C_{n_r}^{rs}$ where $C_{n_r}^{rs}$ is person n_r's cost per period of migration from r to s. This is the sum of the annuitised cost of relocation (removal cost, real estate transaction costs, etc.) plus the net psychic cost of the move (e.g. the cost of leaving behind relatives and friends) per period evaluated at the appropriate shadow price.[6] Hence, the probability that person n_r migrates from r to s, given this specific job offer from a firm in s is therefore

$$\begin{aligned} p_{n_r}^{rs} &= \Pr ob(w_{n_r s} > w_{n_r r} + C_{n_r}^{rs}) \\ &= \Pr ob(\log\left(\frac{w_{n_r s}}{w_{n_r r} + C_{n_r}^{rs}}\right) > 0) \\ &= \Pr ob(\log\left(\frac{\dfrac{w_{n_r s}}{w_{n_r r}}}{1+\dfrac{C_{n_r}^{rs}}{w_{n_r r}}}\right) > 0) \end{aligned}$$

---

[5] In practice, migration is often a family decision. This creates complications which are not considered here, but see Mincer (1978).

[6] Annuitising lump-sum costs obviously creates a role for the interest rate in the decision making, but possible interregional variations in real interest rates are ignored in the model.

$$\approx \Pr ob(\varepsilon_{n,s} - \varepsilon_{n,r} > -\sum_{k=1}^{K} X_{n,r}^{k}(\delta_{ks} - \delta_{kr}) + \pi_{n_r}^{rs}) \tag{3}$$

where $\pi_{n_r}^{rs} = \frac{C_{n_r}^{rs}}{w_{n,r}}$ is a time-equivalent measure of the cost of migration. It follows from (3) and the assumptions about the random variables ε_r and ε_s that

$$p_{n_r}^{rs} \approx 1 - \Phi(z_{n_r}^{rs}) \tag{4}$$

where $\Phi(.)$ is the cumulative distribution of a standard normal random variable, $z_{n_r}^{rs} = \frac{-\sum_{k=1}^{K} X_{n,r}^{k}(\delta_{ks} - \delta_{kr}) + \pi_{n_r}^{rs}}{\sigma_{rs}}$ and σ_{rs} is the standard deviation of $\varepsilon_s - \varepsilon_r$. Using (1) and (2), we can replace (4) by

$$p_{n_r}^{rs} \approx 1 - \Phi\left(\frac{E(\ln \frac{w_{n,r}}{w_{n,s}}) + \pi_{n_r}^{rs}}{\sigma_{rs}}\right) \tag{5}$$

where $E(.)$ refers to the expected value. Equation (5) suggests a number of factors which are likely to influence the *aggregate* migration flow per period from r to s, which we shall denote by M_{rs} (r,s=1,2,...,R).

First, we see from (5) that the probability of migration from r to s is positively related to the expected rate of increase in earnings $E(\ln \frac{w_{n,s}}{w_{n,r}})$. Consequently, at the aggregate level the hypothesis is that $\frac{\partial \ln M_{rs}}{\partial \ln \frac{\overline{w}_s}{\overline{w}_r}} > 0$, where $\overline{w}_r$ and $\overline{w}_s$ refer to median income in regions r and s respectively.[7]

Second, the probability of migration from r to s increases when the time-equivalent cost of migration $\pi_{n_r}^{rs}$ decreases. Hence, it is expected at the aggregate level that $\frac{\partial \ln M_{rs}}{\partial \ln \overline{\pi}^{rs}} < 0$, where $\overline{\pi}^{rs}$ is the average time-equivalent cost of migration for people moving from r to s. It will be assumed that this cost is proportional to the distance between the largest cities of the respective regions.

Third, (5) refers to one specific job offer only. The actual probability of migration will depend on the comparison of the current wage $w_{n,r}$ with *any* job offers received in *any* of the regions s=1,2,...,R, including the region r in which the worker currently resides. It is plausible that the probability of a particular job offer coming from s rather

[7] The use of medians was preferred to the use of means because only grouped data were available and the latter are sensitive to the choice of estimated endpoints in the distribution.

than r is some function of L_r and L_s, say $\gamma\left(\frac{L_s}{L_r}\right)^{\alpha}$ where γ is a proportionality constant which depends, for example, on the intensity of the search for jobs. The larger the local labour market L_r, the more likely the best job offer will be a local one and the lower the probability of migration, while the larger the labour market L_s, the more likely that the best offer comes from s and the higher the probability of migration. Given that probabilities are restricted to lie between zero and one and that there can be large differences in the sizes of the labour markets, it is expected that $0<\alpha<1$. On the other hand, the number of migrants from r to s is for a *given* probability of migration proportional to the number of persons at risk, L_r. Together, this implies that $\frac{\partial \ln M_{rs}}{\partial \ln L_r} = -\alpha + 1$; or $0 < \frac{\partial \ln M_{rs}}{\partial \ln L_r} < 1$ and $\frac{\partial \ln M_{rs}}{\partial \ln L_r} + \frac{\partial \ln M_{rs}}{\partial \ln L_s} = 1$.
In conclusion, the equilibrium migration flows are positively related to the respective sizes of the labour forces and inversely related to the cost of moving between the two. This is the gravity property of gross migration flows. Because of the other factors influencing labour migration, such as the earnings differential, and because the labour migration model simplifies the more complex real world migration processes, the gravity property does not hold exactly. However, empirical evidence for this property dates back as far as Ravenstein (1889) and is remarkably consistent with observed gross internal migration patterns.

