The Geographical Mobility of Māori in New Zealand

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Abstract

This paper describes the geographical location and internal mobility of the Māori ethnic group in New Zealand between 1991 and 2001. It is often suggested that Māori are less mobile than other ethnic groups because of attachment to particular geographical locations. We compare the mobility of Māori in particular locations to the mobility of similar Europeans in those <u>same</u> locations and find that, contrary to this anecdotal evidence, most Māori are, on average, more mobile than Europeans in New Zealand. We do find that the roughly forty percent of Māori who live in areas local to their iwi (tribe) are less mobile than comparable Europeans in those same areas. Defining local areas both based on both traditional iwi locations and current iwi populations, we find suggestive evidence that social ties are more important than land-based attachment in explaining why these Māori are relatively less mobile, but that land-based attachment is also an important impediment to mobility.

1   Introduction

This paper describes the geographical location and internal mobility of the Māori ethnic group in New Zealand. It is often suggested that Māori are less mobile than other ethnic groups because of attachment to particular geographical locations (Walker, 1990). If this is in fact the case, Māori may be disadvantaged because they are less likely to pursue employment opportunities outside locations in which they currently reside. Importantly, government policies often use locational targeting to improve social, economic, and health outcomes for particular population groups, and thus the relative mobility of these groups can affect the efficacy of these policies in reaching their target groups.

Limited prior research has rigorously examined Māori mobility.[1] Vaithianathan (1995) uses unit record data from the 1991 census to study the mobility of Māori between 1986 and 1991 compared to that of non-Māori in a multivariate framework. She finds that Māori are, on average, more mobile than non-Māori, and that Māori location decisions are less responsive than non-Māori decisions to changes in regional unemployment rates. She also finds that Māori living in their traditional iwi area are much less mobile than Māori living outside their iwi area. Renkow and Scrimgeour (2005) use grouped data from the 1996 and 2001 censuses to study the relative mobility of Māori between 1991 and 2001. They find that Māori location decisions are equally responsive to differences in regional unemployment and wage rates as non-Māori decisions.

This paper uses unit record data from the 1991, 1996, and 2001 censuses to present a snapshot of the geographical location of the Māori population in 1991 and to examine Māori mobility between 1991 and 1996, and between 1996 and 2001. Unlike the previous papers, we focus on moves between economically distinct labour market areas, as opposed to between administrative regions; compare Māori mobility patterns to those observed for New

Zealand's European (Pakeha) population, excluding immigrants and other minority groups that may also have different mobility patterns than the majority group; and allow for heterogeneity in outcomes within the Māori population by separately examining the behaviour of individuals who report Māori as their only ethnicity and those who report Māori along with other ethnicities.[2]

Geographical location and mobility are clearly interrelated, as individuals with particular unobserved characteristics (including the desire to live near certain amenities) are drawn to live in certain areas and are more or less mobile than other individuals. Because of this interrelation, we include locational fixed effects (along with individual and household control variables) in our main regression analysis. These fixed effects capture unobserved heterogeneity in the underlying mobility of the population in each geographical location and control for the impact of local economic shocks. Thus, our main results are inferred by comparing the mobility of Māori in particular locations to the mobility of similar Europeans in those <u>same</u> locations. This approach reduces the concern that any differences we might find are related to earlier locational decisions of Māori and non-Māori and not to underlying mobility propensities. The main downside is that we are unable to independently model the direct impact that economic shocks have on Māori and non-Māori mobility rates.

We also examine the importance of land-based attachment and social ties in determining the locational decisions of Māori. A large number of sociological studies have shown that social networks are an important determinant of both international and internal migration patterns (Palloni et al, 2001). For example, Carrington et al (1996) show that the US Great Black Migration of 1915–60 cannot be easily reconciled with migration models that

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[1] A number of papers, including Kerr et al (2001), Maré and Timmins (2004), and Maré and Choy (2001) examine internal mobility in New Zealand using aggregate data, but are unable to analyse differences between population groups.
[2] Chapple (1999) shows that this can be an important distinction when examining labour market outcomes for Māori.

do not allow for network effects. Similarly, Kritz and Nogle (1994) find that social ties are an important factor in the internal migration decisions of recent immigrants to the United States. In this paper, we distinguish between Māori who live in areas local to their iwi (tribe), those who live in other areas, and those who do not report an iwi affiliation. We define local areas based on both traditional iwi locations and current iwi populations. This helps us distinguish between land-based attachment and social ties as factors in Māori mobility decisions.

We find that the roughly forty percent of Māori who live in areas local to their iwi are 1–3% less mobile than comparable Europeans in those same areas. The remaining Māori groups are as mobile as or significantly more mobile than Europeans. Māori with no iwi affiliation (twenty percent of Māori) are 0–4% more mobile and Māori living in areas non-local to their iwi (forty percent of Māori) are 3–8% more mobile than comparable Europeans in those same areas. The mobility differences between Māori and Europeans are roughly constant across all working ages, but Māori with vocational and university qualifications are even more mobile than similarly qualified Europeans. Māori have become more mobile relative to Europeans in the second half of the 1990s. We find suggestive evidence that social ties are more important than attachment to geographical locations in explaining why Māori who live in areas local to their iwi are less mobile than Europeans, but that land-based attachment is also an important impediment to mobility.

2   Data and Background

This paper uses unit record data for the New Zealand population from the 1991, 1996, and 2001 censuses. We restrict our analysis to the New Zealand-born European and Māori population aged 30–54. As discussed later in this section, our mobility measure refers retrospectively to the previous five years, so these individuals are as young as 25 at the beginning of the observation period. We focus on this age group because students and individuals nearing retirement tend to migrate for quite different reasons from working-aged people. We exclude individuals born outside New Zealand and individuals of non-Māori,

non-European ethnicity from our analysis because we suspect that these people may also have different mobility patterns than the majority group of New Zealand-born Europeans.

Individuals can record up to three self-defined ethnicities on a census form. Our main comparison groups are Europeans, sole Māori, and mixed Māori. We define Europeans as all individuals who state that they are of European ethnicity, but are not of Māori ethnicity; sole Māori as all individuals who report Māori as their only ethnicity; and mixed Māori as all individuals who report Māori ethnicity and at least one other ethnicity.[3] Out of the total population of 1.13 million individuals aged 30–54 in the 1991 census, 67% are NZ-born European, 8% NZ-born sole Māori, and 2% NZ-born mixed Māori.

Information is collected in each census about the current usual residential location of each individual and their usual residential location (including overseas) five years before the census date (i.e. at the time of the previous census). The nature of this data means we are unable to track forward the movements of all people living in any one area at an earlier time, but instead must look backwards and examine the location five years ago of all individuals currently in a particular location.[4] The location information is coded to the relatively fine census 'area unit' level.[5] A high proportion of moves between area units are likely to be short-distance residential moves, and thus are not likely to reflect the true mobility of a particular population. Our analysis follows Maré and Timmins (2004) and focuses on the mobility of individuals between local labour market areas (LMAs). These are defined in Newell and Papps (2001) using an algorithm that ensures that most people who live in one

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[3] Europeans, as defined in this paper, may also report other non-Māori ethnicities. Sole Māori and mixed Māori combined are equivalent to the often used 'prioritised' Māori ethnicity defined by SNZ.
[4] It is not possible to calculate the probability that a person living in a certain location moves, as some of the people previously living in that location will not have filled out a census form five years later for various reasons. For example, they may have died, moved overseas, or failed to fill out their census forms in enough detail for their previous addresses to be ascertained. The probabilities that we do calculate (of people moving when we know both their current and previous addresses) are likely to be understated relative to the true probabilities of moves, because the most mobile people are the most likely to be missed or to have an incomplete address record from five years ago. We are also not able to identify multiple moves over the five-year period.

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LMA work in it, and most people who work in one LMA live in it. Appendix A contains further information on how LMAs are created and a map of the 140 LMAs in New Zealand.[6]

The census asks individuals with Māori ancestry to list up to five iwi affiliations. The term iwi can loosely be translated as tribe. The iwi is traditionally the largest socio-political organisation in Māori society, and is generally a territorial entity. It fits within the traditional hierarchy, based on kinship and descent, of waka (founding canoe), iwi (tribe), hapu (sub-tribe) and whanau (family). Iwi do not have to conform to any particular specifications in terms of size or other characteristics and are an evolving set.[7] Māori migration decisions are likely to be complicated by the issue of iwi affiliation, as Māori historically have strong attachment to their traditional iwi lands.

We further classify Māori based on whether they specify any iwi affiliations, and if specified, whether or not they live in an LMA that is a 'local area' of any iwi with which they are affiliated.[8]

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[5] At the time of the 2001 census, there were 1,860 area units in New Zealand, with an average of 2,010 individuals living in each area unit.

[6] Maré and Timmins (2004) examine a more aggregated set of 58 LMAs because of issues with the grouped data used in their paper. There is an additional 'overseas' LMA. The addresses recorded on the census form are not always sufficient for assigning an LMA to either the current or previous residence. We drop individuals with incomplete addresses from our analysis. In appendix B, we examine the characteristics of these individuals. Incomplete addresses do not appear to be randomly distributed through the population. Our regression analysis controls for observed characteristics that are correlated with the likelihood of having an incomplete address. This will eliminate the bias associated with analysing a dependent variable that is not missing at random unless unobserved characteristics are correlated with the likelihood of having an incomplete address **and** observed characteristics.

[7] For example, SNZ periodically reviews its list of iwi, considering new possibilities for iwi in terms of a number of guidelines. At the time of the 2001 census, it recognised approximately 95 individual iwi. Of these, 13 had more than ten thousand members, 14 had between five and ten thousand, 32 had between one and five thousand and 36 had fewer than one thousand members.

[8] Māori without an iwi affiliation are a heterogenous group including individuals reporting Māori ethnicity but not Māori ancestry, Māori who report an iwi affiliation that cannot be classified by SNZ, Māori who do not answer the iwi affiliation question, and Māori who truly do not have an iwi affiliation.

We consider two different definitions of 'local area' LMAs for each iwi, one that is population based and one tradition based. For the population-based measure, we calculate for each LMA–iwi combination the proportion of the total iwi population living in that LMA relative to the proportion of the total European population living in it, based on aggregating the 1996 and 2001 censuses. If this proportion exceeds two, the LMA is considered a local LMA for the iwi.[9] For the tradition-based measure, each of the 93 iwi is allocated to one or more LMA in which it is determined to 'traditionally' reside.[10] Traditional areas are only approximate because of the fluid nature of the historical areas in which different iwi lived and the lack of modern-day consensus on the exact location of these areas. For this reason, we use the population-based definition in our main analysis, but also examine the robustness of our results to using the tradition-based measure.

3   Results

3.1   The Māori Population in 1991

We begin by examining the geographical location of the New Zealand-born working-aged Māori population in 1991 compared to the location of the New Zealand-born European working-aged population. The spatial distribution of these populations in 1991 captures all previous mobility decisions and summarises to some extent the preferences that lead individuals in different ethnic groups to locate in different parts of New Zealand. Figure 1 illustrates the relative Māori and European populations in the 140 LMAs. Darker areas have

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[9] We experimented with other cut-offs, with more broadly defined local areas lessening the mobility differences between local and non-local Māori.

