Department of Labour
TE TARI MAHI

HOUSING MARKETS AND MIGRATION: EVIDENCE FROM NEW ZEALAND

ECONOMIC IMPACTS OF IMMIGRATION WORKING PAPER SERIES

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ABSTRACT

New Zealand's large and volatile external migration flows generate significant year-to-year fluctuations in the demand for residential housing. This paper uses population data from the 1986, 1991, 1996, 2001 and 2006 New Zealand Censuses, house sales price data from Quotable Value New Zealand and rent data from the Department of Building and Housing to examine how population change, international migration, including the return migration of New Zealanders abroad, and internal migration affect rents and sales prices of both apartments and houses in different housing markets in New Zealand. Our analysis focuses on the relationship between the changes in the population in local areas and changes in house sale prices and rents in these areas. Focusing on changes allows us to control for time-invariant unobservable characteristics of local areas that either attract or repel individuals and lead to differential costs of housing.

We find that a one percent increase in an area's population is associated with a 0.2 to 0.5 percent increase in local housing prices. Although international migration flows are an important contributor to population fluctuations, we find no evidence that the inflow of foreign-born immigrants to an area are positively related to local house prices, despite there being a strong correlation over time at the national level. On the other hand, there is a strong positive relationship between inflows of New Zealanders previously living abroad into an area and the appreciation of local housing prices, with a one percent increase in population resulting from higher inflows of returning Kiwis associated with a 6 to 9 percent increase in house prices. Our findings are, however, not robust to the choice of time period, suggesting that factors other than differences in population growth across areas may be more important in determining the rate of local house price appreciation.

JEL classifications: J61, R23

Keywords: Immigration, Housing Markets, House Prices, New Zealand, Internal Migration

INTRODUCTION

New Zealand's large and volatile external migration flows generate significant year-to-year fluctuations in the demand for residential housing. Between 1986 and 2006, net permanent and long-term (PLT) migration into New Zealand added, on average, 0.1 percent annually to the New Zealand resident population, compared with a natural increase of 0.8 percent (from births minus deaths). However, in contrast to the relatively steady growth from the natural increase, net PLT migration flows fluctuated markedly. In 1986, PLT migration outflows roughly offset the natural increase, whereas in 1996, 2002, and 2003, they added more to New Zealand's population than the natural increase.[1] These periods of high net inflows were also periods of high house price growth, a relationship that is clearly evident in Figure 1.

Recent research by Coleman and Landon-Lane (2007) on the links between migration and the New Zealand housing market estimates structural vector autoregressive (VAR) models at the national level for each of two periods: 1962-1982 and 1991-2006. They conclude that "a migration flow equal to 1 percent of the population is associated with an 8-12 percent change in house prices after a year, and a slightly larger effect after three years."(p. 43) They note that this estimate is an order of magnitude larger than is implied by the long-run relationship between house prices and net migration and suggest that housing supply constraints and the potential for migration flows to destabilise income expectations are possible reasons for the very strong time-series relationship. Similarly, Grimes et al (2007) analyse the dynamics of adjustment in regional labour and housing markets using a VAR model on a panel of regions from 1986 to 2006. They find that, at a national level, both house prices and migration rise strongly in response to increased employment. In contrast, a region-specific employment shock results in strong in-migration, but this is not associated with movement in relative house prices. Despite the conflicting local and national findings, it has become widely accepted in New Zealand that immigration has played a significant role in recent house price inflation, as typified by the Reserve Bank's December 2007 Monetary Policy Statement, in which they refer to "… a strong housing market fuelled by the combination of a sharp increase in immigration and an extended period of unusually low global interest rates." (Reserve Bank of New Zealand (2007)).

In this paper, we use population data from the 1986, 1991, 1996, 2001 and 2006 New Zealand Censuses, house sales price data from Quotable Value New Zealand and rent data from the Department of Building and Housing to examine how population change, international migration, including the return migration of New Zealanders abroad, and internal migration affect rents and sales prices of both apartments and houses in different housing markets in New Zealand. We focus particularly on local rather than national impacts, to abstract from the possible confounding influence of macroeconomic factors, and to gain a fuller understanding of the local interaction of migration and housing.

[1] Authors' calculations from Statistics New Zealand (2008) – Tables 1.04, 1.05 and 5.01. Data are for June years.

We begin our analysis by examining the relationship between changes in the population size in local areas and changes in house sale prices and rents in these areas. Focusing on changes allows us to control for time-invariant unobservable characteristics of local areas that either attract or repel individuals and lead to differential costs of housing. This is important because both population and housing market characteristics are likely to reflect unobserved characteristics of local areas (eg. local amenities, job opportunities, commuting costs) and unobserved characteristics of the housing stock in these areas (eg. the size and quality of local dwellings). We also control for changes over time in the observable characteristics of individuals living in different areas (eg. their age, employment status, income, household composition), which allows us to account for changes over time in the type of housing demanded by different individuals and in average dwelling sizes.

We next examine the impact that four key components of population change: new immigrants to New Zealand; New Zealanders returning from living abroad; net inflows of earlier migrants moving from other areas of New Zealand; and net inflows of New Zealanders moving from other areas of New Zealand, have on changes in house sale prices and rents in local areas. Internal and international migrants may be attracted to local areas with generally lower housing costs. If so, this endogenous response will bias downwards our estimate of the relationship between house prices and immigration. Alternatively, if migrants are attracted to areas with improving prospects and consequently with rising house prices, estimates of the causal impact of migration will be biased upwards. Thus, we subsequently use an instrumental variable technique to isolate components of local population change that are independent of local house prices.

In additional analyses, we examine the relationship between the components of population change for each area and different quantiles of the local house price distribution, estimate our main regression models over different sub-periods, and analyse the sorting of new immigrants to New Zealand and New Zealanders returning from living abroad into particular neighbourhoods within local areas. Mean house price changes may fail to capture the effect of population changes if changes in housing demand are focused in particular parts of the house price distribution. For example, returning New Zealanders have relatively high average incomes, suggesting that they may have a greater influence on the demand for higher-price housing. Examining the stability of our results over different sub-periods allows us to assess the robustness of our estimates, while focusing on the sorting of different individuals into particular neighbourhoods within local areas allows us to evaluate the impact of immigration on neighbourhood housing dynamics.

BACKGROUND

New Zealand's current immigration policy admits, on average, an inflow of roughly 1 percent of the overall population each year. In addition, there is a sizeable unrestricted inflow that includes Australians and, predominantly, returning New Zealanders. New Zealand also has a high emigration rate of both locally born individuals and previous migrants. These movements of people result in large changes in the overall population in short periods of time. For example, between 2001 and 2006, the adult population increased by 8 percent, with 93 percent of this increase coming from the inflow of new migrants, 29 percent from the return migration of New Zealanders, −22 percent from demographic change and the emigration of previous migrants and −1 percent from

demographic change and the emigration of New Zealanders. Unlike in many other countries, foreign immigrants to New Zealand have higher levels of qualifications than the general population. Consequently, immigration is expected to affect a broader segment of the housing market than in countries, such as the US, where immigrants are predominantly low-skilled. Returning New Zealanders are also relatively highly skilled and are especially likely to be homeowners as they are typically prime-aged and have higher average incomes than the general population.

The impact of local migration inflows on local house prices will depend on both the size and composition of migration flows to and the elasticity of housing supply in different across local housing markets. Inflows of foreign-born and New Zealand-born migrants from abroad or from elsewhere in New Zealand vary a great deal across local areas and different migrant groups may demand different quantities and types of housing or enter particular segments of the residential housing market – renting as opposed to owning. The short-run impact of unanticipated migration inflows into an area on the local housing market is to generate an increase in housing demand and an increase in house prices that depends on the elasticity of local housing supply.[2] Supply elasticities may vary across areas for a variety of reasons. Glaeser et al (2005) point to three limits to supply that may cause demand shifts to lead to house price inflation—construction costs, increasing land prices, and regulatory barriers to new construction. Land scarcity or permanent barriers to new construction may justify permanently higher house prices when demand increases. In contrast, construction costs can be expected to decline as the rate of construction slows and the building industry expands. Relaxation of regulatory constraints will also lead to a reversal of house price increases.

Short-term increases in population may lead to sustained house price inflation if house price expectations are adaptive rather than forward looking, in which case recent trends are extrapolated into the future. There is some evidence that this is, in fact, the case, which leads to the possibility of house price bubbles and periods of sustained house price inflation. For example, Case and Shiller (1988), (1989), (2003) find that past information helps to predict future house price growth, which would not be the case in an efficient market. Similarly, Capozza et al (2002) find high serial correlation of house prices in metropolitan areas, especially in areas with high population growth, high construction costs, and high incomes. More pertinent for our research, Grimes et al (2004) find some evidence of short-term overshooting of the New Zealand housing market, although they conclude that there is nevertheless gradual convergence to long-run efficiency.

However, over time, the housing impact of migration flows into an area will also affect other areas, as population shares and relative house prices adjust to restore a spatial equilibrium in which people are once again indifferent about which area they locate in. Thus, spatial equilibration will serve to weaken the relationship between local migration and local house prices. We assume that this process of equilibration is only partial within the timeframes that we observe, in which case the relationship between local population change and local house price change still provides a meaningful indication of the impact of population movements on local housing markets.

[2] In an efficient housing market, anticipated changes in population should not cause jumps in house prices as the increased housing demand and the response of housing supply should be reflected in the housing asset price.

A number of recent studies take a similar approach and examine the local impact of immigration on the housing market. This literature is dominated by studies that look at the impact on local rental prices in the US, reflecting the fact that predominantly low-skilled US immigrants tend to live in rented accommodation. In general, they find that immigration has a positive effect on rental prices. For example, Saiz (2003) examines the 1980 "Mariel boatlift" in which Cuban immigrants added 9 percent more individuals to Miami's renter population. He finds that rental prices increased by 8 percent, with smaller increases for top-end rental units, and a slight decline in house sales prices. Saiz (2007) examines annual and decennial immigration flows and rental price changes in metropolitan areas and finds a similar elasticity, with a 1 percent increase in population due to immigrants resulting in a 1 percent increase in rental prices. Ottaviano and Peri (2007) jointly estimate the impacts of immigrants on wages and rents and find slightly lower elasticities of 0.6 to 0.8 for rents, and 0.4 to 0.6 for wages. Greulich et al (2008) estimate a rent elasticity of 0.6, but no significant impact on the rent-to-income (rent-burden) ratio. As Card (2007) points out, the lack of an impact on the rent burden is consistent with a positive effect of immigrants on the wages of native workers – the higher wages attract additional workers, who bid up housing rents. This results in a new spatial equilibrium, with potential immigrants to an area again indifferent between their current location and the high-wage/high-rent combination in the area with a now larger population.

DATA AND SAMPLE CHARACTERISTICS

POPULATION DATA

This paper uses unit record data for the entire usually resident New Zealand population from the 1986, 1991, 1996, 2001 and 2006 Censuses to identify the population and characteristics of different local areas in New Zealand. The Census collects information on each individual's country of birth, their current usual residential location and their usual residential location (including overseas) five years before the census date (ie. at the time of the previous census). We use this information to classify individuals as being 'New Immigrants', 'Returning New Zealanders (Kiwis)', 'Previous Immigrants', or 'Local New Zealanders (Kiwis)' where 'New Immigrants' are individuals not born in NZ who resided outside NZ 5-years previously, 'Returning Kiwis' are individuals born in NZ who resided outside NZ 5-years previously and the remaining two categories consist of non-NZ-born and NZ-born individuals, respectively, who resided in New Zealand 5-years previously.3

Each individual's current usual residence is coded to a census meshblock, which is the smallest geographic area used by Statistics NZ in the collection and processing of data and is typically aligned to cadastral boundaries. In our main analyses, we consider four

[3] Thus, in this classification, New Immigrants may have previously resided in New Zealand more than five-year ago or may have been temporarily abroad five-years ago. The Census typically asks foreign-born individuals their year of first arrival in New Zealand, but this question was not included in 1991, thus we decided to rely on this alternative way of identifying New Immigrants. Also, using the previous location question allows us to treat them consistently with Returning New Zealanders who are identified in the same manner. Furthermore, while actual year of first arrival is obviously more ideal for classifying immigrant when examining immigrant outcomes and assimilation, it is unclear whether this is the case when examining impacts on housing markets.

progressively aggregated definitions of local housing markets and estimate all of these models for each of these definitions. Newell and Papps (2001) use travel-to-work data at area unit level drawn from the 1991 census to derive labour market areas (LMAs) in New Zealand using an algorithm that ensures that most people who live in a LMA work in it, and most people who work in a LMA live in it.4 Two sets of LMAs are defined – one with 140 areas and one with 58. The main difference is that the 140-area set provides greater disaggregation of some relatively small areas. We also define local housing markets using two administrative definitions – 73 territorial local authorities (TLAs) and 16 regional councils (RCs). One advantage of focusing on functional local labour market areas is that migration between LMAs is typically related to employment mobility, whereas migration within a LMA more strongly reflects residential factors. However, policies set at TLA and RC level influence the regulatory environment in a manner this is likely to influence housing markets (Grimes and Liang (2007)).[5]

Population and migrant subgroup counts are calculated for the usually resident population aged 18 and over in each geographic area, excluding individuals for whom there is insufficient information for classifying whether they are NZ-born or foreign-born or in which geographic area they currently reside.[6] We include all non-institutionalised adults regardless of whether they live in private dwellings or group quarters. Thus, we include in our population counts students and military personnel living in group quarters. Our concern with excluding these individuals is that for many the choice whether to reside in a private dwelling is endogenously determined with characteristics of local housing markets. As discussed further below, we allow for the fact that some proportion of the local population in different areas may not have a direct impact on the housing market by including extensive controls for the demographic and socioeconomic characteristics of local areas and examining changes over time in both population and housing markets. We also further divide the 'Previous Immigrants' and 'Local Kiwis' groups into stayers and movers based on whether they lived in the same local housing market 5-years previously.[7] Thus, this is done separately for each of the four definitions of local housing markets.

