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Te Kōmihana Whai Hua o Aotearoa

Job-to-job transitions and the regional job ladder

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The New Zealand Productivity Commission

Te Kōmihana Whai Hua o Aotearoa[1]

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Careful consideration has been given to the privacy, security, and confidentiality issues associated with using administrative and survey data in the IDI. Further detail can be found in the Privacy impact assessment for the Integrated Data Infrastructure available from www.stats.govt.nz

[1] The Commission that pursues abundance for New Zealand

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Overview

This paper uses linked employee-employer data to examine the frequency with which workers change jobs in New Zealand, wage premiums associated with these job transitions, and the impact of house prices on worker mobility.

Transitions are measured annually (based on March-years) between 2000 and 2018 and show that:

- On average over a year 61% of workers remain in their jobs, 21% switch jobs, and 18% of workers exit the workforce. Job-to-job transitions are thus an important dimension of the labour market in New Zealand.
- In relation to the 21% of workers switching jobs, about 5 percentage points involve a change in firm but not region or industry. Of the remaining 16 percentage points, 4 percentage points involve a change in region only, 6 percentage points involve a change in industry only, and 6 percentage points involve a change in both industry and region.

This paper also breaks down these aggregate figures along several dimensions. For example, there are few differences in job-continuation rates among large and medium sized urban areas, but small and rural areas have lower job continuation rates, which largely reflect higher exit rates. In relation to job switches, while the share of workers making job switches in Auckland is little different to other regions, workers in this city are likely to remain in Auckland when they switch jobs. 76% of workers switching jobs in Auckland remain there, compared to 53% of workers switching jobs nationally remaining in their origin region. Conversely, in small cities and minor urban areas workers are likely to change regions when they change jobs (with only 23-29% of workers switching jobs remaining).

Looking at different time periods (particularly before and after the global financial crisis (GFC)), there was an increase in the continuation rate (which has tailed off but still remains high by historical standards) and a fall in the job-to-job transition rate. There was also a sizeable fall in the entry rate and, from 2012, a fall in the exit rate.

A second part of this paper estimates wage premiums associated with these job-to-job transitions. This analysis is complicated by the lack of data on hours of work – as it is not possible to fully distinguish transitions between part-time and full-time work. A proxy is thus used to capture these changes at low wage rates (ie, around minimum wage). This analysis shows that if workers move to other cities to take up new jobs the average wage premiums they earn are not particularly large. For all workers, stayers had real wage growth of 3.0%, while changers had growth of 4.6%. Auckland and Wellington have 1.5% and 1.3% wage premiums respectively above Christchurch.

These small wage premiums could reflect barriers to worker mobility in New Zealand. A third part of this paper thus investigates the relationship between worker mobility and house prices in New Zealand and finds that:

- Increasing relative house prices did not on aggregate slow worker mobility, although this partly reflected the relationship between house prices and consumption and productive amenities.
- When these amenity values were accounted for, then an increase in house prices does on average have a small negative effect on worker mobility.
- For particular industries, however, the effect can be significant, particularly for the agriculture, manufacturing, health and education industries.

1 Introduction

This paper uses linked employer-employee data to examine the frequency with which workers change jobs in New Zealand. The primary focus is whether workers in small centres climb the "job-ladder" differently than workers in large centres and whether these differences have implications for wage growth, productivity and inequality.

Why does the frequency of job changes matter? In the last two decades the greater availability of linked employer-employee data has allowed a greater understanding of the role of job-to-job transitions in influencing inequality, regional productivity, wage growth and even inflation (see Box 1).

Box 1 **Key findings from the international literature on job-to-job transitions**

- Direct job-to job transitions without a period of unemployment are the most common way workers move from one job to another. They are also the most common way that firms gain and lose employees and the main way workers move between industries. When workers leave one firm, half or fewer find a job in the same industry, while the rest switch industries (Golan, Lane and McEntarfer 2007; Bjelland et al., 2011).
- The frequency of shifting jobs is much higher for young workers and this is an important way workers increase their wages. While workers tend to move to higher paying firms, this often means shifting to small, young and growing firms (Haltiwanger et al., 2018). In Germany there has been a documented increase in the extent that these job-to-job transitions result in a movement of the best quality workers to the best quality firms (Card, Heining and Kline 2013).
- The type of work done in large cities and small cities has changed in the last three decades. The new jobs associated with the information revolution are disproportionately located in large cities, particularly those with large university-educated workforces. The number of educated workers has increased fastest in large cities and wage inequality has increased faster in big cities than small cities, as the relative renumeration of workers without tertiary education has disproportionately declined in large cities (Baum-Snow and Pavan 2013; Berger & Frey, 2016).
- In the U.S., the changing wage premiums for educated workers in large and small cities has led to a reduction in the flow of less-educated workers to big cities, with a resultant decline in the movement up the job ladder (Schleicher, 2017). In addition, middle-skill workers have increasingly found less skilled work in smaller cities (Autor, 2019).
- A large fraction of the increase in national wage inequality that has occurred since 1990 reflects differences in the wages paid by different firms (Barth et al 2016; Card, Heining and Kline 2013). There are increasing differences in the productivity levels of different firms operating in the same industry, and these are reflected in wages paid by different firms to ostensibly similar workers. Since job-to-job transitions are the main way workers find work in these firms, the quality of the matching process is an important determinant of the extent that individuals find productive, high-paying jobs.