Fourth, migration flows are often measured over fairly long periods of time, such as five years in Table 2. Over such a period, the potential number of job offers is likely to be positively related to employment growth in the destination region and negatively related to employment growth in the source region. Hence, it is expected that $\frac{\partial \ln M_{rs}}{\partial \ln E_r} < 0$ and $\frac{\partial \ln M_{rs}}{\partial \ln E_s} > 0$, where $E_{r(s)} = \frac{L_{r(s)}(t+1)}{L_{r(s)}(t)}$.

Finally, a fifth factor to consider is that the number and origins of job offers which a worker in r will receive is not just a function of the scale of labour market r relative to the others, but it is also a function of the tightness of the various labour markets. The quantity of wage offers would depend on the degree of disequilibrium in the regional labour markets. This will be proxied by the rate of unemployment.[8] Hence, we expect that $\frac{\partial \ln M_{rs}}{\partial \ln U_r} > 0$ and $\frac{\partial \ln M_{rs}}{\partial \ln U_s} < 0$, where U_r and U_s are the rates of unemployment in regions r and s respectively.

In summary, the following regression model for M_{rs} results:

$$M_{rs} = f\left(\frac{\overline{W}_s}{\overline{W}_r}, \overline{\pi}^{rs}, L_r, L_s, E_r, E_s, U_r, U_s\right) \qquad (6)$$

[8] It may have theoretically attractive to take data on job vacancies into account as well, but suitable data were not available.

which, given the multiplicative nature of the gravity and other spatial allocation models, will be estimated in log-linear form.[9] The discussion above about the frequency and distribution of job offers suggests that the model must be estimated under the restriction that the coefficients of L_r and L_s add to one.

The model of equation (6) is somewhat restrictive in that migration flows between pairs of regions are explained only by conditions in these two regions and are therefore not affected by changes in labour market conditions in other regions. It is more plausible that, for example, when labour demand grows rapidly in a particular region t, migration between regions r and s declines due to the increase in region t's relative "attractiveness". Various system approaches have been proposed to take such system effects into account. Examples are the multinomial logit model of Poot (1984), the demand system approach of Greenwood and Hunt (1984) and the econometric procedures to estimate Alonso's (1978) systemic model of movements developed by Porell and Hua (1981) and Poot (1986). The disadvantage of these methods is that they are computationally rather burdensome. Moreover, these refinements are not essential for the main objective of the present paper, which is to identify statistical differences in the trans-Tasman and intra-Australian flows.

4. REGRESSION MODELS

The discussion of the previous section leads to the specification of the regression model for M_{rs}, the gross migration flow from region r to region s. These flows are given in Table 2. Since there are nine regions, there are 72 interregional flows and, hence, 72 observations for the model. Data sources for M_{rs} and the explanatory variables are listed in the Appendix.

Average regional wages were proxied by regional income as measured by the population census. The variable $\frac{\overline{W}_s}{\overline{W}_r}$ refers to the ratio of median income of males in the origin and destination regions respectively.[10] Median income in New Zealand was converted into purchasing power equivalent Australian dollars, using a conversion factor computed by Brosnan and Poot (1987b). However, it was not possible to correct for inter-state differences in price levels.

The cost of migration $\overline{\pi}^{rs}$ is proxied by the distance between the largest cities of the regions. While the travel and household removal costs are obviously correlated with these distances, the distance variable also proxies the psychic cost of separation from family and friends, the cost of return visits and the cost of gathering information about opportunities in potential destinations. However, in a study of inter-urban migration in

[9] Given the significant differences in the population sizes of the regions, the log-linear form also reduces the likelihood of heteroscedasticity in the error term.

[10] If there is significant interregional variation in hours worked, it is likely that female incomes are more affected than male incomes. Hence, male income was considered a better proxy of the average wage.

New Zealand, Poot (1986) found that Cook Strait, which separates the North and South Islands, acted as an additional geographical barrier. A dummy variable for inter-island migration was statistically significant. Hence, a dummy variable D^{rs} is defined here similarly. It has the value of one for migration from and to Tasmania and New Zealand, and zero otherwise.

Existing job opportunities are proxied by the size of the population of the region of origin and destination, L_r and L_s respectively. The variables E_r and E_s measure actual employment growth over the 1981 to 1986 period in the regions. Additionally, competition for the available jobs is measured by the variables U_r and U_s, which are the regional unemployment rates.

Generally, variables measuring conditions in the origin are based on 1981 census data, while those measuring conditions in the destination are based on 1986 data. Hence we are assuming that workers are on average correctly forecasting the post-migration conditions in the destination.

As noted in the previous section, the model is estimated in log-linear form so that natural logarithms were taken of all variables, except for the dummy variable. The restriction that the coefficients of L_r and L_s sum to one was tested with a standard F test and the model was estimated with Restricted Least Squares (RLS) where there restriction was accepted and Ordinary Least Squares (OLS) otherwise. Regression models are reported in Table 4. Column 1 reports the coefficients of a simple gravity model. While this model provides little information about what causes interregional migration, it does support the search-type theory of labour migration discussed in the previous section.

The hypothesis that the coefficients of L_r and L_s add to one was accepted with an F statistic of 0.492 (with 1 and 67 degrees of freedom). Thus, the model is homogeneous of degree one: a doubling of all populations leads roughly to a doubling of all gross migration flows, so that the probability of migration from any region is not affected by the overall scale of population, *ceteris paribus*. In addition to the significantly negative effect of the distance variable $\overline{\pi}^{rs}$, the island dummy D^{rs} also signifies that geographical barriers create an impediment to migration. The fit of this very simple model is quite good (R^2 = 0.804), although this can be deceptive in a log-linear model (Poot, 1986).