[10] The traditional iwi areas used in this paper are primarily based on the unofficial iwi areas shown at www.takoa.co.nz/media/rohe_iwi.pdf (accessed 28 April 2005), with additional information gained from a range of official and unofficial online sources. Detailed information and a concordance chart for both the population- and tradition-based local areas are available from the authors on request. In general, LMA allocation erred on the side of being too broad, such that an iwi that might have lived in part of an LMA was generally considered local to that LMA. The exception to this rule was when the area of an iwi overlapped with a large number of LMAs, but included only a very small proportion (roughly a tenth or less) of one or more LMAs. These peripheral areas were not included as local LMAs for the particular iwi. Many LMAs are local areas for multiple iwi.

more concentrated Māori populations; lighter areas more concentrated European populations. The shading chosen for each LMA takes into account the overall smaller Māori population.[11]

The geographic distribution of the Māori population in 1991 is similar to that of Europeans in many ways, but there are also a number of salient differences. Māori are much more likely to live in the North Island: 89% live in the North Island compared with 70% of Europeans. Few Māori live in South Island LMAs that contain cities or major towns. For example, the Christchurch LMA contains 12% of the European population and only 4% of the Māori population. In contrast, nearly the same percentage of Māori and Europeans live in the two Auckland area LMAs combined, which make up 23% of the total Māori and European population, and the Wellington LMA, which makes up 10% of the total population.[12] North Island LMAs in the Far North (Kaitaia, Mangapa-Matauri Bay, Hokianga North, Hokianga South, Moerewa, and Kaikohe), East Cape (Whakatane, Matahina-Minginui, Kawerau, Opotiki, East Cape, Tarndale-Rakauroa, Gisborne, Ruakituri-Morere, and Wairoa), and Central North Island (Taumarunui, Tangiwai, Waiouru, Taihape, Tokoroa, Te Kuiti, Turangi, and Rotorua) stand out as having particularly concentrated Māori populations.

3.2   Māori Mobility between 1991 and 2001

We next examine the mobility of the Māori population between 1991 and 1996 and between 1996 and 2001 compared with the mobility of the European population. We categorise each individual's mobility status by comparing their current residence with their residence five

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[11] LMAs are categorised as strongly Māori, weakly Māori, neutral, weakly European, or strongly European based the proportion of the total Māori population in the LMA relative to the proportion of the total European population in it. LMAs that that have a ratio of 2 or greater are categorised as strongly Māori; between 1.35 and 2 as weakly Māori LMAs; between 1 and 1.35 as neutral; between 0.5 and 1 as weakly European; and 0.5 or less as strongly European. This figure is qualitatively similar if the proportions are calculated separately for the South and North Islands. Table C1 presents the distributions of the Māori and European population in each LMA, as well as the underlying data for figure 2.

[12] The ethnic population distribution between the two Auckland LMAs is quite different; 15% of the European population lives in Central Auckland and 8% in South Auckland, whereas 10% of Māori live in Central Auckland and 13% in South Auckland. This type of residential segregation within a larger metropolitan area is perhaps not that surprising given the large differences in both amenities and house prices in these two LMAs.

years ago. Mobility status can take the values *same area unit (AU)*, *same LMA but different AU*, *different LMA*, and *moved from overseas*. Moves within the *same AU* and within the *same LMA but different AU* are likely to be residential moves, as opposed to labour market moves. We initially present results broken down in this manner, but beyond these focus our analysis on moves that involve a change in LMA.

Table 1, in panel A, summarises the average mobility of our three main comparison population groups between 1991 and 1996 and between 1996 and 2001. In the early sample period, Europeans exhibit more local residential mobility than Māori, but in the later period there is little difference between the groups. Māori appear to be, on average, slightly more likely to move to a new LMA than Europeans in both sample periods: 21% (23%) of mixed Māori, 19% (23%) of sole Māori, and 17% (19%) of Europeans change LMAs between 1991 and 1996 (between 1996 and 2001). Moves from overseas, considered a change in LMA, are a small part of overall mobility with Māori slightly less likely to move from overseas.

In panel B, we compare mobility rates across subgroups of the Māori population defined by whether they specify any iwi affiliations, and if specified, whether or not at the beginning of the sample period they live in an LMA that is a population-based local area of any iwi with which they are affiliated. Sole and mixed Māori are combined for this analysis. In 1996, 36% of Māori live in local iwi areas, 45% live in non-local areas, and the remainder have no iwi affiliation. In 2001, 38% live in local areas and 41% live in non-local areas. In both periods, Māori living in a local iwi area are 6–7% less likely to move to a different LMA than Māori living in a non-local iwi area. Māori with no iwi affiliation fall somewhere in between. In general, Māori not living in a local iwi area appear quite a bit more mobile than Europeans (as measured by the percentage changing LMA).

Panel B also examines whether Māori who change LMAs move to local or non-local destination LMAs. Among Māori living in a local LMA at the beginning of the sample period, 50% move to another local LMA compared with 35–38% of Māori living in non-local

LMAs. This suggests that Māori who live in local LMAs have a natural propensity to live in local iwi areas, as well as possibly having attachment to a particular local area. It is also possible that Māori who live in local LMAs are affiliated with iwi that are local to more LMAs, in general, than other Māori. We do not explore this finding further or examine destination choices in more detail in this paper, but this is potentially an interesting area for future analysis.

The finding that Māori are slightly more mobile than Europeans appears at odds with the suggestion that the attachment of Māori to particular geographical locations renders them less mobile. Even Māori who live in local iwi areas appear to be, on average, as mobile as Europeans. However, it is quite possible that this descriptive evidence is misleading. First, we have not controlled for differences in the sociodemographic characteristics of the three ethnic groups. The Māori working-aged population is younger than the European population and younger people are typically more mobile than older ones. Other salient differences exist between the ethnic groups, for example, in educational levels and employment rates, which may also be correlated with mobility.

Second, we have not controlled for differences in where individuals are located. Taking into account the different geographic distribution of the Māori and European populations may be important when examining differences in mobility between these two groups, because, as discussed above, people with a certain innate likelihood of being mobile are also likely to settle in particular areas. Figure 3 illustrates the percentage of the overall Māori and European population new to each LMA, averaged by population for 1996 and 2001, with darker areas having more mobile populations.[13]

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[13] LMAs are categorised as having a very immobile population if less than 20% of the population is new to the LMA on average over a five-year period; an immobile population if 20–25%; an average mobile population if 25–30%; a mobile population if 30–35%; and a very mobile population if greater than 35%w.

This figure highlights the large difference in mobility rates across LMAs. For instance, 21% of Māori and Europeans living in Palmerston North are new to the LMA in each five-year period compared to only 10% living in Christchurch. Comparing figures 1 and 2, there is no clear correlation between the location of particular ethnic groups and the mobility of the local population. However, because of the complicated relationship between location and mobility, we turn next to regression analysis to incorporate these important factors into our analysis.

3.3 Main Regression Analysis

In this section, we report results from OLS regression models that take the form:[14]

$$Y_i = \alpha + \beta X_i + \delta Z_i + e_i \tag{1}$$

where i indexes individuals, Y_i equals 1 if an individual currently lives in a different LMA than where they lived five years ago and equals 0 otherwise, X_i is a vector of indicator (dummy) variables that identify the comparison group to which an individual belongs, and Z_i is a vector of variables that control for differences in the sociodemographic characteristics and geographical location of individuals. We run all regressions separately for the 1991–1996 and 1996–2001 periods, because the descriptive results suggest that overall mobility patterns have changed between the two periods. The coefficients on the X_i variables indicate the average underlying differences in mobility between individuals in different comparison groups and are the main focus of our analysis.

Our main regression analysis splits the Māori and European population into seven comparison groups: Europeans, sole Māori who live in a population-based local LMA at the beginning of the sample period, sole Māori who live in a non-local LMA at the beginning of the sample period, sole Māori who do not report an iwi affiliation, and three analogous groups for mixed Māori. Tables 2 and 3 present summary statistics for all variables used in

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[14] This model is a reduced-form specification of the general internal migration model introduced in Greenwood (1975). We estimate OLS models even though we have a binary dependent variable because our large sample size makes it impractical to estimate discrete choice models (i.e. probit or logit) and makes it extremely unlikely that the choice of model will have any qualitative effect on our results.

the regression analyses for each comparison group and census year. Europeans make up 85% of the analysis population in each census year. Sole Māori in local LMAs are the largest Māori group, including 26% (29%) of the Māori population in 1996 (2001), followed by sole Māori in non-local LMAs with 25% (24%), mixed Māori in non-local LMAs with 20% (16%), sole Māori with no iwi affiliation with 10% (12%), mixed Māori in local LMAs 10% (9%), and mixed Māori with no iwi affiliation with 10% (9%).

Sociodemographic characteristics vary considerably across comparison groups. Māori are, on average, younger, less qualified, less likely to be married, less likely to be in full-time employment, more likely to have low levels of income, and more likely to be a single parent. In general, mixed Māori tend to be more similar to Europeans than sole Māori, and non-local Māori more similar to Europeans than local Māori. Labour market outcomes are better in the second census period compared with the first for all comparison groups with some relative improvements for Māori as well. Qualifications also increased for all comparison groups, also with relative improvements for Māori.

Table 4 presents the results from estimating three specifications of equation (1) for the two sample periods. Standard errors are reported in parentheses. Europeans are the omitted comparison group in each specification, thus the coefficient on each other group is interpreted as the relative difference in mobility between that group and Europeans. In the first specification, we control only for age, gender, and education, in addition to the comparison group indicator variables. A problem with the backward-looking analysis that the census data forces us to undertake is that all sociodemographic variables are measured after an individual has (or has not) moved. Thus, many of these variables are likely to be endogenously determined with mobility (for example, a change in geographical location causes a change in marital status or income) and their inclusion in the regression model will bias the results. Because age is predetermined, gender fixed, and education quasi-fixed for working-aged

individuals, these variables can be included in the regression model without causing concern.[15]

Controlling for these basic characteristics, we find that, in the first time period, all non-local Māori and those without an iwi affiliation are more mobile than Europeans while local Māori are less mobile. In the second period, all Māori are more mobile than Europeans. Combining time periods, local Māori are between 2% less mobile and 1% more mobile, Māori with no iwi affiliation 1–3% more mobile, non-local mixed Māori 4% more mobile, and non-local sole Māori 6–9% more mobile than comparable Europeans. Given our large sample size, all of these differences are strongly significant. Most Māori groups are more mobile relative to Europeans in the later half of the 1990s and none are less mobile.

Figures 3 and 4 graph the age–mobility relationship derived from the regression coefficients on the age variables displayed in table 4 (normalised to age 40). The solid line in each figure shows the results from the first specification. As expected, mobility decreases at a decreasing rate throughout the prime-age range, levelling off around age 47–48. The age–mobility gradient is quite steep early on with 30-year-olds 13–14% more likely to change LMAs than 40-year-olds. We also find a large education-mobility gradient. Individuals with school qualifications are 1% more likely, those with vocational qualifications 3% more likely, and those with university degrees 8% more likely to change LMAs than those with no qualifications. This relationship is stable across the two survey periods in spite of the general increase in qualifications that occurred. Gender is only weakly related to mobility, with women found to be just slightly less mobile than men.

In the second specification, we include LMA fixed effects (measured at the beginning of the sample period) along with the control variables from the first specification. These fixed

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[15] Age is included in the regression as a quartic function (i.e. age, age^2, age^3, and age^4) to allow for non-linear age effects. Education is measured by indicator variables for whether an individual's highest qualification is a school qualification (roughly equivalent to finishing US high school), is a post-school vocational qualification, is a university degree, or is missing relative to the default category of having no qualifications.

effects capture unobserved heterogeneity in the underlying mobility of the population in each geographical location and control for the impact of local economic shocks. Our results are now inferred by comparing the mobility of Māori in particular locations to the mobility of similar Europeans in those <u>same</u> locations. This approach reduces the concern that any differences we might find are related to earlier locational decisions of Māori and non-Māori and not to underlying mobility propensities.

