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Factors associated with internal migration: A comparison between Indigenous and non-Indigenous Australians

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Factors associated with internal migration: A comparison between 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 examines patterns of migration and factors associated with both 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.

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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 personal factors underlying an individual's decision to migrate, and once that decision has been made, the choice of migration destination.

Indigenous Australians have distinct patterns of mobility when compared to 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 undertake migration.

The following section 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 concludes by relating the findings to the broader literature on Indigenous economic development and offering some tentative conclusions.

THEORETICAL MODEL

Although the data we use does not allow us to estimate such a model, to understand the economic factors associated with migration we follow the basic human capital model as 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, Chapman & 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 (developed in Stewart 1941, but taken in this paper from 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 & 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 life cycle characteristics.

SLA: Statistical Local Area

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 life cycle factors are quite likely to be important in the migration decision. 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 and reach their peak at around age 25. The probabilities then decline steadily throughout a person's life.

To come to the conclusion that labour market factors were relatively unimportant, the author was only able to use a broad measure of economic disadvantage in neighbourhood sized areas, the SEIFA index (ABS 2003). Although the SEIFA index (Socio-Economic Indexes for Areas) is influenced in part by the labour market characteristics of the area, it is also influenced by income and education levels. As explained later in this paper, income and employment may have quite different effects which may be the reason for the lack of significance of this variable in explaining migration (it was only significant at the 10% level of significance). However it should be noted that the coefficient on this variable was positive, implying that people move from areas of high disadvantage to low disadvantage.

SEIFA: Socio-Economic Indexes for Areas

Kinfu (2005) also found that distance had a significant effect on migration patterns. That is, pairs of migration zones that were physically proximate 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) examined some of the individual factors associated with mobility. They used 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 (one which is common with any cross-sectional analysis, including this paper) is that the authors 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.

NATSISS: National Aboriginal and Torres Strait Islander Social Survey

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 their last move. They do, however, point out the difficulty in using a measure that only captures the main reported

reason for the last move when the ethnographic evidence suggests that many factors come into play. One set of factors 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 at 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.[1] 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. In terms of current studies, being a high-school student was found to have a negative and substantial effect on the probability of moving. The final variable in Biddle and Hunter's (2005) specification is having been arrested in the five years preceding the survey. The marginal effect for this variable was estimated to be positive and quite large.

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. Reporting that a person has the main caring responsibility for someone under 13 years of age is associated with a lower probability (especially for males), however the other social variables were for the most part insignificant. Reporting that one's health is fair or poor is associated with a lower probability.

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.

PATTERNS OF MIGRATION

ATSIC: Aboriginal & Torres Strait Islander Commission

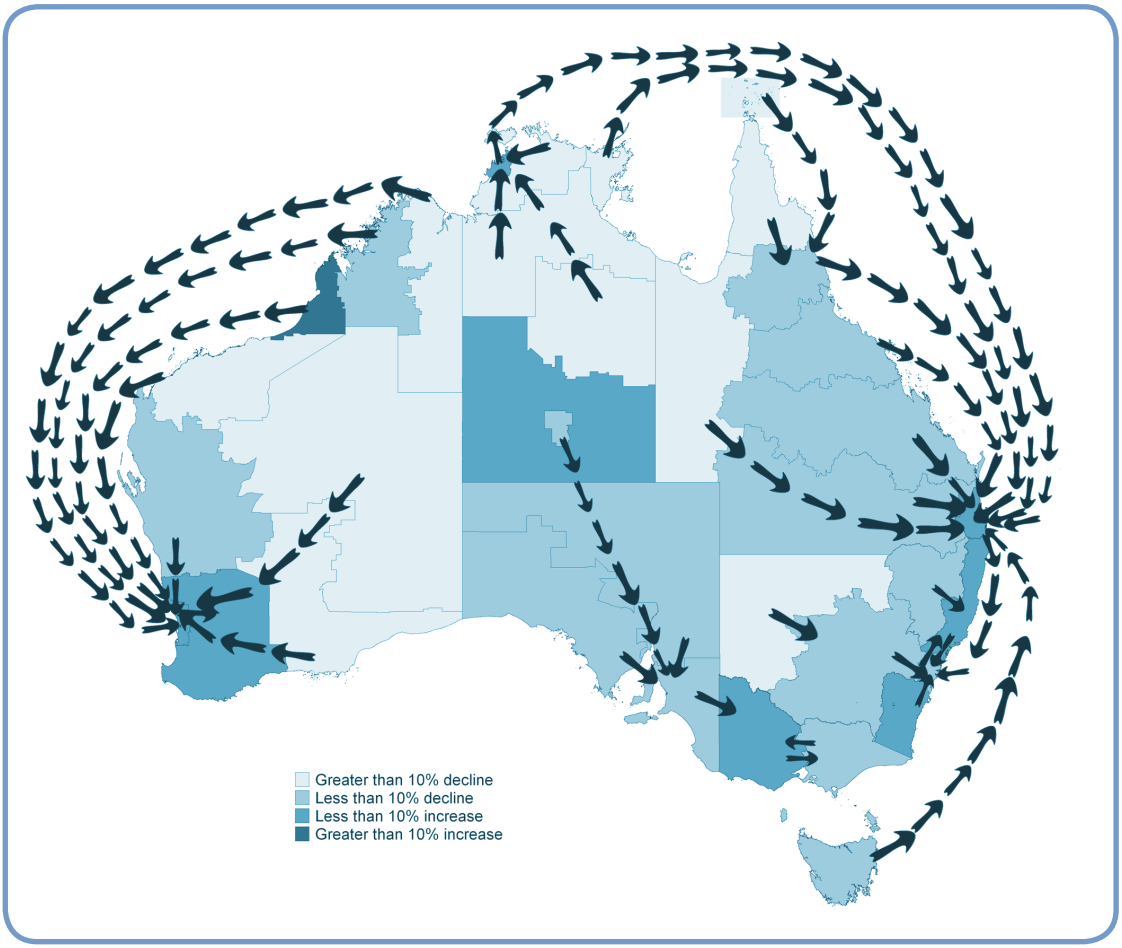
This section looks at the patterns of migration for Indigenous Australians. Although other parts of the paper use SLAs as the basis of the analysis, in this section we use Aboriginal and Torres Strait Islander Commission (ATSIC) regions. Using the 36 ATSIC regions allows us to summarise in a graphical sense the patterns of migration much easier than the roughly 1,350 SLAs and has the benefit of representing to a certain extent Indigenous cultural groups (Arthur & Morphy 2005: Chapter 1). ATSIC region 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. A map is given in Appendix A summarising this information.