Table 4 about here

Column 2 shows the gravity model extended with the economic variables. The effect of the potential income gain $\overline{w}_s/\overline{w}_r$ is, as expected, positive, although not statistically significant at the conventional levels. We shall see below that this is due to the specification error of treating flows from and to New Zealand the same as all other flows. Once New Zealand-specific parameters are introduced, the income ratio variable becomes significant.

The population and migration costs variables in column (2) continue to be significant at the 1 percent level. Since the hypothesis that the coefficients of L_r and L_s add to one could again not be rejected (with an F statistic of 0.178), the reported coefficients were estimated with RLS. The coefficients which measure the impact of employment growth in the origin and destination, E_r and E_s respectively, have the expected sign and are statistically significant at the 5 percent level or better.

The unemployment rates U_r and U_s are significant at the 1 percent level but have the opposite signs from what was expected. It is interesting to note that in a time-series model of trans-Tasman migration it was also found that higher unemployment rates acted as impediments to outward migration rather than as push factors (Brosnan and Poot, 1987b). The finding is also consistent with the observation by Pissarides and Wadsworth (1989) that voluntary quits decline in a slack labour market so that overall geographic mobility is inversely related with the unemployment rate. The migration towards regions with relatively high unemployment rates, *ceteris paribus*, is rather surprising. However, the data show that high unemployment rates are not necessarily inconsistent with rapid growth: Queensland and Northern Territory had rapid population and employment growth over the 1981-86 period, but also high 1986 unemployment rates. Greenwood (1985) and Fields (1979) both note the problems with the role of unemployment rates in aggregate migration models. They suggest that labour turnover data - such as layoff rates, quit rates and unemployment duration - may be better measures, when available, of labour market conditions.

Equation (2) has a higher R^2 than equation (1), and the standard error of the equation drops from 0.560 to 0.471, while the log likelihood increases from -58.398 to -43.086. It should be noted that while there is potentially a problem of simultaneity in this type of regression model, there is at the macro level a much stronger Granger-causality from economic conditions to migration than vice-versa (see e.g. Junankar and Pope, 1990; Poot, 1986) and, hence, it was not considered necessary to adopt an instrumental variables approach.

As noted in the introduction, the central question of the present paper is the role of trans-Tasman migration in the overall interregional migration patterns. There are two ways in which this migration can affect the econometric model. The first is that there are relevant omitted variables affecting migration flows which have a constant value across the regions of Australia, but a different value in New Zealand. National income tax rates are an obvious example. The second is that there are behavioural differences between movements within Australia and trans-Tasman movements. In this case, a person from Melbourne for whom there is, say, a potential 10 percent income gain either from migration to Perth or to Auckland (similar distances) would move to these destinations with different probabilities.

Both propositions are tested in Table 5. We should not preclude the possibility that the structural change is associated with regions other than New Zealand and Table 5 therefore presents classical F-tests of regional-specific coefficients for all nine regions, based on the model of column (2) of Table 4. The restriction that the coefficients of L_r and L_s sum to one, creates the additional restriction that, when the corresponding coefficients of a particular region are different, the regional-specific deviations from the normal levels must sum to zero. Table 4 therefore first reports in the two left hand side columns F statistics (and p-values) of the null hypothesis that the restrictions are correct. When this hypothesis is accepted, parameter constancy is tested with the RLS model and otherwise with the OLS model.[11]

The linear restrictions were accepted in all cases, except for migration models in which model coefficients were different for flows from and to South Australia, Northern Territory, or New Zealand. The very large F statistic for New Zealand (24.275) is the first statistical indicator that the flows from and to New Zealand behaved differently from those between the other regions.

The columns on the right test the null hypothesis that all coefficients (intercepts and slopes) are constant across regions. This null hypothesis is accepted for all regions except Northern Territory and New Zealand. Although not reported in Table 5, it can be shown that is not due just to a different intercept for these regions compared with the others, but that the slope coefficients are different as well.

Although flows from and to Northern Territory also represent outliers in the model (for reasons given later), the largest F statistic is found for New Zealand (6.635). The structural differences between trans-Tasman and other flows are highly significant (a p-value of less than 1 percent). Hence, despite the similarity of the two societies and the largely free movement between them, there are significant national border effects in Australasian migration. The notion of trans-Tasman migration being internal migration thus needs to be qualified. While research has established that this migration has many features which resemble the movement of people within a country, it is not internal migration in a formal econometric sense.

Table 5 about here

Given the significance of New Zealand-specific coefficients, further insights can be obtained by considering the full regression specification. The coefficients can be found in column 3 of Table 4. Several interesting observations can be made. First, the income differential coefficient is now greater and statistically significant at the 5 percent level. The elasticity of trans-Tasman flows to interregional income differentials is smaller, but not significantly so, than the income elasticity of other flows ($\overline{w}_s/\overline{w}_r{}^{NZ}$ is negative, but statistically insignificant). Hence, following the Brosnan and Poot's (1987a) definition of a common labour market being one in which there is free movement and net migration is in the "right" (i.e., higher income) direction, there is indeed a common

[11] Because this stepwise procedure creates a pretest bias, the p-values are only approximately correct.

Australasian labour market despite persistent wage differentials. However, the fact that $\overline{w}_s/\overline{w}_r{}^{NZ}$ is negative, and a comparison of models (2) and (3), suggests that the responsiveness of New Zealanders to the earnings gap has been less than a constant elasticity model would predict. In 1981, purchasing-power corrected median income in New Zealand was higher than in South Australia, Queensland and Tasmania. By 1986, real income in New Zealand was much lower than in any of the other regions.

