The Contrasting Importance of Quality of Life and Quality of Business for Domestic and International Migrants

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Disclaimer

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Abstract

We examine whether bilateral regional migration flows are driven by the city's quality of life (QL) or quality of business (QB). The QL and QB measures are constructed using (quality-adjusted) rents and wages in each city. QL and QB reflect the willingness to pay of households and firms, respectively, for local amenities. The measures are constructed for 31 urban areas in New Zealand using five-yearly census data covering 1986 to 2013. We adopt a gravity model of regional migration – augmented by destination and origin QL and QB – to model bilateral flows of working-age migrants (post tertiary education and pre-retirement age). We also model flows between urban and rural areas and flows for the urban areas to and from overseas locations. We find different attractors for international versus domestic migrants according to the type of city amenity. International migrants are more attracted to cities with productive amenities whereas domestic migrants are more attracted to places with consumption amenities. Thus, in deciding on the type of city amenity to enhance, city officials implicitly choose the type of migrant that they attract as well as the type of city that may result.

JEL codes

J61, R23, R58

Keywords

migration, amenities, quality of life, quality of business, gravity model

Summary haiku

International
and local urban migrants
differ in their tastes

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1 Introduction

We test the importance of local quality of life (QL) and local quality of business (QB) in driving regional migration flows. Often, studies of regional migration focus on flows of domestic migrants[1] while studies of international migration focus on flows of migrants between countries.[2] We examine flows of migrants to, from and within New Zealand.

We distinguish between the location choices of (i) domestic residents who relocate within New Zealand, (ii) domestic residents who relocate to another country, and (iii) international immigrants who choose a specific location within New Zealand. Domestic residents are defined here as those people who were in a New Zealand location five years prior (regardless of their official immigration or citizenship status) while international migrants are defined as those who were not in New Zealand five years prior (regardless of their official immigration or citizenship status). The distinction between domestic and international migrants proves to be important in assessing the effects of a location's quality of life and its quality of business on migrants' location choices.

The QL and QB measures that we adopt are based on those of Gabriel & Rosenthal (2004) and Chen & Rosenthal (2008). They reflect the willingness to pay by workers and firms, respectively, for a location's (consumption and productive) amenities. For a given location, QL is a function of local quality-adjusted rents minus wages, whereas QB is a function of rents plus wages. The intuition underpinning these measures is that places with relatively high rents and low wages must have attractive consumption amenities (high QL), otherwise people would not be willing to live there at those prices. Similarly, firms that choose to locate in places that have high rents and high wages must regard those places as having offsetting productive amenities (high QB), otherwise they would choose to relocate elsewhere.

We use a gravity model of regional migration – augmented by destination and origin QL and QB – to model bilateral flows of working-age migrants (post tertiary education and pre-retirement age). Our data covers the migration flows between the 31 main and secondary urban areas in New Zealand, derived from the 1986-2013 censuses. The QL and QB measures are derived from wage and rent data constructed for each urban area for each census wave. We incorporate migration flows between urban areas and rural New Zealand and also between urban areas and international locations. Thus, we bring together two well-grounded models from the urban economics literature – the gravity model of migration and the amenity values of cities – within a single modelling framework.

[1] Biagi and Dotzel (2018) survey interregional migration models.
[2] Ariu (2018) surveys international migration models.

Our work builds on prior studies of regional within-country migration (e.g. Sjaastad, 1962; Harris and Todaro, 1970; Stark and Bloom, 1985) which focus on the importance of location-specific factors. Some of these prior studies emphasise the importance of both pecuniary and non-pecuniary factors in determining residents' location choice.[3] Chen and Rosenthal (2008) explicitly model regional within-country migration based on QL and QB but do not analyse the impact of these influences on international migrants to or from the USA.

A second set of related studies examines the choice of regional location for new migrants to a country (e.g. Bartel, 1989; Bauer et al., 2007; Epstein, 2008; Lichter and Johnson, 2006; Munshi, 2003; White, 1998). Within New Zealand, studies by Maré et al. (2007), Maré et al. (2016) and Smart et al. (2018) have modelled location choices of new migrants to the country. A number of these studies incorporate both labour market variables and non-pecuniary variables as determinants of migrants' location choices in their analysis. For instance, Smart et al. (2018) find that international migrants to New Zealand are attracted both to areas in which they can earn high wages and to areas with a relatively high proportion of migrants from their origin country. The influence of high wages is consistent with places that have high quality of business being attractive to international migrants while the origin country influence is consistent with a high quality of life being a determinant of migration choices. However, none of these cited studies models international migration explicitly within a framework that incorporates theoretically derived measures of both quality of life and business in the migration model. Furthermore, it is rare to find a study that incorporates both international and domestic migrants' location choices within the same model. A recent contribution that does incorporate both types of migrants is that of Maré and Poot (2019); however that analysis does not incorporate explicit measures of QL and QB as determinants of migrants' location choices.

By including international-urban and rural-urban flows into our gravity model of regional migration, we are able to observe differences in the importance of QL, QB and other factors for migrants coming and going between urban, rural, and international destinations.[4] We find evidence of different attractors for international versus domestic migrants according to the type of city amenity. International migrants are more attracted to cities that are based on productive amenities (QB) whereas domestic migrants are more attracted to places with consumption amenities (QL). This important difference in attractors for different types of migrants has frequently been overlooked by researchers and city officials alike. Indeed, in deciding on the type of city amenity to enhance (e.g. a port that facilitates business or a concert hall that

[3] For instance, after discussing monetary returns to regional migration, Sjaastad (1962) states (p.86): "In addition, there will be a non-monetary component, again positive or negative, reflecting his preference for that place as compared to his former residence."

[4] Formally, we treat migrant groups as being homogeneous within the relevant group, but as heterogeneous between groups. As we discuss subsequently, some heterogeneity within groups and different constraints facing different groups are both likely to influence the empirical findings.

facilitates consumption), city officials are implicitly choosing the type of migrant that they attract as well as the type of city that may result.

2 Model

The gravity model of migration treats migration flows between two locations as increasing in the size of each of their populations and decreasing with the distance between them. We estimate a gravity model of migration, where M_{ijt} represents the migration flow between origin location *i* and destination location *j* from time *t-1* to time *t*.[5] The basic model is set out in equation (1):

$$lnM_{ijt} = \alpha + \beta_1 lnP_{it-1} + \beta_2 lnP_{jt-1} + \beta_3 QL_{it-1} + \beta_4 QL_{jt-1} + \beta_5 QB_{it-1} + \beta_6 QB_{jt-1} + \beta_7 C_{ij} + \gamma_t + \delta_i + \mu_j + \varepsilon_{ijt}. \quad (1)$$

where P_{it-1} (P_{jt-1}) is the population of location *i* (*j*) at time *t-1*, and QL_{it-1} and QB_{it-1} (QL_{jt-1} and QB_{jt-1}) refer to the quality of life measure and quality of business measure for location *i* (*j*) respectively at *t-1*. These variables are lagged to incorporate their values at the beginning of the migration period, reducing the risk of reverse causality. We control for the cost of moving from location *i* to location *j*, C_{ij},[6] and include time fixed effects, γ_t, origin fixed effects, δ_i, and destination fixed effects μ_j. The β terms represent the parameters to be estimated and ε_{ijt} is a random error term clustered at the origin and destination location pair level. To interpret results, note that a one standard deviation increase in either QL or QB will result in (approximately) a 100*β% increase in the migration flow[7].

From the standard gravity model, we expect to find positive coefficients on both origin and destination population. Moving costs, C_{ij}, are captured by an indicator for whether locations *i* and *j* are located on the same island plus separate variables measuring the distance between the two locations for those on the same island and those on different islands.[8] Including the distance measures separately allows for different costs associated with distance when moving to another urban area on the same island versus moving to an urban area on a different island. We expect greater migration between urban areas on the same island (reflecting lower moving costs) with reduced migration between locations that are further apart (reflecting higher moving costs).