Table 1. Net change in usual residents as percent of those in ATSIC region for one or five years

	Indigenous		Non-Indigenous	
ATSIC region	One year	Five years	One year	Five years
Bourke	-2.81	-10.45	-2.37	-11.51
Torres Strait Area	-2.77	-5.92	-8.15	-11.36
Katherine	-2.04	-3.44	-5.92	-15.3
Alice Springs	-1.77	-3	-2.05	-9.13
Ceduna	-1.61	-8.87	-0.56	-2.13
Broome	-1.58	-4.32	-0.11	12.21
Sydney	-1.52	-4.52	-0.62	-2.24
Jabiru	-1.4	-2.44	-11.61	-19.33
Mount Isa	-1.34	-5.85	-4.67	-15.43
Tennant Creek	-1.2	-7.44	-5.53	-28.02
Derby	-1.19	-2.96	-8.19	-8.60
Kununurra	-1.15	-4.27	-5	-12.74
Kalgoorlie	-0.86	-0.66	-2.61	-13.28
Rockhampton	-0.83	-2.88	-0.34	-2.79
South Hedland	-0.67	-3.73	-1.49	-14.59
Nhulunbuy	-0.66	-1.47	-3.14	-16.91
Geraldton	-0.54	-2.13	-1.69	-4.48
Wagga Wagga	-0.42	-1.65	-0.69	-3.80
Ballarat	-0.21	4.17	0.25	0.38
Apatula	-0.13	0.35	4.2	1.49
Tamworth	-0.10	-1.65	-1.07	-5.77
Cooktown	0.08	-2.04	-0.99	-12.25
Warburton	0.10	0.08	0.44	-24.61
Perth	0.12	4.63	0.09	1.20
Roma	0.13	1.31	-0.59	-1.03
Adelaide	0.39	3.82	-0.03	-0.25
Hobart	0.39	-2.73	-0.19	-3.05
Townsville	0.57	0.36	-0.52	-0.49
Cairns	0.65	3.21	-1.3	-3.68
Wangaratta	0.81	1.8	0.01	0.00
Coffs Harbour	0.89	3.21	0.61	3.21
Port Augusta	1.05	-0.75	-1.99	-9.64
Queanbeyan	1.29	2.47	0.95	1.97
Narrogin	1.91	0.35	-0.63	0.55
Brisbane	2.27	8.06	1.27	5.59
Darwin	2.85	6.19	-1.32	0.36

Source: Customised cross-tabulations from the 2001 Census.

Fig. 1. Most common destination of those who migrate and percentage change in population since five years ago—Non-Indigenous, 2001

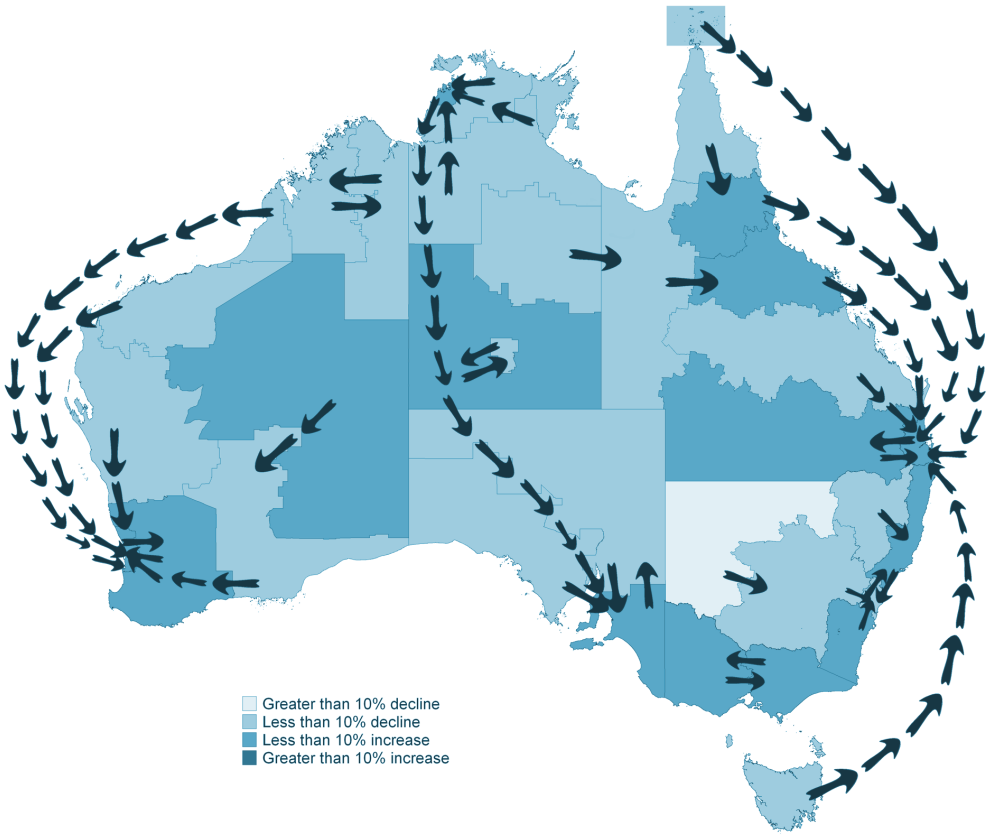


Source: Customised cross-tabulations from the 2001 Census.

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.[2] 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.

Fig. 2. Most common destination of those who migrate and percentage change in population since five years ago—Indigenous, 2001



Source: Customised cross-tabulations from the 2001 Census.

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.

The percentage changes presented in Table 1 show net mobility rates. However, this disguises the large degree of circular migration—that is, moving back and forth between different areas over an extended period of time—that has been reported for the Indigenous population (Taylor 1998). This concept is perhaps 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% of the Indigenous population lived in a different ATSIC region than they did in 2000, and 14.7% had moved ATSIC regions since 1996. This is in comparison to 3.2% and 9.7% respectively of the non-Indigenous population over the same time periods. Biddle and Hunter (2005) give the proportions for each ATSIC region.