Second, the intercept effect D^{rsNZ} is strongly negative. Hence, migration flows between Australia and New Zealand are much lower than what would have been the case had New Zealand been an "island state" of the Commonwealth, like Tasmania. Third, once a trans-Tasman move is considered, distance is less relevant to the trans-Tasman migrant than to the Australian internal migrant. This can be seen from the coefficient of $\overline{\pi}^{rs}NZ$, which is positive and significant. Fourth, the trans-Tasman flows are more than would be expected on the basis of the relative sizes of the population of New Zealand and the Australian regions. This is suggested by the significantly positive coefficients of $L_r{}^{NZ}$ and $L_s{}^{NZ}$.

Inspection of the residuals of model (3) revealed that migration flows between Northern Territory and South Australia were outlier observations, which may explain the significant F statistics for these regions in Table 5. The special character of the migration between Northern Territory and South Australia was earlier noted by Langley (1984) who attributed it to job transfers being a disproportional component of these flows. The regression model with these two observations deleted is given in column (4). There is now stronger evidence that the trans-Tasman flows are less responsive to income differential than intra-Australian flows ($\overline{w}_s/\overline{w}_r$ and $\overline{w}_s/\overline{w}_r{}^{NZ}$ are both significant and the coefficient for the flows from and to New Zealand is 2.190-2.060=0.130).

The regression model (4) was further inspected by a range of diagnostic tests of heteroscedasticity and nonlinearity. [12] None of these suggested departures from the null hypotheses of homoscedasticity and loglinearity respectively.

It remains to consider possible reasons for the significant border effects. First, it is possible that the model has been misspecified, both in terms of omitted relevant variables and in terms of the functional form. Potentially relevant omitted variables would include the age-composition of the population, quality of life variables (such as the pleasantness of the climate), intra-Australian cost of living differences (note that the trans-Tasman one have been taken into account) and interregional differences in government expenditure, taxation and real interest rates. However, given that most of the included variables are statistically significant and that the standard error of the equation is low, it is unlikely that the F test is strongly affected by an omitted variable problem. Moreover, if the variability in such factors across states is small relative to the difference between the

---

[12] The tests were those which are calculated by the DIAGNOS command in Version 7.0 of the SHAZAM econometrics computer program (see SHAZAM User's Reference Manual Version 7.0, McGraw-Hill, 1993).

average Australian level and the New Zealand level of the variable (such as is the case with the average tax rate), then the variable has not been omitted but is instead already captured by the significant intercept effect D^{rsNZ}.

A second reason for the significant border effect is the presence of certain barriers to international migration when compared with internal migration. These could include the psychological cost of a loss of national identity, exposure to discrimination against immigrant groups, a lack of international portability of private superannuation schemes and difficulties in getting qualifications recognised.

A third reason is the earlier made observation that the trans-Tasman migrants are primarily New Zealanders, i.e. there is strong self-selection. Guest (1993) identified differences in interregional mobility behaviour between Australians and New Zealanders.

A fourth point is the role of the housing market. Poot (1993) found that housing has been generally more affordable in Australia than in New Zealand (in terms of the burden of mortgage interest payments). However, the Australian-New Zealand exchange rate has been unfavourable with respect to housing, at least during the 1981-86 period considered in this paper, in that a New Zealand family would not have been able to buy a home in Australia with the proceeds of selling a similar home in New Zealand. There is of course also a strong interregional variation in house prices within Australia. The issue of housing costs and migration warrants further investigation.

The final reason for the significant border effects is the influence of government policies, such as with respect to taxation and expenditure, on migration decisions. Migrants do take these policies into account. Barrington and Davey (1980, p.43) found that 12 percent of New Zealand emigrants mentioned the political situation as a reason for leaving, while 9 percent mentioned tax levels. Their survey was carried out at the time of the Muldoon administration in New Zealand, when New Zealand was the most regulated OECD economy. That the post-1984 economic reform have affected trans-Tasman migration patterns, was demonstrated by Poot (1993), but to what extent Australia, where the reforms have as yet been less extensive, attracted New Zealanders because of a dissatisfaction with the "New Right" policies, is as yet unknown.

There is no doubt that differences in tax rates and government expenditures do matter. Tiebout (1956) already argued that people "vote with their feet" at the local community level and that the competition for taxpayers between local communities leads to an efficient provision of public goods. There is now widespread evidence that fiscally induced migration does occur: interregional migration flows are influenced by tax and government expenditure policies (e.g. Cebula, 1979; Day, 1992). This may be relevant at the international level also. The total tax take as a percentage of GDP in Australia is lower than in New Zealand (OECD, 1992). If migrants interpret lower taxes as evidence of greater efficiency of public services rather than lower levels of public services, this may be one pull factor for migration to Australia. In addition, there may be self selection of migrants based on preferences when the public-private mix is in fact different.

Eligibility for social security is unlikely to have had a great impact on trans-Tasman migration. Migrants who, after settlement on the other side of the Tasman, apply for social welfare benefits have the same entitlements as other permanent residents of the host country. However, under a 1987 agreement, migrants cannot receive during the first six months in either country the unemployment benefit, or Australia's supporting parents benefit, or New Zealand's domestic purposes benefit (Carmichael et al. 1993).

Because of reciprocal arrangements, persons on old age, disability and widow pensions do not find such benefits discontinued after a trans-Tasman move (but they are paid out at the local rates). The respective governments are reimbursed for such payment through transfers between them.[13] Differences between the countries in the generosity of entitlements vary between benefits and over time. They are at present not very great. However, during the early 1980s New Zealand's national superannuation was more generous and may have been a disincentive for retirement migration from New Zealand to Australia (Carmichael et al. 1993).