The basic story is simple and revolves around the concept of a "job ladder." When workers enter the workforce, they are hired by an employer to do a particular job in a particular industry. This match is hardly ever perfect, and many workers subsequently find a different position in a different firm, sometimes doing a similar job in a similar industry, other times swapping occupations or industries, and, at least when young, climbing a job ladder in terms of skills, seniority and wages. Most of these employment changes take place as direct job-to-job transitions, with the person moving from one position to another without leaving the workforce or experiencing a period of temporary

unemployment. When workers change firms, the identity of the new firm and the overall quality of the match are very important as they have a large effect on a person's career and income.

While the issues in Box 1 provide the context for this paper, the paper does not directly address all of them. Rather, it analyses the extent that job-to-job transitions vary across different sized cities to ascertain if the way that these transition paths occur in different cities may explain aspects of their economic performance. The paper is organised into the following chapters. Chapter 2 describes the background information on the employment data and defines different types of job status. Chapter 3 shows descriptive statistics on job-to-job transactions. Chapter 4 reports regression analysis to estimate wage premiums associated with job-to-job transitions. Chapter 5 investigates whether high house prices are a possible barrier to work mobility. Chapter 6 concludes.

2 Defining job-to-job transitions

2.1 Data

The data in this paper are based on the linked employer-employee dataset created by Fabling and Maré (2015). The dataset comprises information concerning all paid jobs from March 2000 to March 2018 is taken from the Employer Monthly Schedule (EMS)[2]. These jobs are matched to the enterprises and plants recorded in the business register. The data measure the number of jobs, and the amount each staff member is paid, but the EMS does not include a vital component of labour inputs, the number of hours each employee works. To improve the measurement of firm labour inputs, Fabling and Maré (2015) derived an estimate of Full-Time Equivalent (FTE) employees using a plausible set of assumptions concerning workers' income, such as the statutory minimum wage and the hourly wage earned in sequential months. If a worker receives a lower monthly income than that which would be earned by a full-time worker earning the minimum wage, that worker is likely to be recorded as a part-time worker. However, these derived FTE measures may overstate the true labour input for a subset of workers (eg, workers who are paid at a high hourly rate and work less than 30 hours a week). Overall, we believe that these derived FTE measures are superior to the simple headcount measure that is often used, as it does not assume all workers work the same number of hours.

In this study, person-level job-to-job flows and job-earnings are analysed on an annual basis. This involves taking snapshots of workers' jobs and job-earnings during March months from 2000 to 2018 and comparing person-level job information between two adjacent years, such as March 2001 and March 2002. March-years are chosen because most New Zealand businesses use 31 March as the end of the accounting year.

For the period covered in this study the linked employer-employee database had a total of 35 943 300 unique person-jobs for workers aged 15 years old and over. However, to make the data comparable with overseas studies, three data filters were applied to exclude unwanted observations.

- The working-age population was restricted to workers aged between 18 and 64, as high-school and retiring workers have different work patterns than workers aged 18 to 64.
- All jobs that were paid less than $100 per month were dropped. We presume these low-paid jobs are temporary or one-off jobs and they are excluded as they are not the focus of the paper. If these jobs were included in the dataset, the noise in the job-to-job flow measures would increase.
- The third filter concerns workers with multiple jobs. In any month, approximately 8% of workers were recorded as having more than one job that earns more than $100 per month. Workers with two jobs were counted twice in our statistics. For example, someone who had jobs A and B at year *t* and job A at year t+1 would contribute one count to the number of workers continuing in the same job and one count to the number of workers exiting their job. Fewer than 1% of workers had three or more jobs and their jobs were ranked by income and the two highest paid jobs selected as their main jobs.

After applying these filters, 30 719 500 person-jobs remained in the final population pool.