[4] The 140 LMAs are defined by enforcing 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.

[5] Local government in New Zealand provides waste management, water, local roads, land management, parks, libraries and other local infrastructure and public goods, but has no role in the provision of education or health services. In the average TLA, nearly 60% of local services are funded from property taxes. These are a mixture of land value (50 TLAs), capital value (23 TLAs), and annual rental value (1 TLA) taxes, and uniform general charges (Kerr et al (2004)). RCs have responsibility for environmental management and public transport.

[6] Approximately 1% of individuals in the 1986 and 1991 census and 4-5% of individuals in the 1996-2006 census do not provide enough information to classify whether they are NZ-born or foreign-born and 0.02-0.03% of individuals have an undefined current address. Imputation was used more liberally by Statistics NZ prior to 1996, which likely explains the increase in individuals missing country of birth.

[7] Approximately 2-4% of individuals in the 1986 and 1991 census and 7-8% of individuals in the 1996-2006 census do not provide a valid 5-years previous census address, although almost all of these individuals provide enough information to identify that they were in New Zealand. Stillman and Maré (2007) compare mobility rates using 5-years previous addresses and intercensal population changes and conclude that the majority of individuals who do not report a valid previous address are, in fact, at the same location now as five years ago. Thus, we code all individuals with an invalid previous address as being in the same LMA five-years ago. The

Table 1 summarises the socioeconomic and demographic characteristics of different population subgroups. Pooling the five censuses, there are roughly 12.6 million person-year observations on adults in New Zealand. On average, 64 percent are New Zealand-born and lived in the same LMA five-years previously (based on the 140 LMA definition), 15 percent are Stayer Previous Immigrants, 12 percent are Internal Migrant Local Kiwis, 5 percent are New Immigrants and 2 percent are Returning Kiwis and Internal Migrant Previous Immigrants. Each census asks questions about homeownership on the dwelling-form that is filled out by one individual in each household, but this is not asked consistently across years.[8] However, in general each of these censuses attempts to ascertain the ownership status of the dwelling that each household occupies which is then attributed to all individuals in the household (eg. whether the dwelling is owned by someone that lives in it, as opposed to whether a particular individual owns the dwelling). Over our twenty-year sample period, New Immigrants have the lowest home ownership rates of any of the groups, at 43 percent, compared with 72-73 percent for Stayer Local Kiwis and Stayer Previous Immigrants and 67 percent overall.[9] In contrast, Returning Kiwis have relatively high home ownership rates (58%) for a group that has moved in the previous five years.

To the extent that there is imperfect substitutability between rental and owned housing, different population groups will affect different parts of the housing market, possibly leading to differential impacts on house price inflation. The type of housing that each group demands may also be different. Returning Kiwis have the highest full-time (wage and salary) employment rate (51% compared with 39% overall) and high real incomes, averaging $31,922 – 22 percent above the overall mean. In contrast, the mean income of New Immigrants is 17 percent below average. Given a positive income elasticity of demand for housing quality, these two groups are likely to exert pressure on different segments of the housing market. New Immigrants and Returning Kiwis both have relatively high educational attainment, with 25 percent and 20 percent, respectively, having a university degree, compared with only 10 percent overall, consistent with their having strong future income prospects and therefore a greater likelihood of making housing investments. These subgroups are also younger (34.9 and 36.0 years,

majority of the analysis in this paper is done at the housing market level and all population movements at this level are identified using intercensal population changes.

[8] For example, in 1986, the question reads "Is this dwelling i) owned with a mortgage, ii) owned without a mortgage, iii) provided rent-free, or iv) rented or leased," while in 1991, the question reads "Do the occupants i) own this dwelling with a mortgage, ii) own this dwelling without a mortgage, ii) occupy this dwelling rent-free, or iv) rent or lease this dwelling," in 1996, the three-part question reads "i) Do you, or anyone who lives here own this dwelling, ii) Do you, or anyone else who lives here, pay rent to the owner (or to their agent) for this dwelling?, iii) Does anyone who lives here make mortgage payments for this dwelling?" in 2001, the three-part question reads "i) Does anyone who lives here make mortgage payments for this dwelling?, ii) Do you, or anyone else who lives here, own or partly own, this dwelling?, iii) Do you, or anyone else who lives here, pay rent to the owner (or to their agent) for this dwelling?" and in 2006, the five-part question reads "i) Do you, or anyone else who lives here, hold this dwelling in a family trust?, ii) Does that trust make mortgage payments for this dwelling?, iii) Do you, or anyone else who lives here, own or partly own this dwelling (with or without a mortgage)?", iv) Does this household pay rent to an owner (or to their agent) for this dwelling?, v) Do you, or anyone else who lives here, make mortgage payments for this dwelling? Furthermore, the 2006 census also includes a question on the individual form which asks, "Do you yourself own, or partly own, the dwelling that you usually live in (with or without a mortgage)?" although we do not examine this question at all.

[9] Morrison (2008) provides a more detailed account of measurement issues and trends in home ownership rates in New Zealand.

respectively) than the overall population (44.3 years). Returning Kiwis are almost entirely (89%) prime-aged (25 – 64), while 20 percent of New Immigrants are young adults (18 – 24) and 75 percent prime-age, compared with an overall age distribution of 15 percent young adult, 70 percent prime-aged and 16 percent older adult.

The quantity of housing demanded also varies across the groups. Both Returning Kiwis and New Immigrants are less likely than the overall population to have children at home, with 43 percent of Returning Kiwis and 45 percent of New Immigrants having a family status of couple with kids or single with kids, versus 47 percent of the overall population. However, New Immigrants live, on average, in larger households than all other population groups, with the average New Immigrant household containing 1.03 children and 2.75 adults versus 0.83 children and 2.34 adults in the overall average household. On the other hand, Returning Kiwis live, on average, in the smallest households of all population groups.[10] New Immigrants are more likely than Returning Kiwis, Stayer Previous Immigrant and Stayer Local Kiwis to live in non-private dwellings (5% versus 3%), but less likely than either group of Internal Migrants (7-8%).

There is undoubtedly correlation between the various characteristics summarised in Table 1, but there do appear to be differences in housing behaviour between the groups, even controlling for differing characteristics. Table 2 presents marginal effects and t-stats from a probit model of the likelihood that a particular individual lives in an owner-occupied dwelling, estimated on an approximate 10 percent random sample of the pooled adult population from the five censuses with 140 LMAs used as the definition of local areas when defining stayers versus movers. The first column of Table 2 shows the home ownership rates of each population group relative to those of Stayer Local New Zealanders, without any control variables. Replicating the findings in Table 1, New Immigrants have the lowest home ownership rates – 30.7 percent lower than Stayer Local Kiwis.

The other columns of Table 2 show the estimated home ownership differences after controlling for a progressively larger set of observable characteristics.[11] Controlling for individual and household demographics, in particular, do change the estimated differences between the groups, but even in a model with full controls including LMA fixed effects, the ranking of groups according to their home ownership behaviour is unchanged. The results from the final specification indicate that New Immigrants are estimated to be 21.2 percent less likely to own a home than Stayer Local Kiwis with the same characteristics living in the same local areas. Returning Kiwis on the other hand are only 9.2 percent less likely to own a home than Stayer Local Kiwis with the same characteristics living in the same local areas and are more likely to own a home than both Local Kiwis and Previous Immigrants that are new to these same areas.

[10] These figures are calculated only for private dwelling. Separate figures have also been calculated for non-private dwellings and are included as control variables in the regression models.

[11] Individual demographics include a quadratic in age, gender, ethnicity (as in Table 1) and qualifications (as in Table 1). Employment and income includes labour force status (as in Table 1), log income and dummies for whether an individual has zero or negative income and for whether income is missing, with log income set to zero for these cases. Household demographics include marital status (as in Table 1), household type (as in Table 1) and the number of 0-5, 5-12, 13-17, 18-24, 25-64, and 65+ year-olds in the dwelling. Region of birth includes dummies for twelve different regions and foreign-born individuals with missing country of birth.

HOUSING MARKET DATA

The housing market data used in this paper come from two different sources. Our data on sales prices comes from Quotable Value New Zealand (QVNZ), which is New Zealand's largest valuation and property information company and currently conducts legally required property valuations for rating (tax) purposes for over 80 percent of New Zealand local government areas (councils)—in earlier years QVNZ conducted valuations for all councils. The remaining councils use competing valuation companies to conduct their property valuations, but these data are purchased by QVNZ to create a complete database of all New Zealand properties. QVNZ maintains a comprehensive database of all property sales that have occurred since 1982 and provides data for several categories of residential dwellings. This database was matched by QVNZ to census meshblocks and made available to us in an aggregate form at the meshblock level on an annual basis.12

Our data on rents comes from the Department of Building and Housing (DBH). Weekly rent data for all rental properties with new tenants are collected from tenants' bonds (deposits) which landlords are required by law to lodge with the Tenancy Services division of the Department at the beginning of a tenancy. While it is not compulsory for a landlord to require a bond from a tenant, any bond that is required from the tenant must legally be lodged by the landlord with Tenancy Services; thus the data cover most arms-length rentals in New Zealand. This database was matched to census area units (which are aggregations of meshblocks) and made available to us in an aggregate form at the area unit level for different property types on a quarterly basis from 1992.

We use the QVNZ data to create average sales prices in each geographic area for two different categories of residential dwelling in each of the census years: dwellings of a fully detached or semi-detached style on their own clearly defined piece of land; and rental flats that have been purpose built. For each of these categories, we aggregate the mean sales price in each meshblock up to the appropriate geographical area weighting by the population of each meshblock in that year.[13] Similarly, we use the DBH data to measure average weekly rents in each geographic area and census year separately for fully detached or semi-detached dwellings and for apartments. We first aggregate these series over the four quarters in each census year and then over the appropriate geographical area weighting by the population of each area unit in that year.[14] We

[12] Property level data are not made available because of confidentiality and privacy reasons. Thus, there is a changing composition of properties being sold over time in different areas because of the building of new properties, the upgrading of older properties, and selective selling of particular type of properties. Given that we are examining fairly aggregated local areas over five-yearly time periods, we have not attempted to mix-adjust the data. We also have information on the valuation of all properties in each meshblock, however we focus on sales prices since they provide the more accurate information on market values.

[13] This aggregation was done after dropping the meshblocks with the highest 1% and lowest 1% of median sales price to median government valuation ratio. In general, overall sales prices and valuations should be similar in an area, so these outliers either reflect measurement error or that properties way outside the norm for an area have been sold.

[14] We also create additional data series which use the number of sales (rentals) in each meshblock (area unit) as the weighting variables and other series which calculate the weighted median of the median sales price (weekly rent) in each meshblock (area unit). Our main results are all qualitatively similar when we use these alternative measures, thus we focus on the population weighted means since this is the average sales price or weekly rent a randomly allocated person would pay for a home in a particular geographic area.

exclude 1986 when we examine the relationship between population changes and rents, but use the 1992 rental data deflated to 1991 dollars to match the 1991 population data.

Our main analyses examine the relationship between local population changes and local changes in house prices and rents. Table 3 summarises these characteristics for the 140 LMAs in each of the census years. The first two panels present the average house prices, rents, and population characteristics across the LMAs in each year, with all estimates weighted by the local population size. Thus, these estimates relate to the average adult in New Zealand. In 1986, the average adult lived in a LMA in 1986 with a population of 154,000 and a mean house sales price of $159,000 in 2006 dollars. Twenty years later in 2006, the average adult lived in a LMA with a population of 226,000 and a mean house sales price of $364,000 in 2006 dollars. Thus, while the LMA population for the average adult increased by nearly 50 percent, the mean house sales price rose by almost 130 percent. Particularly large increases in house prices occurred between 1991 and 1996 (27%) and between 2001 and 2006 (63%).

The third and fourth panels of Table 2 present the average change in house prices, rents, and population characteristics across the LMAs between each year pair of census years, with all estimates weighted by the average local population size in the current and previous census. Thus, the average adult in New Zealand lived in a LMA in 1991 that had experienced less than a 1 percent increase in the mean house sales price since 1986. The equivalent figures for 1991-1996, 1996-2001, and 2001-2006 are a 24 percent increase, an 8 percent increase, and a 65 percent increase, respectively. The house sales and rental markets appear to follow a somewhat different cycle, with rents showing more modest changes, especially in the 2001-2006 period. Rents even declined between 1996 and 2001 (−4%), while sales prices for houses and flats went up by 8% and 2%, respectively.