In addition to being influenced by government policies, migration of course also has significant fiscal implications itself. First, a trans-Tasman migrant from New Zealand abandons his or her share of public property and revenue from public resources in New Zealand and acquires a share of such public assets in Australia. In this way the migrant confers a benefit upon the residents of New Zealand and imposes a cost on the residents of Australia (Usher, 1977). Second, migration affects the per capita tax to fund public services. In this way, net migration from New Zealand to Australia in fact benefits Australia, because the per capita tax required to fund the service in Australia becomes less as the tax base expands, while in New Zealand it becomes more. In addition, there may be economies of scale which strengthen this effect (Poot, 1993). It is obvious that this, all else being equal, could lead to a self-reinforcing process, with ever-increasing net migration towards the larger country. These effects are referred to as "fiscal externalities" (Buchanan and Goetz, 1972). Research on the economic impact of immigration does suggest that the marginal effect of migrants on taxation revenue is greater than on government expenditure. Petchey (1991) and Layard et al. (1992) show that in the presence of fiscal externalities and regional economic rents (resulting from inter alia differences in resource endowments), there is a case for fiscal transfers from the richer to the poorer region. The relevance for trans-Tasman migration is that it suggests that Australia has, on balance, benefited from the flow while the macroeconomic impact on New Zealand has been detrimental (Poot, 1992). Hence, the New Zealand government could, at least in theory, make a case for a transfer payment from Australia similar to certain inter-member transfers within the European Community.

---

[13] The size and scope of such reimbursements is subject to negotiation between the two countries. Given the larger number of New Zealanders in Australia than vice versa, the net transfer is of course in the direction of Australia.

The evidence from Australia and the USA suggests that net immigration is beneficial for the public purse in that it increases government expenditure by less than tax revenue (Foster and Baker, 1991 and Simon, 1989, respectively). Thus, the view that a net outflow from New Zealand may have improved the New Zealand government budgetary situation by reducing the payout of unemployment benefits is a very narrow one which ignores the economy-wide implications of the population redistribution. It is more likely that Australia's public purse has benefited from the net inflow while the New Zealand fiscal position was harmed.

5. CONCLUSIONS

This paper provided simple econometric tests of the propositions that trans-Tasman migration is a form of internal migration and that Australia and New Zealand share a common labour market. Migration between regions within Australasia does move from the low to the high income regions, ceteris paribus. Although earnings differentials have been quite persistent, this suggests that there is indeed a common labour market in a weak sense.

However, the hypothesis that the slope and intercept variables of trans-Tasman specific flows were jointly zero was rejected. Hence, there are behavioural differences between intra-Australian and trans-Tasman migration, so that the latter migration did not conform in an econometric sense to a notion of internal migration in Australasia.

Since the paper has been primarily concerned with the behaviour of migrants, but the available data were restricted to a limited range of macro variables, there are limitations to the extent to which reasons for the behavioural differences can be tested. Except for small local-level surveys (e.g. Bedford and Lidgard, 1993), there has as yet not been a survey of trans-Tasman migrants and, as Carmichael (1993, p. 343) also noted, micro-level data on migration motives are badly needed.

A discussion of trans-Tasman migration in conjunction with trade and capital flows is also warranted. A first contribution in this direction is Poot (forthcoming). Moreover, it is clear from the previous section that the policy implications with respect to the size and composition of government consumption, welfare transfers and the impact on taxation revenue requires further investigation.

REFERENCES

ALONSO, W. (1978), "A Theory of Movements". In: N.M. Hansen (ed.) *Human Settlement Systems*, Ballinger, Mass., 197-211.

BARRINGTON, R. and DAVEY, J. (1980) *Migrants and their Motives.* Planning Paper No. 8, New Zealand Planning Council, Wellington.

BEDFORD, R. and LIDGARD, J. (1993) "Home to Work? The Employment Experiences of Return Migrants". In: P.S. Morrison (ed.) *Labour, Employment and Work in New Zealand*, Department of Geography, Victoria University of Wellington, 136-147.

BORJAS, G.J. (1987) "Self-Selection and the Earnings of Immigrants", *American Economic Review*, 77(4): 531-553.

BORJAS, G.J. (1989) "Economic Theory and International Migration", *International Migration Review*, 23(3): 457-485.

BROSNAN, P. and POOT, J. (1987a) "Economic and Demographic Aspects of Trans-Tasman Population Exchange", *New Zealand Population Review*, 13(2): 4-16.

BUCHANAN, J.M. and GOETZ, C.J. (1972) "Efficiency Limits of Fiscal Mobility: An assessment of the Tiebout Model", *Journal of Public Economics*, 1: 25-30.

BROSNAN, P. and POOT, J. (1987b) " Modelling the Determinants of Trans-Tasman Migration after World War II", *The Economic Record*, 63(December): 313-329.

CARMICHAEL, G.A. ed. (1993) *Trans-Tasman Migration: Trends, Causes and Consequences.* Australian Government Publishing Service, Canberra.

CARMICHAEL, G.A., BUETOW, S. and FARMER, R. (1993) "Policy and Data". Chapter 2 in: G.A. Carmichael (ed.)*Trans-Tasman Migration: Trends, Causes and Consequences*, Australian Government Publishing Service, Canberra.

CASTLES, S. and MILLER, M.J. (1993) *The Age of Migration: International Population Movements in the Modern World.* Macmillan, London.

CEBULA, R.J. (1979) "A Survey of the Literature on the Migration-Impact of State and Local Government Policies", *Public Finance*, 34: 69-84.

DAY, K.M. (1992) "Interprovincial Migration and Local Public Goods", *Canadian Journal of Economics*, 25(1): 123-144.