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 figures. Focusing 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. These are mapped on top of a thematic map of Australia which summarises the net percentage change 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 (Fig. 1 & 2).

Fig. 1 shows Brisbane, Perth and to a lesser extent Sydney, Darwin and Adelaide as attracting the majority of non-Indigenous 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. Fig. 2 presents a similar map for the Indigenous population.

Compared to non-Indigenous migration in Fig. 1, the destinations of choice for the Indigenous population are less likely to be the capital cities. 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.

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.

To measure the association that area level variables have with migration decision we assume a two step process. That is, we assume that 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:

$$M_i = \begin{cases} 1 & \text{if } M_i^* > \mu \\ 0 & M_i^* \leq \mu \end{cases} \quad (1)$$

We assume that the probability that $(M_i = 1)$ is affected by a set of independent variables at the individual level as well as characteristics of the area in which they lived in 1996 (labelled 's' for source area). That is:

$$P(M_i = 1) = f(\alpha_1 X_{i,2001} + \alpha_2 Z_{s,1996} + \varepsilon_i) \quad (2)$$

In Equation (2) ε_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.

For the regional characteristics, we use figures from the 1996 Census that we link to the 2001 Census based on a person's response to the usual residence five years ago question. 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 labor 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 (that is, 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]

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 potential source SLAs are restricted to those with at least one migrant, this leads to 1,244,334 migration pairs for the Indigenous estimates and 1,701,770 pairs for the non-Indigenous estimates.

We assume this count variable is a function of source and destination characteristics, as well the relationship between the two areas. That is:

$$C_{s,d} = g\left(\beta_1 Z_{s,1996} + \beta_2 Z_{d,1996} + \beta_3 Z_{s,d,1996} + \omega_{s,d}\right) \quad (3)$$

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

After testing for and confirming over dispersion, 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. Given we are taking the pool of migrants as given, we adjust the estimates for the number of potential migrants that could move between the two regions. We do this using the number of migrants in the source SLA as the exposure variable where the log of the exposure variable enters the right hand side of the equation with the coefficient restricted to 1.

For the explanatory variables we use 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 use the characteristics of the destination SLA, as well as the difference between the values at the destination and source SLA.

In addition we set up two dummy variables 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.[4] 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).

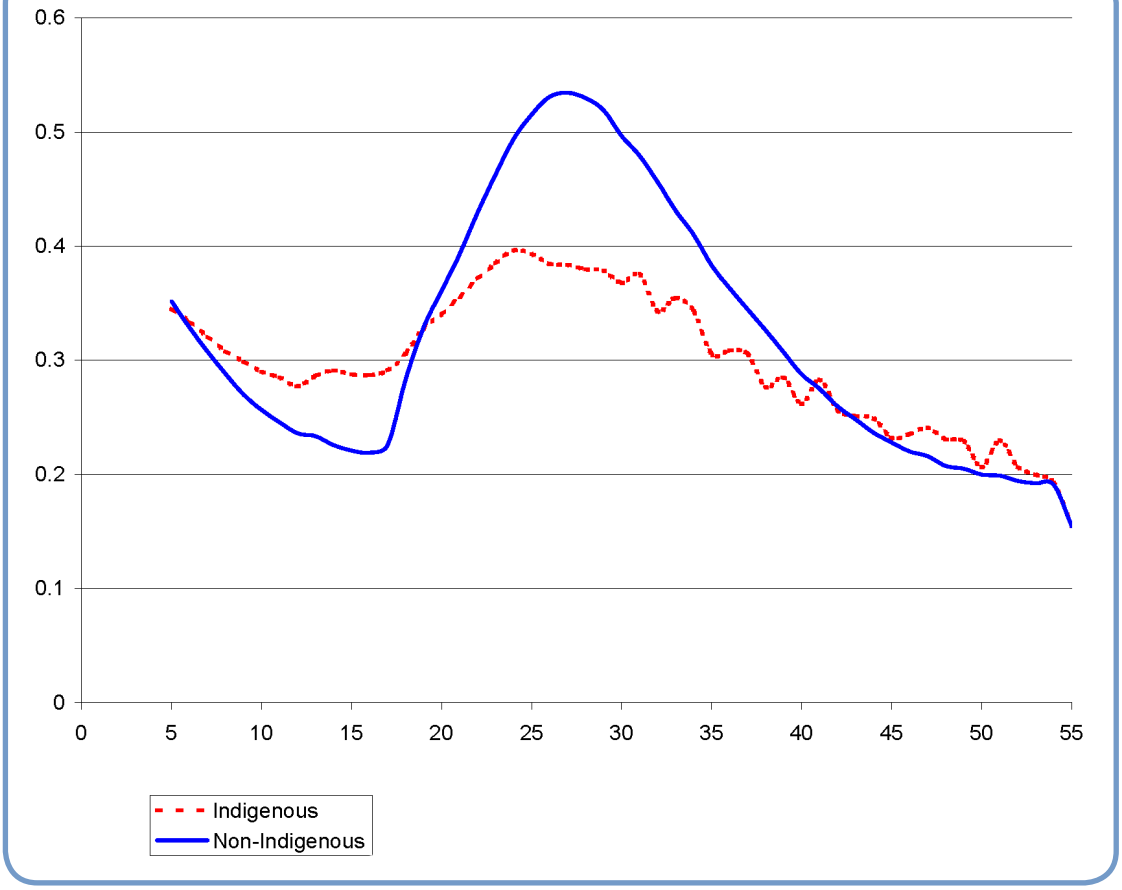
Also following the modified gravity model, the final explanatory variable is the number of people in the potential destination SLA (calculated separately for Indigenous and non-Indigenous Australians).

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.[5] 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. The broken red line is for Indigenous Australians, the unbroken blue line for the non-Indigenous population.

The general shape of the distribution is similar for Indigenous and non-Indigenous Australians (and is quite similar to the figure presented in Kinfu 2005). 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. 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.

Fig. 3. Age distribution of the predicted probability of moving SLA in the last five years



Source: Authors' calculations based on the 2001 Census.