The average adult lived in a LMA that experienced steady population growth from 1986 to 2001 (roughly 5% per year), with slightly stronger population growth (9%) between 2001 and 2006. The inflow of New Immigrants (ie. the number of New Immigrants divided by the population in the LMA five-years previous) increased steadily throughout the sample period, with the average adult living in a LMA with an inflow rate of 4% between 1986 and 1991, 5% between 1991 and 1996, 6% between 1996 and 2001, and 8% between 2001 and 2006. On the other hand, the average adult lived in a LMA with an inflow rate of return New Zealanders that fluctuated between 2 and 3 percent of the previous population over the twenty-year period, with relatively more Kiwis returning from abroad between 1991 and 1996 and between 2001 and 2006 than in the other periods.

We also examine the extent to which different population subgroups are living in different housing markets. Table 4 presents the average house sale price for the average individual in each population subgroup in each year across the 140 LMAs. In other words, we use the spatial distribution of individuals in each subgroup in each census to create a weighted average of house sales price for that group in that year. We also calculate the average sales price growth that occurred for each subgroup of individuals in the previous five-years based on their current location.

These results show that both New Immigrants and Stayer Previous Immigrants live in more expensive housing markets than all other population subgroups in every year. However, they do not, in general, live in housing markets with relatively higher sales

price growth (although this was true in the 1991-1996 period). In fact, on average, New Immigrants and Stayer Previous Immigrants in 2006 lived in LMAs that had lower sales price growth between 2001 and 2006 than the LMAs in which other population subgroups lived (60% growth versus 64-69% growth for all other subgroups). Similar results are also found for the 1996-2001 period. On the other hand, while Returning Kiwis also live in generally more expensive housing markets than other New Zealanders, they tend to settle in markets that have similar growth trajectories as those lived in by other Kiwis.

DESCRIPTIVE EVIDENCE

In this section, we summarise the relationship between population changes and house price changes. We show the time series relationship at the aggregate level, and investigate whether different components of population change are related to house price changes in the same way. We then consider the patterns within each of 140 local labour markets, which allows us to disaggregate the link between population and house price changes, and examine the stability of patterns across sub-periods.

Figure 1 from Coleman and Landon-Lane (2007) shows the strong time-series relationship in New Zealand between net migration and real house price inflation.[15] The authors report that the contemporaneous correlation between these series is 0.55 and that a 1 percent increase in population due to net migration is associated with a 7.8 percent increase in house prices. The top row of Figure 2 summarises the aggregate time series relationships at 5-year intervals using Census and QVNZ data. The first graph is a scatter plot of aggregate data for each of the four intercensal periods (1986-91, 1991-96, 1996-2001, 2001-2006). As in the higher frequency time series data in Figure 1, the relationship is strong and positive. A one percent increase in population over five years is associated with a 12.6 percent increase in house prices.

The second and third graphs then disaggregate the overall population change into the change in the number of New Zealanders and the change in the number of immigrants, both as a proportion of the overall population five-years earlier. The changing number of immigrants is dominated by inflows of New Immigrant, but also includes the net change in the number of Previous Immigrants. The relationship between changes in the immigrant population and house prices is even stronger than the relationship with overall changes in population. A one percent increase in the population from changing numbers of immigrants is associated with a 13.7 percent increase in house prices. In contrast, a net change in population due to the changing number of New Zealanders is negatively associated with house price change (elasticity of −4.4).

These differences do not necessarily imply that immigration leads to higher house prices. This positive relationship may result from the fact that immigrants locate disproportionately in areas with higher house prices (as shown in Table 4), in areas with higher general house price appreciation, which Table 4 suggests is not the case, or are more likely to come to New Zealand when the country is doing well and overall house prices are increasing. When immigrants choose to live in high-price areas or move to

[15] Vertical lines have been added to indicate census dates. Migration is measured as net permanent and long-term migration inflows of both the NZ-born and non-NZ-born, derived from NZ Customs Service arrival and departure card information. Real house price appreciation is measured using nominal house prices from QVNZ data, deflated by the Consumer Price Index.

New Zealand when overall house prices are increasing, average house prices will rise during periods of high immigration because the high-price areas will receive more weight, even if immigrants do not have a causal impact on house prices. A fuller picture is provided by examining the relationship between changes in population and changes in house prices in different local areas.

The graphs in the second row of Figure 2 plot the relationship between local population change and local house price change, for each of 140 LMAs in each census year. The size of each marker is proportional to the average current population and population five years prior in each LMA and the solid line is the best population weighted linear fit of the data. Changes in population and house prices are positively correlated across LMA-year observations although the relationship is much weaker than in the aggregate data (elasticity of 1.3). There is also a positive relationship between changes in the NZ-born population and house prices changes across LMAs (elasticity of 0.4), as areas with higher NZ-born population growth have higher house price appreciation and this effect dominates the negative association in the aggregate data.

The final row of Figure 2 plots the relationship between local population change and local house price growth in each LMA relative to the aggregate changes in each intercensal period, and thus shows whether areas that have population growth that is higher than the national growth rate also have house price appreciation that is higher than the national rate of appreciation. Controlling for aggregate time effects in this way, there is still a positive relationship between population growth and house price growth (elasticity of 0.3). However, this positive effect is now attributed entirely to changes in the NZ-born population (elasticity of 0.7), with a weak negative relationship between immigrant change and house price change (elasticity of –0.3). These results indicate that while overall net immigrant inflows are larger in periods when house price inflation is higher, house price appreciation is not higher in areas where the immigrants locate relative to other areas in the country. In contrast, overall net inflows of the NZ-born are lower in periods of house price appreciation, but local house prices appreciate more in the areas where New Zealanders locate.

Figure 3 separately shows the patterns for each of the four intercensal periods, which are superimposed in the final row of Figure 2. The 2001-2006 period is strikingly different from the others. Both overall house price appreciation and overall population increases were stronger in 2001-2006 than in other periods, but the areas with the largest population increases in 2001-2006 tended to experience smaller increases in house prices. As is evident from the size of the circles in Figure 3, the largest LMAs, which are Auckland and South Auckland, consistently have disproportionately large increases in population due to immigration. In 1991-1996, and to a lesser extent in 1986-1991, house prices grew relatively rapidly in these LMAs. However, in the later two periods, the Auckland LMAs had lower than average house price growth.

While the results presented in Figure 2 suggest that local population changes, in particular those arising from immigration, are not directly related to changes in local house prices, Figure 3 casts doubt on the stability of the relationship between population growth and house price appreciation over time and on our ability to draw conclusions that apply in all time-periods. However, the raw relationships described in these figures do not control fully for heterogeneity in the different population groups that live in different areas in New Zealand or for the fact that people who change locations may self-

select into growth areas where house prices are appreciating. To control for such factors, we undertake more sophisticated multivariate analysis, to which we now turn.

MAIN REGRESSION RESULTS

We posit a linear relationship between the log of house prices and the log of population since both variables exhibit considerable skewness, and allow measurable characteristics of the local population (XLMA,t) to influence house prices. We also allow for area-specific amenities and local differences in the housing stock to have a permanent influence on each area's house prices, and for mean house prices to be different in each period. This specification is shown in Equation (1).

$$\begin{aligned} Ln(House\,\mathrm{Pr}ice)_{LMA,t} &= \alpha + \beta Ln(Pop)_{LMA,t} + \delta X_{LMA,t} + e_{LMA,t} \\ e_{LMA,t} &= \lambda_{LMA} + \tau_t + \varepsilon_{LMA,t} \end{aligned} \tag{1}$$

We estimate this relationship in differences, approximating the change in logs by percentage changes.[16] The key parameter of interest (β) is identified from the covariation of house prices and population change within each area. Focusing on the relationship between changes in population and changes in housing markets allows us to control for time-invariant unobservable characteristics of local areas that either attract or repel individuals and lead to differential costs of housing (α MA). Consistent with the inclusion of time effects (αt) in equation (1), the estimating equation (2) allows for a different mean growth rate in house prices in each period ($\tilde{\tau}_t$).

$$\begin{aligned} Ch(HP)_{LMA(t,t-5)} &= \alpha + \beta Ch(Pop)_{LMA(t,t-5)} + \delta \Delta X_{LMA(t,t-5)} + \Delta e_{LMA,t} \\ \Delta e_{LMA,t} &= \tilde{\tau}_t + \tilde{\varepsilon}_{LMA,t} \end{aligned} \tag{2}$$

where $Ch(z)_{LMA,t} = (z_{LMA,t} - z_{LMA,t-5})/ z_{LMA,t-5}$

Table 5 presents estimates of β from various specifications of equation (2). Each coefficient is from a separate regression, reflecting differences in local area definition, inclusion of covariates and choice of house price variable. All estimates are variance weighted by the population size in each geographic area averaged over the current and previous census and standard errors are robust to clustering at the location level. The first entry in the table shows the population elasticity of house prices estimated from variation across the 140 LMAs. The estimate of 0.255 is identical to the slope of the bottom left graph in Figure 2, and implies that a 1 percent increase in population is associated with a 0.26 percent increase in house prices. The estimate in the second column reveals the impact of controlling for changes in the composition of the local population that may have led to a change in house prices. Controls are included for changes in the age composition, gender composition, qualifications, employment status,

[16] This approximation is adopted to facilitate the subsequent additive decomposition of population growth into components due to New Immigrants, Returning Kiwis, population changes in Previous Immigrants and population changes in Local Kiwis. Fixed effects regression provide an alternative approach for estimating this model, but since house prices are serially correlated, first difference models are more likely to produce unbiased standard errors.

marital status, household type, household composition and income of the local population.[17] The estimated elasticity decreases slightly to 0.133 and becomes insignificantly different from zero due to an increased standard error. At the individual level, many of these control variables are endogenously determined with both locational and housing market choices, thus it is unclear whether we should be including them in the regression. Furthermore, to the extent that changing population characteristics are a direct consequence of migration flows, their influence should be included as part of the effect of migration. Thus, we continue throughout the paper to present regression results both with and without control variables.

In the following rows of Table 5, comparable estimates are obtained using different definitions of local areas. Neither changing the level of geographic aggregation nor including control variables yields any estimates that differ significantly from the base estimate of 0.257, though the standard errors are admittedly relatively large. The estimates derived from variation across 16 Regional Council areas are particularly imprecisely estimated, perhaps not surprisingly given the relatively small number of observations.

As noted earlier, the housing market is not homogeneous. In the remaining columns of Table 5, we examine the impact of population change on sale prices for rental units (flats), and rents for both houses and apartments (flats). Population growth appears to be associated with a larger increase in the sales price of flats than in house prices, with an elasticity of between 0.42 and 0.58. The evidence for rents is more mixed, when control variables are not included in the regression, we estimate a significant elasticity between 0.19 and 0.30 for house rents and between 0.17 and 0.26 for flat rents, but, when control variables are included, we find no relationship between population change and house rents and a significant negative relationship with flat rents (with elasticities between −0.33 and −0.71). This suggests that the positive relationship between population change and local rents is largely a consequence of changes in the composition of the local population that accompany, and may be partly caused by, the population change. Overall, these results are consistent with the evidence presented in Figure 2 and imply that while overall changes in population are positively related to changes in both house sales prices and rents, the relationship is much weaker than that found in the aggregate data for NZ and when examining local housing markets in the US.

As previously discussed, it is possible that different components of population change have differential impacts on the housing market. To investigate this, we decompose the population growth rate in each local area into four additive components relating to

[17] Controls include changes in the following characteristics for the local population: mean age and age-squared, percent aged 18-24 and aged 65+ (omitted percent aged 25-64), percent female, percent with school qualifications, with post-school qualifications, with degree qualifications and with missing qualifications (omitted percent with no qualifications), percent employed part-time in a wage/salary job, employed full-time in a non-wage/salary job, employed part-time in a non-wage/salary job, unemployed and not in the labour force (omitted percent employed full-time in wage/salary job), percent married, de-facto, divorced/separated, widowed and missing marital status (omitted percent never married), percent couple without kids, couple with kids and single with kids (omitted non-family), mean number of 0-5, 5-12, 13-17, 18-24, 25-64, and 65+ year-olds in private dwellings, the same characteristics for non-private dwelling, the percent of individuals living in private dwellings, mean log income, the percent with zero or negative income and the percent with missing income. Unlike in the individual regressions of Table 2, we do not control for the ethnic distribution in local areas because this is higher collinear with the number of immigrants in the local population.

different sources of population change: New Immigrants; Returning Kiwis; net changes in the population of Previous Immigrants; and net changes in the population of Local Kiwis.

$$
\begin{aligned}
Ch(Pop)_{LMA(t,t-5)} = & \left(NewImm_{LMA,t} / Pop_{LMA,t-5}\right) \\
& + \left(\mathrm{Re}turnNZ_{LMA,t} / Pop_{LMA,t-5}\right) \\
& + \left((EarlierImm_{LMA,t} - Imm_{LMA,t-5}) / Pop_{LMA,t-5}\right) \\
& + \left((LocalNZ_{LMA,t} - NZ_{LMA,t-5}) / Pop_{LMA,t-5}\right)
\end{aligned} \tag{3}
$$

If each component of population change affects housing prices in the same way, all four terms in equation (3) will enter equation (2) with a coefficient of □. We relax this constraint and allow each term to have a different coefficient, as shown in equation (4).

$$
\begin{aligned}
Ch(HP)_{LMA(t,t-5)} = & \alpha + \beta_1 \left(NewImm_{LMA,t} / Pop_{LMA(t-5)}\right) \\
& + \beta_2 \left(\mathrm{Re}turnNZ_{LMA,t} / Pop_{LMA(t-5)}\right) \\
& + \beta_3 \left((EarlierImm_{LMA,t} - Imm_{LMA,t-5}) / Pop_{LMA(t-5)}\right) \\
& + \beta_4 \left((LocalNZ_{LMA,t} - NZ_{LMA,t-5}) / Pop_{LMA(t-5)}\right) \\
& + \delta \Delta X_{LMA(t,t-5)} + \Delta e_{LMA,t}
\end{aligned}
$$

$$
\Delta e_{LMA,t} = \tilde{\tau}_t + \tilde{\varepsilon}_{LMA,t} \tag{4}
$$

The results in Table 6 show that different sources of population change are associated with quite different changes in house prices. Whereas the results in Table 5 indicate that a one percent population increase is associated with a 0.26 percent increase in house prices, those in Table 6 imply that a one percent population increase resulting solely from Returning Kiwis is associated with a 9.1 percent increase in house prices. Controlling for general changes in the population composition of local areas, the estimated elasticity falls to 7.6, which indicates that about one-sixth of the overall relationship between inflows of Returning Kiwis and changes in house prices is accounted for by the fact that Returning Kiwis locate in areas where observable population characteristics change in ways that are expected to raise house prices (for example, they located in areas where overall incomes were increasing). Some of this change may, of course, be attributable to the inflow of Returning Kiwis. In contrast, population increases resulting from New Immigrant inflows are associated with lower house prices, although the estimate is statistically different from zero only when controlling for population characteristics.