While the job-to-job transition statistics are based on March employment data, a further adjustment is necessary to derive a useful series for the March month earnings. The LEED records an individual's taxable earnings received in each calendar month. Because calendar months have uneven numbers of days and pay periods (often weekly or fortnightly), earning levels are affected by the timing of pay and the number of pay period in a month. To address this, where possible we calculate an estimate of March earnings based on the average earnings in adjacent months. In the simplest case, March-month earnings are the average earnings in February, March and April. However, some workers may start or

[2] All New Zealand employers must submit the monthly schedule to the Inland Revenue Department. Self-employed workers and working proprietors are excluded from the data.

end their jobs in March and so their average earnings are calculated using previous or future earnings information where possible. For instance, if a worker starts his or her new job in March, their March-month earnings are equal to their average earnings in April, May and June. In this case the March-month earnings are excluded, as Fabling and Maré (2015) found earnings in start and end months are often not consistent with earnings in other months. For short-spelled jobs earnings are not averaged as past/future earnings cannot be observed.

To identify job locations, jobs were linked to plants. A plant is a business unit that engages in an economic activity in one location. Each plant's location is mapped into the area units in the 2013 Census. The economic activities at the plant level are recorded by the 2006 New Zealand Standard Industry Output Category (NZSIOC). In this study, we have 65 NZSIOC industries, which are a mix of two- and three-digit industry categories covering private and public industries.

In some cases, plants may be recorded as having changed their economic activities and/or locations. Approximately 37% of employing plants were recorded to have changed either their industry code or location at least once between 2000 and 2018. Most of these changes were associated with a switch to a similar economic activity or a relocation to a neighbouring area within the same urban area. Of the plants that changed their two or three-digit industry code, 92% remained in the same one-digit industry code. Similarly, 88% of plants that relocated remained in the same urban area.

There are some difficulties in dealing with plants that have changed their industry codes or locations. For example, if a plant changes its industry code from "cake and pastry manufacturing" to "biscuit manufacturing," a standard algorithm would indicate that the employees of the plant had changed jobs to another plant in a different industry and the same location. Since we do not want to record this as a job change, each plant is given a predominant industry code indicating the predominant industry and location for the whole period. This is the activity-location pair that had the highest accumulated number of employees over the period or, if plants had multiple locations with exactly same number of employees, the earliest recorded location. The industry code associated with the predominant plant location is set as the predominant industry for that plant.

The IDI database also includes supplementary data on ethnicity, age and gender. These data were included in our dataset to control for the effects of these person characteristics on earnings and job-to-job transitions.

2.2 Job-to-job transitions

This paper adapts the approach used by Golan, Lane and McEntarfer (2007) to estimate national and regional job-to-job transition flows. We make two changes to their procedure.

- First, they looked at job-to-job transitions in which workers either switched firms within the same industry or switched firms and industries. We subdivide each category to measure whether workers stay in the same city or switch city, creating four rather than two alternatives.
- Second, they used the "Generalised Cross Entropy" statistical technique to estimate transition matrices in a manner that takes into account mistakes and outliers in the reported data. We have not, reporting estimates of the transition matrices calculated directly from the raw data.

To explain the approach taken in the current paper in more detail, we estimate the following quantities:

T_t^j = the number of workers in city j at time t;

S_t^{ij} = the number of workers in industry i and city j at *t* who are in the same job at *t+1* (stayers);

X_t^{ij} = the number of workers in industry i and city j at t who are not in the workforce at *t+1* (exiters);

M_{klt}^{ij} = the number of workers who move firms and who were in industry i and city j at time *t* and industry k and city l and time *t+1* (movers); and

E_t^{ij} = the number of workers in industry i and city j at *t+1* who were not in the workforce at *t* (entrants).

The people who move firms are classified into four categories:

- Workers who change firms but stay in the same city and same industry;
- Workers who move to a job in a different industry but stay in the same city;
- Workers who change industries but stay in the same city; and
- Workers who change industries and cities.

Workers who changed jobs may or may not have change occupations for have different job tasks. For example, an accountant could move from a manufacturing firm to a primary school and do similar work; but a barista promoted to a hotel manager at a new job may be doing quite different tasks. Such information is not recorded and we do not disentangle between changes in jobs and changes in occupations.

The fraction of workers in each of the seven categories (stayers, stayers, entrants and four types of movers) is calculated by dividing the number of workers in each category by the number of workers in the city at time *t*. As percentage, the job-to-job transition rate is thus calculated as $(M_{klt}^{ij}/T_t^j \times 100)\%$. Note that the four categories of movers plus stayers and exits add up to 100%.