The addition of LMA fixed effects reduces the coefficient on each Māori group in both time periods, indicating that Māori do tend to live in LMAs with generally higher mobility rates. Non-local Māori are still much more mobile than Europeans, with mixed Māori in this group 3–4% more mobile, and sole Māori 6–8% more mobile. Māori with no iwi affiliation are now found to be 0–1% more mobile than Europeans. Local Māori are now found to be consistently 1–3% less mobile than Europeans. Again, all Māori groups are more mobile relative to Europeans in the second census period. The age–mobility (the long-dashed lines in figures 3 and 4) and education–mobility gradients are both flatter with the addition of LMA fixed effects. This indicates that younger individuals and those with more education choose to live in locations with generally more mobile populations (and vice versa for older individuals and those with less education).

In the third specification, we include control variables for an individual's marital and employment status, family type, and pre-tax income in the previous year in addition to those included in the second specification.[16] As discussed above, these variables are likely to be endogenously determined with the decision to change LMAs and thus the results from this

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[16] Indicator variables are included for whether an individual is married, de facto married, divorced or separated, widowed, or has missing marital status relative to the default of being never married; for whether an individual is employed full-time as a non-wage/salary earner, employed part-time as a wage/salary earner, employed part-time as a non-wage/salary earner, unemployed, not in the labour force, or missing employment status relative to the default of being employed full-time as a wage/salary earner; measuring an individual's pre-tax earnings in the past year (nine brackets with a default of $30,001–$40,000) or whether their income is missing; and for the type of household in which an individual lives (i.e. a couple with or without dependent/adult children, a single parent of dependent/adult children, or a non-family). We do not present the coefficients on these variables to conserve space, but the full regression results are available from the authors on request.

specification may be biased. For this reason, we consider the second specification to be our preferred specification, but present these results to examine the robustness of our main findings. The inclusion of these additional control variables further reduces the coefficient on each Māori group in both time periods. However, our main conclusions are unchanged: non-local Māori are considerably more mobile than Europeans, local Māori are less mobile than Europeans, and Māori with no iwi affiliation are in between the two extremes (in this specification, 0–2% less mobile than Europeans).

3.4   Robustness Analyses

The regression specifications estimated above assume that sociodemographic characteristics have the same effect on mobility for all comparison groups. It is quite possible that the age–mobility or education–mobility relationships differ across our groups. Table 5 presents the results from re-estimating the second specification above, allowing the relationships between age, gender, and education and mobility to vary for each comparison group. The first column in this table, labelled 'Europeans', shows the relationship between these variables and the mobility of Europeans. The remaining columns present interaction effects for each group, i.e. these coefficients show the additional effect of each characteristic on the mobility of a particular Māori subgroup over and above its effect on Europeans.

The age–mobility relationship derived from this regression for Europeans is graphed in figures 3 and 4 (short-dashed lines) for the two time periods. The pattern in each period is virtually identical to that derived from the results in second specification above. Figures 5 and 6 graph the age–mobility profiles of Māori relative to Europeans in the two time periods. The interaction effects for the age variables are only jointly significant at the 5% level for sole and mixed non-local Māori in 1996 and for local and non-local sole Māori in 2001. There is some evidence in these figures that Māori are relatively more mobile compared to Europeans at younger ages, but in general, it appears that the non-age-varying relationship assumed in the previous regression is a reasonable approximation.

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There is much stronger evidence that the relationship between education and mobility differs across our comparison groups. Again, the estimated relationship for Europeans is unaffected by allowing for interaction effects. However, the interaction effects are significant for all but mixed Māori with no iwi affiliation in 1996 and sole and mixed Māori with no iwi affiliation in 2001. These interaction effects show consistent evidence that qualified Māori are relatively more mobile than similarly qualified Europeans, compared to unqualified Māori relative to unqualified Europeans. These differences are particularly large for local Māori. For example, local Māori with vocational qualifications are 1–2% relatively more mobile than Europeans with vocational qualifications, while local Māori with university degrees are 4–9% relatively more mobile than comparable Europeans. Combining these figures with the average differences between local Māori and Europeans discussed above, local Māori with university degrees are clearly more mobile in absolute terms than comparable Europeans.

We next examine the robustness of our main results in relation to how we define local iwi and to how we define mobility. Table 6 presents the results from re-estimating the second specification in table 4 using different definitions of local iwi and of mobility. In the first column, we re-display our main results from table 4. In the second column, we re-estimate this model using the tradition-based measure of local iwi instead of the population-based measure. In the third column, we re-estimate the original model using a standard distance-based measure of mobility as our dependent variable instead of an indicator variable for changing LMA.[17] In the fourth column, we re-estimate the main model changing the definitions of both local iwi and of mobility. We only present the coefficients on the comparison group indicator variables. Our results are qualitatively similar in all four specifications: sole and mixed local Māori are, on average, less mobile; Māori with no iwi

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[17] The distance of an individual's move is zero if they do not change area unit, otherwise it is the distance between area unit centroids. All people who moved to New Zealand from overseas, or who moved between the Chatham Islands and the rest of New Zealand are dropped from the analysis when using this measure.

affiliation are slightly more mobile; and non-local Māori are much more mobile than comparable Europeans.

3.5 Examining Social Ties and Land-Based Attachment

We find consistent evidence that Māori who live in areas local to their iwi are less mobile than comparable Europeans. There are various explanations for this finding. Some Māori may feel a particularly strong attachment to the traditional geographical area of their iwi, and thus have strong desires to remain living in that area. Others may be attracted to living in areas with large populations of other Māori from their iwi because of the desire to maintain or build social ties within this group, to benefit from iwi-based social networks, or to be close to their extended family. An important difference between these two explanations is that strong land-based ties may encourage individuals to remain in very particular locations, while iwi-based social networks may be available in a variety of locations.

We attempt to examine the relative importance of land-based versus social ties in determining the mobility of Māori by jointly classifying the location of individuals using both the population- and tradition-based measure of local iwi. Some Māori live in tradition-based local areas that are not local based on population (and vice versa) allowing us to measure the relative importance of traditional areas versus population areas in determining mobility decisions (with the caveat that the importance of the tradition-based measure might be understated because of the difficulty in accurately measuring traditional iwi areas). Table 7 presents the results from re-estimating the second specification in table 4 with Māori with iwi affiliations classified using both the population- and tradition-based measure of local iwi. The Māori population is now divided into ten comparison groups.

In each sample period, we find that Māori who are local, based on both definitions, are the least mobile relative to Europeans, followed by Māori who are local, based on population but not on tradition; Māori who are local, based on tradition and not on population; and Māori who are non-local, based on both definitions. Māori with no iwi affiliations are

somewhere in between the second and third group in the above list. Only Māori who are local based on both definitions are consistently less mobile than Europeans, while Māori who are local based only on tradition are 0–4% more mobile than Europeans. These results suggest that social ties are more important than land-based attachment in explaining why some Māori are relatively less mobile than Europeans, but that land-based attachment is also an important impediment to mobility.

4   Conclusions

This paper describes the geographical location and internal mobility of the Māori ethnic group in New Zealand between 1991 and 2001. Unlike previous papers examining Māori mobility, we focus on moves between economically distinct geographical areas; compare Māori mobility patterns to those observed for New Zealand's European (Pakeha) population, excluding immigrants and other minority groups that may also have different mobility patterns from the majority group. We also allow for heterogeneity in outcomes within the Māori population by separately examining the behaviour of individuals who report Māori as their only ethnicity and those who report Māori along with other ethnicities. As well, we examine the importance of land-based and social ties in determining the locational decisions of Māori by distinguishing among Māori who live in areas local to their iwi (tribe), those who live in other areas, and those who do not report an iwi affiliation.

Our main results are inferred by comparing the mobility of Māori in particular locations to the mobility of similar Europeans in those same locations. This approach reduces the concern that any differences we might find are related to earlier locational decisions of Māori and non-Māori, and not to underlying mobility propensities. We find that, contrary to anecdotal evidence, most Māori are, on average, more mobile than Europeans in New Zealand. While the roughly forty percent of Māori who live in areas local to their iwi are 1–3% less mobile than comparable Europeans in those same areas, the remaining Māori groups are as mobile or significantly more mobile than Europeans, with the roughly forty

17

percent of Māori living in areas non-local to their iwi 3–8% more mobile than comparable Europeans. In general, Māori have become more mobile relative to Europeans in the second half of the 1990s.

These results are robust to a variety of specification checks on variable definitions. We also estimate models where the relationships between age, gender, and education and mobility are allowed to vary for each comparison group. We find that the mobility differences between Māori and Europeans are roughly constant across all working ages, but that Māori with vocational and university qualifications are even more mobile than similarly qualified Europeans.

We attempt to examine the relative importance of land-based versus social ties in determining the mobility of Māori by jointly classifying the location of individuals using both a population- and tradition-based measure of local iwi. We find suggestive evidence that social ties are more important than land-based attachment in explaining why Māori who live in areas local to their iwi are less mobile than Europeans. Given that it is likely that similar heterogeneity exists in the European population, it is quite possible that if we had an equivalent measure of social ties to 'local iwi area' for Europeans, we would find that a large number of Europeans are also less mobile than the 'average' New Zealander.

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Figure 1: Relative Māori and European Populations by LMA in 1991