Table 2. Predicted change in probability of moving SLA in the last five years from a change in the area level characteristic

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

Source: Authors' calculations based on the 2001 Census.

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 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 Fig. 2 replicate previous research looking at this issue, albeit with a slightly different method and dependent variable. Table 2 presents the new results from this paper looking at the predicted change in the probability of moving SLA in the five years preceding the Census 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.[6] 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 proportion of the population who were Indigenous in 1996; the average income of Indigenous Australians in the area; the unemployment rate for Indigenous population; and the unemployment rate of the non-Indigenous population. 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 at Appendix B, 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' and represent values close to the median for the Indigenous population.

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 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.

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, things like climate, access to the coast and other things about the natural area that impact on people's quality of life are also important. 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 more likely to move away, 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.[7] That is, Indigenous Australians in high unemployment areas are more likely to make the decision to migrate.

Table 3. Predicted change in number of Indigenous moves per 100 potential migrants associated with various area effects, 2001

	Area effects			
	Proportion Indigenous	Average income	Indigenous unemployment	Non-Indigenous unemployment
Estimated number of moves for the base case[a]	7.52	8.67	9.41	11.12
Predicted effect from major variation of the characteristics of source and destination SLAs from base case[b]	-0.18	0.15	n.s.	0.23
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 destination population	3.03	2.74	2.97	3.67

Note: a. 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.

b. 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.

RESULTS—CHOICE OF DESTINATION (COUNT DATA MODELS)

The remainder of this section looks at the effect the area level characteristics have on 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 and estimates, however the signs and significance do not change when all area level variables are modelled together.

Coefficient estimates are given at Appendix B. However, to present the results we use the predicted change in the number of people who move between the two SLAs. We present results for an SLA pairing with a potential pool of migrants of 100 people, 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.[8] We also assume that population in the destination region is equal to the average values for the population, or 290 and 11,783 for the Indigenous and non-Indigenous populations respectively.

SD: Statistical Division

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 of zero difference between source and destination characteristics. The second line of the table gives the area level value for the base case and the third the difference between the source and destination characteristics for the alternate to the base case. The final line of the table gives the predicted number of people who move between pairs of SLAs using the base case characteristics. Those variables that were not significant 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). So we present the predicted difference in the number of movers 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 the factor 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 origin 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 that decision has been made.

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 (Table 4). 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 quite a fair bit larger.

Non-Indigenous Australians seem to be moving from relatively high income and low unemployment areas to ones with lower values of income and worse 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.

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.

Table 4. Predicted change in number of non-Indigenous moves per 100 potential migrants associated with various area effects, 2001

	Area effects			
	Proportion Indigenous	Average income	Indigenous unemployment	Non-Indigenous unemployment
Estimated number of moves for the base case [a]	7.61	6.75	n.a.	7.53
Predicted effect from the variation of a characteristic of destination SLAs from base case [b]	-0.83	-0.16	n.a.	0.37
Gravity model effects				
SLAs in the same state but different SD	-6.28	-5.52	n.a.	-6.22
SLAs in a different state	-7.46	-6.62	n.a.	-7.38
Effect from doubling destination population	3.69	3.39	n.a.	3.59

Note: a. 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.

b. 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.

Even if Indigenous people migrated to more developed labour markets in major urban areas, there appear to be few employment opportunities awaiting 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 is probably manifest 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.

Notwithstanding, the analysis in this paper 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 is blunted by the depressed employment prospects for Indigenous people in all geographic areas.

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, 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.[9] 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 this, 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 the 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.

NOTES

1. It is possible that these variables exhibit a fairly large degree of multicollinearity. To ensure this was not impacting our results, we re-estimated the equations, including only one variable at a time. The results for these and other variables did not change after doing so.
2. Of the 396,424 Indigenous Australians who were born and not overseas one year ago, 95.5% responded to the usual residence one year ago question. Of the 17,114,958 non-Indigenous Australians, the corresponding figure was 98.5%. Not surprisingly, the response rate for the usual residence five years ago question is lower at 93.4% of the 351,636 applicable Indigenous Australians and 97.9% 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.
3. Given that 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.
4. 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.
5. We also ran the models separately for males and females (Biddle and Hunter 2005a). 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.
6. We also estimated the model with all area level variables included. The magnitudes of the coefficients changed, however the signs stayed the same.
7. We also use the unemployment rate of non-Indigenous Australians 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.

   The mean for the exposure variable for the Indigenous population is 86.80 and the non-Indigenous population 3290.94.
8. Gray, Altman, and Halasz (2005) show that Indigenous opportunities for hunting and gathering are substantial even in settled Australia. Also see Altman, Buchanan and Biddle (2006).

REFERENCES

Altman, J. C. 2005. 'Economic futures on Aboriginal land in remote and very remote Australia: Hybrid economies and joint ventures' in D. Austin-Broos and G. Macdonald (eds), *Culture, Economy and Governance in Aboriginal Australia*, University of Sydney Press, Sydney.

——, Buchanan, G. and Biddle, N. 2006. 'The real 'real' economy in remote Australia' in B.H. Hunter (ed.), *Assessing Recent Evidence on Indigenous Socioeconomic Outcomes: A focus on the 2002 NATSISS*, CAEPR Monograph No. 26, ANU E Press, ANU, Canberra.

Arthur, W. S. and Morphy, F. (eds) 2005. *Macquarie Atlas of Indigenous Australia*, Macquarie Library Pty Ltd, Sydney.

ABS, 2001. *Statistical geography Volume 1: Australian Standard Geographical Classification 2001*, ABS cat. no. 1216.0, ABS, Canberra.

——2002. *Population distribution: Aboriginal and Torres Strait Islander Australians 2001* ABS cat.no. 4705.0, ABS, Canberra.

——2003. *Information paper: Census of population and housing – Socio-Economic Indexes for Areas*, ABS Cat. no. 2039.0, ABS, Canberra.

——2005 *National Aboriginal and Torres Strait Islander Social Survey: Expanded Confidentialised Unit Record File*, ABS Cat. no. 4720.0, ABS, Canberra.

Biddle, N., (forthcoming) Pathways to improved Indigenous education outcomes, Unpublished PhD thesis, ANU, Canberra.