We hypothesise that there will be greater migration towards locations with relatively high QL and QB since we expect that some groups will be attracted to places that are good to reside in and others will be attracted to places that are good for jobs and income. It is less clear whether

[5] For our OLS estimates, we add one to the migration flow since M_{ijt} enters the equation in logarithmic form; this enables us to include pairs of locations between which there is no migration in the estimation sample. This adjustment is not needed for our Poisson and negative binomial regressions.
[6] Ideally one would control for time-specific moving costs but these have not changed materially over our sample period. Estimates of effects of time-varying travel costs on migration show only minor differences (Poot et al., 2016).
[7] The exact estimated migration increase from a one standard deviation change in QL or QB will be 100*($e^{\beta} - 1$)%.
[8] All of the urban areas in our data are located on either of New Zealand's two major islands: North Island and South Island. New Zealand (with a population of 4.24 million in March 2013) has a land area of 268,000 km^2 which is similar to that of the United Kingdom (242,000 km^2).

higher quality places will also retain their populations. Their high levels of productive and consumption amenities will have a direct impact in reducing emigration from those locations.

However, there may also be two other effects that are relevant. The first is a selection effect. People who value consumption amenities highly are more likely to be already located in medium to high QL areas, and they may then move from such an area to an even higher QL area. Conversely, those people who do not value consumption amenities highly are more likely to be already located in low QL places and to stay there. The second effect is a life-course effect. Some people, for instance, may choose to locate in a high QL location when young and then move to a high QB location to earn more later in life.[9] Each of these effects will be reflected in the origin QL coefficient (and similarly for QB if relevant) which is therefore of ambiguous sign. For this reason, we place more emphasis on the destination coefficients than the origin coefficients in interpreting results.

Model (1) is an unrestricted model in which the relative influences of origin and destination variables (QL and QB) can differ. We also report results from a restricted version of this model in which we set β_3=-β_4 and β_5=-β_6 so that it is the difference between origin and destination variables that influences migration choices.

We estimate both these model variants as a function solely of the variables shown in (1), and also with a vector of added amenity variables. We do so in case our estimates of QL and QB impacts are reflecting a specific amenity rather than the aggregated value of amenities as summarised by the QL and QB measures. The chosen amenities are those used by Preston et al. (2018) to estimate determinants of QL and QB across a larger range of urban areas in New Zealand. The amenities include: rainfall, sun hours, wind strength, proximity to the sea or a lake, and shares of employment in each of accommodation/food/recreation services, education, health, land transport and air transport.

Following the approach of Poot et al. (2016), we extend model (1) to incorporate international-urban and rural-urban migration flows. This extended model forms the primary focus of our analysis. Because international and rural locations are not confined to a specific location, we do not observe the distance variables for them, nor can we include their origin population, QL and QB measures (or separate amenity variables for them). Thus we do not estimate the restricted model for origin and destination QL and QB effects, nor do we estimate equations with separate amenity variables for this model.

[9] Grimes et al. (2017) provide an explicit model showing that individuals with a high rate of time preference will tend to move from a high consumption amenity area to a high income area over their lifetime, while those with a high rate of time preference will tend to move in the opposite direction.

In order to include rural and international flows in our model, we define the following dummy variables for each type of migration flow:

- $UtoU_{ij}$ =1 if and only if the origin *i* and destination *j* are both urban areas and 0 otherwise
- $UtoR_{ij}$ = 1 if and only if the origin *i* is an urban area and the destination *j* is rural and 0 otherwise
- $UtoW_{ij}$= 1 if and only if the origin *i* is an urban area and the destination *j* is overseas and 0 otherwise
- $RtoU_{ij}$= 1 if and only if the origin *i* is rural and the destination *j* is an urban area and 0 otherwise
- $WtoU_{ij}$= 1 if and only if the origin *i* is overseas and the destination *j* is an urban area and 0 otherwise.

We then define our gravity model with rural and international-urban migration flows as:

$$lnM_{ijt} = \delta_0 + UtoU_{ij}(\boldsymbol{\alpha_1 O_{it-1}} + \boldsymbol{\beta_1 D_{jt-1}} + \beta_4 C_{ij}) + UtoR_{ij}(\delta_1 + \boldsymbol{\alpha_2 O_{it-1}}) + UtoW_{ij}(\delta_2 + \boldsymbol{\alpha_3 O_{it-1}}) + RtoU_{ij}(\delta_3 + \boldsymbol{\beta_2 D_{jt-1}}) + WtoU_{ij}(\delta_4 + \boldsymbol{\beta_3 D_{jt-1}}) + \gamma_t + \theta_i + \mu_j + \varepsilon_{ijt}. \quad (2)$$

where $\boldsymbol{O_{it-1}}$ is a vector of origin characteristics in the previous wave $(lnP_{it-1}, QL_{it-1}, QB_{it-1})$ and $\boldsymbol{D_{jt-1}}$ is a vector of destination characteristics in the previous wave $(lnP_{jt-1}, QL_{jt-1}QB_{jt-1})$.[10]

We estimate our models with and without origin and destination fixed effects. When we do not include these fixed effects, we can observe the impact of the (time-invariant) distance (and amenity) variables on migration and we can assess the raw association between migration flows and cities' QL and QB. However, omitted (unobserved) variable bias is potentially a problem with these estimates, so our preferred estimates include the fixed effects which account for the impact of time-invariant characteristics of each place on migration flows. There remains some risk that time-varying omitted variables could be correlated with our time-varying explanatory variables (population, QL and QB). Hypothetically, for instance, travel connections may have changed over time and these may be reflected in travel costs as well as in population and amenity variables. The prior results of Poot et al. (2016) suggest that any such changes have not been substantive enough to materially alter our estimates.

Another risk to our modelling strategy is measurement error, especially in QL and QB. An earlier study (Preston et al., 2018) found QL and QB measures to be more volatile (across censuses) for smaller localities, reflecting thin rental and labour markets. For this reason, we restrict our attention to the 31 main and secondary urban areas in the country.

[10] Note that the $UtoU_{ij}$ dummy is omitted as a stand-alone variable to avoid perfect multi-collinearity.

3 Data

We use census data for population movements. We focus on the main and secondary urban areas as defined by Statistics NZ using 2013 boundaries. Where urban areas are geographically contiguous, we combine them into a single urban area, leaving us with 31 urban areas.[11] Our data span six censuses from 1986 to 2013, held every five-years - except for the 2013 census, which was delayed by two years due to the February 2011 Christchurch earthquake. The data is limited to migration flows of usual residents aged 30-59 years of age in year t (i.e. 25-54 five years previously) and their movements relative to five years earlier. The age range is chosen so that we focus on migration flows of the working age population; thus we (intentionally) ignore movements of people who are of typical student and retirement ages. We do not distinguish between international migrants new to New Zealand and those who are New Zealanders returning home.

Information on migration in the New Zealand Census is obtained from a question on current place of residence and that of five years ago. We define bilateral migration flows as the counts of census respondents aged 30-59 in each destination location who were resident in the origin location five years ago. We have no information on any intervening location choices, so we effectively assume that the migration was direct.

The migration flows between the 31 urban areas form 930 origin-destination pairs. These pairs are observed over six censuses, giving rise to a total of 5,580 observations. All migration flows between the urban areas in our data and any other part of New Zealand are coded as urban-rural migration flows. Since flows of individuals from each urban area to overseas are not observed in the census, migration flows between the urban areas in our data and overseas are imputed as the residual change in the population of the urban area after accounting for immigration, internal migration and observed registrations of deaths.[12] Adding in urban-international and urban-rural flows results in 6,324 observations (i.e. an additional 744 destination-origin pairs).