Legend

strongly European
weakly European
neutral
weakly Maori
strongly Maori
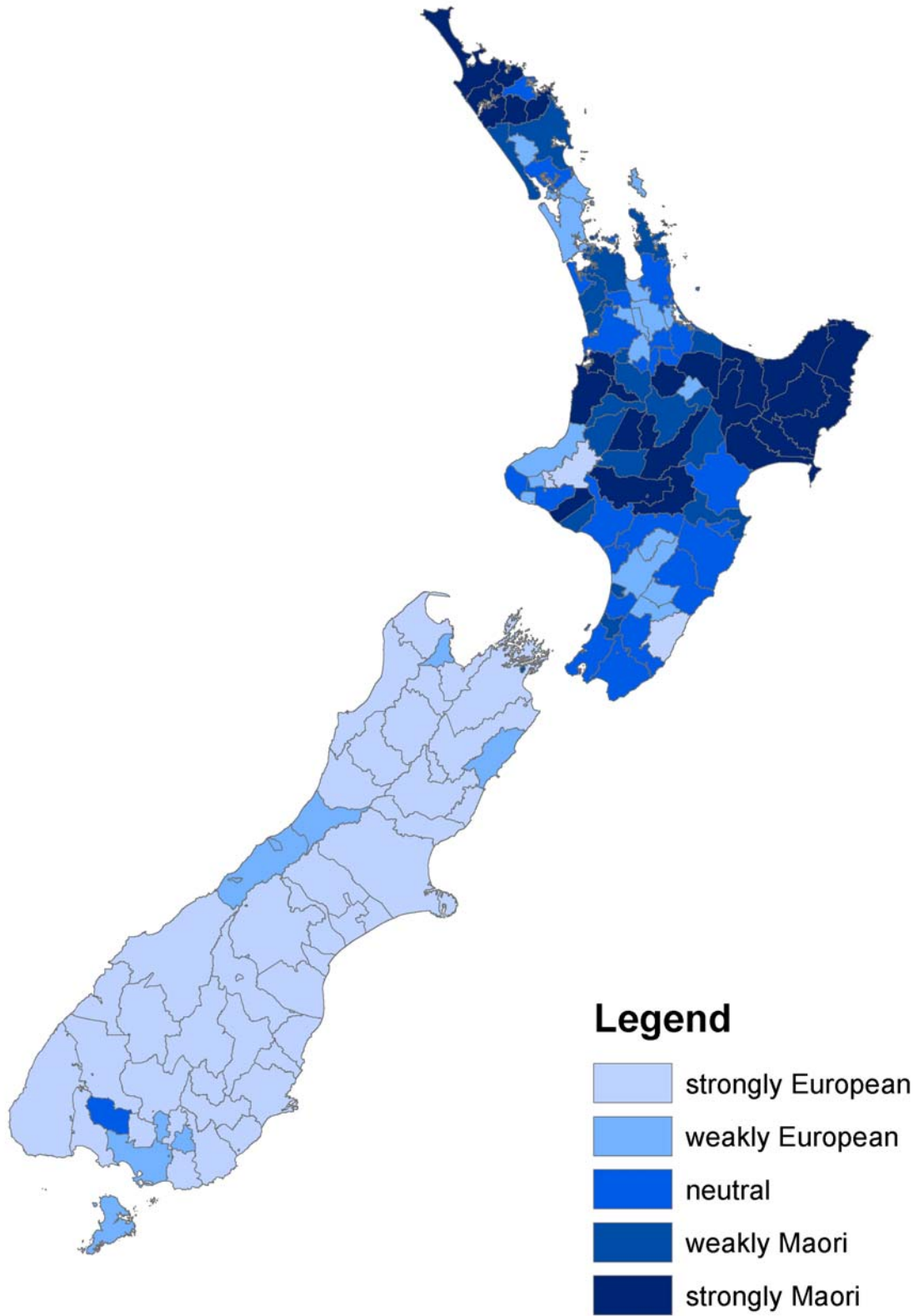
Figure 2: Percentage of the Overall Population New to Each LMA in 1996