ECONOMIC MONITORING GROUP (1986) *Labour Market Flexibility.* New Zealand Planning Council, Wellington.

ECONOMIC PLANNING ADVISORY COUNCIL (EPAC) (1991) *Urban and Regional Trends and Issues*, Council Paper No. 46, Canberra.

FIELDS, G.S. (1979) "Place to Place Migration: Some New Evidence", *Review of Economics and Statistics*, 61: 21-32.

FOSTER, W. and L. BAKER (1991) *Immigration and the Australian Economy.* Australian Government Publishing Service, Canberra.

GUEST, P. (1993) "Distribution and Mobility of the New Zealand-born in Australia". Chapter 7 in: G.A. Carmichael (ed.)*Trans-Tasman Migration: Trends, Causes and Consequences*, Australian Government Publishing Service, Canberra.

GREENWOOD, M.J. (1975) "Research on Internal Migration in the United States", *Journal of Economic Literature*, 13: 397-433.

GREENWOOD, M.J. (1985) "Human Migration: Theory, Models and Empirical Results", *Journal of Regional Science*, 25: 521-567.

GREENWOOD, M.J. and HUNT, G.L. (1984) "Econometrically Accounting for Restrictions in Models of Interregional Migration", *Regional Science and Urban Economics*, 14: 113-128.

GREENWOOD, M.J. and McDOWELL, J. (1986) "The Factor Market Consequences of US Immigration", *Journal of Economic Literature*, 24: 1738-1772.

HICKS, J. (1932) *The Theory of Wages.* Macmillan, London.

JUNANKAR, P.N. and POPE, D. (1990) *Immigration, Wages and Price Stability*. Bureau of Immigration Research, Australian Government Publishing Service, Canberra.

LANGLEY, P.C. (1984) "The Determinants of Labour Force Migration, 1966 to 1971". In: Chapman, B.J., Isaac, J.E. and J.R. Niland (eds.), *Australian Labour Economics: Readings*, MacMillan, Melbourne, 500-509.

LAYARD, R., BLANCHARD, O., DORNBUSH, R. and KRUGMAN, P. (1992) *East-West Migration: The Alternatives*. MIT Press, Cambridge Mass.

LOWE, R.J. (1987) "Comparing 1981 and 1986 Census Labour Force Employment and Unemployment Data", *New Zealand Population Review*, 13(2): 27-34.

MAXWELL, P. and HITE, J.C. (1993) "More Evidence on Regional Income Disparities in Australia". Working Paper 93.09, School of Economics and Finance, Curtin University of Technology, Perth, Western Australia.

McNICOLL, G. (1993) "The Economics of Australian Immigration, with Reference to Trans-Tasman Flows". Chapter 10 in: G.A. Carmichael (ed.)*Trans-Tasman Migration: Trends, Causes and Consequences*, Australian Government Publishing Service, Canberra.

MINCER, J. (1978) "Family Migration Decisions", *Journal of Political Economy*, 86: 749-773.

MOLHO, I. (1986) "Theories of Migration: A Review", *Scottish Journal of Political Economy*, 33: 396-419.

OECD (1992) *Statistics on Member Countries*, Paris.

PETCHEY, J. (1991) "Free Migration, Externalities and Interstate Transfers in a Federal Economy", Department of Economics, Australian National University, mimeo.

PISSARIDES, C.A. and WADSWORTH, J. (1989) "Unemployment and the Inter-Regional Mobility of Labour", *The Economic Journal*, 99: 739-755.

POOT, J. (1984) *Models of New Zealand Internal Migration and Residential Mobility*, unpublished PhD Thesis, Victoria University of Wellington.

POOT, J. (1986) "A System Approach to Modelling the Inter-Urban Exchange of Workers in New Zealand", *Scottish Journal of Political Economy*, 33: 249-274.

POOT, J. (1993) "Trans-Tasman Migration and Economic Growth in Australasia". Chapter 9 in: G.A. Carmichael (ed.)*Trans-Tasman Migration: Trends, Causes and Consequences*, Australian Government Publishing Service, Canberra.

POOT, J. (forthcoming) "Effects of the Trans-Tasman Agreement and the CER". Chapter 7 in: P.J. Lloyd and L. Williams *International Trade and Migration in the APEC Region*, Oxford University Press, Oxford.

PORELL, F.W. and HUA, C.I. (1981) "An Econometric Procedure for Estimation of a Generalised Systemic Gravity Model Under Incomplete Information about the System", *Regional Science and Urban Economics*, 11: 585-606.

RAVENSTEIN, E.G. (1889) "The Laws of Migration", *Journal of the Royal Statistical Society*, 52: 241-301.

SHAW, R.P. (1975) *Migration Theory and Fact: A Review and Bibliography of Current Literature*, Regional Research Institute, Philadelphia.

SHIELDS, G.M. AND SHIELDS, M.P. (1989) "The Emergence of Migration Theory and a Suggested New Direction", *Journal of Economic Surveys*, 3(4): 277-304.

SIMON, J. (1989) *The Economic Consequences of Immigration*. Basil Blackwell, New York.

SJAASTAD, L. (1962) "The Costs and Returns of Human Migration", *Journal of Political Economy*, 70(Supplement): 80-93.

TIEBOUT, C.M. (1956), "A Pure Theory of Local Expenditures", *Journal of Political Economy*, 64: 416-424.

USHER, D. (1977) "Public Property and the Effect of Migration upon Other Residents of the Migrants' Countries of Origin and Destination", *Journal of Political Economy*, 85(5): 1001-1020.