To ensure confidentiality, the migration data derived from the census is randomly rounded to base three,[13] this rounding occurs after any positive flow that is less than six is suppressed. Of our 6,324 potential observations, 1,382 are suppressed while in a further 479 cases we know that the true bilateral flow was zero for that inter-censal period. We treat all

[11] Urban areas that we combine are Northern Auckland Zone, Western Auckland Zone, Central Auckland Zone, and Southern Auckland Zone (into Auckland); Hamilton Zone, Cambridge Zone, and Te Awamatu Zone (into Hamilton); Wellington Zone, Lower Hutt Zone, Upper Hutt Zone, and Porirua Zone (into Wellington); Napier Zone and Hastings Zone (into Napier-Hastings).

[12] The resulting numbers contain some error due to census undercounting, etc.

[13] For instance, a migration flow of 58 is reported as 57 with probability 2/3 and as 60 with probability 1/3; a flow of 59 is reported as 57 with probability 1/3 and as 60 with probability of 2/3; a flow of 60 is reported as 60; and similarly for flows of 61 and 62 (where 63 replaces 57 as the alternative possibility).

suppressed observations as having a flow of two.[14] Appendix Table A1 details the distribution of the aggregated and disaggregated migration flows. The adjustments for nil or low flows clearly have some arbitrariness attached to them. For this reason, the estimates reported in the main text exclude all observations with true zero or suppressed flows. In case these exclusions cause problems of selection bias, we report estimates in the Appendix in which all observations are included. Results are stable across the two samples although estimates are less contaminated by noise in our main set of results.

For the population variable we use counts of the usually resident population aged 30-59, to be consistent with the migrating sample. The population of this age group will be strongly correlated with total population, so in the regression will likely pick up the attractiveness of total city size. Distance is measured as kilometres between the city-centre of each urban area in 2013, obtained using Google Maps, and this is entered in a separate variable for urban areas on the same or different islands.[15]

Our QL and QB measures for each urban area and time period are based on those used in Preston et al. (2018) and in Maré and Poot (2019). Briefly, these models are based on the spatial equilibrium insights of Rosen (1979) and Roback (1982, 1988) as extended by Gabriel and Rosenthal (2004) and Chen and Rosenthal (2008). The quality of business and quality of life in location *i* are calculated as:

$$QB_{it} = \frac{\gamma}{1-\gamma}\ln(r_{it}) + \ln(w_{it}) \qquad (3)$$

$$QL_{it} = \alpha\ln(r_{it}) - \ln(w_{it}) \qquad (4)$$

where $\ln(r_{it})$ is the quality-adjusted rent premium in location i at time t, $\ln(w_{it})$ is the quality-adjusted wage premium in location i at time t, γ (1- γ) is the coefficient on land (labour) in the representative firm's Cobb-Douglas production function, and α is the coefficient on housing in the representative consumer's utility function.[16] Based on aggregate data, we set γ=0.1 and α=0.2. Firms that operate in a location with highly productive amenities (i.e. in places with a high quality of business) can afford to pay a combination of high rents and high wages given their higher productivity. Individuals who live in a location with high consumption amenities (i.e. in places with a high quality of life) will be prepared to pay higher rents relative to wages than elsewhere since they benefit from the non-pecuniary amenities in that location. Thus the QL and QB measures reflect the value that households (for QL) and firms (for QB) place on local amenities, and rents will be bid up to reflect higher productive and consumption amenities.

[14] As with all other observations, one is then added to this value for the OLS estimates. Thus $lnM_{ijt} = 0$ for true zero flows, $lnM_{ijt} \approx 1.1$ for suppressed flows, and $lnM_{ijt} \approx 2.0$ for the lowest reported flows (of six).

[15] The distance information between urban areas was provided by the authors of Poot et al. (2016). For urban areas which we combined because they are contiguous, we took the average of the distance between each of the combined urban areas and the other location.

[16] Rents and wages are quality-adjusted at each census date. Rents are quality-adjusted by regressing actual rents on the number of rooms, number of bedrooms, dwelling type and available heating types. Wages are quality-adjusted by regressing actual wages on age, gender, ethnicity, industry, birthplace, religion and qualifications.

Each of QL and QB has been normalised to mean zero and standard deviation one across the sample of 130 urban locations listed in Preston et al. (2018). That study showed that QB tended to be high in larger places so the bulk of our 31 ("large") urban areas has QB>0. Similarly, smaller places tend to have higher quality of life so a majority of our areas has QL<0.

In constructing QL and QB for this study we have made one conceptual change relative to the measures in Preston et al. (2018). The prior studies defined rents and wages as those paid and earned by individuals who resided in a specific location. This meant if an individual resided in location A and worked in a separate location B that the wage earned in B would be attributed to location A. In practice, some of our (smaller) locations are close enough to larger cities to enable commuting, and this approach may bias upwards the wages attributed to these smaller locations (resulting in an upwardly biased estimate for QB and a downwardly biased estimate of QL in those towns). For the measures used in the current study we instead define wages for a location to be the wages earned by people who work in that location. In equilibrium, the person's wage in a town near a main city will equal the wage in the city less transport costs; thus for the individual the wage earned in the home location is the relevant (after transport cost) income indicator.

The resulting QL and QB measures for our 31 urban areas in 2013 are displayed in Figure 1. Figures 2 and 3 show the 1986 and 2013 values for QL and QB respectively, indicating movements in quality of life and quality of business over our sample period. In each of the figures, the size of circle is proportional to the urban area's 2013 population. Appendix Tables A2 and A3 provide the QL and QB values respectively for each census year for each location.

We see from the three figures and the Appendix tables that New Zealand's largest city (Auckland) has the highest quality of business, closely followed by the capital city (Wellington) and then by the next two largest cities (Christchurch and Hamilton). The high QB in larger urban areas is consistent with agglomeration economies reported in other studies (e.g. Maré and Graham, 2013). Smaller places, on average, have a higher quality of life, with Queenstown (a popular tourist resort) being the most favoured area in this respect; however, some smaller urban areas (e.g. Tokoroa) have low QL. Figures 2 and 3 reveal considerable persistence in both QL and QB from the start to the end of the sample period, but also indicate cases of substantial changes in fortunes over time. For instance, Ashburton has moved substantially upwards as a place for business while Levin has moved substantially downwards; Auckland's quality of life has declined substantially over the sample period. Thus, we see considerable temporal as well as spatial variation in our QL and QB measures over the sample which enables us to test the influence of these variables on migrants' location choices even after accounting for destination and origin fixed effects.