Other sources of population change have no significant relationship with changes in house prices. This general pattern is evident for all four geographic area definitions, albeit with differences in the statistical significance of particular estimates. Table 6 reports estimates of equation (4) not only for house price changes but also for changes in flat prices and rents for houses and flats. The impact of the population change components on the sales price of flats is very similar to the impact on house sales prices, with Returning Kiwis being most strongly associated with flat price appreciation. Rents

are also higher in areas where Returning Kiwis locate, though the elasticity of 3 to 5 is lower than the impact on sales prices.[18]

It is perhaps surprising that components of population change can be related to house price changes in such markedly different ways. It is unlikely that the quantity of housing demanded by Returning Kiwis and New Immigrants differs greatly, although Tables 1 and 2 do show that Returning Kiwis are much more likely than New Immigrants to own homes. Some of the differential impact of New Immigrants compared with Returning Kiwis may occur because of stronger self-selection of Returning Kiwis into markets that would have had high house price appreciation anyway or into markets where housing supply is relatively inelastic. In this context, housing markets may be defined by local areas or by the type of housing demanded if there is imperfect local substitutability between different housing types.

Population increase due to the arrival of New Immigrants is almost always estimated to be relatively small and negative, though the estimates are rarely statistically significant. There are obvious issues of endogeneity, as New Immigrants may choose locations partly on the basis of expected house price growth. The direction of bias is not, however, clear. New Immigrants may choose to locate in areas where economic prospects are improving, leading to an upward bias in the estimated elasticity, or they may be choosing areas that are becoming relatively less expensive, in which case the estimated elasticities will be understated. To gauge the importance of endogeneity, we use an instrumental variables approach to estimate the elasticity of local house prices with respect to a component of the New Immigrant inflow that is independent of local house prices. Maré et al. (2007) show that migrant networks are the most important factor in the settlement decisions of recent migrants to New Zealand. Thus, following the approach taken by Bartel (1979), Altonji and Card (1991) and others, we instrument the inflows of New Immigrants to a local area with the concentration of immigrants from the same region of birth in that area in the previous census.[19]

The specification for this model is similar to that in equation (4), but only the inflow rate of New Immigrants is included as a population component,

$$Ch(HP)_{LMA(t,t-5)} = \alpha + \beta(NewImm_{LMA,t} / Pop_{LMA(t-5)}) + \delta\Delta X_{LMA(t,t-5)} + \Delta e_{LMA,t}$$

$$\Delta e_{LMA,t} = \tilde{\tau}_t + \tilde{\varepsilon}_{LMA,t} \qquad (5)$$

[18] Another fairly consistent pattern across the various specifications is that an increase in the number of Previous Immigrants in an area is associated with a moderately strong increase in local sales prices (an elasticity of around 0.5 to 2) and a similar sized decrease in local rents. However, these estimates are mostly not significant.

[19] Formally, let RM_{gt} represent the number of New Immigrants from source country g in census t, and let $\lambda_{gk(t-5)}$ represent the fraction of immigrants from country g that is observed living in location k in the previous census. In the absence of endogenous location decisions, the number of New Immigrants from country g who would be expected to live in location k in census t is $\lambda_{gk(t-5)} * RM_{gt}$. Summing over all countries, we calculate the component of the supply of New Immigrants in each location that occurs because of an individual's desire to live near other migrants from their home country. In practice, we group individuals into thirteen regions when calculating this instrument (Australia; Pacific Islands; British Isles; Western Europe; Eastern Europe; North America, Central and South America; North Africa and the Middle East; Sub-Saharan Africa; South-East Asia; North-East Asia; Southern and Central Asia; and missing country of birth). The first stage regression of actual New Immigrant flows into an area on the predicted flow performs well. In the case of 140 LMAs, the partial R^2 is 0.47 and the Wald statistic for the significance of the instrument in the first-stage regression has a value of 199 (see Baum et al (2007) for a discussion on evaluating the quality of an instrument).

We adopt this specification to allow comparability with findings in other studies, such as Saiz (2007) and Ottaviano and Peri (2007) which estimate similar models.

The IV and corresponding OLS estimates are shown in Table 7. The top-left entry in the table is the OLS estimate for the elasticity of house prices in one of 140 LMAs with respect to New Immigrants. The coefficient of –0.270, implies that a 1 percent population increase from New Immigrants is associated with a 0.27 percent decrease in house prices. This elasticity is larger than the estimated elasticity when controlling for other sources of population change (–0.730 from Table 6), although neither coefficient is significantly different from zero. The omission of the other population change components in Table 7 thus leads to an understatement of the negative relationship between inflows of New Immigrants and house prices. Even though this is the case, a comparison of the OLS and IV estimates in this specification still provides a useful indication of the degree to which New Immigrants self-select into areas with stronger or weaker house price inflation.

The IV estimates in Table 7 are generally smaller (more negative) than the corresponding OLS estimates. Across all of the different specifications, the OLS estimates are reduced by about 0.2-0.5 in specifications that do not control for population characteristics, and by a larger amount (1.0 to 2.8) when these covariates are included. This suggests that New Immigrants are choosing areas that have rising house prices, and that the OLS estimates consequently overstate the positive impact of New Immigrants on house price appreciation. Adjusting for this bias strengthens our conclusions from Table 6 that New Immigrant inflows are associated with lower house price appreciation. These estimates are starkly different from comparable estimates from studies on the US housing market, being of a similar magnitude but opposite sign. For example, Saiz (2007) finds elasticities of around 1 for rents and greater than 2 for house prices, compared to our IV estimates of around –3 for both house prices and rents (140 LMAs, including covariates).

We next extend this model to also include controls for the other population components. A lack of credible instruments for each of the four population components prevents us from estimating a full instrumental variables version of equation (4). Instead, we divide population change into two rather than four components, allowing for separate impacts of changes in the local New Zealand-born and immigrant populations.

$$\begin{aligned} Ch(HP)_{LMA(t,t-5)} = \alpha &+ \beta_1 \left((Imm_{LMA,t} - Imm_{LMA,t-5}) / Pop_{LMA(t-5)} \right) \\ &+ \beta_2 \left((NZ_{LMA,t} - NZ_{LMA,t-5}) / Pop_{LMA(t-5)} \right) \\ &+ \delta \Delta X_{LMA(t,t-5)} + \Delta e_{LMA,t} \end{aligned}$$

$$\Delta e_{LMA,t} = \tilde{\tau}_t + \tilde{\varepsilon}_{LMA,t} \qquad (6)$$

Then, for instruments, we use the predicted inflow of New Immigrants, as in Table 7 and the inflow rates of return New Zealanders from the previous inter-censal period. The quality of the instruments is lower in this extended model; in the case of 140 LMAs, the partial R2 is 0.32 and the Wald statistic for the significance of the instrument has a value of 67 for the first-stage regression first-stage predicting the change in the immigrant population and the partial R2 is 0.24 and the Wald statistic for the significance of the instrument has a value of 11 for the first-stage regression first-stage predicting the change in the NZ-born population.

As in Table 6, increases in the immigrant population are associated with lower house price appreciation, whereas increases in the New Zealand-born population are associated with higher house prices. The top-left entry in the table is the OLS estimate for the elasticity of house prices in one of 140 LMAs with respect to changes in the local immigrant population. The coefficient of –0.480, implies that a 1 percent population increase from immigrants is associated with a 0.48 percent decrease in house prices. The next entry down is the OLS estimate for the elasticity of house prices with respect to changes in the local NZ-born population. The coefficient of 0.810, implies that a 1 percent population increase from immigrants is associated with a 0.81 percent increase in house prices. Instrumenting to take account of endogenous locational choices strengthens these patterns, with the house price elasticity for immigrants decreasing to –0.98 and for NZ-born increasing to 1.31 (in 140 LMAs). The difference between the OLS and IV estimates are significantly larger when controling for covariates. Overall, these results imply that immigrants are choosing to live in areas with higher house price growth while the New Zealand-born are choosing to live in areas with low house price appreciation, and controling for this, there is an even stronger negative relationship between movements of immigrants and house prices and an even stronger positive relationship between movements of New Zealanders and house prices.

ADDITIONAL REGRESSION RESULTS

IMPACTS ON THE HOUSE PRICE DISTRIBUTION

Mean house price changes may fail to capture the effect of population changes if changes in housing demand are focused in particular parts of the house price distribution. For example, Returning Kiwis have relatively high average incomes, suggesting that they may have a grater influence on demand for higher-price housing. They are however, like New Immigrants, relatively young and may therefore exert more pressure on the market for lower priced first-homes.

Table 9 shows the relationship between the components of population change for each area and different quantiles of the local house price distribution. Inflows of Returning Kiwis are most strongly related to house price increases at the 25th percentile of the house price distribution (elasticity of 10.4), although around half of this effect is accounted for by observable changes in local population characteristics, some of which may be a result of the different characteristics of the Returning Kiwis. The changes in median house prices and upper quartile house prices are somewhat lower than at the lower quartile, although still high, with elasticities of 7 to 8. The patterns are consistent across different geographic area definitions, although the elasticities are estimated with less precision. Overall, the general pattern of effects estimated for mean house prices are also evident at other points in the local house price distribution, suggesting that population changes have similar impacts in relative terms on both cheaper and more expensive homes in local areas experiencing these changes.

SUB-PERIOD DIFFERENCES

The descriptive results in Figure 3 indicate that the relationship between population changes and house price changes differs across the four intercensal periods. In this section, we re-estimate equations (2) and (4) allowing the overall population elasticity in equation (2) and the elasticities of each population component in equation (4) to vary

by period. This extension allows us to test whether our regression results are robust across time-periods or follow a similar pattern as the descriptive results.

The resulting estimates are presented in Table 10. The first panel contains population change elasticities for each period and shows that the finding of different elasticities in different periods still holds when we control for local population characteristics and when we examine other housing price measures.[20] The remaining panels show the estimates of the period-by-period elasticities for each population component, with each column containing estimates from a single regression. These results reveal a number of variations from our general findings. Inflows of Returning Kiwis are not significantly associated with house prices in 1986-1991, and are associated with relatively less house price appreciation in 2001-2006, compared with 1991-1996 and 1996-2001. New Immigrant inflows are associated with higher house prices in both 1986-1991 (without population covariates) and 1991-1996, and strongly declining house prices in 1996-2001 (marginally significant) and 2001-2006 (without population covariates). In both 1991-1996 and 2001-2006, changes in the number of Local Kiwis and Previous Immigrants are more strongly associated with house prices than in other periods, with areas experiencing increases in the number of Local Kiwis having lower house price appreciation and areas with increased numbers of Previous Immigrants having higher appreciation.

The lack of consistency in these estimates across the different periods suggests that the relationship between components of population change and house price movements is more complex than can be captured by our estimation. At the least, it suggests that there are omitted or mediating factors that may be more important than population change per se in determining house prices. Further consideration is warranted of cyclical influences at the aggregate or LMA level. Unfortunately, the five-yearly frequency of our data means it not ideally suited for analysis along this dimension.

NEIGHBOURHOOD HOUSING MARKETS

One potential criticism of our estimation approach is that immigrants may have a strong effect on neighbourhood housing markets without affecting the more aggregated areas on which our analyses so far focus. To assess the strength of the relationship between population changes and neighbourhood housing prices, we re-estimate equation (4), but at the level of census areas units and include fixed effects for each LMA-year combination.[21] Area units are aggregations of census meshblocks, typically contain around 2,000 people, and correspond to suburbs within cities, and to somewhat larger areas outside cities. Because we include fixed effects for each LMA-year combination, our estimates are based on variation in changes in the composition of neighbourhood populations within local labour market areas, and control for the fact that different areas in New Zealand are more or less attractive to New Immigrants and Returning Kiwis and have higher or lower house prices.

