An Analysis of the Internal Migration of Indigenous and Non-Indigenous Australians

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Abstract
Enhancing migration and mobility has been put forward by various commentators as a solution to Indigenous disadvantage in Australia. This paper examined patterns of migration and factors associated with the decision to move and the choice of destination in order to assess the feasibility of this suggestion. The results suggest that Indigenous Australians are less responsive to local economic factors than other Australians, with social and cultural factors appearing to play a particularly significant role in their decision making. It is probable that this reflects a ‘rational’ response to the depressed demand for Indigenous labour across Australia and the greater opportunity for non-market activities.

1. Introduction
Motivation for the Study
Along with births and deaths, internal migration patterns are important factors influencing the demographic and economic futures of geographic areas and the people that live in them. The study of migration is important because policy-makers need to understand how many people live in an area and what sort of people move into and out of an area. Areas with net inward migration may experience greater pressure on the supply of goods and services, whereas those with net outward migration may experience labour shortages and lower levels of consumption of goods and services. While migration is an intrinsically geographic phenomenon, the culmination of several demographic forces with a spatial dimension, it also reflects all the individual decisions of people in various areas. This paper examines some of the geographic and individual factors underlying the individual’s decision to migrate, and once that decision has been made, the choice of migration destination.

Indigenous Australians have distinct patterns of mobility from other Australians and are almost entirely unaffected by international migration. They are more likely to live in small town and declining regional communities. Indigenous Australians are also a relatively mobile population who are more likely to change residence over a
given period of time. While Taylor (1997) shows that short-term circular mobility in the local area is common among Indigenous Australians, less is known about their patterns of migration (i.e. long-term or permanent moves to another area). With the exception of Taylor and Kinfu (2005) and Biddle and Hunter (2005) there have been no studies analysing unit record (micro) data to examine where, and for what reasons, Indigenous Australians move.

The first part of this paper outlines the theoretical model underlying the empirical analysis. After introducing the extant literature, the patterns of migration in Australia for Indigenous and non-Indigenous Australians are then discussed. In the penultimate section we look at the area level factors associated with the individual’s decision to move, as well as the characteristics of the area that are associated with migrants choosing to move to that area. The paper finishes with a conclusion that relates the findings to the broader literature on Indigenous economic development and provides some tentative conclusions.

**Theoretical Model**

The economic factors associated with migration can be modelled using the basic human capital model developed in Lewis (1954), Sjaastad (1962), Todaro (1969, 1976) and Harris and Todaro (1970). According to this model, migration occurs when the predicted discounted future income stream available at a potential destination is greater than the discounted future income stream at the person’s current location plus the costs of migration. Individuals may therefore choose to move if they see another area as giving them a greater chance of obtaining employment, or if they are already employed, gaining a job with higher remuneration.

Individuals are likely to also take into account the relative costs of living in an area when weighing the income and employment benefit of moving. That is, given the quite different costs of living across Australia (Saunders *et al.* 1998 and Chapman and Greenville 2002), people are unlikely to move to areas where they will receive a higher income if that income has to be spent on higher housing costs. Put differently people may choose to ‘downsize’ and move to areas with lower average income but cheaper housing costs.

The act of migration itself also imposes certain costs. Even if people predict that there are areas where their income (after housing costs) will be higher than it currently is, the increase in their predicted income from moving may not be enough to cover these costs. These costs of migration can be represented via a modified gravity model (first developed in Stewart 1941, and then modified into the form used in this paper in Greenwood 1997). According to the modified gravity model, the probability of moving between two areas is based in part on the size of the origin and destination populations, but inversely related to the distance between the two areas. The distance between the two areas is said to proxy the cost of migration which could be either social or economic:

- Social (psychic) costs of migration: The main social cost of moving is related to the effect it has on a person’s ability to maintain their existing social networks. The greater the distance between two areas, the more costly and time consuming it is to make frequent return visits to maintain the social
networks developed in the area. Distances from their source areas aside, individuals are able to build new social networks in their destination area. This is a possible reason why people are likely to move to areas with a high concentration of individuals with similar characteristics to themselves (based on ethnicity, country of birth, language, etc.) Other costs to migration are likely to vary throughout a person’s life-cycle. For example, those in mid to late secondary school who move schools are likely to experience significant disruption to their studies (above and beyond the disruption to their peer social networks).

- Economic costs of migration: Moving to another area can also involve reasonably large economic costs. Firstly, there are the direct physical costs of moving oneself and one’s family (e.g. transport, removalists, costs involved in searching for accommodation). Secondly, especially in the short term, a family that moves may have to forego some of their income. That is, even though a person’s income may increase in the long-term, wages often decline in the short-term because people lose firm specific human capital (Yankow 2003). Furthermore, the opportunity cost in terms of spousal income may also be important. That is, for a married couple, moving to improve one spouse’s income may come at the cost of their partner’s income (Greenwood 1997).

A further impediment to migration could be the uncertainty or risk involved with moving (Khwaja 2000). If people already have a job lined up in another area, then they may be able to predict with reasonable accuracy the benefits of migration (at least in the short term). However if people do not have a job in advance and are instead considering whether to move to improve their prospects of obtaining a job, then they may be less likely to feel that the uncertain future benefits are worth the risk (given the known economic and social costs).

All these factors may influence Indigenous Australians differently to non-Indigenous Australians. Indigenous Australians may be employed in different sorts of jobs, and arguably work in a different segment of the labour market to that which employs most other Australians (Hunter 2004a). Consequently, local labour market conditions may affect the Indigenous workforce more or less than other workers. Past and expected future labour market discrimination may also weaken their responsiveness to economic incentives (Hunter 2005).