Our approach to calculate job-to-job transitions is illustrated in Table 1. In year *t* the population can be segmented into people in employment and people not in employment (unemployed people and people outside the labour market (non-participants)). In Table 1 it is assumed there are 100 (T_t^j) workers in employment in March of year *t*. We then measure the status of people in March in year *t+1* and in the example below 61 (S_t^{ij}) workers remained with the same firm over this year, 21(M_{klt}^{ij}) changed firms, and 18 workers exited the labour market. A number of people who were not in employment in March of year *t* took up jobs over this year (in the table this is 20 (E_t^{ij}) workers). We measure these entrants to give us the people in employment in March of year *t+1*, which is the sum of the entrants and the number of people in continuing employment. We then repeat this exercise for later years.

Table 1 Illustration of job-to-job calculations

		Status at *t+1*			
		Continuing employed		Exits (to unemployment and non-participation)	Entrants
Status at *t*	Employed (100)	Stayers	Job-to-job transitions (movers)		
		61	21	18	
	Unemployed and non-participants				20

As stated above, we calculate the job-to-job transition rate as the number of job transitions between *t* and *t+1* divided by the number of people employed at *t*. Note that we use employment at time *t* as the denominator rather than employment at *t+1*. Note also that we calculate the transition rate as a share of total employment not simply the share of continuing employment (which excludes exits from the denominator). When employment at time *t* is used as the denominator, the continuation, exit and job-to-job transition rates indicate the fraction of workers in a city who maintain or change their work status. These measures are not directly affected by the growth rate of the city. In contrast, if the denominator were employment at time *t+1*, the measures would indicate the fraction of people in jobs who had their jobs in the previous year or who were new to their jobs, these fractions will depend on whether the city is growing slowly or rapidly. To illustrate, consider a fast-growing and slow-growing city with the same

number of employees at time *t*. If employment at *t+1* were used as the denominator, the fast-growing city would be recorded as having a smaller fraction of workers continuing in the same job than the slow-growing city even if the fractions of people who were employed at time *t* who stayed in the same job were the same. This is simply because the total number of jobs is increasing in a fast growing city. As there is considerable diversity in city growth rates in New Zealand, with many slow growing cities and a few fast growing cities, using employment at time *t* as the denominator allows a better cross-city comparison of the extent that workers in different cities have different job-to-job transition rates.

3 Descriptive statistics on job-to-job transitions

3.1 National average

Table 2 presents the average transition matrices for all workers in New Zealand plus separate results for males and females disaggregated into three age groups. While there is a distinctive age pattern, discussed below, there are only small differences between male and female transition rates. Women are slightly less likely to stay in a job than men (particularly for younger women) and they have slightly higher entry and exit rates, but the differences are small.

Table 2 Job-to-job transition rates by demographic group (2000-2018)

Age	Stayers (%)	Same industry (%)			Different industry (%)			Exit (%)	Entry (%)	Number of jobs
		Same location	Different location	Total	Same location	Different location	Total			
					Female					
18–24	40.3	5.7	4.5	10.2	11.3	8.9	20.2	29.3	41.9	2 406 400
25–54	63.3	5.1	4.2	9.3	6.0	4.6	10.6	16.9	18.4	10 693 100
55–64	69.1	3.9	3.6	7.5	2.9	2.5	5.4	17.9	9.9	2 145 700
					Male					
18–24	45.5	5.1	4.1	9.2	10.7	9.3	20.0	25.3	39.0	2 723 000
25–54	65.4	4.2	4.1	8.3	6.3	5.8	12.1	14.3	15.2	10 747 000
55–64	68.8	2.8	3.4	6.2	3.6	3.7	7.3	17.6	9.7	2 004 300
					New Zealand					
All	61.4	4.6	4.1	8.7	6.5	5.6	12.1	17.8	19.8	30 719 500

Source: Authors' calculations using Linked Employer-Employee Database

Notes:

1. The numbers of jobs in the last column are rounded randomly for confidentiality. There is thus likely to be some small variation in the total number of person jobs in New Zealand in different tables

On average 61.4% of workers in employment remained in the same job over a year, 20.8% (12.1% + 8.7%) of workers moved jobs, and 17.8% of workers exited the labour force. Job-to-job transitions thus accounted for a larger share of labour market flows than shifts from employment into unemployment or non-participation, although for workers aged 55+ the proportion of exits was higher than that of job transfers. Overall these rates of job-to-job transitions were comparable to those found in the United States (Golan, Lane and McEntarfer, 2007).

Of the 20.8% switching to a different firm, 8.7 percentage points switched to a firm in the same industry and 12.1 percentage points switched industries. For each of these groups, roughly 47% of job changes involve moving to a new location. Such regional shift rates vary by city and are quite different in Auckland than elsewhere.

Young workers (workers aged 18–24) were more mobile than older workers. The fraction of young workers staying with the same firm was about 20 percentage points lower than the fraction of workers aged 25–54. This largely reflected higher exit rates and more frequent shifts in the industry they work in.