Legend

- very low
- low
- average
- high
- very high
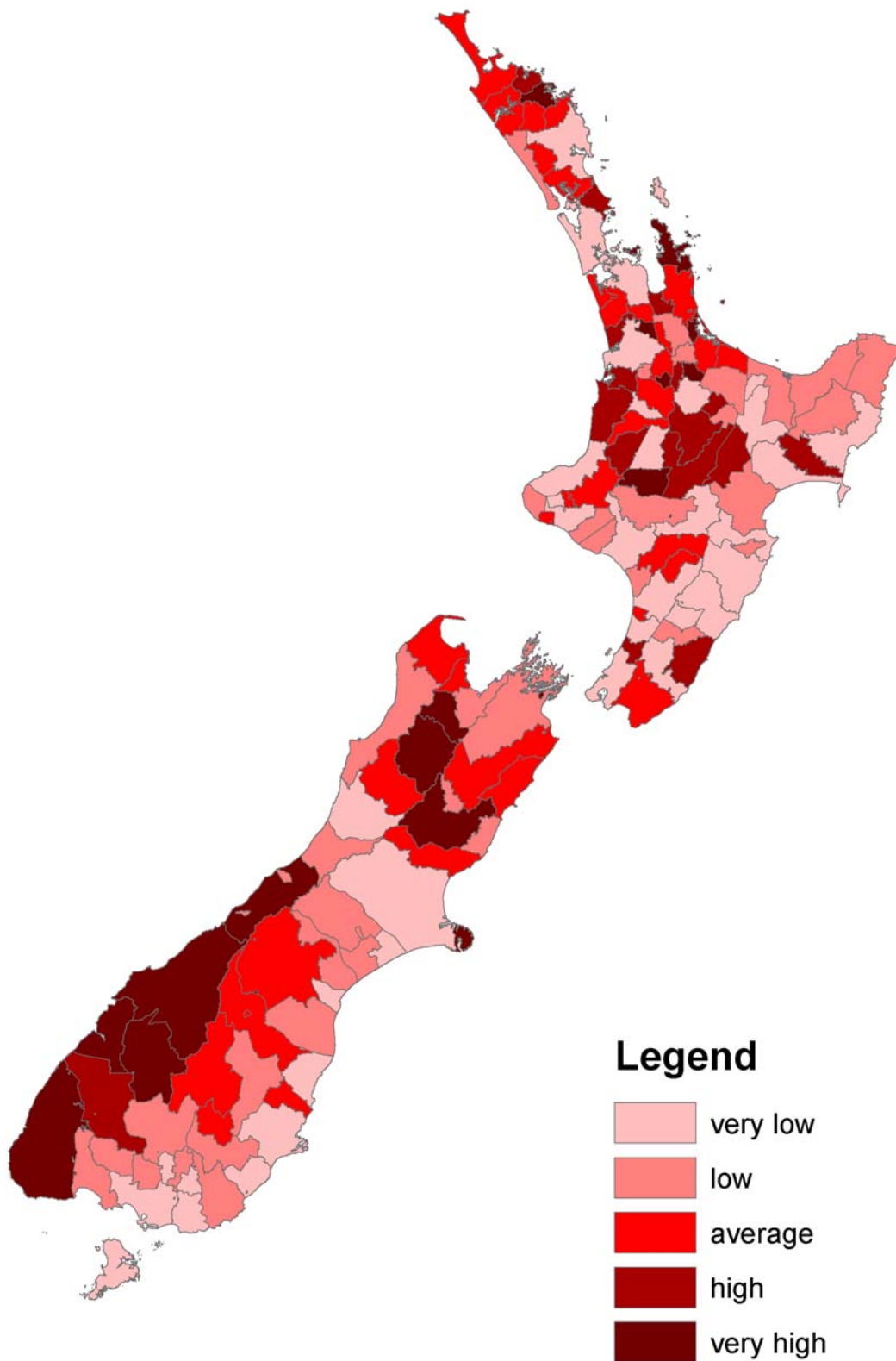
Figure 3: Regression Estimates of Age-Mobility Patterns between 1991 and 1996
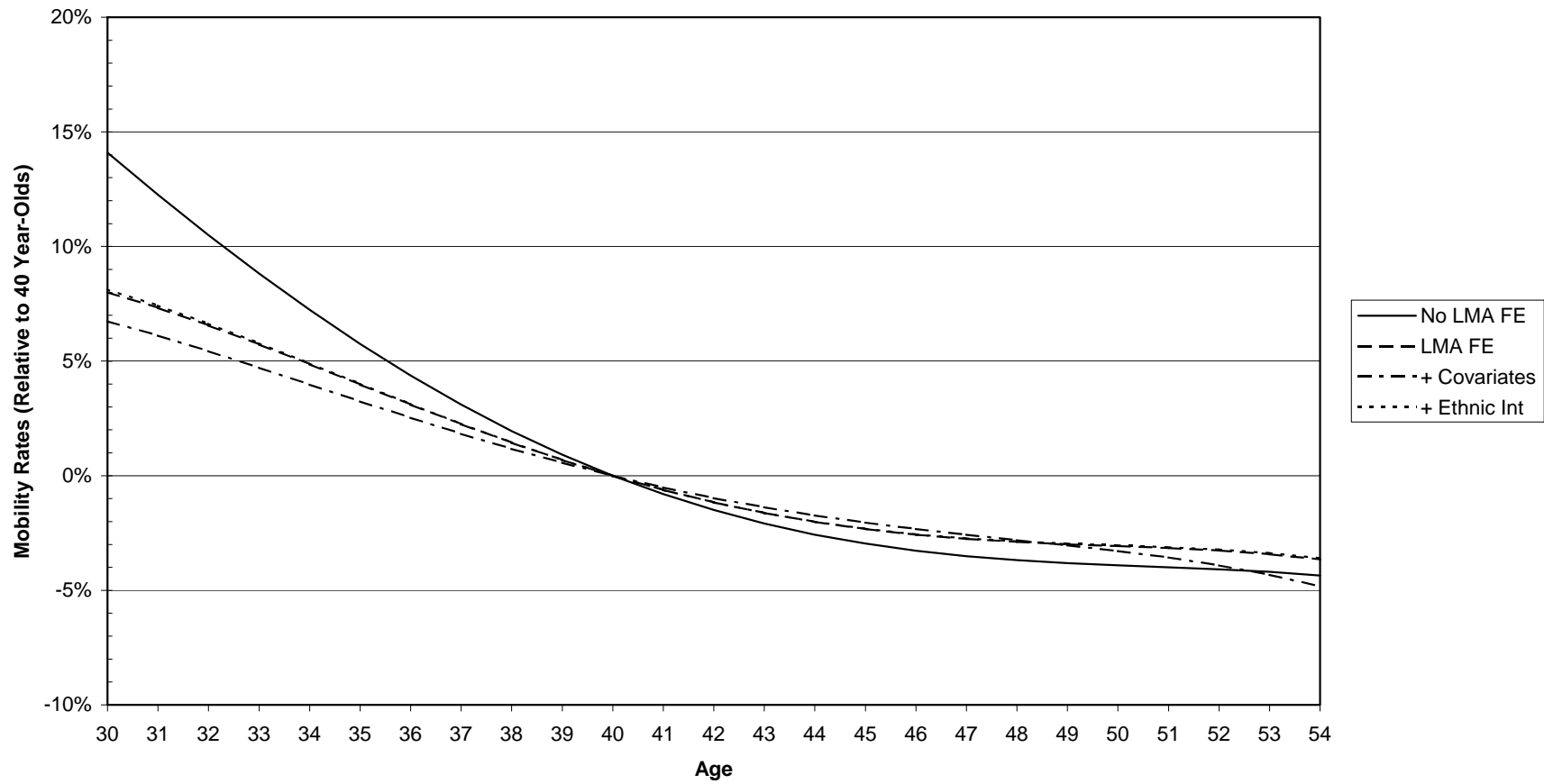
Figure 4: Regression Estimates of Age-Mobility Patterns between 1996 and 2001
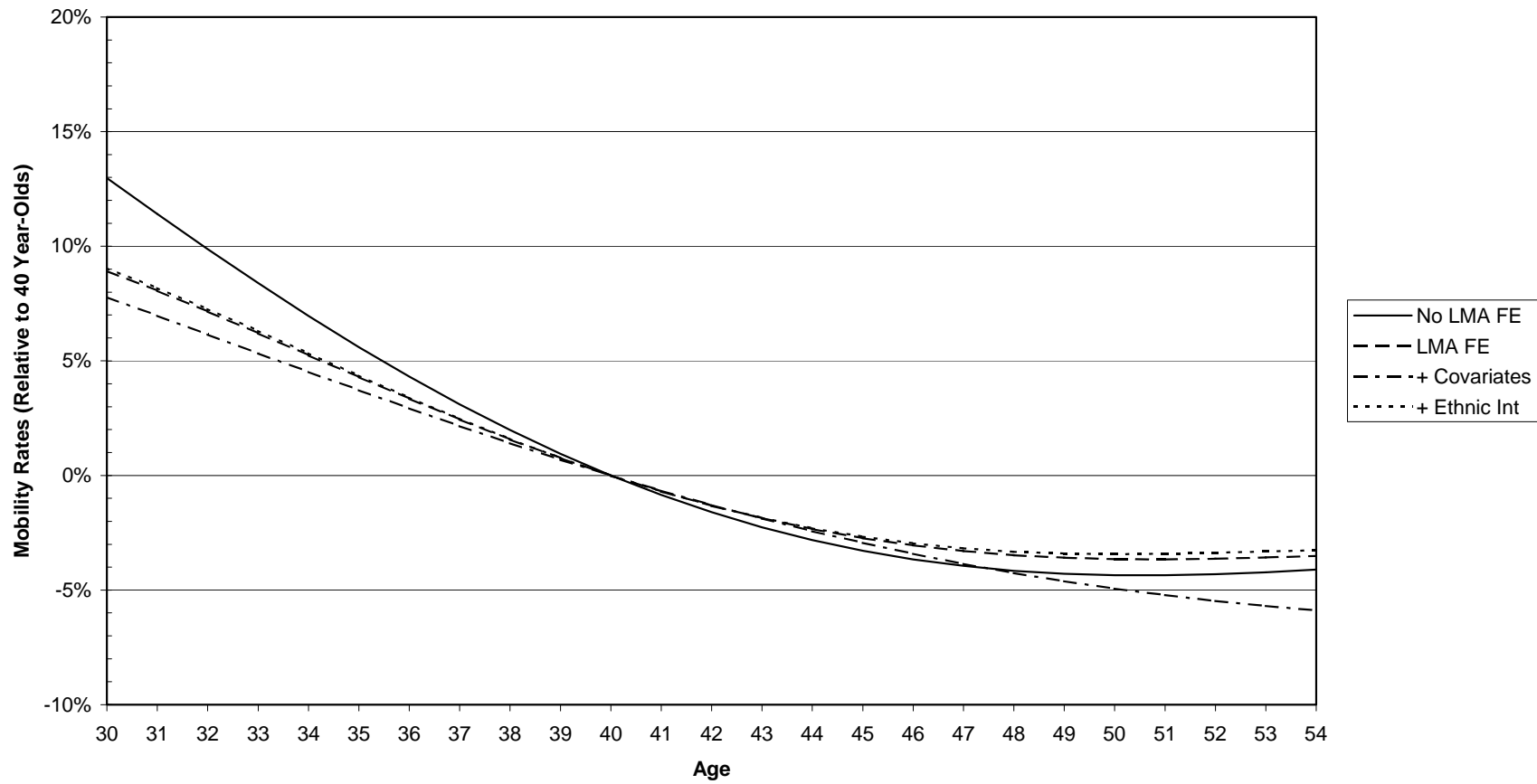
Figure 5: Regression Estimates of Age-Mobility Patterns by Ethnicity between 1991 and 1996
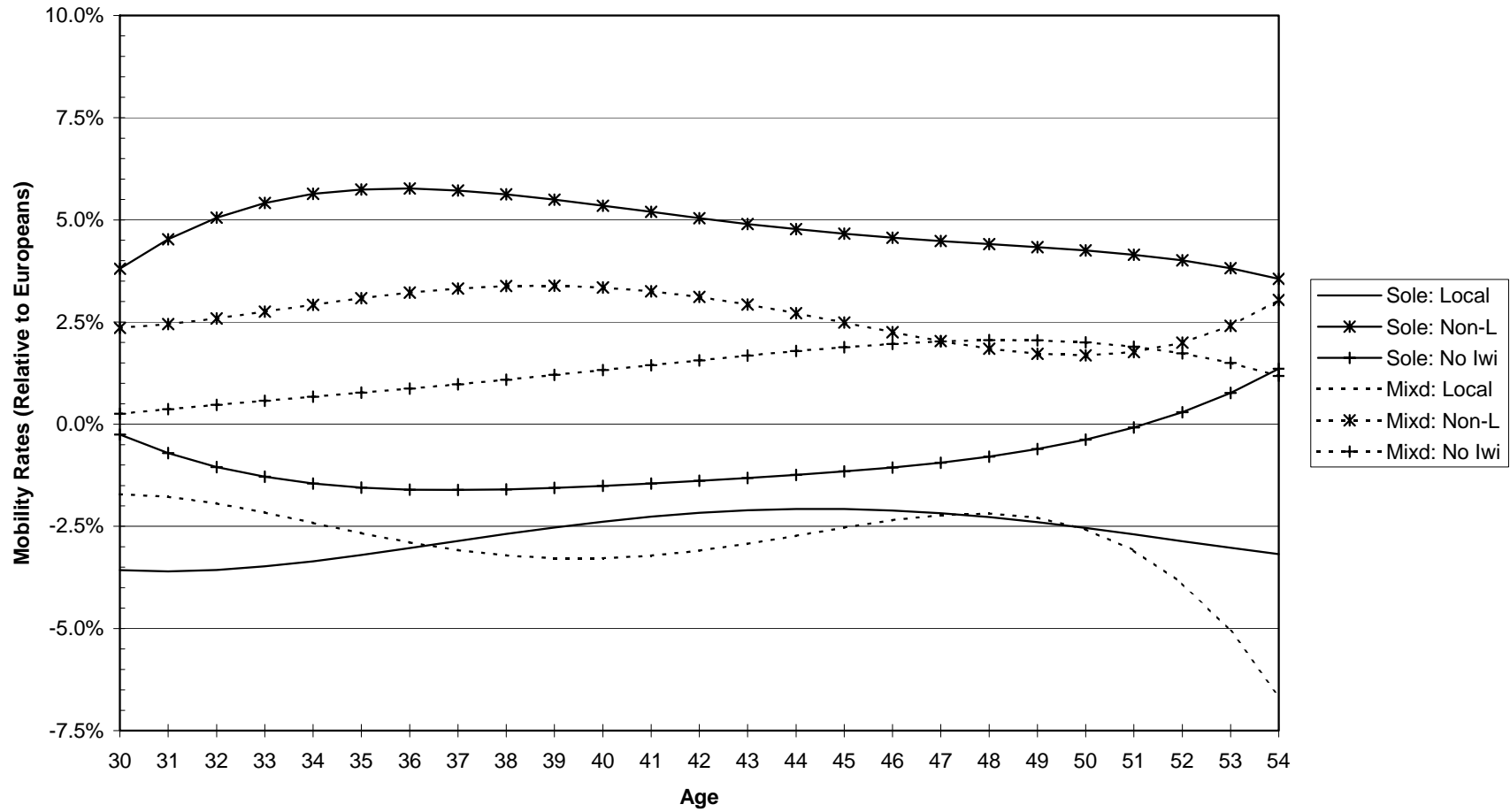
Figure 6: Regression Estimates of Age-Mobility Patterns by Ethnicity between 1996 and 2001
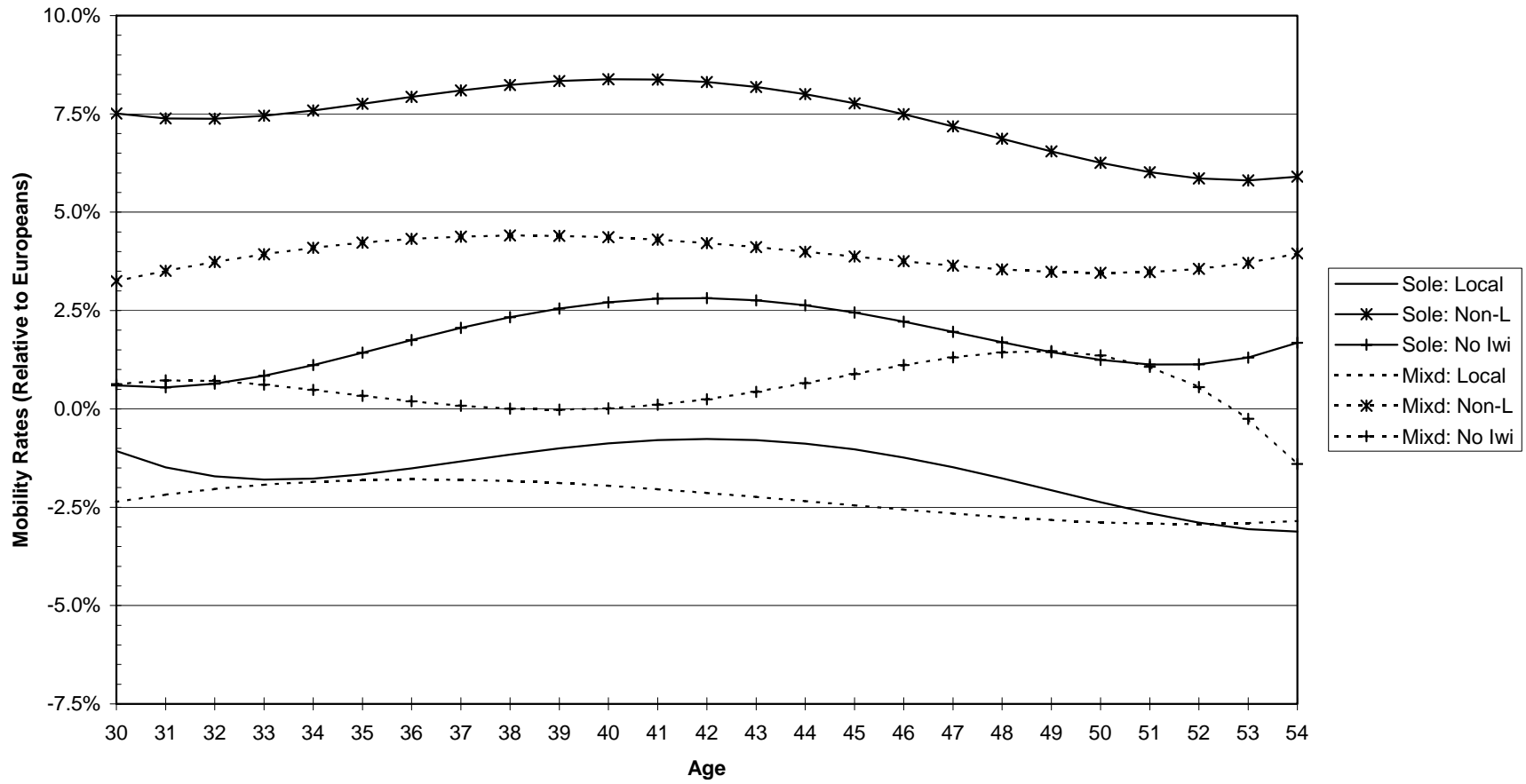
Table 1: Mobility Status by Ethnicity, Location, and Year

Panel A	Between 1991 and 1996			Between 1996 and 2001		
	Sole Māori	Mixed Māori	European	Sole Māori	Mixed Māori	European
Same AU	60%	56%	58%	53%	51%	56%
Changed AU, Same LMA	20%	23%	25%	24%	26%	25%
Changed LMA	17%	17%	14%	21%	20%	16%
Moved from Overseas	2%	4%	4%	2%	3%	3%
Moved from Outside LMA	19%	21%	17%	23%	23%	19%
Population	76,128	50,694	734,463	89,547	47,508	773,352
Panel B	Māori: Local Iwi	Māori: Non-Local Iwi	Māori: No Iwi Affiliation	Māori: Local Iwi	Māori: Non-Local Iwi	Māori: No Iwi Affiliation
Same LMA	84%	77%	81%	80%	74%	78%
Changed LMA	16%	23%	19%	20%	26%	22%
Changed to Local LMA	8%	8%		10%	10%	
Changed to Non-Local LMA	8%	15%		10%	16%	
Population	45,042	57,300	24,486	51,726	55,764	29,571

Note: Newell and Papps (2001) define 140 labour market areas (LMAs) using an algorithm that ensures that most people who live in one LMA work in it, and most people who work in one LMA live in it. See Appendix A for more detail. We calculate for each LMA–iwi combination the proportion of the total iwi population living in that LMA relative to the proportion of the total European population living in it, based on aggregating the 1996 and 2001 censuses, and if this proportion exceeds two, the LMA is considered a local LMA for the iwi.