In addition to differential economic incentives from migration facing Indigenous and other Australians, social costs may also differ. For example, it may be difficult to find schools to meet the special needs of Indigenous children (Schwab and Sutherland 2003). Also, if Indigenous people want to maintain links with Indigenous community and networks, then they will have to have regard to the number of Indigenous people in the neighbourhood. While the latter can be couched in ‘pseudo-economic’ terms of social capital (i.e. ensuring that one’s bonding social capital does not depreciate), many aspects of these networks are social and cultural, which do not have direct economic implications (Hunter 2004b). The point being made here is that the empirical analysis has to take into account the differential incentives for Indigenous and non-Indigenous people to migrate.
Previous Research on Indigenous Migration

Taylor and Bell (1999) looked at the propensity to move in the one year preceding the 1996 Census. They found that Indigenous Australians were more likely to have moved address during that time period. However, of those who had moved address, a higher proportion moved within the same Statistical Local Area (SLA) rather than outside their area. Taylor and Bell (1999) also found a lower level of variation in mobility rates by age or lifecycle characteristics for the Indigenous compared to non-Indigenous population.

Kinfu (2005) used data from the 2001 Census to look at the area level factors associated with migration. Looking at the number of people who moved between pairs of 64 ‘migration zones’, Kinfu (2005) reported that although the Indigenous population was highly mobile, the ‘pattern of migration is characterized by family rather than labor mobility.’

The author also reports mortality adjusted migration intensities. These results, which plot migration intensity by age, show that lifecycle factors are quite likely to be important in the migration decision. Migration rates start off high at age zero, then decline till around age 15. The intensities then increase quite quickly as individuals either leave the home for schooling or to take up employment. The probabilities reach their peak at around age 25 and then decline steadily throughout a person’s life.

Kinfu (2005) also found that distance had a significant effect on migration patterns. That is, pairs of migration zones that were next to each other had higher levels of migration between them. Moreover, the greater the distance between the centroids of the regions, the lower the levels of migration.

Taylor and Kinfu (2005) looked at some of the individual factors associated with mobility. They use the 2002 National Aboriginal and Torres Strait Islander Social Survey (NATSISS) as their data source and whether or not a person had moved in the year preceding the survey as their dependent variable. They found that ‘the probability of movement peaks among young adults, is similar overall for males and females, is higher for single people and especially high among the unemployed, greater for those in private rental dwellings, and lowest in remote areas.’ One problem with the analysis (and which is common with any cross-sectional analysis, including this paper) is that Taylor and Kinfu (2005) only have information on the individual after they have moved. It is unclear therefore, whether those who are unemployed are more likely to move, or whether those who have moved are more likely to be unemployed.

Taylor and Kinfu (2005) also report on the reason given for the last move. They find that Indigenous Australians are more likely to report social or housing issues as the main reason for the last move than employment or accessibility reasons. They do, however, point out the difficulty in using a measure that only captures the main reason for the last move when the ethnographic evidence suggests that many factors come into play. One set of factors may influence the decision to move, and another the choice of destination (Gale 1972; Gale and Wundersitz 1982; Gray 2004).

Biddle and Hunter (2005) also examine the characteristics of the individual that are associated with whether or not a person migrated in the last year and for those who did migrate the number of moves, and the reason for the last move. Unlike Taylor and Kinfu (2005), Biddle and Hunter (2005) estimated that females have a slightly
higher probability of moving than males. Although Biddle and Hunter (2005) found that those who were married had a lower probability of moving, the effect of being married was only found to be significant for females. Other social variables were also significant especially the recognition of one’s homelands which had a reasonably large positive marginal effect for males.\footnote{It is possible that these variables exhibit a fairly large degree of multicollinearity. To ensure this was not impacting our results, we repeatedly re-estimated the model by including one variable at a time. The results for these and other variables did not change after doing so.} Having fair or poor health is also associated with a higher probability of moving. This could capture people moving to be nearer health services or it could reflect the effect of moving on one’s health.

Higher levels of education were generally found to have a positive association with the probability of moving, however this was only through non-school qualifications as opposed to higher levels of school completion. Being a high-school student was found to have a negative and substantial effect on the probability of moving. Another notable variable in Biddle and Hunter’s (2005) specification is having been arrested in the five years preceding the survey, which was estimated to have reasonably large and positive marginal effects.

Biddle and Hunter (2005) also looked at the association a set of independent variables has with the main reason a person gave for their last move. For the most part, age does not appear to effect whether a person moved for employment reasons. Females were, however, found to have a lower probability of reporting such reasons as the motivation for their move. Most social variables were insignificant with the exception of one variable, the main caring responsibility for someone under 13 years of age, which is associated with a lower probability (especially for males). Reporting that one’s health is fair or poor is associated with a lower probability of migration.

The education variables appear to have a strong positive association with people who indicate they are moving for employment reasons, however this effect appears to be dominated by females. School students are less likely to have moved because of their employment circumstances, however this is not surprising given that ‘to be near education facilities’ was one of the alternate options on the NATSISS questionnaire.

2. Patterns of Migration

This section looks at the patterns of migration for Indigenous Australians. Although other parts of the paper use Statistical Local Areas (SLAs) as the basis of the analysis, in this section we use ATSIC regions. Using the 36 ATSIC regions allows us to graphically summarise the patterns of migration more easily than the 1,350 SLAs and has the benefit of representing to a certain extent Indigenous cultural groups (Arthur and Morphy 2005, chapter 1). ATSIC regional boundaries were devised after a process of negotiation with local peoples, and can be said to capture a cultural homogeneity within regions that is missed by boundaries based solely of statistical criteria. Notwithstanding, it should be kept in mind though that using such a broad geographic region hides the large number of moves that occur within ATSIC regions. ABS (2002) outlines the mapping of ATSIC regions to the standard ABS geography (as used in this paper), as well as the names used by the ABS.
To measure migration, we use data from the 2001 Census. In particular, we use three questions which ask for a person’s usual residence: on the night of the Census; one year ago; and five years ago. These addresses were coded to give a person’s SLA across the three time periods which we then mapped to ATSIC regions giving us whether a person had changed ATSIC regions in the year preceding the Census, or the five years preceding the Census.