In contrast, 70% of workers aged 55–64 were in the same job after a year, and while they have broadly similar exit rates to workers aged 25–54, they were less likely to move to firms in other industries.

3.2 Regional patterns

Table 3 shows the transition matrices for nine regional groups: Auckland; Wellington; Christchurch; medium-sized cities (split into those that grew quickly and those that grew slowly);[3] small cities and towns (also split into those that grew quickly and those that grew slowly);[4] minor urban areas with populations between 1 000 and 9 999; and rural areas. Transition matrices are calculated for all industries and (in Table 4) for a subset of non-tradeable industries that are present in similar ratios in all cities.

Table 3 Job-to-job transition rates by city groups (2000-2018, all industries)

Origin region	Stayers (%)	Same industry (%)			Different industry (%)			Exit (%)	Entry (%)	Number of jobs
		Same location	Different location	Total	Same location	Different location	Total			
Auckland	62.1	6.3	2.1	8.4	9.2	2.9	12.1	17.4	19.8	10 068 500
Wellington	62.9	4.9	4.0	9.0	6.7	4.8	11.6	16.5	17.6	3 342 900
Christchurch	62.8	4.5	4.0	8.6	6.9	5.3	12.2	16.4	18.2	3 059 600
Medium cities (fast)	61.4	3.5	5.3	8.8	5.5	6.8	12.3	17.5	19.8	4 284 200
Medium cities (slow)	63.1	3.2	5.1	8.4	5.3	6.4	11.7	16.9	18.5	3 128 900
Small cities (fast)	55.5	2.8	6.8	9.5	3.7	8.6	12.2	22.7	25.8	1 748 400
Small cities (slow)	57.4	1.9	6.3	8.2	3.1	10.3	13.4	21.0	22.5	380 700
Minor urban	61.6	2.4	6.6	9.0	3.2	8.0	11.1	18.3	20.0	1 994 600
Rural areas	55.9	4.9	4.7	9.6	4.4	8.8	13.2	21.4	23.6	2 711 300
New Zealand	61.4	4.6	4.1	8.7	6.5	5.6	12.1	17.8	19.8	30 719 100

Source: Authors' calculations using Linked Employer-Employee Database

Notes:

1. The numbers of jobs in the last column are rounded randomly for confidentiality. There is thus likely to be some small variation in the total number of person jobs in New Zealand in different tables

The transition matrices for large cities, medium cities, and minor urban areas have similar continuation, exit, and entry rates. Between 61% and 63% of workers are in the same job after a year, between 16% and 18% leave the workforce, and between 18% and 20% of jobs are filled by entrants.

Small cities and rural areas have exit and entry rates that are about 5 percentage points higher and, correspondingly, continuation rates about 5 percentage points lower. The low continuation rates in small cities and rural areas may reflect the disproportionately large fraction of workers in agricultural industries for, as we show below, these have high entry and exit rates. The differences between large, medium and small cities are less marked for non-tradeable industries than for all industries.

[3] The split was made according to the average growth rate between 1976 and 2013. The fast-growing medium-size cities are Blenheim, Hamilton, Kapiti, Nelson and Tauranga. The slow-growing medium-size cities are Dunedin, Gisborne, Invercargill, Napier-Hastings, New Plymouth, Palmerston North, Rotorua, Timaru, Wanganui, and Whangarei.

[4] The split was made according to the average growth rate between 1976 and 2013. The fast-growing small-size cities are, Queenstown, Rangiora and Taupo. The slow-growing medium-size cities are Ashburton, Fielding, Greymouth Hawera, Levin, Masterton, Oamaru, Tokoroa, and Whakatane.

Table 4 Job-to-job transition rates by city groups (2000-2018, non-tradable industries)

Origin region	Stayers (%)	Same industry (%)			Different industry (%)			Exit (%)	Entry (%)	Number of jobs
		Same region	Different region	Total	Same region	Different region	Total			
Auckland	62.6	7.0	2.1	9.0	8.5	2.8	11.3	17.0	19.6	4 211 600
Wellington	64.5	4.8	3.7	8.5	6.2	4.4	10.7	16.3	17.4	1 445 700
Christchurch	63.5	5.1	4.1	9.1	6.2	4.7	10.9	16.5	18.6	1 114 200
Medium cities (fast)	64.2	4.1	5.2	9.3	4.9	5.8	10.7	15.8	17.8	1 174 800
Medium cities (slow)	66.3	3.5	4.8	8.3	4.6	5.6	10.2	15.2	16.6	1 556 600
Small cities (fast)	61.2	1.8	7.4	9.2	3.3	7.8	11.2	18.4	20.5	144 300
Small cities (slow)	66.2	2.5	6.6	9.1	3.4	6.4	9.8	14.9	16.0	546 100
Minor urban	65.7	2.5	6.6	9.1	2.9	6.3	9.3	15.9	17.3	819 500
Rural areas	60.9	2.3	9.2	11.6	3.0	6.6	9.6	17.9	20.0	425, 500
New Zealand	63.9	5.0	4.1	9.0	6.2	4.5	10.7	16.4	18.3	11 438 300