Table 2: Population Characteristics by Ethnicity and Location in 1996

	Sole Māori: Local Iwi	Sole Māori: Non-Local Iwi	Sole Māori: No Iwi Affiliation	Mixed Māori: Local Iwi	Mixed Māori: Non-Local Iwi	Mixed Māori: No Iwi Affiliation	European
Moved from Outside LMA	16%	24%	19%	16%	23%	20%	17%
Mean Distance Moved (km)	29.1	54.6	35.5	31.7	47.3	38.8	34.4
Mean Age	40.2	40.3	39.4	39.5	39.5	38.9	41.2
Female	54%	51%	50%	58%	54%	51%	51%
Has No Qualifications	59%	53%	66%	43%	33%	42%	28%
Has School Qualification	15%	17%	12%	24%	26%	25%	27%
Post-school Qualification	11%	12%	7%	19%	22%	19%	26%
University Degree	1%	3%	1%	3%	7%	4%	10%
Missing Qualifications	14%	15%	14%	12%	11%	10%	8%
Single, Never Married	19%	17%	20%	14%	13%	14%	10%
Legally/De Facto Married	61%	62%	59%	70%	71%	71%	77%
Divorced/Separated/Widowed	14%	14%	14%	13%	13%	12%	10%
Missing Marital Status	6%	7%	7%	4%	4%	3%	2%
Employed Full-Time	44%	51%	46%	54%	59%	59%	66%
Employed Part-Time	12%	12%	11%	15%	15%	14%	17%
Unemployed	12%	10%	11%	8%	6%	6%	3%
Not in the Labour Force	31%	27%	32%	23%	20%	20%	15%
Income < $10,000	28%	24%	26%	24%	21%	22%	20%
$10,001 - $20,000	29%	26%	27%	27%	23%	22%	19%
$20,001 - $30,000	18%	21%	19%	19%	20%	20%	19%
$30,001 - $40,000	9%	12%	9%	13%	15%	14%	16%
$40,001 - $70,000	6%	8%	5%	10%	13%	13%	17%
> $70,000	1%	1%	1%	2%	3%	3%	6%
Income Missing	10%	9%	12%	5%	5%	5%	3%
Non-Family Member	18%	21%	22%	14%	17%	17%	16%
Couple, No Children	10%	13%	13%	12%	15%	16%	20%
Couple, Children	50%	48%	45%	56%	54%	54%	56%
Single Parent	22%	18%	20%	18%	14%	13%	8%
Percent of Overall Population	4%	4%	1%	1%	3%	1%	85%
Percent of Māori Population	26%	25%	10%	10%	20%	10%	
Population	32,394	31,371	12,372	12,651	25,932	12,114	734,463

Note: See the note for table 1 for more information about the creation of labour market areas (LMAs) and local Iwi affiliation.

Table 3: Population Characteristics by Ethnicity and Location in 2001

	Sole Māori: Local Iwi	Sole Māori: Non-Local Iwi	Sole Māori: No Iwi Affiliation	Mixed Māori: Local Iwi	Mixed Māori: Non-Local Iwi	Mixed Māori: No Iwi Affiliation	European
Moved from Outside LMA	20%	27%	22%	21%	25%	22%	19%
Mean Distance Moved (km)	38.5	66.1	43.4	38.8	58.6	43.9	41.9
Mean Age	40.9	40.9	40.2	40.1	39.7	39.4	41.9
Female	55%	51%	48%	60%	59%	51%	52%
Has No Qualifications	46%	41%	53%	32%	24%	35%	22%
Has School Qualification	22%	26%	19%	33%	35%	31%	35%
Post-school Qualification	15%	16%	8%	21%	24%	18%	26%
University Degree	3%	5%	1%	5%	11%	5%	12%
Missing Qualifications	14%	12%	19%	9%	7%	10%	5%
Single, Never Married	22%	21%	23%	17%	17%	17%	12%
Legally/De Facto Married	58%	59%	52%	67%	68%	65%	75%
Divorced/Separated/Widowed	12%	13%	12%	12%	12%	12%	11%
Missing Marital Status	7%	7%	13%	4%	3%	5%	2%
Employed Full-Time	49%	57%	50%	57%	61%	59%	67%
Employed Part-Time	14%	12%	12%	16%	15%	14%	16%
Unemployed	12%	9%	11%	8%	6%	6%	3%
Not in the Labour Force	25%	22%	27%	20%	18%	20%	13%
Income < $10,000	22%	18%	21%	19%	17%	18%	15%
$10,001 - $20,000	28%	23%	24%	24%	21%	21%	17%
$20,001 - $30,000	19%	21%	19%	19%	18%	18%	17%
$30,001 - $40,000	12%	15%	11%	15%	15%	15%	16%
$40,001 - $70,000	9%	13%	8%	14%	19%	15%	22%
> $70,000	1%	2%	1%	3%	5%	4%	9%
Income Missing	9%	7%	16%	5%	4%	8%	4%
Non-Family Member	23%	26%	29%	17%	19%	21%	19%
Couple, No Children	11%	14%	13%	13%	15%	15%	21%
Couple, Children	44%	42%	38%	51%	50%	49%	51%
Single Parent	22%	18%	20%	19%	16%	16%	9%
Percent of Overall Population	4%	4%	2%	1%	2%	1%	85%
Percent of Māori Population	29%	24%	12%	9%	16%	9%	
Population	39,078	33,369	17,103	12,654	22,395	12,468	773,352

Note: See the note for table 1 for more information about the creation of labour market areas (LMAs) and local Iwi affiliation.

Table 4: Regressions of Whether Individuals Moved LMA from Five Years Ago

	Between 1991 and 1996			Between 1996 and 2001		
	(1)	(2)	(3)	(1)	(2)	(3)
Sole Māori: Local Iwi	-0.016*	-0.025*	-0.041*	0.013*	-0.012*	-0.032*
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Sole Māori: Non-Local Iwi	0.062*	0.057*	0.042*	0.085*	0.077*	0.057*
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Sole Māori: No Iwi Affiliation	0.007*	-0.002	-0.020*	0.029*	0.011*	-0.013*
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Mixed Māori: Local Iwi	-0.017*	-0.021*	-0.028*	0.009*	-0.008*	-0.014*
	(0.003)	(0.003)	(0.003)	(0.004)	(0.003)	(0.003)
Mixed Māori: Non-Local Iwi	0.044*	0.034*	0.028*	0.042*	0.042*	0.036*
	(0.002)	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)
Mixed Māori: No Iwi Affiliate	0.015*	0.008*	0.001	0.016*	0.008*	-0.001
	(0.003)	(0.003)	(0.003)	(0.004)	(0.003)	(0.003)
Age	0.091	0.301*	0.221*	0.078	0.177*	0.043
	(0.065)	(0.058)	(0.058)	(0.066)	(0.061)	(0.060)
Age ^ 2 / 100	-0.511*	-1.164*	-0.880*	-0.403	-0.698*	-0.196
	(0.237)	(0.214)	(0.213)	(0.241)	(0.224)	(0.219)
Age ^ 3 / 1000	0.099*	0.190*	0.147*	0.072	0.112*	0.031
	(0.038)	(0.034)	(0.034)	(0.039)	(0.036)	(0.035)
Age ^ 4 / 10000	-0.006*	-0.011*	-0.009*	-0.004	-0.006*	-0.002
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
F-Test of Joint Significance	[4304]*	[2047]*	[1385]*	[3570]*	[2248]*	[1927]*
Female	-0.004*	0.001	-0.012*	-0.010*	-0.007*	-0.011*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Has School Qualification	0.012*	0.009*	0.018*	0.011*	0.009*	0.019*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Vocational Qualification	0.026*	0.017*	0.031*	0.028*	0.022*	0.036*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
University Degree	0.082*	0.054*	0.066*	0.082*	0.064*	0.073*
	(0.002)	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)
F-Test of Joint Significance	[628]*	[256]*	[386]*	[590]*	[379]*	[477]*
LMA Fixed Effects	No	Yes	Yes	No	Yes	Yes
R-Squared	0.03	0.21	0.22	0.03	0.16	0.20

Note: Coefficients followed by a star are significantly different from zero at the 5 percent level. Standard errors are in parentheses. All regressions control for whether educational status is missing. Specification 3 also includes control variables for marital and employment status, income, and household composition. Sample size is 861.3 thousand in 1996 and 910.4 thousand in 2001.

Table 5: Regressions of Whether Individuals Moved LMA from Five Years Ago with Ethnicity Interaction Effects

		Interaction Effects					
	Europeans	Sole Māori Local Iwi	Sole Māori Non-Local Iwi	Sole Māori No Iwi Affiliation	Mix Māori Local Iwi	Mix Māori Non-Local Iwi	Mix Māori No Iwi Affiliation
Mobility Between 1991 and 1996							
Age	0.297*	-0.148	0.337	-0.225	0.481	-0.275	0.059
	(0.063)	(0.310)	(0.315)	(0.497)	(0.497)	(0.344)	(0.502)
Age ^ 2 / 100	-1.151*	0.535	-1.160	0.803	-1.914	1.101	-0.238
	(0.232)	(1.139)	(1.159)	(1.837)	(1.835)	(1.270)	(1.861)
Age ^ 3 / 1000	0.188*	-0.083	0.175	-0.127	0.332	-0.191	0.043
	(0.037)	(0.184)	(0.187)	(0.298)	(0.298)	(0.206)	(0.303)
Age ^ 4 / 10000	-0.011*	0.005	-0.010	0.008	-0.021	0.012	-0.003
	(0.002)	(0.011)	(0.011)	(0.018)	(0.018)	(0.012)	(0.018)
F-Test of Joint Significance	[1702]*	[1.61]	[4.09]*	[1.79]	[1.29]	[3.07]*	[0.30]
Female	0.000	0.000	0.005	0.011	-0.003	0.007	-0.008
	(0.001)	(0.004)	(0.004)	(0.006)	(0.006)	(0.004)	(0.006)
Has School Qualification	0.008*	-0.010	0.001	0.018	0.000	-0.002	0.001
	(0.001)	(0.006)	(0.005)	(0.010)	(0.008)	(0.006)	(0.008)
Vocational Qualification	0.015*	0.024*	0.025*	0.033*	0.024*	0.023*	0.005
	(0.001)	(0.006)	(0.006)	(0.013)	(0.008)	(0.006)	(0.009)
University Degree	0.052*	0.093*	0.040*	-0.006	0.041*	-0.009	-0.001
	(0.001)	(0.017)	(0.012)	(0.043)	(0.019)	(0.009)	(0.016)
F-Test of Joint Significance	[208]*	[15.1]*	[9.07]*	[3.58]*	[3.24]*	[5.94]*	[0.36]
Mobility Between 1996 and 2001							
Age	0.211*	-0.421	-0.355	-0.461	0.018	-0.043	0.446
	(0.067)	(0.305)	(0.328)	(0.452)	(0.529)	(0.398)	(0.527)
Age ^ 2 / 100	-0.826*	1.524	1.338	1.747	-0.026	0.224	-1.740
	(0.243)	(1.118)	(1.201)	(1.664)	(1.950)	(1.468)	(1.947)
Age ^ 3 / 1000	0.133*	-0.241	-0.219	-0.288	-0.002	-0.046	0.297
	(0.039)	(0.180)	(0.193)	(0.269)	(0.316)	(0.238)	(0.316)
Age ^ 4 / 10000	-0.008*	0.014	0.013	0.017	0.000	0.003	-0.019
	(0.002)	(0.011)	(0.012)	(0.016)	(0.019)	(0.014)	(0.019)
F-Test of Joint Significance	[1878]*	[3.01]*	[2.85]*	[2.36]	[0.19]	[0.27]	[0.49]
Female	-0.008*	0.000	0.006	-0.005	0.014*	0.005	0.008
	(0.001)	(0.004)	(0.004)	(0.006)	(0.007)	(0.005)	(0.007)
Has School Qualification	0.010*	-0.008	-0.012*	-0.008	0.001	-0.008	-0.004
	(0.001)	(0.005)	(0.005)	(0.008)	(0.008)	(0.007)	(0.008)
Vocational Qualification	0.022*	0.016*	0.001	-0.001	0.014	0.010	0.001
	(0.001)	(0.006)	(0.006)	(0.011)	(0.009)	(0.007)	(0.010)
University Degree	0.062*	0.065*	0.021*	0.006	0.058*	0.001	0.006
	(0.002)	(0.011)	(0.009)	(0.024)	(0.016)	(0.009)	(0.016)
F-Test of Joint Significance	[310]*	[14.8]*	[3.75]*	[0.44]	[4.51]*	[2.59]*	[0.17]