——, and Hunter, B.H., 2005. 'Economic characteristics of areas associated with internal migration: A comparison between Indigenous and non-Indigenous Australians', Australian Labour Market Research Workshop, Canberra, December 2005.

Borland, J. and Hunter, B.H. 2000. 'Does crime affect employment status?—the case of Indigenous Australians', *Economica*, 67(1): 123–44.

Brown, D., Kinfu, Y., Taylor, J., and Bell, M., 2004. 'Demographic change in remote areas of Australia: Issues and opportunities', 2004 SEGRA Conference, Alice Springs.

Chapman, L., and Greenville, J., 2002. 'Profiling rural Australia: Impact of changes in the agriculture sector on rural towns', *Australian Commodities*, 9(1): 234–49.

Daly, A.E. and Hunter, B.H. 1999. 'Incentives to work: replacement ratios and the cost of job loss among unemployed Indigenous Australians', *Australian Economic Review*, 32 (3): 219–36.

Freebairn, J. 2005. 'Reforming Industrial Relations and Social Equity', Presented to the 34th Conference of Economists, held at the University of Melbourne, 26th to 28th September, Melbourne.

Gale, F. 1972. *Urban Aborigines*, ANU Press, Canberra.

—— and Wundersitz, J. 1982. *Adelaide Aborigines: A Case Study of Urban Life 1966–1981*, Development Studies Centre, ANU, Canberra.

Graves, P.E., 1979. 'A life-cycle empirical analysis of migration and climate, by race', *Journal of Urban Economics*, 6(1): 135–47.

Gray, A. 2004. 'The formation of contemporary Aboriginal settlement patterns in Australia: government policies and programmes', in J. Taylor and M. Bell (eds), *Population Mobility and Indigenous Peoples in Australasia and North America*, Routledge, London and New York.

Gray, M.C., Altman, J.C. and Halasz, N. 2005. 'The economic value of wild resources to the Indigenous community of the Wallis Lake catchment', *CAEPR Discussion Paper No. 272*, CAEPR, ANU, Canberra.

Greene, W. 2000. *Econometric Analysis*, 4th edition, Prentice Hall, New Jersey.

Greenwood, M.J., 1997. 'Internal migration in developed countries', in Rosenzweig and Stark (eds), *Handbook of Population and Family Economics*, Elsevier Science, Amsterdam.

Gregory, R.G. 2005. 'Between a rock and a hard place: Economic policy and the employment outlook for Indigenous Australians'. in D. Austin-Broos and G. Macdonald (eds) *Culture, Economy and Governance in Aboriginal Australia*, University of Sydney Press, Sydney.

Harris, J.R., and Todaro, M.P., 1970. 'Migration, unemployment and development: A two-sector analysis', *American Economic Review* 60 (1): 126–42.

Hughes, H. 2005a. 'The economics of Australian Apartheid: The causes of Indigenous deprivation', Presented to the 34th Conference of Economists, held at the University of Melbourne, 26th to 28th September, Melbourne.

—— 2005b. 'The economics of Indigenous deprivation and proposals for reform', *Issues Analysis No. 63*, The Centre for Independent Studies, St Leonards, NSW.

Hunter, B.H. 1996. 'Indigenous Australians and the socioeconomic status of urban neighbourhoods', *CAEPR Discussion Paper No. 106*, CAEPR, ANU, Canberra.

—— 2004a. *Indigenous Australians in the Contemporary Labour Market*, ABS Cat. no. 2052.0, ABS, Canberra.

—— 2004b. 'Taming the Social Capital Hydra?', *Learning Communities: International Journal of Learning in Social Contexts*, 2004 (2): 19–35

—— 2005. 'The role of discrimination and the exclusion of Indigenous people from the labour market', in D. Austin-Broos and G. Macdonald (eds), *Culture, Economy and Governance in Aboriginal Australia*, University of Sydney Press, Sydney.

Khwaja, Y., 2000. *Should I stay or should I go? Migration under uncertainty: A new approach*, University of London Working Paper, University of London, London.

Kinfu, Y., 2005. 'Spatial mobility among Indigenous Australians: Patterns and determinants', *ANU Working Papers in Demography no. 97*, ANU, Canberra.

Long, L.H., 1992. 'Changing Residence: Comparative perspectives and its relations to age, sex and marital status', *Population Studies*, 46 (1): 133–47

Maddala, G.S., 1983. *Limited Dependent Variables and Qualitative Variables in Econometrics*, Cambridge University Press, Cambridge.

Saunders, P., Chalmers, J., McHugh, M., Murray, C., 1998. *Development of Indicative Budget Standards for Australia*, Report for the Department of Social Security, Budget Standards Unit, SPRC, UNSW, Sydney

Sjaastad, L., 1962. 'The costs and returns of human migration', *Journal of Political Economy*, Vol 70 (5, Part 2: Investment in Human Beings): 80–93.

Ross, K. 1999. *Occasional Paper: Population Issues, Indigenous Australians*, ABS cat. no. 4708.0, ABS, Canberra.

Schwab, R. G. and Sutherland, D. 2003. 'Indigenous learning communities: a vehicle for community empowerment and capacity development', *Learning Communities: International Journal of Learning in Social Contexts*, 1 (1): 53–70.

Taylor, J. 1997. 'The contemporary demography of Indigenous Australians', J*ournal of the Australian Population Association*, 14 (1): 77–114.

—— 1998. 'Measuring short-term population mobility among Indigenous Australians: options and implications', *Australian Geographer*, 29 (1): 125–37.

—— and Bell, M., 1999. 'Changing places: Indigenous population movement in the 1990s', *CAEPR Discussion Paper no. 189*, CAEPR, ANU, Canberra.

—— and Bell, M., 2004. 'Continuity and Change in Indigenous Australian population mobility', in J. Taylor and M. Bell (eds), *Population mobility and Indigenous Peoples in Australasia and North America*, Routledge, London.

—— and Kinfu, Y., forthcoming. 'Differentials and Determinants of Indigenous population mobility', in B.H. Hunter (ed.), *Assessing Recent Evidence on Indigenous Socioeconomic Outcomes: A focus on the 2002 NATSISS*, CAEPR Monograph No. 26, ANU E-Press, Canberra.

Todaro, M.P., 1969. 'A model of labour migration and urban unemployment in less developed countries', *American Economic Review*, 59 (1): 139–48.