[20] The coefficients in the first column are the slopes of the fitted lines in the first column of Figure 3.
[21] For confidentiality reasons, area units with less than 100 adults are excluded from the estimation. This drops less than 0.2% of the overall adult population.

The resulting estimates are presented in Table 11 and show a similar pattern to those for more aggregated geographical areas (Table 6), although the magnitudes of the effects are smaller. In neighbourhoods where Returning Kiwis add an additional one percent to the population, house prices rise by 1.3 percent, controlling for changes in neighbourhood population characteristics. The rise is somewhat smaller and statistically insignificant for flat sales prices (0.8 percent), for housing rentals (0.2 percent), and for flat rentals (0.2 percent). These results indicate that the relationship between components of population change and changes in house prices is evident both in aggregated housing markets, whether these are defined as local labour market areas, TLAs or RCs, and in local neighbourhoods, controlling for the greater area effects.

To summarise, neighbourhoods experiencing relatively higher population growth from Returning Kiwis have greater house price increases than the rest of their LMA regardless to the overall scale of the Returning Kiwi inflow to the LMA. Opposite results are found for inflows of New Immigrants, with neighbourhoods with relatively larger inflows experiencing slower house price growth relative to the LMA in general. Further investigation is warranted into whether the intra-LMA relationship between neighbourhood population changes and neighbourhood house price appreciation results from the sorting of different population groups into different neighbourhoods and/or from highly localised differential impacts on housing demand due to imperfect substitutability of housing in different neighbourhoods and neighbourhood variation in housing supply responsiveness.

CONCLUSIONS

New Zealand's large and volatile external migration flows generate significant year-to-year fluctuations in the demand for residential housing. This paper uses population data from the 1986, 1991, 1996, 2001 and 2006 New Zealand Censuses, house sales price data from Quotable Value New Zealand and rent data from the Department of Building and Housing to examine how population change, international migration, including the return migration of New Zealanders abroad, and internal migration affect rents and sales prices of both apartments and houses in different housing markets in New Zealand. Our analysis focuses on the relationship between the changes in the population in local areas and changes in house sale prices and rents in these areas. Focusing on changes allows us to control for time-invariant unobservable characteristics of local areas that either attract or repel individuals and lead to differential costs of housing.

We find that areas with relatively high population growth over a five-year period also tend to experience relatively rapid appreciation in house prices. A one percent increase in the population of a local area is associated with that area having house and flat sales prices and weekly rents that are between 0.2 and 0.5 percent higher. Although international migration flows are an important contributor to population fluctuations, we find no evidence that the inflow of foreign-born immigrants to an area are positively related to local house prices, despite there being a strong correlation over time at the national level. On the other hand, there is a strong positive relationship between inflows of New Zealanders previously living abroad into an area and the appreciation of local housing prices, with a one percent increase in population resulting from higher inflows of returning Kiwis associated with a 6 to 9 percent increase in house prices. These findings remain when we use instrumental variables estimation to control for the fact that individuals may choose locations partly on the basis of expected house price growth.

We also examine the relationship between population changes and neighbourhood housing prices controlling for the fact that different aggregate areas in New Zealand are more or less attractive to different individuals and have higher or lower house prices. Reinforcing our main results, we find that neighbourhoods which experience relatively high population growth from returning New Zealanders have greater house price increases than the rest of their labour market area and that neighbourhoods with relatively larger inflows of foreign-born immigrants experienced slower house price growth relative to the labour market area in general.

These overall relationships are not, however, robust across different time periods, suggesting that population growth is not the dominant determinant of house price changes and that there are omitted or mediating factors that may be more important than population change per se in determining house prices. Further consideration is warranted of cyclical influences at the aggregate or LMA level. Unfortunately, the five-yearly frequency of our data means it not ideally suited for analysis along this dimension.

Previous studies that examine housing markets in the United States have found that immigrant inflows lead to higher local house prices. It is difficult to know why the impacts of immigrant inflows on housing markets differ in New Zealand, although consistent with these results, recent work by Maré and Stillman (2007) finds that immigrant inflows to NZ also have small impacts on the labour market. Card (2007) argues that if immigrants raise the productivity and wages of native workers, spatial sorting leads to rents being bid up by incoming workers entering to take advantage of the spillovers. Taken together, the results in this paper and Maré and Stillman (2007) are consistent with there being weaker labour market spillovers in NZ than in the US.

Our overall results raise doubts about whether the strong positive correlation that exists between immigration and house price appreciation over time at the national level is in fact causal, given the lack of a similar relationship at different spatial scales, controling for aggregate trends. This suggests that the relationship at the national level may be a consequence of omitted aggregate time series factors that raise both immigration and house prices. However, our estimates could understate the impact of immigration on house prices if local house prices are affected by population changes in all areas, as part of a process of spatial equilibration. The fact that we find a positive relationship between local overall population change and local house prices and differential impacts of returning New Zealanders and new immigrants, and that our findings are consistent across different definitions of local areas, suggests that the methodology used in this paper (and in previous studies on the impact of immigration on the US housing market) provides valid estimates of the causal impact of immigration on house prices in New Zealand.

There are a number of dimensions along which our current research can be extended, some of which we plan to consider in future work. First, it would be useful to incorporate information about supply-side constraints in different housing markets so we can see whether the transmission of housing demand into price increases is linked to these local conditions (cf: Capozza et al (2002)). If there is a causal relationship between different components of population change and house prices, the impacts will be larger if immigrants and/or returning New Zealanders locate in areas where housing supply is relatively inelastic. Second, we can look more deeply at the sorting of different groups of individuals into different neighbourhoods, both to examine whether immigrants settle

into areas with more elastic housing supply and to examine the extent to which New Zealanders leave neighbourhoods in which immigrants are settling (cf: Saiz and Wachter (2006)). Third, since it is quite likely that the impact of population change may be asymmetric since once homes are built they general remain part of the housing stock for the long-term, we could examine whether the impacts of population changes on house prices differ when the population is increasing compared with when it is declining (cf: Grimes et al (2004)). Fourth, we can attempt to quantify the extent to which local population changes spillover to house prices in different areas of New Zealand.

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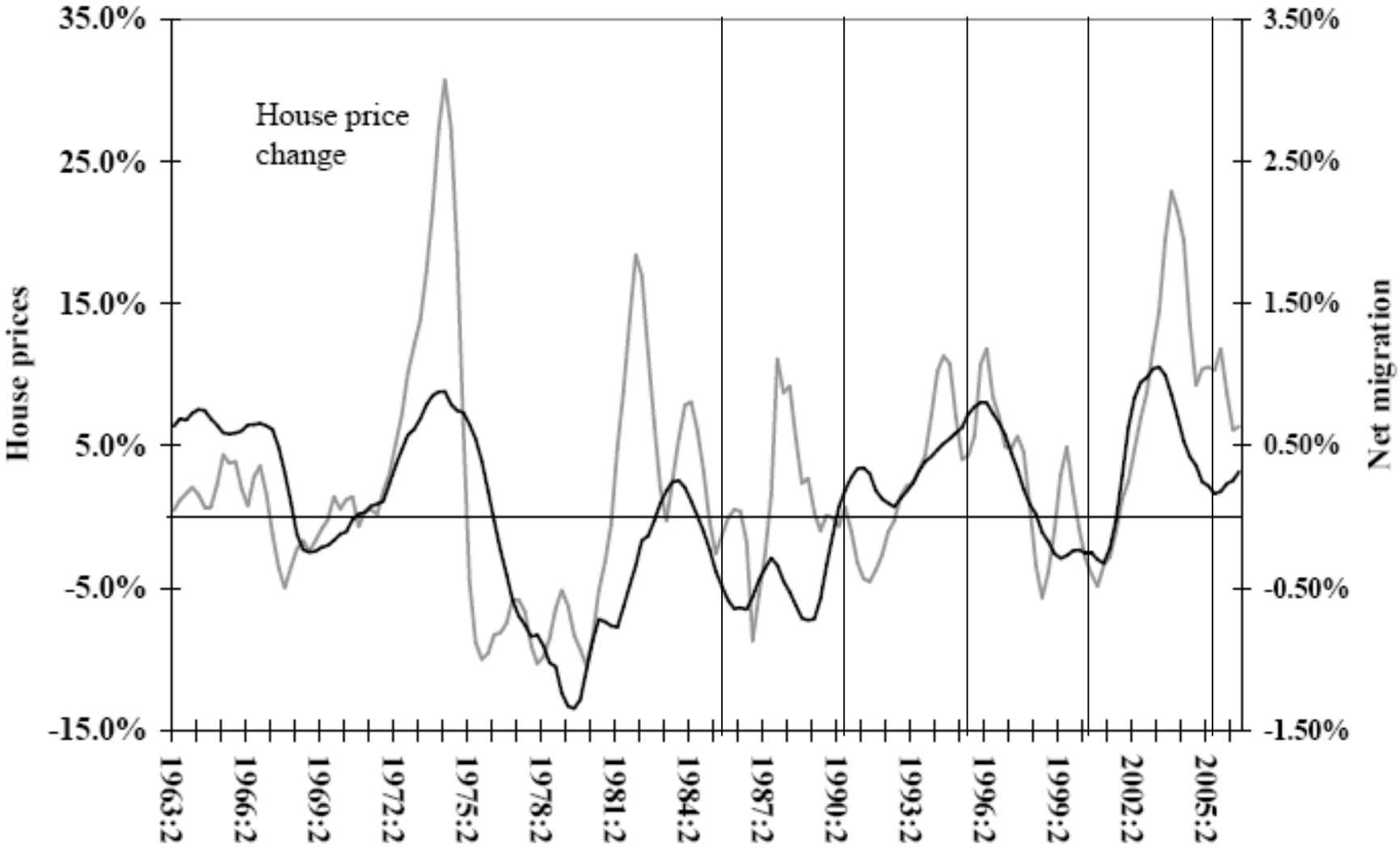
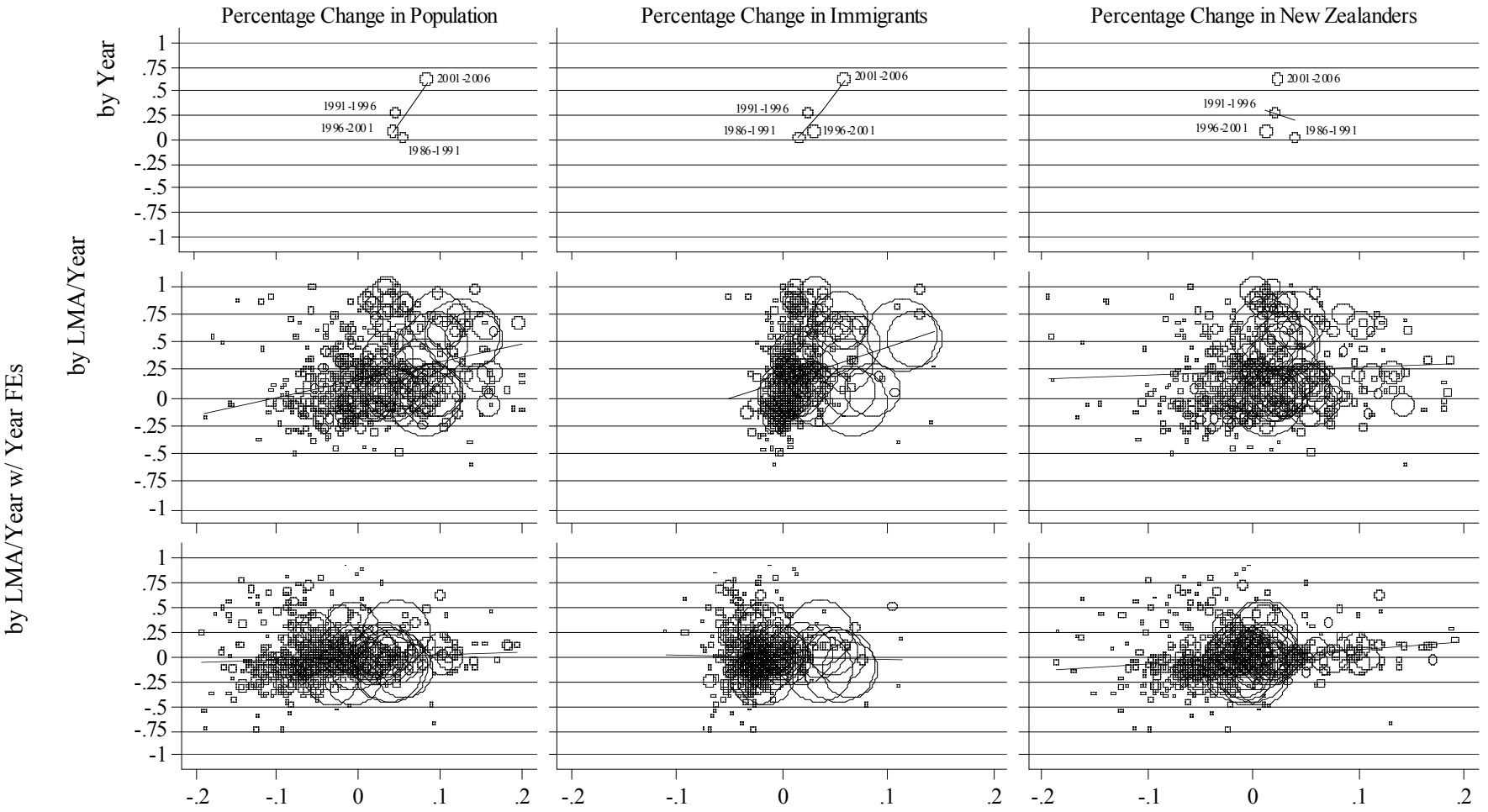