WILLIS, R. (1993) "Employment Change in Manufacturing: Australia versus New Zealand, 1987-1992". In: P.S. Morrison (ed.) *Labour, Employment and Work in New Zealand*, Department of Geography, Victoria University of Wellington, 23-28.

APPENDIX

Definitions of variables and sources

M_{rs} Number of persons usually resident in region s at the time of the 1986 census and who lived in region r five years earlier.
Source: Intra-Australia: Provided by M. Bell, Applied Population Research Unit, The University of Queensland. Trans-Tasman: 1981-86 migration from Australia to New Zealand was 42,123 (see Carmichael (1993), p. 256). These were apportioned over regions of origin based on unpublished ABS statistics on Permanent and Long-Term Departures by country of next residence. The 1981-86 in-migration into Australian was 556,529. Based on unpublished ABS statistics on Permanent and Long-Term Arrivals by country of last residence, 12.68 percent of these (70,589) originated from New Zealand. They were apportioned over Australian States and Territories according to 1981-86 migration into Australia of persons born in Oceania.

$\overline{w}_s/\overline{w}_r$ The ratio of median individual income of males of region s in 1986 over median income of males in region r in 1981. Those with income in the categories "none" and "not stated" were excluded in the computation of median income.
Sources for 1986 income data: Australia: Australian Bureau of Statistics, *Summary Characteristics of Persons and Dwellings* (Catalogue Nos 2479.0 to 2486.0, 1988 and 1989), Table C28. New Zealand: Department of Statistics, 1986 Census, Series B Report 24, *Regional Summary*, Table 11. Conversion to Australian dollars is based on a purchasing power parity exchange rate, computed by Brosnan and Poot (1987b).
Sources for 1981 income data: Australia: Australian Bureau of Statistics, *Summary Characteristics of Persons and Dwellings* (Catalogue Nos 2435.0 to 2442.0, 1982 and 1983), Table 21. New Zealand: Department of Statistics, *New Zealand Official Yearbook*, 1983, p. 752. Conversion to Australian dollars is based on a purchasing power parity exchange rate, computed by Brosnan and Poot (1987b).

$\overline{\pi}^{rs}$ Distance between the largest cities of regions r and s, measured as the distance by the most direct route on regular scheduled air services.
Source: *Australian Pacific Tours Map of Australia.* and *New Zealand Official Yearbook 1986-87*, p. 592.

L_r Population usually resident in region r at the time of the 1981 census.
Source: Australia: Australian Bureau of Statistics, *Summary Characteristics of Persons and Dwellings* (Catalogue No 2487.0, 1989), Table CU47.

L_s Population usually resident in region s at the time of the 1986 census.
Source: Australia: Provided by M. Bell, Applied Population Research Unit, The University of Queensland. These figures are very similar to those reported in ABS Table CU47 (see the source of P81i). New Zealand: 1981 and 1986 census, *Regional Summary.*

$E_{r(s)}$ Percentage male employment growth in region r(s) between 1981 and 1986.
Source: Australia: Australian Bureau of Statistics, *Summary Characteristics of Persons and Dwellings* (Catalogue Nos 2479.0 to 2486.0, 1988 and 1989), Table C29. New Zealand: Lowe (1987), p. 34.

U_r The total unemployment rate of region r in 1981.
Source: Same as for E_r.

U_s The total unemployment rate of region s in 1986.
Source: Same as for E_s.

$\overline{w}_s/\overline{w}_r{}^{NZ}$ etc. These variables are obtained by multiplying the corresponding variable defined above by a dummy variable which takes the value of one for flows from and to New Zealand and zero otherwise. Consequently, the coefficient of this variable measures the incremental difference in the elasticity of migration with respect to the explanatory variable for New Zealand flows compared with the other flows.

Table 1: Net Interregional Migration, Australasia

Year ended 30 June	NSW	Vic.	Qld	SA	WA	Tas.	NT	ACT	NZ
					(000s persons)				
1982	-14.8	-12.1	40.7	-4.5	5.8	-1.9	2.4	0.0	-15.5
1983	-16.0	-4.5	22.1	-0.2	2.1	-1.2	0.6	1.1	-3.9
1984	-8.6	-2.5	11.8	0.7	1.5	0.7	0.8	1.0	-5.5
1985	-2.3	-2.5	20.5	-1.8	5.3	0.9	1.0	1.5	-22.6
1986	-2.0	-8.2	27.8	-0.6	14.3	0.1	0.1	2.3	-33.6
1987	2.0	-7.6	31.4	-2.3	16.1	-2.6	-0.7	3.3	-39.5
1988	-0.9	-8.5	40.5	0.7	14.6	-3.1	-3.9	3.4	-42.7
1989	-30.2	-8.7	54.9	1.5	13.6	-1.1	-2.5	1.1	-28.7

Sources: ABS Unpublished Tabulations of Overseas Arrivals and Departures (PLT&Short-Term Visitors); ABS *Yearbook Australia*, 1990