Table 1 gives the change in the applicable population as a percentage of those who were in that ATSIC region one or five years ago respectively. The calculation for the Indigenous and non-Indigenous populations are done separately and the entries are ranked by the change in the Indigenous residents between 2000 and 2001. It should be noted that the figures in the following table are not the same as the percentage change in the population. To calculate such a figure would require data on births and deaths, as well as overseas arrivals and departures.

Not surprisingly, most ATSIC regions had a higher percentage change in usual residents between 1996 and 2001 than between 2000 and 2001. For the most part, however, the direction of the change was similar across the two periods. Bourke, Sydney, Mount Isa, the Torres Strait Area and Tennant Creek all experienced a large net loss in Indigenous usual residents with Ballarat, Brisbane, Perth and Darwin experiencing a large net gain.

The patterns of net migration among Indigenous and other Australians are complex. With the exception of Sydney, Indigenous people tend to have higher (and positive) net migration into major metropolitan areas. Sydney had a negative net internal migration rate despite having a buoyant, international labour market, perhaps because of exceptionally high housing costs. In regional and remote Australia where the net migration rates tend to be negative, Indigenous people are less likely to move away than other Australians. This may be an indication of a greater cultural connection with their customary land. Whatever the reason, it is clear that Indigenous and non-Indigenous migration are driven by different factors.

Net mobility rates by region do not take into account the total number of people who move areas over a given time period. This is better captured by the proportion of the population who had moved out of each ATSIC region in the one or five years preceding the last Census.

Across Australia, compared to the non-Indigenous population, a higher proportion of the Indigenous population were in a different ATSIC region in 2001 than they were in both 2000 and 1996. That is, in 2001 6.2 per cent of the Indigenous population lived in a different ATSIC region than they did in 2000, and 14.7 per cent had moved ATSIC regions since 1996. This is in comparison to 3.2 per cent and 9.7 per cent respectively of the non-Indigenous population over the same time periods. Biddle and Hunter (2005) give the proportions for each ATSIC region.

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2 Of the 396,424 Indigenous Australians who were born and not overseas one year ago, 95.5 per cent responded to the usual residence one year ago question. Of the 17,114,958 Non-Indigenous Australians, the corresponding figure was 98.5 per cent. Not surprisingly, the response rate for the usual residence five years ago question is lower at 93.4 per cent of the 351,636 applicable Indigenous Australians and 97.9 per cent of the 15,718,322 applicable non-Indigenous Australians. Those who did not state their usual residence were excluded from the analysis, as were those who did not state whether they were Indigenous or not.
### Table 1 - Net Change in Usual Residents as per cent of those in ATSIC Region one or five years before 2001