Source: Authors' calculations using Linked Employer-Employee Database

Notes:

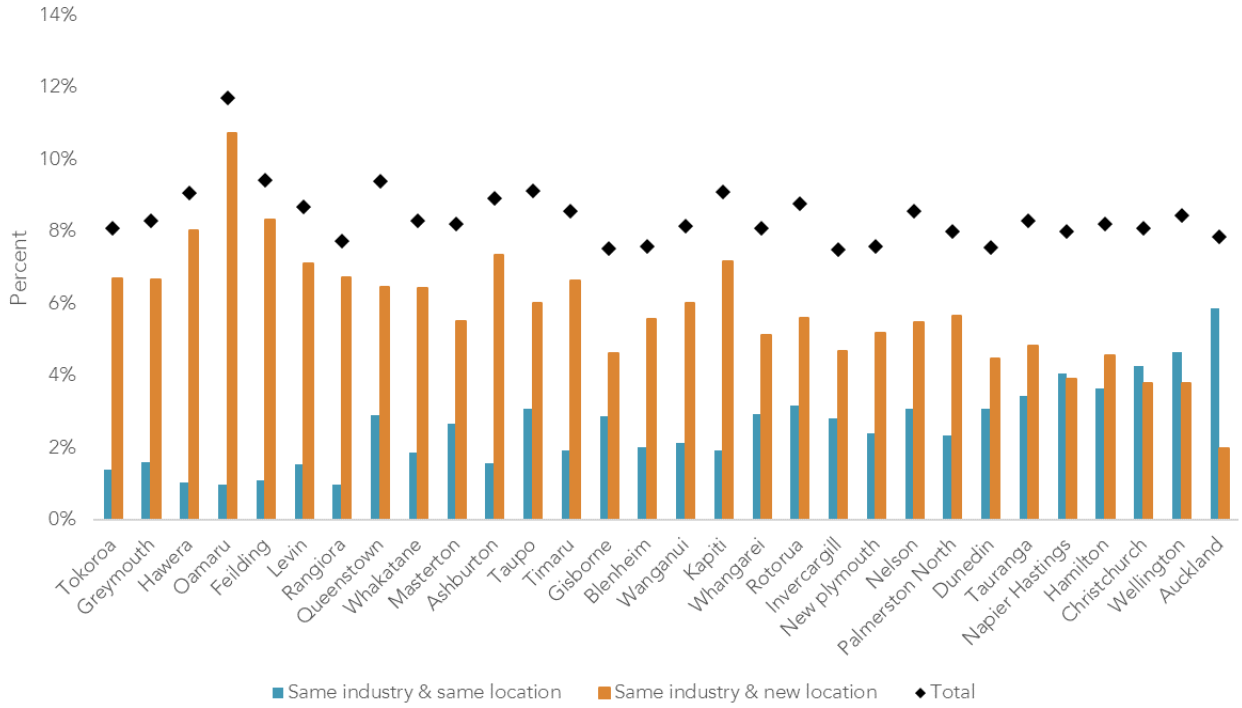
1. The numbers of jobs in the last column are rounded randomly for confidentiality. There is thus likely to be some small variation in the total number of person jobs in New Zealand in different tables
2. Coleman and Zheng (2019) rank industries by standard deviations of the location quotients across urban areas and allocate industries below the medium to the non-tradable category. Non-tradable industries are often unevenly distributed across locations, such as restaurants, schools and hospitals

The transition rates for the number of workers moving firms within the same industry and the number of workers moving to firms in different industries are very similar across city sizes. Each year about 9% of workers move to a job in another firm in the same industry, and 11% move to a firm in a different industry. There is a large difference, however, in the fraction of workers moving cities, which decreases with the size of cities:

- In Auckland, 75% of the 9% of workers who moved to different firms in the same industry stayed in Auckland and 25% moved to other cities;
- In slowly growing small cities, less than 40% of the 9.1% of workers who moved to different firms in the same industry stayed in the same city;
- Similarly, 75% of the 11.3% of workers who switched industries in Auckland stayed in Auckland and 25% moved to other cities, whereas in slowly growing small cities 65% of the workers who switched industries also moved cities; and
- Medium cities had a similar pattern to small cities, with a majority of workers changing jobs also changing cities.