Table 2: Interregional Migration and Population Growth in Australasia, 1981-86

From/To	NSW	VIC	QLD	SA	WA	TAS	ACT	NT	NZ	Deaths & Emigr.	Total
NSW	4497821	46837	103119	16897	21939	6530	26993	6419	16011	350324	5092890
VIC	53167	3400343	51773	16270	17874	7311	7725	4827	6744	286600	3852634
QLD	52189	26355	2009190	8039	10916	4099	5882	6846	10918	124701	2259135
SA	15450	17179	13548	1137146	7960	2203	2525	7394	1786	82693	1287884
WA	13632	12847	10752	6142	1117546	2108	2179	4574	4836	90801	1265417
TAS	5254	7487	6383	2197	2734	367467	1031	693	522	27078	420846
ACT	22687	5234	8397	2097	2449	801	165300	830	678	13122	221595
NT	4619	3577	8156	5938	4065	620	943	82312	628	5637	116495
NZ	24869	10941	20485	2464	8951	692	1151	-1038	2844708	228008	3143307
Overseas in 1981	179004	125634	58703	33167	65268	5404	12768	5990	87873	-573811	-
1981 resid. not stated	104436	86666	48652	20183	29123	6190	3617	7602	39513	-345982	-
Aged 0-4 in 1986	407388	295300	200862	97512	113969	35396	20792	14869	249075	-1435163	-
TOTAL	5380516	4038400	2540020	1348052	1402794	438821	250906	143394	3263292	-1145992	17660203
1981-86 net migration	-52878	-35234	97369	-8001	19818	-1937	5256	4075	-28468	-	0

Source: 1981 and 1986 Australian and New Zealand Censuses; Australian Bureau of Statistics, annual external migration data; unpublished interstate migration data provided by M. Bell, Department of Geographical Scienes, University of Queensland.

Table 3: Interregional Migration Probabilities, 1981-86

From/To	NSW	VIC	QLD	SA	WA	TAS	ACT	NT	NZ	Deaths & Emigr.	Total
NSW	88.32	0.92	2.02	0.33	0.43	0.13	0.53	0.13	0.31	6.88	100.00
VIC	1.38	88.26	1.34	0.42	0.46	0.19	0.20	0.13	0.18	7.44	100.00
QLD	2.31	1.17	88.94	0.36	0.48	0.18	0.26	0.30	0.48	5.52	100.00
SA	1.20	1.33	1.05	88.30	0.62	0.17	0.20	0.57	0.14	6.42	100.00
WA	1.08	1.02	0.85	0.49	88.31	0.17	0.17	0.36	0.38	7.18	100.00
TAS	1.25	1.78	1.52	0.52	0.65	87.32	0.24	0.16	0.12	6.43	100.00
ACT	10.24	2.36	3.79	0.95	1.11	0.36	74.60	0.37	0.31	5.92	100.00
NT	3.96	3.07	7.00	5.10	3.49	0.53	0.81	70.66	0.54	4.84	100.00
NZ	0.79	0.35	0.65	0.08	0.28	0.02	0.04	0.03	90.50	7.25	100.00

Source: Derived from Table 2.

Table 4: Restricted Least Squares Regression Models
(standard errors in parentheses; *: α <0.10, **: α<0.05 and ***: α < 0.01)

	(1)	(2)	(3)	(4)
Constant	-2.231	-2.983	-2.688	-6.451
$\overline{w}_s/\overline{w}_r$		0.874 (0.643)	2.005 ** (0.877)	2.190 *** (0.767)
$\overline{\pi}^{rs}$	-0.351 *** (0.094)	-0.505 *** (0.088)	-0.452 *** (0.080)	-0.410 *** (0.070)
D^{rs}	-1.036 *** (0.138)	-0.912 *** (0.130)	-0.608 *** (0.192)	-0.265 (0.184)
L_r	0.527 *** (0.036)	0.357 *** (0.052)	0.353 *** (0.076)	0.471 *** (0.072)
L_s	0.473 *** (0.036)	0.643 *** (0.052)	0.673 *** (0.086)	0.814 *** (0.081)
E_r		-4.314 *** (1.570)	-4.020 ** (1.762)	-2.023 (1.623)
E_s		4.548 ** (1.794)	4.473 ** (1.938)	6.587 *** (1.753)
U_r		-1.036 *** (0.380)	-2.102 *** (0.515)	-2.380 *** (0.459)
U_s		1.553 *** (0.304)	1.737 *** (0.327)	1.746 *** (0.288)
$\overline{w}_s/\overline{w}_r NZ$			-1.875 (1.416)	-2.060 * (1.233)
$\overline{\pi}^{rs}NZ$			0.852 ** (0.330)	0.810 *** (0.287)
$D^{rs}NZ$			-31.405 *** (6.228)	-27.986 *** (5.479)
L_rNZ			0.732 *** (0.177)	0.613 *** (0.156)
L_sNZ			0.854 *** (0.178)	0.713 *** (0.158)
E_rNZ			7.174 (4.349)	5.178 (3.816)
E_sNZ			11.436 ** (4.288)	9.322 ** (3.757)
U_rNZ			0.779 (0.930)	1.057 (0.815)
U_sNZ			-0.072 (0.696)	-0.081 (0.606)
n	72	72	72	70
Log Likelihood	-58.398	-43.086	-13.557	-2.959
s	0.560	0.471	0.340	0.296
R^2	0.804	0.872	0.944	0.959

Table 5: Significance Tests of Constant Coefficients across Regions

	A. Linear Restrictions		B. Parameter Constancy [1]	
Region	F Statistic [2]	P-Value	F Statistic [2]	P-Value
NSW	1.509	0.354	0.859	0.567
VIC	0.082	0.922	0.360	0.949
QLD	0.218	0.805	0.808	0.611
SA	4.460 **	0.016	1.410	0.208
WA	0.214	0.808	0.869	0.558
TAS	0.735	0.484	1.442	0.200
ACT	1.155	0.323	0.814	0.605
NT	6.340 ***	0.003	2.579 **	0.015
NZ	24.275 ***	0.000	6.635 ***	0.000

Note: 1 When the linear restrictions were rejected, the F test for parameter constancy was based on the unrestricted model.

2 *: $\alpha < 0.10$, **: $\alpha < 0.05$ and ***: $\alpha < 0.01$