Note: Coefficients followed by a star are significantly different from zero at the 5 percent level. Standard errors are in parentheses. All regressions control for whether educational status is missing and for LMA fixed effects. Sample size is 861.3 thousand in 1996 and 910.4 thousand in 2001.

Table 6: Additional Regressions of Whether Individuals Moved from Five Years Ago

	Between 1991 and 1996				Between 1996 and 2001			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Sole Māori: Local Iwi	-0.025*	-0.037*	-4.65*	-7.99*	-0.012*	-0.019*	-2.53*	-4.02*
	(0.002)	(0.003)	(0.75)	(0.99)	(0.002)	(0.003)	(0.76)	(0.95)
Sole Māori: Non-Local Iwi	0.057*	0.037*	22.70*	15.87*	0.077*	0.055*	28.15*	19.95*
	(0.002)	(0.002)	(0.72)	(0.61)	(0.002)	(0.002)	(0.77)	(0.65)
Sole Māori: No Iwi Affiliation	-0.002	0.000	3.15*	3.68*	0.011*	0.013*	5.60*	6.40*
	(0.003)	(0.003)	(1.13)	(1.13)	(0.003)	(0.003)	(1.07)	(1.07)
Mixed Māori: Local Iwi	-0.021*	-0.019*	-5.32*	-5.84*	-0.008**	-0.015*	-5.98*	-7.07*
	(0.003)	(0.004)	(1.11)	(1.39)	(0.003)	(0.004)	(1.22)	(1.47)
Mixed Māori: Non-Local Iwi	0.034*	0.027*	12.34*	10.12*	0.042*	0.038*	16.01*	13.43*
	(0.002)	(0.002)	(0.79)	(0.73)	(0.002)	(0.002)	(0.93)	(0.86)
Mixed Māori: No Iwi Affiliation	0.008**	0.009*	3.28*	3.53*	0.008**	0.009*	1.77	2.17*
	(0.003)	(0.003)	(1.14)	(1.14)	(0.003)	(0.003)	(1.23)	(1.23)
Measurement of Local Iwi	Population	Traditional	Population	Traditional	Population	Traditional	Population	Traditional
Measurement of Mobility	Δ LMA	Δ LMA	Distance	Distance	Δ LMA	Δ LMA	Distance	Distance
R-Squared	0.21	0.21	0.02	0.02	0.16	0.16	0.02	0.02

Note: Coefficients followed by a star are significantly different from zero at the 5 percent level. Standard errors are in parentheses. All regressions control for whether educational status is missing and for LMA fixed effects. Sample size is 861.3 thousand in 1996 and 910.4 thousand in 2001 for the regressions with change LMA as the mobility measure and 828.6 thousand in 1996 and 882.4 thousand in 2001 when distance is used because these regressions exclude all individuals moving from overseas and to/from the Chatham Islands.

Table 7: Regressions of Whether Individuals Moved LMA from Five Years Ago Examining Traditional versus Population Based Local Iwi Classifications

|	Population Based	Traditional Areas	Between 1991 and 1996	Between 1996 and 2001
Sole Māori	Local	Local	-0.046*	-0.027*
			(0.003)	(0.003)
	Local	Non-Local	-0.006*	0.006*
			(0.003)	(0.003)
	Non-Local	Local	0.030*	0.044*
			(0.010)	(0.009)
	Non-Local	Non-Local	0.058*	0.079*
			(0.002)	(0.002)
	No Iwi Affiliation		0.028*	-0.002
			(0.003)	(0.003)
Mixed Māori	Local	Local	-0.034*	-0.022*
			(0.004)	(0.005)
	Local	Non-Local	-0.010*	0.007
			(0.004)	(0.005)
	Non-Local	Local	0.019*	0.000
			(0.008)	(0.008)
	Non-Local	Non-Local	0.036*	0.046*
			(0.002)	(0.003)
	No Iwi Affiliation		-0.009*	0.008*
			(0.003)	(0.003)

Note: Coefficients followed by a star are significantly different from zero at the 5 percent level. Standard errors are in parentheses. All regressions control for whether educational status is missing and for LMA fixed effects. Sample size is 861.3 thousand in 1996 and 910.4 thousand in 2001.

Appendix A: Labour Market Areas

Newell and Papps (2001) create labour market areas (LMAs) using travel-to-work data at area unit level drawn from the 1991 census. We use the 140 LMAs defined by the preferred specification in their paper, which enforces a minimum employed population of 2,000 and 75% self-containment of workers (allowing for some trade-off between the two). These LMAs have an average size of approximately 1900 square kilometres. In main urban areas, LMAs generally encompass the urban area and an extensive catchment area. In rural areas, LMAs tend to consist of numerous small areas, each centred on a minor service centre.

The advantage of using functionally defined LMAs over administratively defined areas, such as territorial local authorities, is that migration between LMAs is generally associated with a change of job, whereas migration within a LMA is often motivated by residential factors. By disregarding migration within LMAs, we are able to largely isolate job-related migration. Administratively defined geographic areas are much less able separate these two types of migration.

Figure A1: New Zealand Labour Market Areas
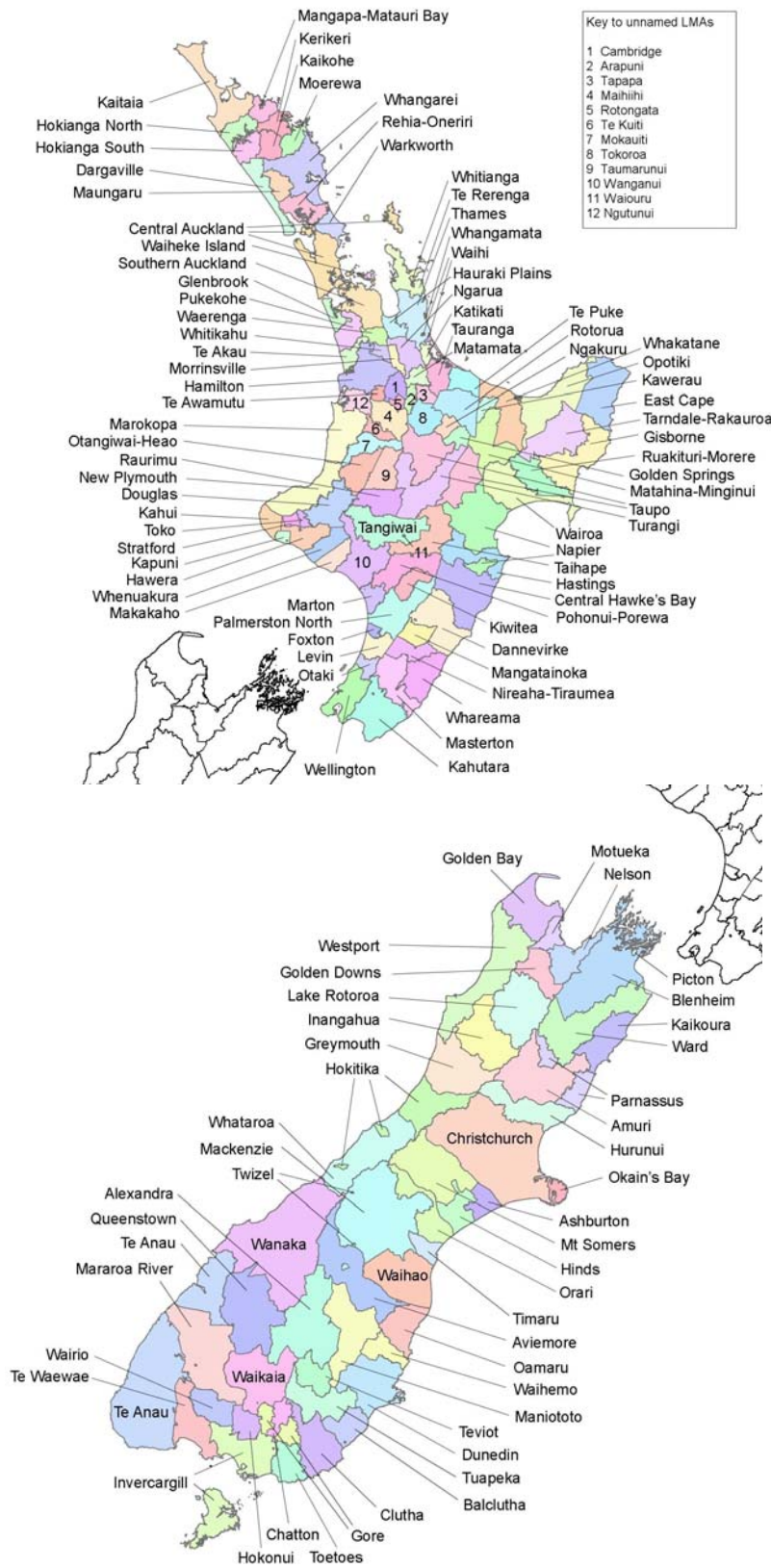
Appendix B: Incomplete Census Addresses

Addresses supplied for an individual's current usual residence or residential address five years ago are occasionally unclear or insufficiently detailed to assign that address to an LMA. When an individual's current usual residence is unclear, SNZ allocates the individual to a location based on the information that is available and random allocation. 'Address five years ago', however, is not coded to a specific area unit if the location cannot be determined accurately. We consider the address of an individual to be incomplete if 'address five years ago' cannot be allocated to either 'overseas' or a specific area unit within New Zealand.

In this section we examine the frequency of incomplete addresses for individuals with different observable characteristics. Table B1 shows the percentage of individuals in our three main comparison ethnic groups with incomplete addresses, out of the total population with certain observable characteristics. Incomplete addresses are a fairly common problem, though the proportion of addresses that are incomplete varies considerably between groups with different characteristics. In the 1996 census, 11% of sole Māori, 10% of mixed Māori, and 7% of Europeans have incomplete addresses. Similar figures, although slightly lower, are reported for the 2001 census. Men are between 2% and 4% more likely to have incomplete addresses than women. There is a strong age gradient, with those aged 30–34 being 4% to 7% more likely to have incomplete addresses than those aged 45–54. There is a weak educational gradient—individuals with no qualifications are 1% to 3% more likely to have incomplete addresses than those with university degrees. These differences are fairly consistent for each ethnic group in both census years.