<table>
<thead>
<tr>
<th>ATSIC region</th>
<th>Indigenous One year</th>
<th>Indigenous Five years</th>
<th>Non-Indigenous One year</th>
<th>Non-Indigenous Five years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bourke</td>
<td>-2.81</td>
<td>-10.45</td>
<td>-2.37</td>
<td>-11.51</td>
</tr>
<tr>
<td>Torres Strait Area</td>
<td>-2.77</td>
<td>-5.92</td>
<td>-0.56</td>
<td>-11.36</td>
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<td>Katherine</td>
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<td>-3.44</td>
<td>-5.92</td>
<td>-15.30</td>
</tr>
<tr>
<td>Alice Springs</td>
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<td>-3.00</td>
<td>-0.11</td>
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</tr>
<tr>
<td>Ceduna</td>
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<td>-8.87</td>
<td>-0.56</td>
<td>-2.13</td>
</tr>
<tr>
<td>Broome</td>
<td>-1.58</td>
<td>-4.32</td>
<td>-0.04</td>
<td>12.89</td>
</tr>
<tr>
<td>Sydney</td>
<td>-1.52</td>
<td>-4.52</td>
<td>-0.62</td>
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</tr>
<tr>
<td>Jabiru</td>
<td>-1.40</td>
<td>-2.44</td>
<td>-11.61</td>
<td>-19.33</td>
</tr>
<tr>
<td>Mount Isa</td>
<td>-1.34</td>
<td>-5.85</td>
<td>-4.67</td>
<td>-15.43</td>
</tr>
<tr>
<td>Tennant Creek</td>
<td>-1.20</td>
<td>-7.44</td>
<td>-5.53</td>
<td>-28.02</td>
</tr>
<tr>
<td>Derby</td>
<td>-1.19</td>
<td>-2.96</td>
<td>-8.19</td>
<td>-8.60</td>
</tr>
<tr>
<td>Kununurra</td>
<td>-1.15</td>
<td>-4.27</td>
<td>-5.00</td>
<td>-12.74</td>
</tr>
<tr>
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<td>-0.86</td>
<td>-0.66</td>
<td>-2.61</td>
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</tr>
<tr>
<td>Rockhampton</td>
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<td>-2.88</td>
<td>-0.34</td>
<td>-2.79</td>
</tr>
<tr>
<td>South Hedland</td>
<td>-0.67</td>
<td>-3.73</td>
<td>-1.49</td>
<td>-14.59</td>
</tr>
<tr>
<td>Nhulunbuy</td>
<td>-0.66</td>
<td>-1.47</td>
<td>-3.14</td>
<td>-16.91</td>
</tr>
<tr>
<td>Geraldton</td>
<td>-0.54</td>
<td>-2.13</td>
<td>-1.69</td>
<td>-4.48</td>
</tr>
<tr>
<td>Wagga Wagga</td>
<td>-0.42</td>
<td>-1.65</td>
<td>-0.69</td>
<td>-3.80</td>
</tr>
<tr>
<td>Ballarat</td>
<td>-0.21</td>
<td>4.17</td>
<td>0.25</td>
<td>0.38</td>
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<tr>
<td>Apatula</td>
<td>-0.13</td>
<td>0.35</td>
<td>4.20</td>
<td>1.49</td>
</tr>
<tr>
<td>Tamworth</td>
<td>-0.10</td>
<td>-1.65</td>
<td>-1.07</td>
<td>-5.77</td>
</tr>
<tr>
<td>Cooktown</td>
<td>0.08</td>
<td>-2.04</td>
<td>-0.99</td>
<td>-12.25</td>
</tr>
<tr>
<td>Warburton</td>
<td>0.10</td>
<td>0.08</td>
<td>0.44</td>
<td>-24.61</td>
</tr>
<tr>
<td>Perth</td>
<td>0.12</td>
<td>4.63</td>
<td>0.09</td>
<td>1.20</td>
</tr>
<tr>
<td>Roma</td>
<td>0.13</td>
<td>1.31</td>
<td>0.59</td>
<td>-1.03</td>
</tr>
<tr>
<td>Adelaide</td>
<td>0.39</td>
<td>3.82</td>
<td>-0.03</td>
<td>-0.25</td>
</tr>
<tr>
<td>Hobart</td>
<td>0.39</td>
<td>-2.73</td>
<td>-0.19</td>
<td>-3.05</td>
</tr>
<tr>
<td>Townsville</td>
<td>0.57</td>
<td>0.36</td>
<td>-0.52</td>
<td>-0.49</td>
</tr>
<tr>
<td>Cairns</td>
<td>0.65</td>
<td>3.21</td>
<td>-1.30</td>
<td>-3.68</td>
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<tr>
<td>Wangaratta</td>
<td>0.81</td>
<td>1.80</td>
<td>0.01</td>
<td>0.00</td>
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<tr>
<td>Coffs Harbour</td>
<td>0.89</td>
<td>3.21</td>
<td>0.61</td>
<td>3.21</td>
</tr>
<tr>
<td>Port Augusta</td>
<td>1.05</td>
<td>-0.75</td>
<td>-1.99</td>
<td>-9.64</td>
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<td>Queenbeyan</td>
<td>1.29</td>
<td>2.47</td>
<td>0.95</td>
<td>1.97</td>
</tr>
<tr>
<td>Narrogin</td>
<td>1.91</td>
<td>0.35</td>
<td>-0.63</td>
<td>0.55</td>
</tr>
<tr>
<td>Brisbane</td>
<td>2.97</td>
<td>8.06</td>
<td>1.27</td>
<td>5.59</td>
</tr>
<tr>
<td>Darwin</td>
<td>2.85</td>
<td>6.19</td>
<td>-1.32</td>
<td>0.36</td>
</tr>
</tbody>
</table>

*Source: Customised cross-tabulations from the 2001 Census*

A more comprehensive picture than the relative number of people moving in and out of a region is provided by analysing where people are moving to. Full information for this is given in Biddle and Hunter (2005), but as it is too complex to be easily analysed, we summarise it in the following map. Focussing on five yearly migration (that is those who had moved between 1996 and 2001), we begin by mapping the most common destination of those non-Indigenous Australians who had moved ATSIC regions as a series of arrows running from the source ATSIC region to the destination. There is only one set of arrows from each source ATSIC region so, although a large number of people may move from say Victoria to Queensland, because more people move between the two Victoria ATSIC regions, this migration path is not represented.
To put the most common destinations into perspective, they are presented on top of a thematic map of Australia which summarises the net percentage change in population presented earlier into four groups. These four groups run from the lightest shade being those ATSIC regions with a greater than 10 per cent decrease to the darkest shade which represents those ATSIC regions with a greater than 10 per cent increase (figures 1 and 2).

Figure 1 - Most Common Destination of those who Migrate and percentage change in Population since five years ago—non-Indigenous, 2001

Source: Customised cross-tabulations from the 2001 Census

Figure 1 shows Brisbane, Perth and to a lesser extent Sydney, Darwin and Adelaide as pulling in the majority of non-Indigenous internal migrants. There are, however, a number of other common movements including: from Bourke to Wagga Wagga; from the Torres Strait Area and Cooktown to Cairns; and from Tamworth to Coffs Harbour. Figure 2 presents a similar map for the Indigenous population.

Compared to non-Indigenous migration in figure 1, the destinations of choice for the Indigenous population are less likely to be the capital cities, though movements into Perth and Brisbane are still quite common. There appears to be large movement between Kununurra and Derby in the north of Western Australia and between Alice Springs and Apatula in the centre. Those from Warburton are most likely to move to Kalgoorlie and those in Tennant Creek are most likely to move to Mount Isa, who are in turn most likely to move to Townsville. Figures 1 and 2 are consistent with maps provided in Memmott et al. (2004), which were based on earlier censuses (and different geographic boundaries).
3. Characteristics of the Area Associated with Migration

This section looks at the characteristics of the area in which a person lives that may be associated with a person subsequently migrating.

The association between area level variables and migration decisions can be modelled as a two step process. Individuals first make the decision to move to a different SLA based on the characteristics of the SLA in which they live. Once the decision to migrate has been made, the decision of migrants to move to a particular SLA is made based on the characteristics of the potential destinations relative to their current destination. Obviously this is a simplified assumption and, as pointed out by Greenwood (1997), individuals are likely to make the decision to move based on the potential areas available to them. However, in a mixed level analysis such as this where we include individual and household factors, it was not possible to model the two factors together.