Source: Coleman and Landon-Lane (2007), Figure 1

Figure 1: New Zealand House Price Inflation and Net Migration



The size of the circles are proportional to the average current population and population five years prior in each LMA
The solid line is the best population weighted linear fit

Figure 2: Change in House Sale Prices and Population Changes

Table 1: Characteristics of Different Population Groups

	Total Population	New Immigrants	Returning Kiwis	Internal Migrants - Previous Immigrant	Internal Migrants - Local Kiwi	In Same LMA140 - Previous Immigrant	In Same LMA140 - Local Kiwi
Own Home	67%	43%	58%	53%	47%	72%	73%
Non-Private Dwelling	4%	5%	3%	7%	8%	3%	3%
Own w/ Mortgage	39%	30%	42%	32%	31%	37%	41%
Own w/o Mortgage	29%	13%	16%	21%	16%	34%	32%
Rent	24%	46%	34%	33%	39%	20%	19%
Free	3%	3%	3%	3%	5%	2%	3%
Missing	2%	3%	2%	3%	2%	3%	2%
Mean Age	44.3	36.0	34.9	50.3	45.3	43.9	37.0
Aged 18-24	15%	20%	9%	7%	14%	14%	26%
Aged 25-64	70%	75%	89%	70%	69%	71%	66%
Aged 65+	16%	5%	2%	23%	17%	15%	8%
Female	52%	52%	51%	51%	52%	50%	52%
European	83%	45%	91%	69%	89%	73%	87%
Maori	11%	0%	11%	0%	13%	1%	17%
Pacific	4%	9%	2%	15%	2%	11%	2%
Asian	5%	42%	1%	14%	1%	15%	1%
Other	0%	4%	0%	1%	0%	1%	0%
No Qualifications	29%	11%	15%	27%	33%	19%	25%
School Quals	28%	32%	29%	28%	27%	30%	31%
Post-School Quals	24%	21%	31%	23%	24%	25%	25%
University Degree	10%	25%	20%	12%	7%	17%	11%
Missing	9%	12%	5%	11%	9%	8%	6%
Full-Time W/S	39%	38%	51%	35%	39%	37%	44%
Part-Time W/S	9%	8%	8%	8%	9%	7%	8%
Full-Time Other	12%	8%	12%	11%	12%	10%	9%
Part-Time Other	3%	3%	3%	3%	3%	3%	3%
Unemployed	4%	7%	6%	4%	4%	6%	7%
NILF	33%	36%	20%	40%	33%	36%	29%
Mean Real Income	26,180	21,673	31,922	25,513	26,688	25,681	25,249
Missing Income	6%	12%	4%	7%	5%	5%	5%
Married	54%	56%	44%	63%	54%	56%	43%
Defacto	10%	10%	16%	7%	9%	10%	15%
Div/Sep	7%	4%	9%	8%	8%	9%	8%
Widowed	6%	2%	1%	9%	7%	6%	4%
Never Married	16%	12%	25%	7%	16%	14%	26%
Missing	1%	4%	1%	1%	1%	1%	1%
Non-Family	27%	31%	31%	23%	25%	33%	38%
Couple - No Kids	27%	23%	25%	29%	27%	28%	23%
Couple - Kids	38%	40%	35%	41%	39%	33%	31%
Single - Kids	9%	5%	8%	7%	9%	6%	8%
Mean # Kids	0.83	1.03	0.77	0.86	0.80	0.86	0.87
Mean # Adults	2.34	2.75	2.26	2.43	2.28	2.39	2.39
Mean # People	3.17	3.78	3.03	3.29	3.08	3.25	3.25
% of Population		5%	2%	2%	12%	15%	64%
Individuals	12,623,493	592,899	254,997	272,133	1,568,559	1,903,527	8,031,381

Notes: All dollar amounts are in 2006 dollars. Average dwelling size is measured only for individuals in privately owned dwellings.

Table 2: Probit Regression Estimates of Likelihood of Homeownership

(Marginal Effects and T-Stats)

	No Controls	Year Fixed Effects	Individual Demographics	Employment and Income	Household Demographics	Region of Birth	LMA Fixed Effects
New Immigrants	-0.307	-0.296	-0.272	-0.262	-0.210	-0.217	-0.212
	(458)	(263)	(112)	(69)	(89)	(88)	(90)
Returning Kiwis	-0.167	-0.166	-0.149	-0.145	-0.095	-0.095	-0.092
	(145)	(139)	(112)	(107)	(106)	(60)	(59)
Internal - Previous Immigrants	-0.188	-0.186	-0.207	-0.200	-0.136	-0.151	-0.150
	(54)	(54)	(48)	(47)	(42)	(42)	(41)
Internal - Local Kiwis	-0.251	-0.253	-0.212	-0.207	-0.126	-0.125	-0.123
	(61)	(61)	(65)	(62)	(56)	(40)	(40)
Stayer - Previous Immigrants	-0.003	0.000	-0.025	-0.022	-0.019	-0.027	-0.024
	(183)	(184)	(151)	(147)	(119)	(118)	(116)
Individuals	1,184,616	1,184,616	1,184,616	1,184,616	1,184,616	1,184,616	1,184,616

Notes: Differences are relative to New Zealanders living in the same LMA as five-years-ago. Control variables are added progressively to each specification

Table 3: Housing Markets and Population Characteristics in 140 Labour Market Areas

	1986	1991	1996	2001	2006
Local Housing Market Characteristics - Levels for the Average Adult					
Mean Sales Price for Houses	159,054	161,403	205,233	222,430	363,665
	(4111)	(4481)	(7151)	(7109)	(10203)
Mean Sales Price for Flats	141,759	136,205	162,639	166,647	256,732
	(3321)	(3338)	(5216)	(5611)	(7470)
Mean Weekly Rent for Houses		233	266	257	304
		(6.1)	(8.3)	(7.3)	(7.0)
Mean Weekly Rent for Flats		179	203	194	218
		(4.2)	(6.5)	(6.2)	(5.6)
Local Population Characteristics - Levels for the Average Adult					
Population	153,838	167,144	182,268	197,833	225,876
	(11334)	(12307)	(13443)	(14574)	(16462)
Percent New Migrants	0.024	0.033	0.045	0.054	0.072
	(0.001)	(0.002)	(0.002)	(0.003)	(0.003)
Percent Return New Zealanders	0.021	0.018	0.022	0.017	0.023
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Local Housing Market Characteristics - Changes for the Average Adult					
Percent Change in Mean Sales Price for Houses		0.002	0.235	0.078	0.654
		(0.010)	(0.014)	(0.013)	(0.019)
Percent Change in Mean Sales Price for Flats		-0.038	0.174	0.016	0.566
		(0.012)	(0.020)	(0.021)	(0.027)
Percent Change in Mean Weekly Rent for Houses			0.127	-0.038	0.191
			(0.012)	(0.006)	(0.010)
Percent Change in Mean Weekly Rent for Flats			0.122	-0.055	0.136
			(0.016)	(0.007)	(0.013)
Local Population Characteristics - Changes for the Average Adult					
Percent Change in Population		0.057	0.048	0.045	0.085
		(0.004)	(0.005)	(0.005)	(0.005)
Decomposition of Population Change:					
New Immigrants / Population 5-Years Ago		0.035	0.048	0.057	0.079
		(0.002)	(0.003)	(0.003)	(0.004)
Return NZers / Population 5-Years Ago		0.019	0.024	0.018	0.025
		(0.000)	(0.001)	(0.000)	(0.001)
Change in Immigrants / Population 5-Years Ago		-0.019	-0.022	-0.026	-0.019
		(0.001)	(0.001)	(0.001)	(0.001)
Change in NZers / Population 5-Years Ago		0.022	-0.002	-0.004	0.000
		(0.003)	(0.003)	(0.003)	(0.003)

Notes: All dollar amounts are in 2006 dollars. All level (change) estimates are variance weighted by the population size in each geographic area in a particular year (averaged over the current and previous census). Standard errors are in parentheses.

Table 4: Allocation of Different Population Groups to Different Housing Markets

	1986	1991	1996	2001	2006
Mean Sales Price for Houses - Weighted by Subgroup Population in each 140 LMA					
New Immigrants	178,155	190,312	254,400	269,392	418,519
	(3820)	(3933)	(7276)	(6290)	(9443)
Returning Kiwis	169,382	173,866	220,759	239,977	379,911
	(4050)	(4423)	(7350)	(6923)	(10003)
Internal Migrants - Previous Immigrant	163,235	165,098	215,406	230,042	375,748
	(4053)	(4342)	(7126)	(6802)	(9974)
Internal Migrants - Local Kiwi	150,983	151,799	190,697	206,539	334,824
	(4092)	(4419)	(6823)	(6866)	(10171)
In Same LMA - Previous Immigrant	177,010	181,946	234,640	254,624	407,392
	(3886)	(4137)	(7158)	(6518)	(9274)
In Same LMA - Local Kiwi	155,626	157,050	197,030	213,018	348,916
	(4071)	(4454)	(6949)	(7069)	(10080)
Percent Change in Mean Sales Price for Houses - Weighted by Subgroup Population in each 140 LMA					
New Immigrants		0.029	0.300	0.060	0.602
		(0.007)	(0.014)	(0.011)	(0.014)
Returning Kiwis		0.011	0.258	0.088	0.647
		(0.009)	(0.015)	(0.013)	(0.018)
Internal Migrants - Previous Immigrant		0.004	0.257	0.091	0.642
		(0.010)	(0.014)	(0.013)	(0.018)
Internal Migrants - Local Kiwi		-0.007	0.232	0.089	0.690
		(0.012)	(0.014)	(0.014)	(0.022)
In Same LMA - Previous Immigrant		0.021	0.260	0.082	0.595
		(0.007)	(0.015)	(0.012)	(0.014)
In Same LMA - Local Kiwi		-0.002	0.227	0.076	0.668
		(0.010)	(0.014)	(0.013)	(0.020)

Notes: All dollar amounts are in 2006 dollars. Standard errors are in parentheses.

Table 5: The Relationship between Changes in the Local Population and Changes in the Local Housing Market

	% Change Mean Sales Price for Houses		% Change Mean Sales Price for Flats		% Change Mean Weekly Rent for Houses		% Change Mean Weekly Rent for Flats	
140 Local Labour Market Areas (Full Sample for Sales Prices: 560, for Weekly Rents: 420)								
% Change in Pop	0.255*	0.133	0.455**	0.476*	0.189*	-0.012	0.255**	-0.346*
	(0.129)	(0.143)	(0.171)	(0.205)	(0.094)	(0.113)	(0.088)	(0.158)
Geo/Years	532	532	342	342	277	277	201	201
R-Squared	0.70	0.82	0.61	0.75	0.55	0.79	0.44	0.78
73 Territorial Local Authorities (Full Sample for Sales Prices: 292, for Weekly Rents: 219)								
% Change in Pop	0.216	0.016	0.443**	0.364*	0.296**	0.197	0.174*	-0.332*
	(0.147)	(0.145)	(0.142)	(0.180)	(0.109)	(0.143)	(0.079)	(0.161)
Geo/Years	291	291	289	289	217	217	190	190
R-Squared	0.73	0.87	0.63	0.76	0.56	0.83	0.44	0.76
58 Local Labour Market Areas (Full Sample for Sales Prices: 232, for Weekly Rents: 174)								
% Change in Pop	0.290	0.130	0.423*	0.583*	0.190	-0.212	0.210	-0.699**
	(0.166)	(0.165)	(0.188)	(0.259)	(0.105)	(0.161)	(0.109)	(0.183)
Geo/Years	231	231	227	227	173	173	158	158
R-Squared	0.75	0.89	0.65	0.79	0.58	0.85	0.42	0.82
16 Regional Councils (Full Sample for Sales Prices: 64, for Weekly Rents: 48)								
% Change in Pop	-0.011	1.060	-0.071	1.460	0.013	-0.159	0.204	-0.710**
	(0.334)	(0.963)	(0.367)	(0.963)	(0.205)	(0.550)	(0.165)	(0.159)
Geo/Years	64	64	64	64	48	48	48	48
R-Squared	0.80	0.98	0.75	0.97	0.62	0.99	0.49	1.00
Covariates	No	Yes	No	Yes	No	Yes	No	Yes

Notes: ** p<0.01, * p<0.05. All estimates are variance weighted by the population size in each geographic area averaged over the current and previous census. All models include year fixed effects and standard errors are robust to clustering at the location level. Covariates include changes in age composition, gender composition, qualifications, employment status, marital status, household type, household composition and income of the local population.