Yankow, J.J., .2003. 'Migration, job change, and wage growth: A new perspective on the pecuniary return to geographic mobility', *Journal of Regional Science*, 43(3): 483–516.

APPENDIX A: MAP OF ATSIC REGIONS WITH ABS NAMES

Source: ABS 2001.

APPENDIX B: COEFFICIENT ESTIMATES (DECISION TO MOVE)

Table B.1 Coefficient estimates—Indigenous (I)

	No area level effect		Proportion of the population Indigenous	
	Coefficient	Standard Error	Coefficient	Standard Error
Intercept	-1.0167	0.0098	-0.8396	0.0100
Female	0.0311	0.0046	0.0278	0.0047
Area level effect	n.a.	n.a.	-1.3460	0.0112
Aged 05	0.6186	0.0157	0.6204	0.0161
Aged 06	0.5873	0.0156	0.5856	0.0160
Aged 07	0.5509	0.0158	0.5411	0.0161
Aged 08	0.5149	0.0158	0.4998	0.0161
Aged 09	0.4888	0.0160	0.4809	0.0163
Aged 10	0.4631	0.0159	0.4534	0.0163
Aged 11	0.4485	0.0163	0.4339	0.0166
Aged 12	0.4257	0.0164	0.4178	0.0167
Aged 13	0.4524	0.0166	0.4513	0.0169
Aged 14	0.4664	0.0168	0.4712	0.0170
Aged 15	0.4566	0.0170	0.4547	0.0172
Aged 16	0.4548	0.0172	0.4656	0.0175
Aged 17	0.4663	0.0176	0.4676	0.0179
Aged 18	0.5088	0.0179	0.5168	0.0183
Aged 19	0.5715	0.0182	0.5985	0.0187
Aged 20	0.6046	0.0185	0.6412	0.0190
Aged 21	0.6467	0.0190	0.6820	0.0195
Aged 22	0.6890	0.0192	0.7150	0.0197
Aged 23	0.7245	0.0194	0.7595	0.0199
Aged 24	0.7539	0.0196	0.7926	0.0201
Aged 25	0.7455	0.0195	0.7867	0.0200
Aged 26	0.7227	0.0195	0.7605	0.0200
Aged 27	0.7208	0.0194	0.7465	0.0199
Aged 28	0.7104	0.0188	0.7349	0.0193
Aged 29	0.7077	0.0189	0.7358	0.0194
Aged 30	0.6789	0.0188	0.7066	0.0192
Aged 31	0.6986	0.0195	0.7077	0.0200
Aged 32	0.6120	0.0196	0.6308	0.0200
Aged 33	0.6443	0.0201	0.6515	0.0205
Aged 34	0.6122	0.0202	0.6196	0.0207
Aged 35	0.5074	0.0205	0.5254	0.0210
Aged 36	0.5165	0.0207	0.5186	0.0212
Aged 37	0.5083	0.0210	0.4949	0.0214
Aged 38	0.4232	0.0211	0.4281	0.0216
Aged 39	0.4482	0.0213	0.4448	0.0218
Aged 40	0.3785	0.0212	0.3849	0.0217
Aged 41	0.4425	0.0225	0.4224	0.0230
Aged 42	0.3621	0.0225	0.3453	0.0229
Aged 43	0.3462	0.0232	0.3341	0.0237
Aged 44	0.3394	0.0243	0.3093	0.0247
Aged 45	0.2840	0.0239	0.2855	0.0244
Aged 46	0.2953	0.0250	0.2682	0.0254
Aged 47	0.3132	0.0256	0.2998	0.0261
Aged 48	0.2807	0.0261	0.2705	0.0266
Aged 49	0.2754	0.0264	0.2624	0.0269
Aged 50	0.1980	0.0266	0.1931	0.0272
Aged 51	0.2768	0.0286	0.2509	0.0291
Aged 52	0.1992	0.0292	0.1763	0.0297
Aged 53	0.1744	0.0304	0.1599	0.0310
Aged 54	0.1482	0.0314	0.1260	0.0319

Table B.2. Coefficient estimates—Indigenous (II)