Figure 1: 2013 QL and QB measures for 31 urban areas

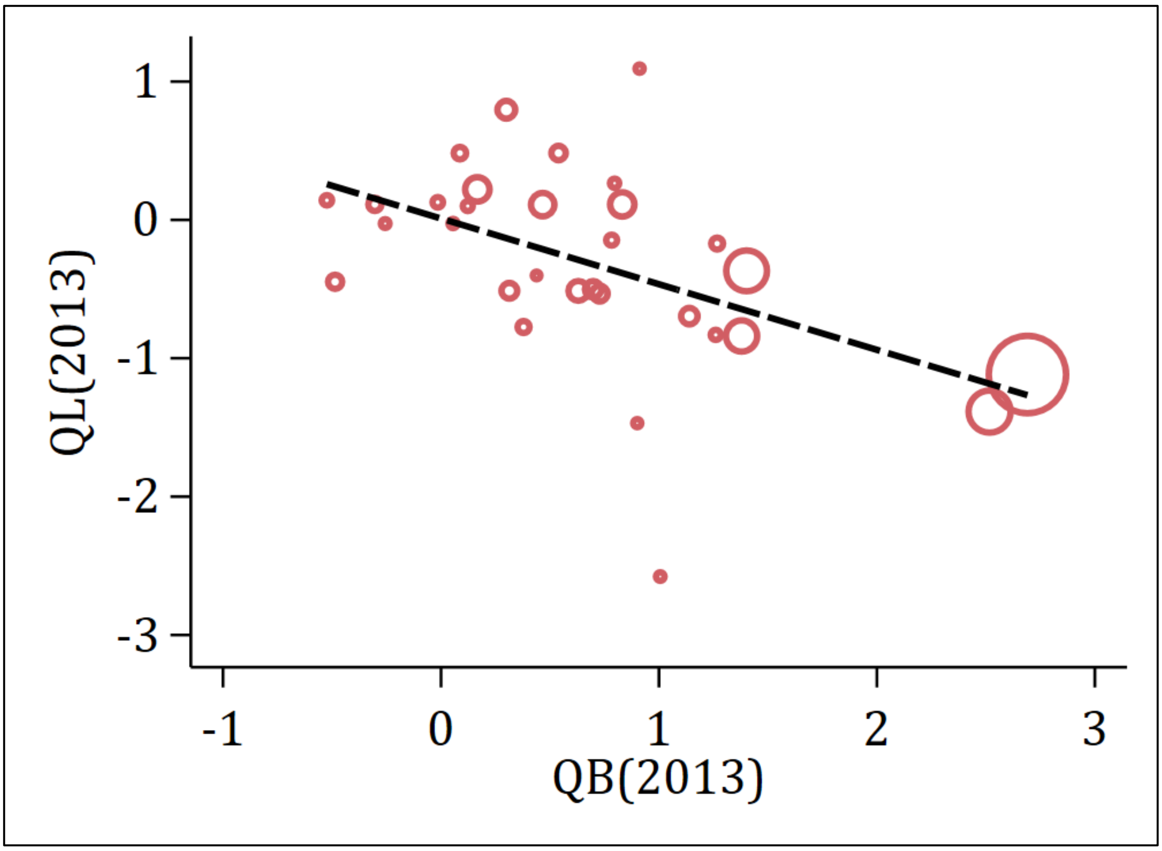


Figure 2: 1986 and 2013 QL measures

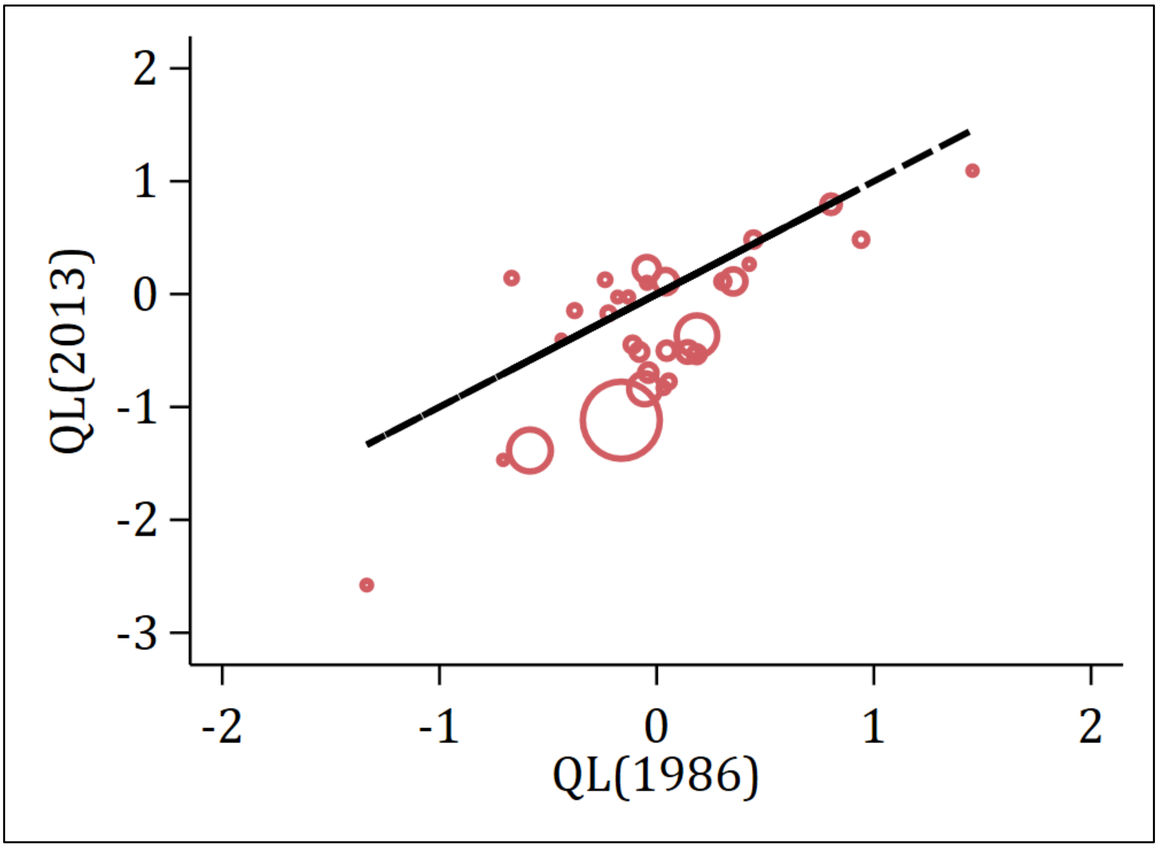
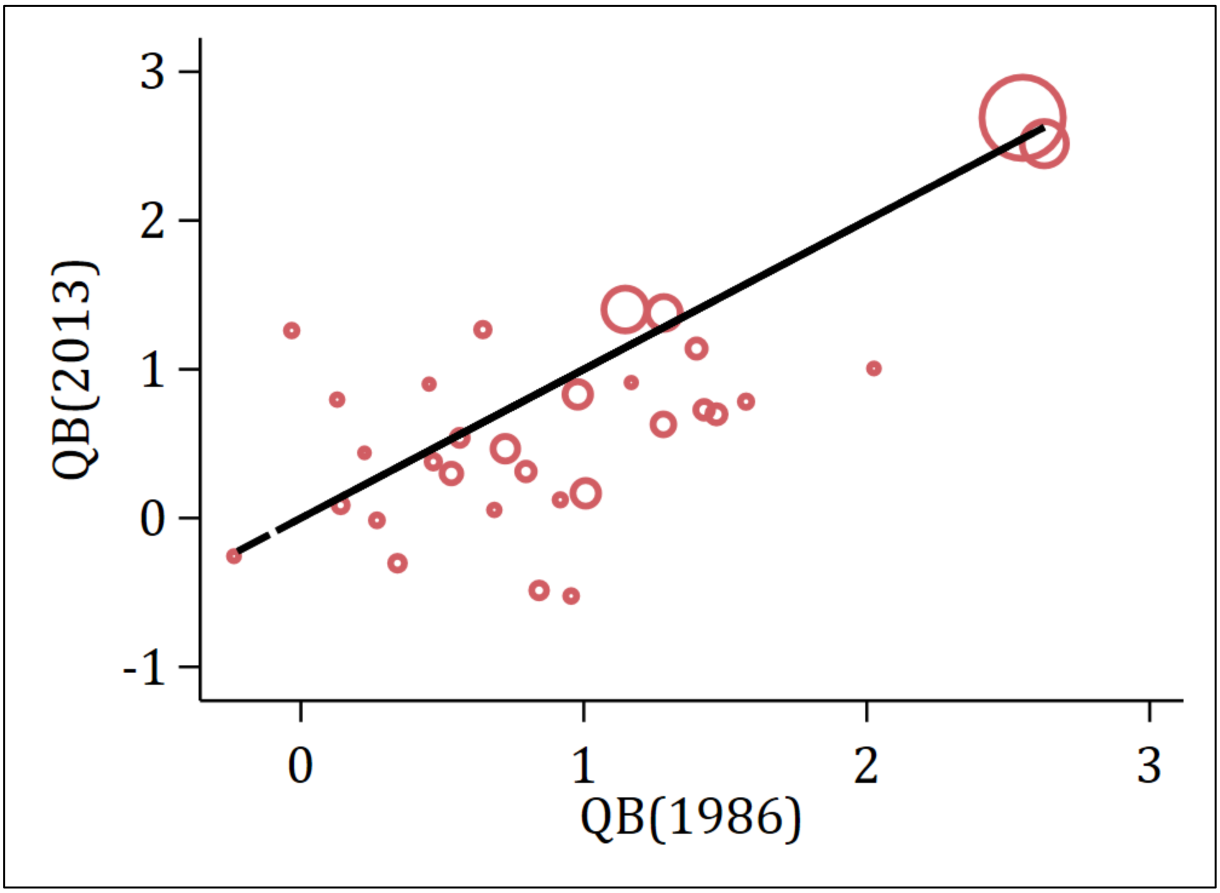


Figure 3: 1986 and 2013 QB measures



4 Gravity Model Results

We begin by using equation (1) to model bilateral urban to urban flows for the 31 urban areas over the six census waves using OLS regressions. This specification does not include flows to and from rural and international locations.