Table B2 presents the distribution of characteristics for individuals with a complete address compared to the characteristics of those with an incomplete address for each of the three main comparison groups. Individuals with incomplete addresses are more likely to be male, younger, non-married, not working full-time, and not in a family arrangement, and to have low qualifications and low income. These individuals are also much more likely to have

missing responses for other variables. Again, these differences are apparent for all three comparison groups.

It is likely that more mobile individuals are more likely to have incomplete addresses, because of the difficulty in recalling an address from five years previously—especially if multiple moves have occurred in the meantime. If we assume that individuals with missing addresses are the most mobile people in a particular ethnic group (beyond their observable characteristics), then our main findings may underestimate the mobility of Māori relative to Europeans because more Māori are dropped from the analysis.

Table B1: Characteristics of Individuals with Incomplete Addresses

Percentage with an Incomplete Address	Sole Māori	Mixed Māori	European
1996			
Overall	10.5%	9.5%	7.1%
Female	9.0%	7.9%	6.1%
Male	12.1%	11.2%	8.1%
25 - 34	13.6%	12.0%	10.2%
35 - 44	9.9%	8.8%	6.9%
45 - 54	8.3%	7.4%	5.2%
No Qualification	10.6%	10.1%	8.2%
School Qualification	8.7%	8.5%	6.7%
Vocational Qualification	8.4%	8.4%	6.2%
University Degree	9.7%	7.2%	5.1%
Sample Size	85,065	55,986	790,407
2001			
Overall	10.4%	9.2%	6.4%
Female	8.9%	8.0%	5.5%
Male	12.0%	10.7%	7.5%
25 - 34	13.8%	12.3%	10.7%
35 - 44	10.3%	8.9%	6.3%
45 - 54	7.9%	6.2%	4.4%
No Qualification	10.2%	9.8%	8.0%
School Qualification	8.5%	8.2%	5.9%
Vocational Qualification	8.6%	7.7%	5.3%
University Degree	8.4%	6.5%	4.7%
Sample Size	99,945	52,302	826,521

Note: All numbers given in this table are expressed as percentages of the New Zealand-born working-aged population of the stated ethnicity. An address is incomplete if the individual's address five years ago cannot be allocated to 'overseas' or a specific area unit in New Zealand.

Table B2: Sample Characteristics by Whether Individuals Have An Incomplete Address

	Sole Māori Complete Address	Sole Māori Incomplete Address	Mixed Māori Complete Address	Mixed Māori Incomplete Address	European Complete Address	European Incomplete Address
Mean Age	40.5	38.9	39.5	37.9	41.6	39.3
Female	52%	44%	55%	47%	52%	44%
Has No Qualifications	51%	51%	34%	36%	25%	30%
Has School Qualification	20%	16%	29%	26%	31%	29%
Post-school Qualification	12%	10%	21%	18%	26%	22%
University Degree	3%	2%	6%	5%	11%	8%
Missing Qualifications	14%	21%	10%	15%	7%	11%
Single, Never Married	20%	28%	15%	23%	11%	18%
Legally/De Facto Married	59%	42%	69%	51%	76%	60%
Divorced/Separated/Widowed	13%	16%	12%	17%	11%	15%
Missing Marital Status	7%	15%	4%	10%	2%	6%
Employed Full-Time	50%	41%	59%	52%	66%	63%
Employed Part-Time	12%	11%	15%	12%	16%	13%
Unemployed	11%	14%	6%	10%	3%	5%
Not in the Labour Force	27%	34%	20%	26%	14%	19%
Income < $10,000	23%	28%	20%	24%	17%	19%
$10,001 - $20,000	26%	26%	23%	25%	18%	21%
$20,001 - $30,000	20%	15%	19%	18%	18%	19%
$30,001 - $40,000	12%	7%	15%	11%	16%	14%
$40,001 - $70,000	9%	5%	14%	9%	19%	14%
> $70,000	1%	1%	4%	2%	8%	5%
Income Missing	10%	18%	5%	11%	4%	8%
Non-Family Member	23%	39%	18%	33%	17%	31%
Couple, No Children	12%	10%	14%	13%	21%	20%
Couple, Children	45%	30%	52%	36%	54%	39%
Single Parent	20%	20%	16%	18%	9%	10%
Population	165,684	19,326	98,205	10,080	1,507,815	109,113

Note: All numbers given in this table are expressed as percentages of the New Zealnd-born working-aged population of the stated ethnicity. An address is incomplete if the individual's address five years ago cannot be allocated to 'overseas' or a specific area unit in New Zealand.

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Table C1: Tabular Data for Labour Market Areas in 1991

LMA	Percentage of Total Maori Population	Percentage of Total European Population	Percentage of Population in a New LMA (1996 & 2001)
Kaitaia	1.33	0.35	26.37
Mangapa-Matauri Bay	0.27	0.06	30.98
Hokianga North	0.39	0.04	28.46
Hokianga South	0.50	0.06	29.38
Kerikeri	0.33	0.28	39.62
Moerewa	0.88	0.13	25.79
Kaikohe	0.94	0.13	25.95
Whangarei	2.87	1.81	19.05
Maungaru	0.04	0.07	29.76
Dargaville	0.43	0.24	20.45
Rehia-Oneriri	0.26	0.23	29.78
Warkworth	0.22	0.38	33.06
Central Auckland	9.85	15.31	16.92
Waiheke Island	0.12	0.16	43.20
Southern Auckland	12.88	7.83	18.73
Glenbrook	0.32	0.34	28.32
Pukekohe	0.94	0.61	26.47
Whitianga	0.05	0.07	47.56
Te Rerenga	0.19	0.14	41.95
Whangamata	0.08	0.09	44.04
Thames	0.72	0.68	27.08
Hauraki Plains	0.06	0.10	30.34
Waihi	0.20	0.21	34.74
Te Akau	0.05	0.03	34.09
Whitikahu	0.04	0.07	36.31
Waerenga	0.08	0.09	28.92
Ngarua	0.22	0.40	23.72
Morrinsville	0.18	0.28	25.67
Matamata	0.26	0.33	23.37
Hamilton	5.26	3.93	18.54
Cambridge	0.33	0.54	27.27
Rotongata	0.03	0.03	37.09
Te Awamutu	0.60	0.43	24.26
Ngutunui	0.14	0.06	32.90
Maihiihi	0.36	0.22	29.53
Tokoroa	1.66	0.54	16.59
Tapapa	0.03	0.03	36.79
Arapuni	0.10	0.10	32.39
Marokopa	0.22	0.09	30.03
Mokauiti	0.10	0.05	25.94
Te Kuiti	0.49	0.13	19.33
Turangi	0.75	0.12	32.93
Taupo	0.99	0.61	30.44
Katikati	0.11	0.17	36.33
Te Puke	0.70	0.41	28.74
Tauranga	2.31	2.38	28.52
Golden Springs	0.09	0.06	24.50
Ngakuru	0.03	0.06	34.93
Rotorua	4.23	1.43	20.30
Whakatane	1.95	0.65	22.19
Matahina-Minginui	0.65	0.05	18.55
Kawerau	1.37	0.16	16.83
Opotiki	1.04	0.17	23.19
East Cape	0.94	0.03	24.65
Tarndale-Rakauroa	0.27	0.07	23.95
Gisborne	3.12	0.90	16.84
Ruakituri-Morere	0.12	0.03	30.92
Wairoa	1.11	0.16	18.26
Hastings	3.03	1.69	17.93
Napier	1.82	1.78	20.81
Central Hawke's Bay	0.51	0.44	19.55
New Plymouth	1.60	2.24	14.20
Douglas	0.01	0.05	26.61
Toko	0.01	0.06	29.34
Stratford	0.19	0.32	19.69
Kahui	0.18	0.17	21.69
Kapuni	0.05	0.06	27.15
Hawera	0.52	0.53	18.98
Whenuakura	0.16	0.07	23.13
Makakaho	0.10	0.07	24.65
Raurimu	0.04	0.03	40.45
Otangiwai-Heao	0.10	0.06	32.03
Taumarunui	0.67	0.21	18.37

Tangiwai	0.32	0.10	22.14
Waiouru	0.16	0.04	64.84
Wanganui	1.75	1.34	15.64
Pohonui-Porewa	0.13	0.11	25.49
Taihape	0.22	0.07	19.11
Marton	0.32	0.26	23.04
Kiwitea	0.04	0.06	29.17
Palmerston North	2.10	3.09	17.34
Dannevirke	0.44	0.37	18.04
Mangatainoka	0.11	0.17	19.78
Nireaha-Tiraumea	0.05	0.08	23.94
Foxton	0.24	0.14	26.37
Levin	0.81	0.65	18.80
Otaki	0.31	0.18	31.40
Wellington	8.42	9.95	14.42
Whareama	0.03	0.07	34.63
Masterton	0.85	0.97	19.12
Kahutara	0.13	0.16	29.45
Golden Bay	0.06	0.16	26.62
Motueka	0.19	0.36	27.46
Golden Downs	0.02	0.04	35.90
Lake Rotoroa	0.01	0.05	35.74
Nelson	0.51	1.93	21.30
Ward	0.01	0.04	26.42
Picton	0.15	0.11	38.24
Blenheim	0.48	1.14	24.06
Kaikoura	0.09	0.12	28.59
Westport	0.11	0.32	20.13
Inangahua	0.03	0.08	28.07
Greymouth	0.16	0.52	18.05
Whataroa	0.01	0.03	39.24
Hokitika	0.14	0.27	20.49
Amuri	0.04	0.10	41.65
Parnassus	0.02	0.06	23.79
Hurunui	0.03	0.11	26.50
Christchurch	4.24	11.84	13.08
Okain's Bay	0.02	0.07	35.09
Mt Somers	0.02	0.15	21.28
Hinds	0.01	0.16	24.93
Ashburton	0.16	0.67	17.84
Orari	0.10	0.38	21.66
Timaru	0.26	1.21	14.92
Twizel	0.03	0.04	37.87
Mackenzie	0.02	0.12	28.23
Waihao	0.05	0.30	20.76
Aviemore	0.02	0.06	26.91
Oamaru	0.13	0.66	16.55
Waihemo	0.01	0.07	28.26
Teviot	0.02	0.07	28.36
Maniototo	0.03	0.09	22.11
Alexandra	0.14	0.43	27.14
Wanaka	0.04	0.12	42.89
Queenstown	0.06	0.27	42.68
Dunedin	0.96	3.77	12.90
Clutha	0.06	0.23	20.84
Balclutha	0.12	0.37	19.68
Tuapeka	0.06	0.14	23.25
Waikaia	0.02	0.10	22.41
Hokonui	0.04	0.18	20.07
Toetoes	0.02	0.09	16.95
Te Anau	0.02	0.07	45.78
Mararoa River	0.01	0.07	30.34
Wairio	0.07	0.07	24.38
Te Waewae	0.05	0.10	21.17
Chatton	0.01	0.08	22.98
Gore	0.27	0.51	14.15
Invercargill	1.65	2.37	11.25
Overall	109,257	755,520	864,777

Note: All numbers given in this table are expressed as percentages of the New Zealand-born working-aged population of the stated ethnicity that can be identified to live in a well-defined LMA.

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