	Average income		Indigenous unemployment		Non-Indigenous unemployment	
	Coefficient	Standard Error	Coefficient	Standard Error	Coefficient	Standard Error
Intercept	-2.0189	0.0143	-1.2632	0.0110	-1.2999	0.0109
Female	0.0314	0.0047	0.0293	0.0047	0.0302	0.0046
Area level effect	0.0036	0.0000	0.0105	0.0002	0.0331	0.0005
Aged 05	0.6261	0.0160	0.6117	0.0158	0.6176	0.0158
Aged 06	0.5950	0.0159	0.5801	0.0157	0.5837	0.0157
Aged 07	0.5573	0.0160	0.5412	0.0159	0.5462	0.0159
Aged 08	0.5102	0.0160	0.5041	0.0159	0.5099	0.0159
Aged 09	0.4910	0.0162	0.4786	0.0161	0.4847	0.0160
Aged 10	0.4628	0.0162	0.4530	0.0160	0.4593	0.0160
Aged 11	0.4473	0.0165	0.4408	0.0164	0.4429	0.0164
Aged 12	0.4240	0.0166	0.4170	0.0165	0.4222	0.0165
Aged 13	0.4566	0.0169	0.4447	0.0167	0.4477	0.0167
Aged 14	0.4717	0.0170	0.4632	0.0169	0.4669	0.0168
Aged 15	0.4636	0.0172	0.4515	0.0171	0.4509	0.0170
Aged 16	0.4651	0.0174	0.4502	0.0173	0.4550	0.0172
Aged 17	0.4733	0.0179	0.4612	0.0177	0.4638	0.0177
Aged 18	0.5204	0.0181	0.5074	0.0180	0.5065	0.0179
Aged 19	0.5904	0.0185	0.5723	0.0184	0.5781	0.0183
Aged 20	0.6297	0.0188	0.6074	0.0187	0.6163	0.0186
Aged 21	0.6693	0.0193	0.6467	0.0192	0.6533	0.0191
Aged 22	0.7085	0.0195	0.6893	0.0194	0.6929	0.0193
Aged 23	0.7404	0.0197	0.7299	0.0195	0.7324	0.0195
Aged 24	0.7663	0.0199	0.7618	0.0197	0.7641	0.0197
Aged 25	0.7630	0.0198	0.7497	0.0196	0.7544	0.0195
Aged 26	0.7347	0.0198	0.7299	0.0196	0.7336	0.0196
Aged 27	0.7289	0.0197	0.7250	0.0195	0.7323	0.0195
Aged 28	0.7109	0.0191	0.7163	0.0189	0.7220	0.0189
Aged 29	0.7124	0.0192	0.7124	0.0190	0.7180	0.0189
Aged 30	0.6848	0.0191	0.6824	0.0189	0.6895	0.0188
Aged 31	0.6963	0.0198	0.7023	0.0196	0.7039	0.0196
Aged 32	0.6073	0.0199	0.6160	0.0197	0.6222	0.0196
Aged 33	0.6443	0.0204	0.6440	0.0202	0.6487	0.0201
Aged 34	0.6110	0.0206	0.6094	0.0204	0.6146	0.0203
Aged 35	0.5108	0.0208	0.5067	0.0206	0.5123	0.0206
Aged 36	0.5131	0.0210	0.5181	0.0208	0.5193	0.0208
Aged 37	0.4984	0.0213	0.5059	0.0211	0.5051	0.0211
Aged 38	0.4197	0.0215	0.4250	0.0212	0.4258	0.0212
Aged 39	0.4380	0.0217	0.4505	0.0215	0.4483	0.0214
Aged 40	0.3793	0.0215	0.3808	0.0213	0.3826	0.0213
Aged 41	0.4283	0.0228	0.4416	0.0226	0.4365	0.0226
Aged 42	0.3491	0.0229	0.3550	0.0227	0.3563	0.0226
Aged 43	0.3356	0.0236	0.3447	0.0233	0.3404	0.0233
Aged 44	0.3210	0.0246	0.3333	0.0244	0.3285	0.0244
Aged 45	0.2764	0.0243	0.2877	0.0241	0.2860	0.0240
Aged 46	0.2770	0.0253	0.2865	0.0251	0.2857	0.0251
Aged 47	0.3123	0.0260	0.3205	0.0258	0.3075	0.0257
Aged 48	0.2755	0.0264	0.2819	0.0263	0.2773	0.0262
Aged 49	0.2572	0.0267	0.2791	0.0266	0.2736	0.0265
Aged 50	0.1928	0.0270	0.1993	0.0268	0.2047	0.0267
Aged 51	0.2543	0.0291	0.2755	0.0289	0.2736	0.0287
Aged 52	0.1875	0.0296	0.1946	0.0294	0.1976	0.0293
Aged 53	0.1644	0.0308	0.1761	0.0306	0.1704	0.0305
Aged 54	0.1228	0.0318	0.1509	0.0315	0.1448	0.0315

Table B.3. Coefficient estimates—Non-Indigenous (I)

	No area level effect		Proportion of the population Indigenous	
	Coefficient	Standard Error	Coefficient	Standard Error
Intercept	-1.0162	0.0009	-1.0381	0.0009
Female	0.0082	0.0007	0.0093	0.0007
Area level effect	n.a.	n.a.	1.5730	0.0106
Aged 05	0.6352	0.0028	0.6325	0.0028
Aged 06	0.5726	0.0028	0.5700	0.0028
Aged 07	0.5138	0.0028	0.5111	0.0028
Aged 08	0.4573	0.0029	0.4548	0.0029
Aged 09	0.4029	0.0029	0.4004	0.0029
Aged 10	0.3623	0.0029	0.3595	0.0029
Aged 11	0.3278	0.0029	0.3254	0.0029
Aged 12	0.2972	0.0029	0.2947	0.0030
Aged 13	0.2889	0.0030	0.2862	0.0030
Aged 14	0.2632	0.0030	0.2605	0.0030
Aged 15	0.2472	0.0030	0.2443	0.0030
Aged 16	0.2409	0.0030	0.2384	0.0030
Aged 17	0.2634	0.0030	0.2614	0.0030
Aged 18	0.4435	0.0029	0.4420	0.0029
Aged 19	0.5729	0.0029	0.5718	0.0029
Aged 20	0.6599	0.0028	0.6592	0.0029
Aged 21	0.7442	0.0029	0.7438	0.0029
Aged 22	0.8387	0.0029	0.8386	0.0029
Aged 23	0.9228	0.0029	0.9230	0.0029
Aged 24	1.0004	0.0029	1.0005	0.0029
Aged 25	1.0549	0.0029	1.0547	0.0029
Aged 26	1.0935	0.0029	1.0933	0.0029
Aged 27	1.1026	0.0028	1.1012	0.0028
Aged 28	1.0908	0.0028	1.0889	0.0028
Aged 29	1.0638	0.0027	1.0620	0.0027
Aged 30	1.0077	0.0026	1.0055	0.0026
Aged 31	0.9637	0.0027	0.9615	0.0027
Aged 32	0.9064	0.0027	0.9042	0.0027
Aged 33	0.8432	0.0027	0.8413	0.0027
Aged 34	0.7881	0.0027	0.7859	0.0028
Aged 35	0.7193	0.0027	0.7171	0.0027
Aged 36	0.6663	0.0027	0.6643	0.0027
Aged 37	0.6165	0.0027	0.6139	0.0027
Aged 38	0.5659	0.0027	0.5636	0.0027
Aged 39	0.5118	0.0027	0.5096	0.0027
Aged 40	0.4566	0.0027	0.4542	0.0027
Aged 41	0.4183	0.0028	0.4163	0.0028
Aged 42	0.3715	0.0028	0.3694	0.0028
Aged 43	0.3364	0.0028	0.3343	0.0028
Aged 44	0.2986	0.0029	0.2963	0.0029
Aged 45	0.2707	0.0029	0.2684	0.0029
Aged 46	0.2446	0.0029	0.2425	0.0029
Aged 47	0.2302	0.0030	0.2284	0.0030
Aged 48	0.2009	0.0030	0.1989	0.0030
Aged 49	0.1924	0.0030	0.1909	0.0030
Aged 50	0.1737	0.0030	0.1720	0.0030
Aged 51	0.1705	0.0031	0.1691	0.0031
Aged 52	0.1541	0.0031	0.1524	0.0031
Aged 53	0.1469	0.0031	0.1458	0.0031
Aged 54	0.1419	0.0031	0.1408	0.0031