Table 1 reports the results for eight specifications, each based on equation (1), for the sample that excludes zero and suppressed flows. Appendix Table A4 reports the results for the full sample that includes these flows. In each case the cost vector is proxied by the three distance-related variables described in section 2. Time fixed effects and a constant are included in all equations (but not reported). The first four columns (in each of Tables 1 and A4) do not include separate amenity variables, which are added for the final four columns. Even numbered columns include origin and destination fixed effects while odd numbered columns omit these effects. Columns 1, 2, 5 and 6 include unrestricted destination and origin QL and QB while the remaining columns restrict impacts of these variables to be related to the difference between their destination and origin values.[17] Our analysis of results concentrates on the estimates shown in Table 1, but the full sample estimates (Table A4) show similar patterns.

Prior to analysing the effects of our focal variables (QL and QB) we note that the cost variables all have the expected signs (and are significant in 22 of 24 cases); thus people are more likely to migrate to places in the same island and that are closer to their origin location. Population has positive effects on both arrivals and departures so that people both tend to leave large places and to migrate to large places. Once origin and destination fixed effects are added, we find that the impact of origin population is materially larger than that of destination population indicating that (domestic) residents are, on balance, tending to leave the larger cities for smaller places. Coefficients on the time fixed effects (which are not reported) show a tendency to become increasingly negative through the sample period (relative to a zero base in 1986) implying, ceteris paribus, that inter-urban migration flows have tended to reduce over time.[18]

Turning to quality of life, we see that destination QL is, in all (unrestricted) cases, a strong drawcard for migrants. We also observe that migrants tend to leave places with high QL, consistent with a selection effect or a life-course pattern (at least for those with a high rate of time preference). In each case, the destination QL effect is greater than the origin effect so that people, on balance, leave places that are nice to live in and move to places that are even more attractive. Once the coefficients are restricted, this effect remains significant for the raw results without other amenities (column 3) but not with other controls added.

With respect to quality of business, all unrestricted equations show that people tend to migrate out of cities with high QB. In addition, once origin and destination fixed effects are included, there is little evidence that they are attracted to places where quality of business is high. In the restricted equations, migrants are seen either to be indifferent to QB or, on balance, to leave places with high QB. Thus, locations with a high quality of business do not appear to be attractive to domestic (working age) migrants. Instead, the buoyant economic conditions in cities that are good for business may afford existing residents in those cities the incomes and the capital (through high house prices and rents associated with both high QL and high QB) to leave those locations for more pleasant places in which to live.[19]

[17] We explored a further specification based on equation (1) that was estimated just for emigrants from Christchurch (one of New Zealand's three largest cities) that suffered devastating earthquakes between 2006 and 2013. This specification explored whether estimated patterns of emigration from Christchurch changed following the (exogenous) earthquakes. We found no evidence of a change in the emigration pattern from Christchurch in relation to QL and QB following the earthquakes.

[18] This pattern is the opposite of what we might expect if it were the case that reductions in transport costs through the period had boosted migration flows.

[19] We note that the attractiveness of (expensive) high QB locations may be different for people at the start of their working careers (e.g. those aged under 25 years) and this group is (intentionally) omitted from our sample. A complementary study is examining location choices of tertiary graduates with respect to QL and QB in potential destinations.

The results in Table 1 apply only to inter-urban flows and so do not include inflows and outflows of urban locations with rural and international locations. We gain deeper insights by extending the analysis to these additional flows, based on equation (2). OLS results are reported in Table 2 for the sample that excludes zero and suppressed flows. Table A5 in the Appendix reports results for which these flows are included. The first two columns of Table A5 report OLS results (with and without location fixed effects); column 3 reports Poisson regression estimates and column 4 presents negative binomial estimates (each incorporating location fixed effects).[20] We cannot estimate the restricted format for this specification since we do not observe QL and QB for rural and international observations. We also do not observe amenities for these locations and so drop the specifications with added amenities (noting that the Table 1 results were not materially impacted by the inclusion or exclusion of these variables).

In Tables 2 and A5, prefixes before each of the QL, QB and population variables indicate whether the estimated coefficient refers to flows that are urban to urban (U-U), rural to urban (R-U), world (international) to urban (W-U), urban to rural (U-R) or world to urban (W-U). In the discussion that follows, we concentrate primarily on the results with origin and destination fixed effects included (i.e. column 2 of Table 2). These results are similar to each of the OLS, Poisson and negative binomial regression results (with location fixed effects added) that are reported in Table A5 for each of our focal variables.

The cost variables, which are applicable only to urban to urban flows, again indicate that people are more likely to migrate to locations in the same island and are less likely to migrate to distant places. Origin and destination population in each case has a positive effect on migration flows both for intra-country and inter-country migration. It is noteworthy that the largest impact of destination population on migration flows is on flows of international migrants to urban areas (W-U), as opposed to flows of urban to urban (U-U) or rural to urban (R-U) migrants. Thus, consistent with the gateway city findings of Smart et al. (2018), international migrants to New Zealand are attracted to the larger population centres.

Migration from rural to urban areas (R-U) is negatively impacted by a destination's QL and QB (albeit not significantly so for the latter). House prices (and rents) are low in rural areas compared with those in places with high quality of life and quality of business. The negative impact of destination QL and QB on rural flows is consistent with housing in these more attractive urban areas being out of reach of many potential migrants from rural locations. Consistent with this hypothesis, we see some evidence (at the 10% significance level) of urban residents from high QB areas (which are likely to have high house prices) migrating to rural locations.

[20] The Poisson and negative binomial regressions do not require us to add one to migration flows to enable the zero flows to be included; however, we still need to impose an arbitrary flow (assumed to be two) for suppressed flows, which inevitably results in some inaccuracy. The negative binomial results are preferred to the Poisson regression results in this case since the data displays over-dispersion contrary to the assumptions of the Poisson approach.

Urban to urban migration is again affected positively by both origin QL and by destination QL. Thus, there appears to be an interchange of domestic residents between urban areas that are valued highly as places to live. However, the same pattern does not extend to the impacts of QB. Here we see that destination QB is not an attractor for domestic urban (or rural) migrants, while high origin QB boosts migration to other urban areas. A one standard deviation increase in QB in an origin location increases migration out of that location to other urban areas by approximately 20%. Consistent with the results in Table 1, therefore, a city that boosts its attractiveness to business also reduces its retention of domestic residents. This pattern is consistent with places that have high QB having high house prices, so enabling or incentivising existing residents to move elsewhere.

Migration responses are very different for international migrants to urban locations (i.e. W-U). While international migrants tend to move to locations that have high QL (column 1 of Table 2), a location that further improves its QL does not attract additional international migrants (i.e. column 2 which incorporates location fixed effects). By contrast, destination QB is a highly significant attractor (both with and without fixed effects). A one standard deviation increase in QB in a destination location increases international migration into that location by approximately one third. Notably, the attractiveness of QB holds even though we control for the impacts on migration flows of population in the destination location – i.e. after controlling for the gateway city phenomenon. As Smart et al. (2018) discuss, New Zealand's immigration policies prioritise migrants with marketable skills, so it is likely that these people are attracted to places with a high quality of business (as well as to places with a large population).