Table 6: The Relationship between Changes in Local Population and Changes in Local Housing Markets

	% Change Mean Sales Price for Houses		% Change Mean Sales Price for Flats		% Change Mean Weekly Rent for Houses		% Change Mean Weekly Rent for Flats	
140 Local Labour Market Areas (Full Sample for Sales Prices: 560, for Weekly Rents: 420)								
IR New Immig	-0.730	-1.389**	-0.662	-0.038	-0.438	-0.741*	-0.265	-1.410**
	(0.387)	(0.497)	(0.503)	(0.749)	(0.263)	(0.325)	(0.328)	(0.473)
IR Return NZers	9.136**	7.623**	9.046**	6.989**	3.316	4.952*	0.206	3.646
	(2.494)	(2.152)	(2.565)	(2.390)	(2.121)	(1.929)	(2.883)	(2.384)
% Change in Imm	1.526	0.959	1.436	0.527	-0.109	-1.094	-1.750	-2.097**
	(1.138)	(1.077)	(1.398)	(1.299)	(1.096)	(0.643)	(0.982)	(0.770)
% Change in NZ	-0.260	-0.567	0.063	-0.184	0.323	-0.158	0.870*	-0.177
	(0.310)	(0.374)	(0.415)	(0.545)	(0.268)	(0.261)	(0.379)	(0.372)
Geo/Years	532	532	342	342	277	277	201	201
R-Squared	0.72	0.83	0.63	0.75	0.58	0.81	0.47	0.80
73 Territorial Local Authorities (Full Sample for Sales Prices: 292, for Weekly Rents: 219)								
IR New Immig	-0.709**	-1.432*	-0.485	-0.362	-0.302*	-0.775*	-0.163	-1.529**
	(0.225)	(0.653)	(0.288)	(0.776)	(0.114)	(0.354)	(0.178)	(0.522)
IR Return NZers	7.746	5.169*	7.252*	4.529	2.191	2.696	1.959	3.928
	(4.180)	(1.982)	(3.341)	(2.313)	(2.301)	(1.903)	(2.962)	(2.284)
% Change in Imm	1.027	1.077	1.795	2.063	-0.076	0.178	-0.369	-0.642
	(1.287)	(0.836)	(1.236)	(1.039)	(0.799)	(0.473)	(1.052)	(0.656)
% Change in NZ	-0.094	-0.409	0.148	-0.245	0.600	0.116	0.277	-0.467
	(0.573)	(0.318)	(0.438)	(0.385)	(0.355)	(0.349)	(0.447)	(0.269)
Geo/Years	291	291	289	289	217	217	190	190
R-Squared	0.75	0.87	0.64	0.77	0.60	0.84	0.46	0.77
58 Local Labour Market Areas (Full Sample for Sales Prices: 232, for Weekly Rents: 174)								
IR New Immig	-0.834*	-0.893	-0.751	-0.295	-0.472	-1.179**	-0.357	-1.424*

	(0.397)	(0.791)	(0.510)	(1.046)	(0.241)	(0.409)	(0.317)	(0.604)
IR Return NZers	7.713*	5.504	7.746*	5.720	2.915	6.225**	1.760	2.936
	(3.604)	(2.868)	(3.552)	(3.517)	(2.787)	(1.759)	(3.685)	(2.339)
% Change in Imm	0.760	0.081	0.872	-0.036	-0.369	-1.547	-1.196	-1.578
	(1.177)	(1.174)	(1.233)	(1.834)	(0.955)	(0.951)	(1.154)	(1.308)
% Change in NZ	0.156	-0.304	0.358	0.265	0.471	-0.410	0.573	-0.742
	(0.483)	(0.475)	(0.478)	(0.635)	(0.349)	(0.403)	(0.572)	(0.571)
Geo/Years	231	231	227	227	173	173	158	158
R-Squared	0.77	0.89	0.67	0.80	0.62	0.87	0.45	0.83
16 Regional Councils (Full Sample for Sales Prices: 64, for Weekly Rents: 48)								
IR New Immig	-1.278	-1.019	-1.529	5.969	-0.858	1.188	-0.766	-2.369*
	(1.039)	(2.535)	(1.216)	(2.893)	(0.657)	(1.848)	(0.736)	(1.024)
IR Return NZers	17.067*	10.222	18.281*	7.537	8.607	16.649	7.338	3.427
	(6.967)	(8.983)	(7.445)	(15.287)	(7.500)	(13.406)	(8.778)	(9.953)
% Change in Imm	1.548	0.465	0.556	-0.397	-0.794	0.221	-2.206	0.780
	(3.424)	(5.198)	(4.755)	(5.521)	(1.667)	(3.986)	(1.825)	(3.125)
% Change in NZ	-0.596	0.883	-0.737	0.285	0.353	-2.468	0.648	-1.132
	(0.889)	(1.474)	(1.011)	(2.237)	(0.593)	(1.633)	(0.776)	(1.612)
Geo/Years	64	64	64	64	48	48	48	48
R-Squared	0.82	0.98	0.77	0.97	0.68	1.00	0.57	1.00
Covariates	No	Yes	No	Yes	No	Yes	No	Yes

Notes: ** p<0.01, * p<0.05. All estimates are variance weighted by the population size in each geographic area averaged over the current and previous census. All models include year fixed effects and standard errors are robust to clustering at the location level. Covariates include change in the age composition, gender composition, qualifications, employment status, marital status, household type, household composition and income of the local population. IR stands for the inflow rate, eg the number of new immigrants or return Kiwis divided by the population five-years ago in an area.

Table 7: The Relationship between Inflows of New Immigrants and Changes in Local Housing Markets (Instrumental Variables)

	% Change Mean Price for Houses				% Change Mean Price for Flats				% Change in Mean Rent for Houses				% Change in Mean Rent for Flats			
	OLS		IV		OLS		IV		OLS		IV		OLS		IV	
140 Local Labour Market Areas (Full Sample for Sales Prices: 560, for Weekly Rents: 420)																
IR New Immig	-0.270	-0.926	-0.724**	-3.092**	-0.211	0.482	-0.713**	-2.319	-0.166	-0.550	-0.486**	-3.089**	0.080	-1.232*	-0.183	-3.230**
	(0.140)	(0.578)	(0.162)	(1.167)	(0.175)	(0.708)	(0.184)	(1.187)	(0.093)	(0.312)	(0.115)	(0.873)	(0.078)	(0.473)	(0.099)	(1.076)
Geo/Years	532	532	532	532	342	342	342	342	277	277	277	277	201	201	201	201
R-Squared	0.70	0.82	0.70	0.81	0.61	0.75	0.60	0.74	0.55	0.79	0.54	0.75	0.44	0.79	0.43	0.77
73 Territorial Local Authorities (Full Sample for Sales Prices: 292, for Weekly Rents: 219)																
IR New Immig	-0.210	-1.211	-0.590*	-3.488**	-0.292	-0.069	-0.676**	-2.124	-0.152	-0.697	-0.425**	-3.344**	0.081	-1.499**	-0.133	-2.769**
	(0.195)	(0.684)	(0.236)	(1.050)	(0.214)	(0.786)	(0.184)	(1.235)	(0.081)	(0.409)	(0.088)	(0.923)	(0.063)	(0.552)	(0.068)	(0.946)
Geo/Years	291	291	291	291	289	289	289	289	217	217	217	217	190	190	190	190
R-Squared	0.73	0.87	0.73	0.86	0.62	0.76	0.62	0.76	0.55	0.83	0.54	0.79	0.44	0.76	0.43	0.75
58 Local Labour Market Areas (Full Sample for Sales Prices: 232, for Weekly Rents: 174)																
IR New Immig	-0.270	-0.474	-0.733**	-3.044	-0.206	0.351	-0.674**	-1.756	-0.132	-1.015**	-0.446**	-3.812**	0.055	-1.421*	-0.214*	-2.763*
	(0.155)	(0.715)	(0.180)	(1.660)	(0.189)	(0.779)	(0.179)	(1.733)	(0.094)	(0.375)	(0.116)	(1.052)	(0.084)	(0.643)	(0.086)	(1.118)
Geo/Years	231	231	231	231	227	227	227	227	173	173	173	173	158	158	158	158
R-Squared	0.75	0.89	0.75	0.89	0.64	0.79	0.64	0.79	0.57	0.85	0.57	0.82	0.42	0.81	0.41	0.81
16 Regional Councils (Full Sample for Sales Prices: 64, for Weekly Rents: 48)																
IR New Immig	-0.471*	0.451	-0.911**	-1.467	-0.454	6.514*	-0.927**	4.324**	-0.266	0.273	-0.499**	-1.757	0.017	-3.349**	-0.245*	4.362**
	(0.203)	(2.445)	(0.261)	(1.795)	(0.226)	(2.544)	(0.308)	(1.674)	(0.133)	(1.552)	(0.135)	(1.340)	(0.102)	(0.582)	(0.115)	(0.589)
Geo/Years	64	64	64	64	64	64	64	64	48	48	48	48	48	48	48	48
R-Squared	0.80	0.98	0.80	0.98	0.75	0.97	0.75	0.97	0.62	0.99	0.62	0.99	0.49	1.00	0.48	1.00
Covariates	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes

Notes: ** p<0.01, * p<0.05. All estimates are variance weighted by the population size in each geographic area averaged over the current and previous census. All models include year fixed effects and standard errors are robust to clustering at the location level. Covariates include change in the age composition, gender composition, qualifications, employment status, marital status, household type, household composition and income of the local population. IR stands for the inflow rate, eg the number of new immigrants divided by the population five-years ago in an area. The inflow rate of new migrants is instrumented by the predicted inflow rate based on the location of previously settled migrants from the same region of birth.

Table 8: The Relationship between Changes in Local Population and Changes in Local Housing Markets (Instrumental Variables)

	% Change Mean Price for Houses				% Change Mean Price for Flats				% Change in Mean Rent for Houses				% Change in Mean Rent for Flats			
	OLS		IV		OLS		IV		OLS		IV		OLS		IV	
140 Local Labour Market Areas (Full Sample for Sales Prices: 560, for Weekly Rents: 420)																
% Change in Imm	-0.480*	0.768*	0.984**	-2.861*	-0.422	0.029	-0.883*	-1.894	-0.331*	0.937**	0.608**	2.569**	-0.075	1.641**	-0.178	3.041**
	(0.216)	(0.385)	(0.269)	(1.148)	(0.282)	(0.664)	(0.345)	(1.214)	(0.137)	(0.346)	(0.185)	(0.767)	(0.134)	(0.409)	(0.158)	(0.966)
% Change in NZ	0.801**	0.424*	1.313	1.701**	1.159**	0.629	1.659*	2.415**	0.658**	0.335*	1.195*	1.692**	0.573*	0.151	0.867	1.206*
	(0.218)	(0.188)	(0.764)	(0.641)	(0.289)	(0.332)	(0.722)	(0.691)	(0.161)	(0.146)	(0.541)	(0.598)	(0.231)	(0.204)	(0.588)	(0.551)
Geo/Years	532	532	532	532	342	342	342	342	277	277	277	277	201	201	201	201
R-Squared	0.71	0.82	0.71	0.80	0.62	0.75	0.62	0.73	0.57	0.80	0.55	0.74	0.46	0.80	0.45	0.77
73 Territorial Local Authorities (Full Sample for Sales Prices: 292, for Weekly Rents: 219)																
% Change in Imm	-0.412	-0.733	-0.642	3.507**	-0.322	0.339	0.753**	-2.042	-0.232	-0.507	-0.415*	3.138**	-0.018	1.332**	-0.041	2.793**
	(0.293)	(0.436)	(0.405)	(1.169)	(0.236)	(0.505)	(0.287)	(1.366)	(0.123)	(0.257)	(0.196)	(0.974)	(0.133)	(0.428)	(0.176)	(1.018)
% Change in NZ	0.659**	0.285	1.301**	1.382**	0.982**	0.373	1.332**	1.283*	0.748**	0.449*	1.355**	1.291**	0.341**	0.037	0.921	0.815
	(0.230)	(0.185)	(0.487)	(0.508)	(0.186)	(0.291)	(0.504)	(0.591)	(0.139)	(0.177)	(0.440)	(0.476)	(0.122)	(0.218)	(0.474)	(0.433)
Geo/Years	291	291	291	291	289	289	289	289	217	217	217	217	190	190	190	190
R-Squared	0.74	0.87	0.73	0.85	0.64	0.76	0.63	0.75	0.59	0.84	0.56	0.77	0.45	0.77	0.42	0.74
58 Local Labour Market Areas (Full Sample for Sales Prices: 232, for Weekly Rents: 174)																
% Change in Imm	-0.607*	-0.661	1.062**	-3.351	-0.537	-0.287	0.999**	-2.105	-0.349*	1.353**	0.660**	3.577**	-0.143	1.515**	-0.325	-2.772*
	(0.233)	(0.569)	(0.271)	(2.017)	(0.286)	(0.643)	(0.348)	(2.125)	(0.135)	(0.379)	(0.195)	(1.192)	(0.132)	(0.526)	(0.175)	(1.098)
% Change in NZ	1.115**	0.414	1.445	2.181*	1.314**	0.897*	1.853*	2.918**	0.749**	0.269	1.371*	2.298**	0.583	-0.351	1.159	0.879
	(0.359)	(0.227)	(0.907)	(0.952)	(0.380)	(0.369)	(0.853)	(1.046)	(0.226)	(0.197)	(0.655)	(0.834)	(0.293)	(0.261)	(0.731)	(0.566)
Geo/Years	231	231	231	231	227	227	227	227	173	173	173	173	158	158	158	158
R-Squared	0.76	0.89	0.76	0.87	0.66	0.79	0.66	0.77	0.61	0.86	0.58	0.77	0.44	0.83	0.42	0.80
16 Regional Councils (Full Sample for Sales Prices: 64, for Weekly Rents: 48)																
% Change in Imm	-0.699	-0.812	1.182**	-2.014	-0.736	4.331	-1.219*	4.381*	-0.453*	0.547	-0.622*	-5.070	-0.172	-1.541	-0.300	5.405**
	(0.337)	(1.952)	(0.382)	(1.741)	(0.370)	(2.269)	(0.495)	(1.988)	(0.169)	(2.023)	(0.248)	(3.441)	(0.165)	(0.800)	(0.278)	(1.428)
% Change in NZ	1.317	1.902	1.729	2.631*	1.212	0.167	2.789	0.900	1.147*	-0.542	2.355	3.500	1.120	-0.260	2.539	1.830*
	(0.751)	(1.371)	(2.167)	(1.170)	(0.711)	(1.649)	(2.091)	(1.507)	(0.494)	(1.508)	(1.378)	(2.114)	(0.624)	(0.614)	(1.688)	(0.833)

Geo/Years	64	64	64	64	64	64	64	64	48	48	48	48	48	48	48	48
R-Squared	0.81	0.98	0.80	0.98	0.76	0.97	0.74	0.97	0.66	0.99	0.62	0.98	0.52	1.00	0.47	0.99
Covariates	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes

Notes: ** p<0.01, * p<0.05. All estimates are variance weighted by the population size in each geographic area averaged over the current and previous census. All models include year fixed effects and standard errors are robust to clustering at the location level. Covariates include change in the age composition, gender composition, qualifications, employment status, marital status, household type, household composition and income of the local population. Both main RHS variables are instrumented using i) the predicted inflow rate of new immigrants based on the location of previously settled migrants from the same region of birth and ii) the lagged inflow rate of return New Zealanders.