Table B.4 Coefficient estimates—Non-Indigenous (II)

	Average income		Non-Indigenous unemployment	
	Coefficient	Standard Error	Coefficient	Standard Error
Intercept	-0.9784	0.0012	-1.4081	0.0019
Female	0.0082	0.0007	0.0081	0.0007
Area level effect	-0.0041	0.0001	0.0010	0.0000
Aged 05	0.6349	0.0028	0.6381	0.0028
Aged 06	0.5723	0.0028	0.5760	0.0028
Aged 07	0.5135	0.0028	0.5175	0.0028
Aged 08	0.4570	0.0029	0.4608	0.0029
Aged 09	0.4025	0.0029	0.4061	0.0029
Aged 10	0.3618	0.0029	0.3653	0.0029
Aged 11	0.3273	0.0029	0.3308	0.0029
Aged 12	0.2967	0.0029	0.2998	0.0030
Aged 13	0.2883	0.0030	0.2918	0.0030
Aged 14	0.2625	0.0030	0.2663	0.0030
Aged 15	0.2465	0.0030	0.2503	0.0030
Aged 16	0.2403	0.0030	0.2442	0.0030
Aged 17	0.2628	0.0030	0.2667	0.0030
Aged 18	0.4430	0.0029	0.4475	0.0029
Aged 19	0.5722	0.0029	0.5765	0.0029
Aged 20	0.6592	0.0028	0.6630	0.0028
Aged 21	0.7435	0.0029	0.7465	0.0029
Aged 22	0.8380	0.0029	0.8401	0.0029
Aged 23	0.9222	0.0029	0.9224	0.0029
Aged 24	0.9997	0.0029	0.9979	0.0029
Aged 25	1.0543	0.0029	1.0523	0.0029
Aged 26	1.0929	0.0029	1.0899	0.0029
Aged 27	1.1019	0.0028	1.0975	0.0028
Aged 28	1.0902	0.0028	1.0855	0.0028
Aged 29	1.0631	0.0027	1.0575	0.0027
Aged 30	1.0070	0.0026	1.0011	0.0026
Aged 31	0.9629	0.0027	0.9568	0.0027
Aged 32	0.9057	0.0027	0.8996	0.0027
Aged 33	0.8426	0.0027	0.8370	0.0027
Aged 34	0.7873	0.0027	0.7818	0.0028
Aged 35	0.7187	0.0027	0.7138	0.0027
Aged 36	0.6656	0.0027	0.6607	0.0027
Aged 37	0.6157	0.0027	0.6111	0.0027
Aged 38	0.5651	0.0027	0.5613	0.0027
Aged 39	0.5111	0.0027	0.5076	0.0027
Aged 40	0.4558	0.0027	0.4526	0.0027
Aged 41	0.4175	0.0028	0.4143	0.0028
Aged 42	0.3708	0.0028	0.3678	0.0028
Aged 43	0.3356	0.0028	0.3330	0.0028
Aged 44	0.2978	0.0029	0.2949	0.0029
Aged 45	0.2698	0.0029	0.2669	0.0029
Aged 46	0.2438	0.0029	0.2408	0.0029
Aged 47	0.2292	0.0030	0.2261	0.0030
Aged 48	0.1998	0.0030	0.1960	0.0030
Aged 49	0.1913	0.0030	0.1877	0.0030
Aged 50	0.1725	0.0030	0.1681	0.0030
Aged 51	0.1692	0.0031	0.1644	0.0031
Aged 52	0.1528	0.0031	0.1480	0.0031
Aged 53	0.1456	0.0031	0.1403	0.0031
Aged 54	0.1405	0.0031	0.1351	0.0031

APPENDIX C: COEFFICIENT ESTIMATES (CHOICE OF DESTINATION)

Table C.1. Coefficient estimates—Indigenous (I)

	Proportion of the population Indigenous		Average income	
	Coefficient	Standard Error	Coefficient	Standard Error
Intercept	-8.982942	0.0113868	-8.685944	0.0365919
Destination population	0.0011674	0.0000126	0 .000946	0.0000111
Source and destination same SD	3.939471	0.0186438	3.953055	0.0188334
Source and destination same state	2.162453	0.0148018	2.155653	0.0148201
Difference in area level between source and destination	-0.4067921	0.0451967	0.0003519	0.0000887
Destination area level	-1.847424	0.0733983	-0.0009647	0.0001172

Table C.2. Coefficient estimates—Indigenous (II)

	Indigenous unemployment		Non-Indigenous unemployment	
	Coefficient	Standard Error	Coefficient	Standard Error
Intercept	-9.261592	0.0209545	-9.395789	0.0233037
Destination population	0.0009462	0.0000108	0.0009846	0.0000109
Source and destination same SD	3.948564	0.0186866	3.937419	0.018616
Source and destination same state	2.146298	0.0147709	2.161277	0.0147796
Difference in area level between source and destination	0.00047	0.0005631	0.0041769	0.0016381
Destination area level	0.0124324	0.0007425	0.044921	0.0021988

Table C.3. Coefficient estimates—Non-Indigenous (I)

	Proportion of the population Indigenous		Average income	
	Coefficient	Standard Error	Coefficient	Standard Error
Intercept	-9.238825	0.0032853	-9.52065	0.0122772
Destination population	0.0000335	1.26 x10-7	0.0000345	1.27 x10-7
Source and destination same SD	3.905806	0.0073206	3.905761	0.0073753
Source and destination same state	2.167949	0.0049379	2.201086	0.0050471
Difference in area level between source and destination	-1.93437	0.0230616	-0.0004698	0.0000221
Destination area level	0.6062688	0.0328078	0.0007016	0.0000292

Table C.4. Coefficient estimates—Non-Indigenous (II)

	Non-Indigenous unemployment	
	Coefficient	Standard Error
Intercept	-9.424784	0.0068914
Destination population	0.0000338	1.24 x10-7
Source and destination same SD	3.912925	0.0073431
Source and destination same state	2.170016	0.0049751
Difference in area level between source and destination	0.0151893	0.0005143
Destination area level	0.0225204	0.000703