Figures 1 and 2 show the relationship between urban size and the moving rates in more detail.

Figure 1 Job-to-job transition rates on workers who remain in the same industry (2000-2018)

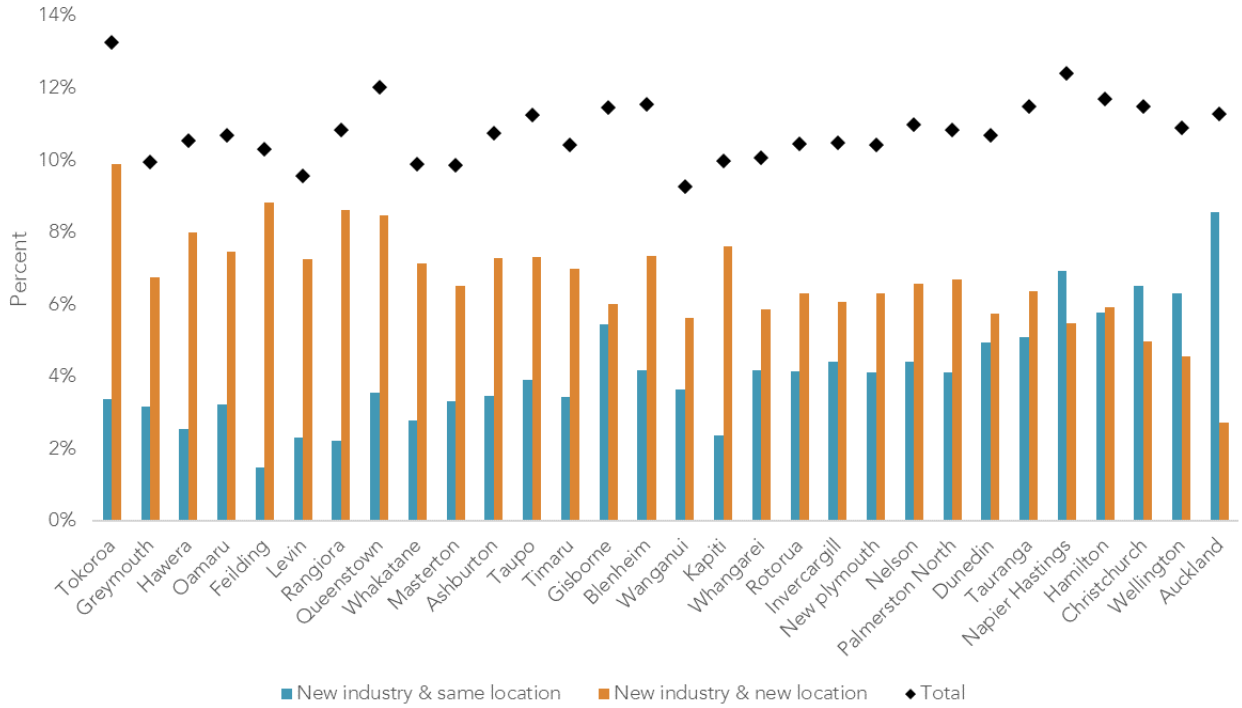


Source: Authors' calculations using Linked Employer-Employee Database

Notes:

1. Cities are ordered from the smallest (left) to largest (right) population in Census 2013

Figure 2 Job-to-job transition rates on workers who change industries (2000-2018)



Source: Authors' calculations using Linked Employer-Employee Database

Notes:

1. Cities are ordered from the smallest (left) to largest (right) population in Census 2013

The figures show that the overall rates of moving are similar across cities but that smaller cities have a much larger fraction of workers moving cities when they change jobs. It is perhaps not surprising that workers living in small cities who want to stay in the same industry change locations when they move

firms, because there are fewer alternative firms in any industry in small cities. However, workers in small cities are also more likely to change cities when they get a new job in a different industry than workers in large cities. The difference in the fraction of workers moving cities when they move firms is the most noticeable way that job-to-job transition rates depend on city size.

Table 3 and Table 4 can be used to compare the job-to-job transition rates of all industries with the subset that are non-tradeable. We have focused on non-tradeable industries because they are found in all locations in approximately equal fractions. To identify non-tradeable industries, we:

- first calculated the location quotient for each city-industry combination, which is the fraction of the city's employees in an industry relative to the national fraction of employees in that industry; and
- then calculated the cross-city variance of the location quotients for each industry and chose the 17 out of 65 industries with the lowest variance.