The attractiveness of places with high (and improving) quality of business to international migrants is consistent with the housing channel affecting domestic residents' migration patterns. A number of studies find that immigration has a positive impact on house prices in New Zealand either at the aggregate level (Coleman and Landon-Lane, 2007; McDonald, 2013) or at the local level (Stillman and Maré, 2008).[21] A location that improves its quality of business attracts international migrants which, consistent with these prior studies, raises house prices, and this both crowds out rural residents from migrating to these locations and encourages urban residents of these locations to move elsewhere; i.e. to move to locations with lower QB accompanied by lower housing costs. Thus we see a migration system in which changes to amenities that boost business productivity affect the migration patterns of both international and domestic migrants; international migrants increase their presence in high QB locations at the same time as domestic residents reduce their presence in these locations.

[21] Stillman and Maré find that returning (New Zealand-born) migrants have a greater effect on house prices than do foreign-born migrants.

Table 1: Gravity model: Inter-urban migration (zero and suppressed flows dropped)

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Destination QL (QL_{jt-1})	0.440***	0.128***			0.350***	0.117***		
	(0.038)	(0.024)			(0.039)	(0.025)		
Destination QB (QB_{jt-1})	0.134***	0.049*			0.117***	0.032		
	(0.034)	(0.023)			(0.035)	(0.023)		
Origin QL (QL_{it-1})	0.155***	0.079**			0.245***	0.092***		
	(0.038)	(0.024)			(0.037)	(0.023)		
Origin QB (QB_{it-1})	0.097**	0.114***			0.111**	0.132***		
	(0.035)	(0.024)			(0.036)	(0.023)		
Difference QL (QL_{jt-1} - QL_{it-1})			0.133***	0.022			0.042	0.01
			(0.033)	(0.018)			(0.027)	(0.018)
Difference QB (QB_{jt-1} - QB_{it-1})			0.014	-0.033*			-0.002	-0.051**
			(0.032)	(0.016)			(0.028)	(0.016)
Destination population (lnP_{jt-1})	0.761***	0.286***	0.769***	0.388***	0.762***	0.164*	0.770***	0.267***
	(0.022)	(0.070)	(0.023)	(0.065)	(0.024)	(0.073)	(0.023)	(0.069)
Origin population (lnP_{it-1})	0.738***	1.004***	0.745***	1.103***	0.742***	1.139***	0.748***	1.237***
	(0.022)	(0.091)	(0.024)	(0.086)	(0.023)	(0.083)	(0.023)	(0.078)
Same island dummy	1.593***	1.869***	0.825	1.864***	1.593***	1.861***	0.822	1.856***
	(0.473)	(0.471)	(0.457)	(0.472)	(0.469)	(0.472)	(0.455)	(0.472)
Distance if same island (ln)	-0.737***	-0.855***	-0.686***	-0.854***	-0.739***	-0.856***	-0.688***	-0.855***
	(0.031)	(0.026)	(0.034)	(0.026)	(0.030)	(0.026)	(0.033)	(0.026)
Distance if different island (ln)	-0.524***	-0.615***	-0.584***	-0.615***	-0.527***	-0.617***	-0.587***	-0.617***
	(0.063)	(0.066)	(0.061)	(0.066)	(0.063)	(0.066)	(0.062)	(0.066)
N	3740	3740	3740	3740	3740	3740	3740	3740
R^2	0.843	0.904	0.821	0.903	0.849	0.905	0.828	0.904
Added amenity variables	No	No	No	No	Yes	Yes	Yes	Yes
Destination & origin fixed effects	No	Yes	No	Yes	No	Yes	No	Yes

The dependent variable in all models is the natural logarithm of the migration flow (plus one) between the destination and origin location, i.e. the population aged 30-59 in each destination urban area that was usually resident in the origin city five years ago. An observation is an origin-destination pair. The sample includes 31 cities (930 destination-origin pairs) over six censuses from 1986 to 2013. Distance is the 2013 driving distance between the origin and destination cities in km. All models include year fixed effects and a constant not shown. Added amenity variables include shares of employment in each of accommodation/food/recreation services, education, health, land transport and air transport in equations 5 to 8, plus rainfall, sun hours, wind strength, and proximity to the sea or a lake in equations 5 and 7. Estimation is by OLS. Standard errors clustered by origin-destination location pair in parentheses; *p<0.1, **p<0.05, ***p <0.01.

Table 2: Gravity Model: Inter-Location Migration (zero and suppressed flows dropped)

	1	**2**
U-U: Destination QL (QL_{jt-1})	0.448***	0.119***
	(0.037)	(0.027)
R-U: Destination QL (QL_{jt-1})	0.119	-0.259**
	(0.077)	(0.085)
W-U: Destination QL (QL_{jt-1})	0.362**	-0.016
	(0.120)	(0.079)
U-U: Destination QB (QB_{jt-1})	0.138***	0.019
	(0.033)	(0.025)
R-U: Destination QB (QB_{jt-1})	0.017	-0.122
	(0.053)	(0.095)
W-U: Destination QB (QB_{jt-1})	0.473***	0.334***
	(0.134)	(0.083)
U-U: Origin QL (QL_{it-1})	0.161***	0.153***
	(0.037)	(0.026)
U-R: Origin QL (QL_{it-1})	0.125**	0.035
	(0.046)	(0.088)
U-W: Origin QL (QL_{it-1})	0.368	0.263
	(0.189)	(0.136)
U-U: Origin QB (QB_{it-1})	0.101**	0.183***
	(0.034)	(0.025)
U-R: Origin QB (QB_{it-1})	0.172***	0.218*
	(0.049)	(0.097)
U-W: Origin QB (QB_{it-1})	0.571***	0.598***
	(0.155)	(0.097)
U-U: Destination population (lnP_{jt-1})	0.758***	0.432***
	(0.022)	(0.080)
R-U: Destination population (lnP_{jt-1})	0.664***	0.331***
	(0.034)	(0.098)
W-U: Destination population (lnP_{jt-1})	1.046***	0.714***
	(0.077)	(0.085)
U-U: Origin population (lnP_{jt-1})	0.735***	0.657***
	(0.022)	(0.086)
U-R: Origin population (lnP_{jt-1})	0.734***	0.647***
	(0.027)	(0.107)
U-W: Origin population (lnP_{jt-1})	1.013***	0.933***
	(0.098)	(0.104)
Same island dummy	1.613***	1.694***
	(0.474)	(0.441)
Distance if same island (ln)	-0.737***	-0.846***
	(0.031)	(0.027)
Distance if different island (ln)	-0.522***	-0.631***
	(0.063)	(0.061)
N	4463	4463
R^2	0.915	0.943
Destination & origin fixed effects	No	Yes

The dependent variable in all models is the natural logarithm of the migration flow (plus one) between the destination and origin location, i.e. the population aged 30-59 in each destination urban area that was usually resident in the origin city five years ago. An observation is an origin-destination pair. The sample includes 31 cities, plus 'rural' (i.e. all New Zealand locations other than the 31 urban areas) and world (1,054 destination-origin pairs) over six censuses from 1986 to 2013. Distance is the 2013 driving distance between the origin and destination cities in km. All models include year fixed effects, dummies for rural to urban, world to urban, urban to rural, and urban to world, and a constant not shown. Estimation is by OLS. Standard errors clustered by origin-destination location pair in parentheses; *p<0.1, **p<0.05, ***p <0.01.

5 Conclusions

Local policy-makers and planners make decisions over local amenities that affect the attractiveness of their localities. They may choose to improve consumption amenities such as libraries, parks, cycle-ways, cultural facilities, skate parks, etc., and so improve the quality of life for residents in a particular place. Alternatively, or in addition, they may choose to improve productive amenities such as railyards, ports and high speed internet services that make a city a better place for firms to locate in and do business. Coleman and Grimes (2010) show that, provided the benefits outweigh the costs of such decisions, the locality will improve its attractiveness to migrants from other areas and this will place pressure on local property prices.