**Method – Decision to Move (probit model)**

In the first step, we let $M_i^*$ represent the unobserved increase in utility to the individual $i$ from moving SLA in the five years to 2001. We observe whether that desired level is greater than a given threshold which is affected amongst other things by the unobserved cost of moving. That is:
\[ M_i^* > \mu \]
\[ M_i = \begin{cases} 1 & M_i^* > \mu \\ 0 & M_i^* \leq \mu \end{cases} \]

The probability that \( M_i = 1\) is assumed to be affected by a set of independent variables at the individual level (\( \alpha_1 X_{i,2001} \)) as well as characteristics of the area in which they lived in 1996 (\( \alpha_2 Z_{s,1996} \)) where the subscript \( s \) refers to a source area. That is:

\[ P( M_i = 1) = f(\alpha_1 X_{i,2001} + \alpha_2 Z_{s,1996} + \epsilon_i) \]

In equation \( \epsilon_i \) is an unobserved error term distributed with a mean of zero and variance of one. We estimate the parameters of the model using maximum likelihood estimation (Maddala 1983) and focus our discussion on the predicted change in the probability of moving. For this first set of estimations, we use all individuals who were aged five years and over in 2001 and responded to the two usual residence questions.

Regional characteristics are captured by linking geographic aggregates from the 1996 Census to the unit record data for the 2001 Census using a person’s usual residence five years ago. Hence we do not need to worry about migration influencing the area level figures. The regional characteristics used in our analysis are:

- The proportion of the population in the SLA who identified as being Indigenous.
- The unemployment in the SLA.
- Average income in the area.

The last two variables were calculated separately for the Indigenous and non-Indigenous populations in the area. The local non-Indigenous unemployment rate is used in the Indigenous regressions as a proxy for the overall state of labour market in a region. Note that this is not a direct measure of the local availability of jobs for Indigenous workers, which is better captured by Indigenous unemployment rates as Indigenous people tend to work in a different segment of the labour market to other Australians.

Despite having information on the characteristics of the area in which a person lived five years ago, we unfortunately do not have information on the characteristics of the individual themselves five years ago (i.e., we are not able to match individuals through time). Given the majority of characteristics on the Census are likely to have changed over the five year period, there are very few characteristics of the individual that we are able to use in the model. We are therefore restricted to age, gender and Indigenous status.\(^3\)

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\(^3\)Given the method of establishing Indigenous status on the Census is through self reporting, and there is strong evidence that the propensity to report being Indigenous appears to have increased through time (Ross 1999), there is quite a strong possibility that there are a number of individuals who changed their status between the two Censuses. Unfortunately it is not possible to take this into account.
Method - Choice of Destination (count data model)

In the second step looking at the choice of destination we use as the population of interest the pool of internal migrants for whom \( M_i = 1 \). From this pool of internal migrants, we construct a new area level variable representing the number of people who move between each possible pair of source (\( SLA_s \)) and destination (\( SLA_d \)) regions. As the potential source SLAs are restricted to those with at least one migrant this gives us 1,244,334 migration pairs for the Indigenous estimates and 1,701,770 pairs for the non-Indigenous estimates.

The theory indicates that this count variable should be a function of both source and destination characteristics, as well the relationship between the two areas. That is:

\[
C_{s,d} = g(\beta_1 Z_{s,1996} + \beta_2 Z_{d,1996} + \beta_3 Z_{s,d,1996} + \omega_{s,d})
\]

Once again a separate set of estimates is carried out for Indigenous and non-Indigenous Australians.

After testing for and confirming overdispersion,\(^4\) we assume the number of people who move between each pair of SLAs is distributed via the negative binomial distribution where \( \omega_{s,d} \) is once again an error term with a mean of zero. Since the pool of potential migrants is assumed to be given, we adjust the estimates for the number of migrants that could move between the two regions. We do this using the number of migrants in the source SLA as the exposure variable.\(^5\)

The explanatory variables include the area level variables used to explain the decision to migrate in the first place (the proportion of the population Indigenous, average income and unemployment rate). We also use the characteristics of the destination SLA, as well as the difference between the values of the destination and source SLAs.

In addition, two dummy variables are constructed that indicate whether the source and destination SLAs are either in the same Statistical Division or in a different Statistical Division but the same state.\(^6\) By using these two variables we capture important aspects of the modified gravity model (Greenwood 1997) where shorter moves are likely to result in lower movement costs. In comparison to using a distance measure, however, these variables allow us to capture the fact that in Australia moving between States and Territories involves certain administrative costs (for example moving to a different educational system with a different structure and curriculum).

Also following the modified gravity model, the final explanatory variable is the number of people in the potential destination SLA (calculated separately for Indigenous and non-Indigenous Australians).

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\(^4\) Overdispersion is a violation of the standard assumptions of the Poisson model and occurs when the variance of the data is greater than the mean (Greene 2000).

\(^5\) This variable is used to scale the migration pairs by the number of potential movers. The log of the exposure variable enters the right hand side of the equation with the coefficient restricted to 1 (Dean 1992).

\(^6\) There are only two Statistical Divisions in the Northern Territory with the second covering all of the Northern Territory apart from Darwin. Therefore for this jurisdiction we use whether or not the two SLAs are in the same ATSIC region.
Results – Decision to Move (probit estimates)

We begin by presenting results for the predicted probability of having moved SLA in the five years preceding the 2001 Census with age as the only independent variable and models estimated separately for Indigenous and non-Indigenous Australians. Age is included as a series of 49 dummy variables for each age ranging from 5 to 54, with those aged 55 plus as the base case. This is equivalent to calculating the proportion of the people who move areas separately for each age group and shows the patterns of migration by age without controlling for area level factors. Figure 3 reports the age profile of the predicted probability of moving SLA in the last 5 years with the broken line representing the estimates for Indigenous Australians and the unbroken line representing the analogous estimates for the non-Indigenous population.