Table 9: The Relationship between Changes in Local Population and Changes in the Distribution of Sales Prices for Houses

	% Change in the 25th Percentile		% Change in the 50th Percentile		% Change in the 75th Percentile	
	140 Local Labour Market Areas (Full Sample: 560)					
IR New Immig	-0.742	-0.846	-0.381	-1.307*	-0.566	-2.044**
	(0.484)	(0.713)	(0.473)	(0.631)	(0.491)	(0.693)
IR Return NZers	10.411**	5.832	7.982*	6.412*	7.295**	5.981*
	(3.049)	(2.989)	(3.113)	(2.569)	(2.546)	(2.701)
% Change in Imm	1.691	-0.118	1.362	0.970	0.704	1.107
	(1.549)	(1.534)	(1.316)	(1.286)	(1.259)	(1.319)
% Change in NZ	-0.499	-0.537	-0.217	-0.704	-0.296	-0.913
	(0.449)	(0.497)	(0.375)	(0.433)	(0.377)	(0.510)
Geo/Years	532	532	532	532	532	532
R-Squared	0.60	0.69	0.65	0.76	0.57	0.69
	73 Territorial Local Authorities (Full Sample: 292)					
IR New Immig	-0.914*	-1.645	-0.568	-1.656**	-0.883*	-2.080**
	(0.387)	(0.847)	(0.356)	(0.625)	(0.348)	(0.777)
IR Return NZers	7.634	4.195	6.251	4.001	6.050	3.742
	(4.833)	(2.925)	(4.408)	(2.762)	(4.639)	(2.925)
% Change in Imm	0.290	-0.493	0.179	-0.098	-0.219	-0.260
	(1.621)	(1.194)	(1.478)	(0.983)	(1.409)	(1.046)
% Change in NZ	0.232	0.162	0.182	0.075	0.097	-0.206
	(0.700)	(0.480)	(0.631)	(0.407)	(0.638)	(0.392)
Geo/Years	291	291	291	291	291	291
R-Squared	0.64	0.80	0.68	0.82	0.69	0.84
	58 Local Labour Market Areas (Full Sample: 232)					
IR New Immig	-0.824	-1.208	-0.403	-0.882	-0.810	-1.506
	(0.507)	(0.883)	(0.505)	(0.732)	(0.530)	(0.863)
IR Return NZers	7.492	2.216	7.561	3.777	6.551	2.001
	(4.180)	(3.892)	(3.857)	(3.372)	(3.498)	(3.252)
% Change in Imm	0.059	-0.904	0.803	0.531	-0.313	0.205
	(1.762)	(1.869)	(1.550)	(1.604)	(1.408)	(1.395)
% Change in NZ	0.186	0.084	0.183	-0.246	0.424	0.113
	(0.666)	(0.658)	(0.567)	(0.571)	(0.528)	(0.504)
Geo/Years	231	231	231	231	231	231
R-Squared	0.70	0.84	0.71	0.85	0.70	0.86
	16 Regional Councils (Full Sample: 64)					
IR New Immig	-1.383	3.246	-1.320	0.702	-1.598	-2.581
	(1.238)	(3.769)	(1.192)	(4.149)	(1.276)	(3.221)
IR Return NZers	17.500*	2.037	14.909	-1.197	15.611	10.743
	(6.926)	(12.522)	(8.342)	(12.015)	(9.047)	(11.627)
% Change in Imm	1.064	-6.532	-0.050	-7.087	-1.218	1.303
	(4.695)	(9.000)	(4.305)	(9.421)	(4.403)	(5.755)
% Change in NZ	-0.641	2.798	0.250	3.307	-0.020	0.623
	(0.976)	(2.182)	(0.989)	(1.990)	(0.894)	(2.203)
Geo/Years	64	64	64	64	64	64
R-Squared	0.79	0.96	0.77	0.97	0.77	0.97
Covariates	No	Yes	No	Yes	No	Yes

Notes: ** p<0.01, * p<0.05. All estimates are variance weighted by the population size in each geographic area averaged over the current and previous census. All models include year fixed effects and standard errors are robust to clustering at the location level. Covariates include change in the age composition, gender composition, qualifications, employment status, marital status, household type, household composition and income of the local population. IR stands for the inflow rate, eg the number of new immigrants or return Kiwis divided by the population five-years ago in an area.

Table 10: The Relationship between Changes in Local Population and Changes in Local Housing Markets by Year - 140 LMA Only

	% Change Mean Sale Price for Houses		% Change Mean Sale Price for Flats		% Change Mean Weekly Rent for Houses		% Change Mean Weekly Rent for Flats	
Percent Change in Local Population								
1986 - 1991	0.699**	-0.197	0.394	-0.073				
	(0.212)	(0.317)	(0.273)	(0.454)				
1991 - 1996	1.606**	1.149**	1.395**	0.953*	0.970*	0.344	1.187**	-0.002
	(0.525)	(0.324)	(0.480)	(0.386)	(0.414)	(0.308)	(0.446)	(0.327)
1996 - 2001	0.348	0.180	0.772	0.660	0.087	-0.060	0.168	-0.268
	(0.322)	(0.347)	(0.408)	(0.583)	(0.150)	(0.201)	(0.149)	(0.240)
2001 - 2006	-1.382**	-0.885**	-0.769	0.218	-0.441	-0.325	-0.652*	-0.759*
	(0.361)	(0.329)	(0.696)	(0.662)	(0.256)	(0.196)	(0.305)	(0.291)
Population Components 1986-1991								
IR New Immig	1.967**	-1.043	1.293	-2.494				
	(0.626)	(1.081)	(0.711)	(2.071)				
IR Return NZers	-2.192	-1.911	-3.551	-0.499				
	(3.230)	(4.224)	(4.673)	(7.357)				
% Change in Imm	-1.114	-0.746	-1.162	1.636				
	(1.157)	(1.818)	(1.311)	(2.358)				
% Change in NZ	0.742*	-0.013	0.721	-0.147				
	(0.339)	(0.480)	(0.531)	(0.800)				
Population Components 1991-1996								
IR New Immig	4.408**	3.556**	4.408**	3.235	3.260**	3.047**	3.815**	1.667*
	(0.898)	(1.204)	(0.450)	(1.867)	(0.418)	(0.652)	(0.263)	(0.809)
IR Return NZers	12.264**	7.252	9.456*	7.008	0.254	-0.829	-0.016	-0.318
	(3.891)	(4.695)	(4.121)	(4.770)	(3.144)	(3.818)	(2.448)	(3.769)
% Change in Imm	8.982**	2.863	9.897**	5.640	2.685*	-0.848	1.187	-1.757
	(1.814)	(1.477)	(1.589)	(3.209)	(1.075)	(1.435)	(0.714)	(2.038)
% Change in NZ	-2.378**	-0.996	-2.463**	-1.424	-0.499	0.014	-0.391	-0.202
	(0.593)	(0.552)	(0.852)	(0.997)	(0.545)	(0.608)	(0.597)	(0.697)
Population Components 1996-2001								
IR New Immig	-1.590	-3.261*	-1.073	-1.909	-0.894**	-0.974*	-0.989*	-0.976
	(1.637)	(1.282)	(1.463)	(1.551)	(0.298)	(0.448)	(0.372)	(0.721)
IR Return NZers	13.172	19.888**	24.767*	35.376**	4.485*	7.078*	2.743	6.495
	(8.829)	(5.958)	(10.035)	(7.955)	(2.186)	(2.818)	(2.797)	(3.431)
% Change in Imm	0.204	0.239	2.490	-0.277	-0.298	-0.587	-2.125*	-1.798
	(2.670)	(2.065)	(3.080)	(2.761)	(0.696)	(1.007)	(0.929)	(1.427)
% Change in NZ	0.295	-0.247	-0.667	-1.228	0.348	-0.071	0.792*	0.148
	(0.441)	(0.505)	(0.995)	(1.084)	(0.252)	(0.375)	(0.383)	(0.499)
Population Components 2001-2006								
IR New Immig	-1.904**	-0.808	-1.828**	-0.511	-1.036**	-0.402	-0.931**	-1.359
	(0.614)	(0.734)	(0.668)	(1.161)	(0.267)	(0.454)	(0.291)	(0.683)
IR Return NZers	6.473	1.107	9.183	4.633	4.548	3.211	3.392	1.592
	(5.109)	(4.350)	(6.424)	(6.116)	(2.713)	(2.066)	(3.258)	(3.131)
% Change in Imm	4.335	2.190	3.993	1.494	2.307	-0.257	4.393*	2.860
	(3.101)	(2.589)	(3.917)	(3.612)	(1.501)	(0.938)	(2.081)	(2.242)
% Change in NZ	-2.058*	-1.665	-0.741	-0.734	-0.341	-0.159	-1.240	-1.074
	(0.882)	(0.881)	(1.259)	(1.395)	(0.447)	(0.358)	(0.808)	(0.780)
Geos 86-91	129	129	82	82				

Geos 91-96	137	137	88	88	84	84	65	65
Geos 96-01	136	136	86	86	94	94	68	68
Geos 01-06	130	130	86	86	99	99	68	68
Covariates	No	Yes	No	Yes	No	Yes	No	Yes

Notes: ** $p<0.01$, * $p<0.05$. All estimates are variance weighted by the population size in each geographic area averaged over the current and previous census. All models include year fixed effects and standard errors are robust to clustering at the location level. Covariates include change in the age composition, gender composition, qualifications, employment status, marital status, household type, household composition and income of the local population. IR stands for the inflow rate, eg the number of new immigrants or return Kiwis divided by the population five-years ago in an area. Only the coefficients on the population components are allowed to vary across intercensal periods.

Table 11: The Relationship between Population Changes and Changes in Neighbourhood Housing Markets within Local LMAs

	% Change Mean Sales Price for Houses		% Change Mean Sales Price for Flats		% Change Mean Weekly Rent for Houses		% Change Mean Weekly Rent for Flats	
IR New Immig	-0.120*	-0.173*	-0.273**	-0.348**	-0.172**	-0.203**	-0.130**	-0.072
	(0.058)	(0.070)	(0.048)	(0.058)	(0.046)	(0.035)	(0.040)	(0.052)
IR Return NZers	2.787**	1.346**	1.517**	0.838	0.632**	0.167	0.644**	0.201
	(0.284)	(0.345)	(0.509)	(0.629)	(0.177)	(0.151)	(0.238)	(0.232)
% Change in Imm	-0.130	0.009	-0.015	0.101	-0.030	0.018	-0.048	0.022
	(0.067)	(0.054)	(0.042)	(0.074)	(0.042)	(0.027)	(0.051)	(0.037)
% Change in NZ	0.071	0.060	0.027	-0.012	0.121**	0.115**	0.115**	0.050*
	(0.049)	(0.038)	(0.033)	(0.047)	(0.022)	(0.025)	(0.041)	(0.021)
Geo/Years	5893	5893	3422	3422	3017	3017	1912	1912
Local Area/Years	423	423	195	195	176	176	113	113
R-Squared	0.02	0.07	0.01	0.04	0.02	0.08	0.02	0.12
Covariates	No	Yes	No	Yes	No	Yes	No	Yes

Notes: ** p<0.01, * p<0.05. All estimates are variance weighted by the population size in each geographic area averaged over the current and previous census. All models include LMA/year fixed effects and standard errors are robust to clustering at the location level. Covariates include change in the age composition, gender composition, qualifications, employment status, marital status, household type, household composition and income of the local population. IR stands for the inflow rate, eg the number of new immigrants or return Kiwis divided by the population five-years ago in an area.

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