We show that these aggregate effects represent only a portion of the full story. An improvement in a destination's quality of life will attract domestic migrants while at the same time incentivising some existing residents to move elsewhere, so there is an exchange of domestic residents. There is no discernible effect of an improvement of QL on the city's attractiveness for international migrants. An improvement in a locality's quality of business, by contrast, attracts international migrants but not domestic migrants, while existing residents are again incentivised to shift elsewhere. A one standard deviation increase in a location's quality of business is estimated to increase international migration into that location by approximately one-third, while raising domestic residents' migration out of that location by approximately one-fifth. These patterns are similar to the localised patterns that we see in the literature on effects of gentrification (e.g. Van Criekingen, 2009; Hochstenbach and van Gent, 2015) in which gentrification pushes up local property values and encourages an exchange of residents to and from the area. A key difference with our analysis is that as well as the exchange of domestic residents when QL changes we see an exchange of international migrants for domestic residents when QB changes.

Our results indicate that city investments to improve amenities will not be neutral with regard to the demographic composition of a city. In particular, a drive to improve amenities that raise firms' productivity is likely to change the composition of the city's population towards a greater proportion of international migrants. Based on prior studies of the effects of migration on housing markets, the mechanism by which this demographic switch occurs is likely to be through a rise in house prices consequent on the rise in international migration to the city. The house price pressures enable existing homeowners (and incentivise existing renters) to leave the city in favour of places with lower housing costs. Thus policy-makers should be aware that productivity-oriented amenity investments make a city more attractive in aggregate but the disaggregated effects on location choice will differ between existing residents of the city, domestic residents elsewhere in the country, and potential international migrants.

Appendix Tables

Appendix Table 1: Distribution of migration flows and usually resident population

Migration flow	% zero observations	% suppressed observations	Excluding zero and suppressed flows		
			Mean flow	**Min flow**	**Max flow**
M_{ijt}: *All*	7.6%	21.9%	525	6	75168
M_{ijt}: *U-U*	8.6%	24.4%	110	6	4185
M_{ijt}: *U-R*	0.0%	0.0%	1715	207	18648
M_{ijt}: *U-W*	0.0%	11.3%	5061	12	66639
M_{ijt}: *R-U*	0.0%	0.0%	1282	240	8394
M_{ijt}: *W-U*	0.0%	0.0%	2918	54	75168
			Mean	Min	Max
$Population_{it}$			35850	1494	532437

Appendix Table 2: Quality of life (QL) by urban area and census year

	Year					
Urban Area	**1986**	**1991**	**1996**	**2001**	**2006**	**2013**
Ashburton	0.032	-0.040	-0.365	-0.550	-0.563	-0.831
Auckland	-0.163	-0.684	-0.793	-1.589	-1.594	-1.117
Blenheim	0.941	0.518	0.707	0.538	0.423	0.483
Christchurch	0.185	-0.079	-0.117	-0.278	-0.321	-0.368
Dunedin	0.041	0.385	0.442	0.229	0.196	0.111
Feilding	-0.130	-0.689	-0.352	-0.600	-0.404	-0.026
Gisborne	0.305	0.146	0.456	-0.267	-0.588	0.112
Greymouth	-0.439	0.002	0.010	0.004	0.084	-0.401
Hamilton	-0.055	-0.547	-0.495	-0.876	-0.901	-0.839
Hawera	-0.707	-1.492	-0.920	-1.971	-1.323	-1.469
Invercargill	-0.079	-0.722	-0.764	-0.658	-0.318	-0.512
Kapiti	0.446	0.205	0.725	0.512	0.600	0.484
Levin	-0.668	-0.348	-0.302	-0.292	-0.173	0.142
Masterton	-0.237	-0.139	-0.266	0.066	-0.162	0.128
Napier-Hastings	-0.046	-0.024	0.517	0.114	-0.058	0.221
Nelson	0.803	0.656	0.732	0.709	0.503	0.797
New Plymouth	-0.039	-0.294	-0.509	-0.870	-0.657	-0.695
Oamaru	-0.180	-0.050	0.345	0.060	0.244	-0.026
Palmerston North	0.143	-0.152	-0.503	-0.602	-0.733	-0.513
Pukekohe	-0.222	-0.235	-0.293	-0.399	-0.747	-0.171
Queenstown	1.454	0.586	0.298	0.290	0.133	1.094
Rangiora	0.426	0.061	0.244	-0.067	0.197	0.265
Rotorua	0.047	-0.611	-0.394	-0.644	-0.730	-0.501
Taupo	-0.378	-0.368	-0.411	-0.043	-0.300	-0.146
Tauranga	0.353	-0.021	0.197	-0.007	0.037	0.112
Timaru	0.055	-0.100	-0.340	-0.615	-0.475	-0.774
Tokoroa	-1.335	-1.946	-2.159	-2.324	-2.147	-2.578
Wanganui	-0.111	-0.508	-0.415	-0.519	-0.512	-0.447
Wellington	-0.584	-1.001	-1.449	-1.841	-1.803	-1.385
Whakatane	-0.045	-0.134	0.242	-0.282	-0.196	0.100
Whangarei	0.185	-0.382	-0.201	-0.679	-0.852	-0.532

Quality of life (QL) values are standardised to have a mean of zero and a standard deviation of one across 130 New Zealand urban areas.

Appendix Table 3: Quality of business (QL) by urban area and census year

	Year					
Urban Area	**1986**	**1991**	**1996**	**2001**	**2006**	**2013**
Ashburton	-0.033	-0.248	0.260	0.155	0.610	1.261
Auckland	2.551	3.418	3.180	3.569	3.324	2.691
Blenheim	0.140	0.226	-0.226	-0.022	0.333	0.087
Christchurch	1.147	1.481	1.417	1.284	1.344	1.402
Dunedin	0.722	0.887	0.566	0.398	0.552	0.466
Feilding	0.684	1.316	0.777	0.576	0.265	0.055
Gisborne	0.341	0.333	0.308	0.133	0.281	-0.303
Greymouth	0.225	0.191	0.308	-0.074	-0.198	0.439
Hamilton	1.283	1.607	1.518	1.717	1.609	1.379
Hawera	0.453	0.667	0.795	1.435	0.640	0.900
Invercargill	0.795	0.555	0.689	0.141	0.202	0.314
Kapiti	0.561	1.411	0.478	1.001	0.446	0.539
Levin	0.955	0.909	0.392	0.149	-0.300	-0.524
Masterton	0.269	0.135	0.087	-0.078	0.067	-0.015
Napier-Hastings	1.007	0.757	0.338	0.352	0.513	0.167
Nelson	0.532	0.710	0.708	0.505	0.622	0.300
New Plymouth	1.398	1.204	1.214	0.885	0.868	1.139
Oamaru	-0.236	-0.326	-0.589	-0.685	-0.810	-0.256
Palmerston North	1.281	1.709	1.508	1.096	0.895	0.630
Pukekohe	0.643	1.137	1.406	1.633	1.900	1.267
Queenstown	1.168	0.744	2.042	1.764	2.357	0.911
Rangiora	0.128	0.510	0.337	0.803	0.745	0.796
Rotorua	1.469	1.601	1.348	1.449	1.131	0.698
Taupo	1.573	1.470	1.228	1.070	1.152	0.783
Tauranga	0.978	1.242	1.123	1.196	1.089	0.831
Timaru	0.468	0.170	0.286	0.150	-0.005	0.379
Tokoroa	2.025	1.919	1.759	1.725	0.847	1.006
Wanganui	0.842	0.825	0.533	-0.032	-0.295	-0.486
Wellington	2.627	3.556	3.160	3.322	2.832	2.517
Whakatane	0.917	0.836	0.423	0.710	0.600	0.123
Whangarei	1.425	1.152	0.975	1.028	1.070	0.728

Quality of life (QB) values are standardised to have a mean of zero and a standard deviation of one across 130 New Zealand urban areas.