Figure 3 - Age Distribution of the Predicted Probability of Moving SLA in the last five years

Source: Authors’ calculations on the 2001 Census.

The general shape of the distribution is similar for Indigenous and non-Indigenous Australians. For both populations, the probability of moving SLAs in the five years up until age 5 is reasonably high. The probability then declines up until age 15, increases for the next 10 years or so, then declines again. There are, however, differences between the two populations. The Indigenous population maintains a much higher probability of moving throughout infants, primary and secondary school than the non-Indigenous population. This could be both a consequence of relatively low engagement with formal schooling as well as being the cause of lower attendance and higher truancy. This issue is one that warrants further investigation however is difficult to analyse with the currently available data.

Whilst staying somewhat lower throughout the teenage years, the probability of moving SLAs is much higher during the peak migration years of around 20 to 35

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7 We also ran the models separately for males and females (Biddle and Hunter 2005). Although for Indigenous and non-Indigenous Australians, the predicted probabilities are slightly higher for females than males, the patterns are almost exactly the same. We therefore focus on the estimations using both males and females together.
for the non-Indigenous population. This is the age at which the non-Indigenous population move out of home, begin a career and start a family (Long 1992). It would appear that such life-cycle events have much less of an impact on the migration patterns of Indigenous Australians.

The results presented in figure 3 replicate previous research looking at this issue, albeit with a slightly different method and dependent variable. The following table presents the predicted change in the probability of moving SLA (between 1996 and 2001) that results from a change in the characteristic of the area.

Given the quite distinct possibility that the area level characteristics in 1996 are jointly determined, the effects are estimated using separate specifications. Four specifications were used for the Indigenous population with the previous set of age dummies and sex as well as a separate estimate for the value in 1996 of: the proportion of the population who were Indigenous; the average income of Indigenous Australians in the area; the unemployment rate for Indigenous population; and the unemployment rate of the non-Indigenous population. Comparing the results for these last two variables will give some insight into the effect of the CDEP scheme as opposed to other aspects of the labour market. We pick this issue up again in the discussion of the results.

For the non-Indigenous population only three estimates were carried out: the proportion of the population who were Indigenous in 1996, the average income of non-Indigenous Australians in the area; and the unemployment rate of the non-Indigenous population.

Coefficients are presented in Biddle and Hunter (2006), where for all seven specifications the area level characteristics were significant. We summarise results below using the predicted probability for one value of the area characteristic alongside the predicted probability for a second value. The two values used are given in the row labelled ‘change in characteristics of the SLA’ and represent values close to the respective median for that column from the Indigenous population (apart from the last column where a lower rate is used to reflect lower non-Indigenous unemployment).

<table>
<thead>
<tr>
<th>Change in characteristics</th>
<th>Proportion of the population Indigenous</th>
<th>Average income</th>
<th>Indigenous unemployment rate</th>
<th>Non-Indigenous unemployment rate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4% to 10%</td>
<td>$250 to $300</td>
<td>20% to 30%</td>
<td>10% to 15%</td>
</tr>
<tr>
<td>Predicted change in the probability of moving SLA associated with change in characteristics</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indigenous</td>
<td>0.356 to 0.327</td>
<td>0.275 to 0.339</td>
<td>0.292 to 0.330</td>
<td>0.324 to 0.385</td>
</tr>
<tr>
<td>Non-Indigenous</td>
<td>0.398 to 0.435</td>
<td>0.327 to 0.345</td>
<td>n.a.</td>
<td>0.382 to 0.374</td>
</tr>
</tbody>
</table>

Source: Authors' calculations on the 2001 Census.

Looking at the first column, having a higher proportion of the population who were Indigenous leads to an increase in the probability of moving for non-Indigenous

8 We also estimated the model with all area level variables included. The magnitudes of the coefficients changed, however the signs stayed the same.
Australians, but a decrease for Indigenous Australians. This difference is perhaps not surprising as according to the gravity model (Greenwood 1997), having a higher proportion of people of a similar ethnic group in one’s area decreases the motivation to move. In terms of the human capital model, this effect can be explained through the social costs of moving being higher in these areas, however, it may also be as a result of the type of area where Indigenous Australians are more likely to live having an effect.

That higher income areas are associated with a higher probability of moving is somewhat more difficult to explain using the human capital model. If people are motivated to move to improve their future lifetime income, we would expect that those in higher income areas have less motivation to move than those in low income areas. Such findings are, however, not unusual and are often explained as representing unobserved ‘amenities’ (Graves 1979).

Consider a model where income is important in determining where a person lives, however, so too are things like climate, access to the coast and other things about the natural area that impact on people’s quality of life. Those areas with good amenities are likely to attract individuals to them and hence to obtain a given supply of workers’ wages do not need to be terribly high. In areas where amenities are bad, and hence people are likely to move away from such areas, wages must be kept higher to compensate. The best example of this in Australia is mining areas where wages need to be high to compensate for the unpleasant environment. As we are unable to fully incorporate amenity variables in this paper, this may be an explanation for the observed positive correlation between income and the probability of moving.

The effects of the unemployment rate on the decision of Indigenous Australians to migrate have the expected sign. This is true whether we use the Indigenous unemployment rate or the non-Indigenous unemployment rate. That is, Indigenous Australians in high unemployment areas are more likely to make the decision to migrate. We use the unemployment rate of non-Indigenous Australians as an additional explanatory variable to the unemployment rate of the Indigenous population because without being able to control for the presence of the CDEP scheme, the non-Indigenous unemployment rate may be a better measure of the private sector labour market in the area.