Appendix Table 4: Gravity model: Inter-urban migration (full sample)

	1	2	3	4	5	6	7	8
Destination QL (QL_{jt-1})	0.460***	0.162***			0.405***	0.155***		
	(0.031)	(0.031)			(0.034)	(0.031)		
Destination QB (QB_{jt-1})	0.154***	0.071*			0.141***	0.058*		
	(0.027)	(0.028)			(0.031)	(0.029)		
Origin QL (QL_{it-1})	0.209***	0.072*			0.265***	0.078*		
	(0.034)	(0.031)			(0.034)	(0.031)		
Origin QB (QB_{it-1})	0.121***	0.137***			0.135***	0.150***		
	(0.030)	(0.028)			(0.031)	(0.028)		
Difference QL (QL_{jt-1} - QL_{it-1})			0.126***	0.045*			0.070**	0.039
			(0.029)	(0.023)			(0.027)	(0.023)
Difference QB (QB_{jt-1} - QB_{it-1})			0.016	-0.033			0.003	-0.046*
			(0.026)	(0.020)			(0.025)	(0.021)
Destination population (lnP_{jt-1})	0.847***	0.342***	0.873***	0.458***	0.849***	0.192*	0.875***	0.309***
	(0.018)	(0.082)	(0.020)	(0.076)	(0.021)	(0.087)	(0.021)	(0.080)
Origin population (lnP_{it-1})	0.827***	0.887***	0.853***	1.003***	0.825***	1.036***	0.850***	1.153***
	(0.019)	(0.091)	(0.021)	(0.087)	(0.019)	(0.091)	(0.019)	(0.087)
Same island dummy	2.188***	1.627***	1.491**	1.627***	2.189***	1.627***	1.491**	1.627***
	(0.446)	(0.461)	(0.468)	(0.461)	(0.448)	(0.461)	(0.470)	(0.461)
Distance if same island (ln)	-0.875***	-0.964***	-0.830***	-0.964***	-0.875***	-0.964***	-0.830***	-0.964***
	(0.028)	(0.028)	(0.031)	(0.028)	(0.027)	(0.028)	(0.030)	(0.028)
Distance if different island (ln)	-0.569***	-0.757***	-0.625***	-0.757***	-0.570***	-0.757***	-0.625***	-0.757***
	(0.061)	(0.066)	(0.065)	(0.066)	(0.062)	(0.066)	(0.065)	(0.066)
N	5580	5580	5580	5580	5580	5580	5580	5580
R^2	0.858	0.893	0.839	0.893	0.861	0.894	0.842	0.893
Added amenity variables	No	No	No	No	Yes	Yes	Yes	Yes
Destination & origin fixed effects	No	Yes	No	Yes	No	Yes	No	Yes

The dependent variable in all models is the natural logarithm of the migration flow (plus one) between the destination and origin location, i.e. the population aged 30-59 in each destination urban area that was usually resident in the origin city five years ago. An observation is an origin-destination pair. The sample includes 31 cities (930 destination-origin pairs) over six censuses from 1986 to 2013. Distance is the 2013 driving distance between the origin and destination cities in km. All models include year fixed effects and a constant not shown. Added amenity variables include shares of employment in each of accommodation/food/recreation services, education, health, land transport and air transport in equations 5 to 8, plus rainfall, sunhours, wind strength, and proximity to the sea or a lake in equations 5 and 7. Estimation is by OLS. Standard errors clustered by origin-destination location pair in parentheses; *p<0.1, **p<0.05, ***p <0.01.

Appendix Table 5: Gravity model: Inter-location migration (full sample)

	1: OLS	**2: OLS**	**3: Poisson**	**4: Neg Bin**
U-U: Destination QL (QL_{jt-1})	0.451***	0.081*	0.14	0.13
	(0.031)	(0.038)	(0.17)	(0.08)
R-U: Destination QL (QL_{jt-1})	0.096	-0.288**	-0.19	-0.32***
	(0.077)	(0.090)	(0.18)	(0.12)
W-U: Destination QL (QL_{jt-1})	0.339**	-0.045	-0.05	-0.06
	(0.125)	(0.093)	(0.15)	(0.09)
U-U: Destination QB (QB_{jt-1})	0.148***	-0.034	0.05	0.01
	(0.027)	(0.039)	(0.07)	(0.08)
R-U: Destination QB (QB_{jt-1})	0.005	-0.173	-0.11	-0.09
	(0.055)	(0.097)	(0.09)	(0.11)
W-U: Destination QB (QB_{jt-1})	0.462**	0.284**	0.34***	0.32***
	(0.142)	(0.095)	(0.07)	(0.08)
U-U: Origin QL (QL_{it-1})	0.200***	0.082*	0.22*	0.14**
	(0.034)	(0.034)	(0.13)	(0.07)
U-R: Origin QL (QL_{it-1})	0.103*	-0.056	0.15	0.02
	(0.048)	(0.095)	(0.16)	(0.10)
U-W: Origin QL (QL_{it-1})	0.270	0.112	0.29**	0.19*
	(0.338)	(0.266)	(0.15)	(0.10)
U-U: Origin QB (QB_{it-1})	0.115***	0.163***	0.12*	0.20***
	(0.030)	(0.031)	(0.07)	(0.07)
U-R: Origin QB (QB_{it-1})	0.160**	0.190	0.12	0.29***
	(0.054)	(0.101)	(0.09)	(0.11)
U-W: Origin QB (QB_{it-1})	0.996**	1.026***	0.27***	0.74***
	(0.303)	(0.249)	(0.05)	(0.11)
U-U: Destination population (lnP_{jt-1})	0.849***	0.700***	0.84***	0.59**
	(0.018)	(0.121)	(0.29)	(0.25)
R-U: Destination population (lnP_{jt-1})	0.671***	0.520***	0.59**	0.33
	(0.036)	(0.132)	(0.28)	(0.26)
W-U: Destination population (lnP_{jt-1})	1.053***	0.902***	0.98***	0.71***
	(0.081)	(0.127)	(0.28)	(0.25)
U-U: Origin population (lnP_{jt-1})	0.829***	0.661***	0.44**	0.83***
	(0.019)	(0.091)	(0.21)	(0.26)
U-R: Origin population (lnP_{jt-1})	0.741***	0.581***	0.34	0.65**
	(0.030)	(0.111)	(0.24)	(0.26)
U-W: Origin population (lnP_{jt-1})	1.046***	0.886***	0.62***	0.95***
	(0.171)	(0.149)	(0.21)	(0.25)
Same island dummy	2.177***	1.387**	0.97	1.42
	(0.447)	(0.453)	(1.02)	(1.06)
Distance if same island (ln)	-0.874***	-0.959***	-0.77***	-1.02***
	(0.028)	(0.027)	(0.09)	(0.05)
Distance if different island (ln)	-0.570***	-0.786***	-0.65***	-0.85***
	(0.061)	(0.065)	(0.15)	(0.18)
N	6324	6324	6324	6324
R^2	0.896	0.918	0.974	0.787
Destination & origin fixed effects	No	Yes	Yes	Yes

The dependent variable in the OLS models is the natural logarithm of the migration flow (plus one) between the destination and origin location, i.e. the population aged 30-59 in each destination urban area that was usually resident in the origin city five years ago. The dependent variable in the Poisson and negative binomial (Neg Bin) models is the migration flow. An observation is an origin-destination pair. The sample includes 31 cities, plus 'rural' (i.e. all New Zealand locations other than the 31 urban areas) and world (1,054 destination-origin pairs) over six censuses from 1986 to 2013. Distance is the 2013 driving distance between the origin and destination cities in km. All models include year fixed effects, dummies for rural to urban, world to urban, urban to rural, and urban to world, and a constant not shown. Standard errors clustered by origin-destination location pair in parentheses; *p<0.1, **p<0.05, ***p <0.01.

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