Neither unemployment rate variables may fully capture the effect of the CDEP scheme, especially if people treat CDEP jobs differently to non-CDEP employment when making the decision to move. For example, there may be greater ties to areas with the CDEP scheme which may explain why those who live in areas with low rates of unemployment (as a result of the presence of the CDEP scheme) have a lower probability of moving. Nonetheless, the non-Indigenous unemployment rate is unlikely to be affected by the CDEP scheme. So, given those Indigenous Australians who live in areas with a low non-Indigenous unemployment are also less likely to move, there is some evidence that Indigenous Australians are moving to take advantage of non-CDEP job prospects as well.

**Results - Choice of Destination (count data models)**

The remainder of this section looks at the association the area level characteristics have with the number of people from the pool of migrants who decide to migrate between each pair of SLAs. Once again we use three or four separate specifications, however the signs and significance do not change when all area level variables are modelled together.
Coefficient estimates are given in Biddle and Hunter (2006), however, to present the results in a more intuitive manner, we use the predicted change in the number of people moving between the two SLAs. We present results for an SLA pairing with a potential pool of migrants of 100 people\(^9\) and for the base case assume that the SLAs are in the same Statistical Division (SD) and there are no differences between the area level characteristics of the source and destination SLA (see column heading in tables 3 and 4). The population in the destination region is assumed to be equal to the average values for the population (i.e., 290 and 11,783 for the Indigenous and non-Indigenous populations respectively). The predicted number of people who move between a pair of SLAs with the base case characteristics is given in the first line of the table.

To look at the predicted change in the number of people who move (the area effect), we hold the characteristics of the destination SLA constant, but relax the assumption that there is no difference between source and destination characteristics.

The second line of the numbers in the table gives the predicted number of people estimated to move between the pairs of SLAs under the base case assumptions minus the predictions under the alternative assumptions. If the effects on migration (of the difference between source and destination SLAs) were not significant, they are labelled n.s.

We also present results for the predicted change in the number of movers after changing other population characteristics (one at a time whilst holding all else constant). That is, there results are the predicted difference in the number of movers from the base case for a pair of SLAs: which are in the same state but different SD; which are in a different state; and after doubling the population of the destination region.

Table 3 shows that ‘gravity model effects’, whereby shorter moves are likely to result in lower movement costs, tend to dominate amongst the factors associated with the choice of destination. For example, compared to SLAs in the same SD, those in different SDs within the same state have substantially lower predicted number of movers, whereas those in different states have predictions close to zero. That is, moves between local or adjacent SLAs are far more common than longer moves within a state or between states. Doubling the destination SLA population (e.g., from 290 to 580 Indigenous Australians) leads to around three extra individuals moving between the two SLAs.

The economic area effects have only a small (albeit generally significant) association with the predicted number of people who move between SLAs. Compared to the base case, those SLA pairs where the source SLA has 10 per cent of the population who identified as Indigenous, but the destination SLA has 4 per cent being Indigenous are predicted to have 0.18 fewer people move between the areas than the base case (where both SLAs have 10 of the population Indigenous). In other words, Indigenous Australians are slightly less likely to move to areas with a larger proportion of the population Indigenous than where they are currently living.

On the other hand, Indigenous Australians are more likely to move to areas with higher average incomes than their current region. Compared to the previous section where the unemployment rate in the area had a large effect on whether or not to move, the differences in Indigenous unemployment rates do not seem to have much of an effect on the decision of where to move once the decision to move has been made.

\(^9\) The actual mean for the exposure variable for the Indigenous population is 86.80 and the non-Indigenous population 3290.94. However, we use the same value for Indigenous and non-Indigenous Australians to keep the results comparable.
<table>
<thead>
<tr>
<th>Area effects</th>
<th>Proportion Indigenous</th>
<th>Average income</th>
<th>Indigenous unemployment</th>
<th>Non-Indigenous unemployment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated number of moves for the base case&lt;sup&gt;a&lt;/sup&gt;</td>
<td>7.52</td>
<td>8.67</td>
<td>9.41</td>
<td>11.12</td>
</tr>
<tr>
<td>Predicted effect from the variation in the characteristics of source and destination SLAs from the base case&lt;sup&gt;b&lt;/sup&gt;</td>
<td>-0.18</td>
<td>0.15</td>
<td>n.s.</td>
<td>0.23</td>
</tr>
</tbody>
</table>

**Gravity model effects (relative to base case)**

| SLA in the same state but different SD                                     | -6.25                 | -7.23          | -7.86                  | -9.24                       |
| SLA in a different state                                                   | -7.38                 | -8.50          | -9.23                  | -10.90                      |
| Effect from doubling the destination population                             | 3.03                  | 2.74           | 2.97                   | 3.67                        |

**Note**: The base case assumes that the source and destination SLAs are in the same SD. The area characteristics for the base case are: 10 per cent of the local population is Indigenous, the average income is $300, Indigenous unemployment rate is 30 per cent and the Non-Indigenous unemployment rate is 15 per cent. This predicted change in moves is associated with the destination SLA having the following characteristics: the proportion of the local population who are Indigenous is 4 per cent, average income is $250, and the Indigenous and non-Indigenous unemployment rates are 20 per cent and 10 per cent respectively. The characteristics of source SLA are the same as those in the base case, but the characteristics of the destination SLA are varied one at a time (i.e. the characteristic for respective columns).

**Source**: Authors’ calculations on the 2001 Census based on estimation of equation 3.

---

<table>
<thead>
<tr>
<th>Area effects</th>
<th>Proportion Indigenous</th>
<th>Average income</th>
<th>Indigenous unemployment</th>
<th>Non-Indigenous unemployment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated number of moves for the base case&lt;sup&gt;a&lt;/sup&gt;</td>
<td>7.61</td>
<td>6.75</td>
<td>n.a.</td>
<td>7.53</td>
</tr>
<tr>
<td>Predicted effect from the variation in the characteristics of source and destination SLAs from the base case&lt;sup&gt;b&lt;/sup&gt;</td>
<td>-0.83</td>
<td>-0.16</td>
<td>n.a.</td>
<td>0.37</td>
</tr>
</tbody>
</table>

**Gravity model effects (relative to base case)**

| SLA in the same state but different SD                                     | -6.28                 | -5.52          | n.a.                   | -6.22                       |
| SLA in a different state                                                   | -7.46                 | -6.62          | n.a.                   | -7.38                       |
| Effect from doubling the destination population                             | 3.69                  | 3.39           | n.a.                   | 3.59                        |

**Note**: The base case assumes that the source and destination SLAs are in the same SD. The area characteristics for the base case are: 10 per cent of the local population is Indigenous, the average income is $300, Indigenous unemployment rate is 30 per cent and the Non-Indigenous unemployment rate is 15 per cent. This predicted change in moves is associated with the destination SLA having the following characteristics: the proportion of the local population who are Indigenous is 4 per cent, average income is $250, and the Indigenous and non-Indigenous unemployment rates are 20 per cent and 10 per cent respectively. The characteristics of source SLA are the same as those in the base case, but the characteristics of the destination SLA are varied one at a time (i.e. the characteristic for respective columns).

**Source**: Authors’ calculations on the 2001 Census based on estimation of equation 3.
The gravity model effects once again seem to dominate for the non-Indigenous population with the magnitude of the effects being similar to the estimates on the Indigenous population. The estimated effect of the proportion of the population who are Indigenous is once again negative, however, in this case the magnitude of the effect is larger.

Non-Indigenous Australians seem to be moving from areas relatively high income and low unemployment to ones with lower average income and higher unemployment rates. This could once again reflect moving out of areas with high property prices (which are not measurable using the Census) to more affordable areas.

4. Discussion

The study of Indigenous mobility and migration is potentially important for understanding how policy might facilitate Indigenous employment outcomes. Gregory (2005) considers mobility as necessary for enhancing Indigenous employment prospects in remote areas. Another prominent economist, Hughes (2005a, 2005b) emphasises mobility, *inter alia*, as a means to alleviating Indigenous disadvantage, especially in remote areas. Given the recent advocacy for enhanced mobility, it is surprising how limited the existing research on Indigenous mobility is. This paper attempts to remedy this hole in the literature.

Even if Indigenous people migrated to more developed labour markets in major urban areas, there appear to be few employment opportunities waiting for them there with the difference between Indigenous and non-Indigenous employment probabilities being similar in both metropolitan and remote areas (Hunter 2004a). Within metropolitan areas, Indigenous people tend to live in disadvantaged suburbs with relatively high unemployment rates (Hunter 1996). Therefore, the main issue is: how can policy-makers enhance Indigenous employment prospects in all areas, not just remote areas?

The ABS monograph *Indigenous Australians in the Contemporary Australian Labour Market* showed, amongst other things, that labour market discrimination cannot be discounted as a major factor underlying Indigenous employment disadvantage in metropolitan, provincial and remote Australia (Hunter 2004a, chapter 4). Furthermore, such discrimination probably results in the inability to find jobs rather than in low wages. Given the pervasively poor employment prospects of Indigenous Australians, and the probable existence of significant labour market discrimination throughout Australia, migration or mobility policy is unlikely to be a short-term solution to Indigenous economic development.

The analysis in this paper also points to Indigenous people tending to move out of high unemployment areas, a fact that is consistent with a human capital style approach to migration analysis. Migration is also crucially affected by social and cultural factors (measured in this paper by the proportion of the population in the area who are Indigenous), which are arguably more important than the economic factors for Indigenous Australians. One reason for the relative importance of social factors is that economic incentives to move to buoyant labour markets are blunted by the depressed employment prospects for Indigenous people in all geographic areas. While the existence of a local CDEP scheme complicates the incentives to move, most CDEP
participants do not get much more than their unemployment benefit equivalent income and hence the financial incentives are not substantially altered. Notwithstanding, the existence of a local CDEP scheme is likely to change other labour market behaviour, especially the educational participation of indigenous youth (see Hunter 2003).

The apparent (relative) lack of responsiveness of Indigenous mobility to economic incentives may be construed as indication that Indigenous people are not integrated into the Australian labour market. However, Indigenous opportunities for non-market activities (e.g. hunting and gathering and customary activities) are more important than those available for non-Indigenous Australians and the observed patterns of Indigenous mobility and migration probably reflect this. Stated another way, Indigenous mobility is not a problem to be solved by policy makers as it probably reflects the rational choices facing Indigenous people. Notwithstanding there is an argument for further academic work to develop a theoretical model that takes into account the opportunities for market and non-market opportunities to enhance our ability to predict mobility patterns (e.g., using the informal model outlined in Altman 2005).

While the role of migration is more complex for overall Indigenous economic development than previously thought, policy-makers still need to take it into account in regional economic plans and demographic projections. The research community also needs to take into account the role of selective migration in altering estimated models of individual behaviour in the social and economic domains. An example of the latter is that having been arrested in the last five years is associated with relatively high rates of mobility. Hence, it would be desirable to identify whether mobility decisions are related to effect of arrest on employment prospects documented in Borland and Hunter (2000). Unfortunately, most survey data does not have adequate information on mobility so it is not possible to test competing hypotheses at this stage.

This paper covers a large amount of previously uncharted territory, but is designed to motivate a more detailed interrogation of the factors driving Indigenous and non-Indigenous mobility. Whatever one’s position on the current debate on Indigenous economic development, there is a greater need for policy-makers and researchers to understand the processes underlying migration and mobility.

References


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