These industries, which include retailing, health, and education, account for about 40% of all employment.[5]

Since these non-tradeable industries are found everywhere in similar proportions it may be imagined that there is less of a need to move cities if a worker wants to switch firms without changing industries. However, this is not the case. Table 4 shows that the transition rates for non-tradeable industries are similar to those of the whole economy. There is little difference between the fractions of workers changing firms but remaining in the same industry for non-tradeable industries and the total economy. In each case there is the same tendency for workers in small towns and cities to move to another city when they shift firms, irrespective of whether they stay in the same industry or move to a different industry. The results also indicate that workers in non-tradeable industries are slightly more likely to remain in the same firm than other workers and less likely to switch industries. In Section 3.3 this is traced to the high continuation rates in the government, health, and education industries.

Where do workers move to if they find jobs in a different city? Two general patterns of inter-region movements are observed in our data. The first pattern is a disproportionately large inflow of workers to Auckland, Wellington and Christchurch from elsewhere. 53% of workers relocate to one of these three major cities. This could reflect the role of agglomeration effects in shaping job opportunities, skill matching and improved social and environmental benefits for workers. The second pattern is that most of inter-regional movements are over short distances. For example, the top three destinations of Ashburton workers are Christchurch (42.3%), Timaru (12.3%) and Dunedin (10.7%). Distance in this context is usually taken as a proxy for complex migration costs, such as commuting time and cultural differences. Such short-distance moves are common in many international studies (Australian Productivity Commission (2014); Arpaia et al., (2016)), indicating that the majority of workers will move to adjacent regions which provide easier to access jobs.

3.3 Industry patterns

Table 5 presents job-to-job transition rates for different industries arranged into 16 one-digit industries.[6] The transition rates are similar across most industries. In most industries, 56–68% of workers stay with the same firm from year to year, 5–10% of workers move firms and stay in the same industry, and 10–16% of workers switch industries each year.

[5] See Coleman, Maré and Zheng (2019) for a list of these industries.
[6] The results are calculated at the 65 industry level and then arranged into the one-digit industry level.

Table 5 Job-to-job transition rates by industry (2000-2018)

Industry	Stayers (%)	Same industry (%)			Different industry (%)			Exit (%)	Entry (%)	Number of jobs
		Same location	Different location	Total	Same location	Different location	Total			
Agriculture	46.6	6.9	2.7	9.5	6.4	9.0	15.4	28.5	31.6	1 599 900
Mining	65.8	2.4	3.9	6.2	4.3	10.2	14.5	13.5	12.5	88 200
Manufacturing	68.3	2.1	3.4	5.6	6.7	6.1	12.8	13.3	13.1	3 849 900
Utility	66.8	2.1	4.1	6.2	6.9	7.4	14.3	12.7	12.9	196 500
Construction	63.5	3.6	4.0	7.6	6.1	6.1	12.3	16.6	18.8	1 873 400
Wholesale trade	66.9	2.1	3.1	5.2	7.8	6.6	14.3	13.6	13.8	1 651 500
Retail trade and accommodation	52.5	5.6	3.9	9.5	8.7	6.3	15.0	23.0	28.7	4 846 700
Transport and warehousing	64.6	3.7	5.1	8.7	6.2	5.9	12.1	14.6	14.4	1 330 600
Telecommunication	63.7	4.2	4.0	8.2	8.2	4.6	12.8	15.2	14.8	612 600
Bank and finance	66.0	5.7	6.2	11.8	5.6	3.9	9.5	12.7	11.6	865 000
Rental and real estate services	56.8	3.1	2.6	5.7	9.5	7.0	16.5	20.9	23.1	419 200
Professional, science, computing	56.2	3.7	3.2	6.9	9.3	6.6	15.9	21.0	24.6	3 938 800
Central and local government	68.9	5.2	6.3	11.5	4.9	4.0	8.9	10.7	10.9	1 632 600
Education	66.7	7.3	5.7	13.0	3.1	2.5	5.6	14.7	15.7	2 913 800
Health	68.0	6.5	5.2	11.7	2.9	2.2	5.1	15.2	16.2	3 165 800
Recreational and other services	62.8	3.4	2.2	5.6	7.6	4.9	12.5	19.2	21.3	1 544 100
New Zealand	61.4	4.6	4.1	8.7	6.5	5.6	12.1	17.8	19.8	30 528 600

Source: Authors' calculations using Linked Employer-Employee Database

Notes:

1. The number of jobs in the last column are rounded randomly for confidentiality. These is thus likely to be some small variation in the total number of person jobs in NZ in different tables

The first exception is workers working in the Government, education, and health industries, which account for approximately 22% of total employment. Workers in these industries are 5.3 to 7.5 percentage points more likely than average to stay with the same firm. Workers in the health and education industries have relatively low rates of job-switches and when they do switch firms they are relatively likely to remain in the same industry (with job shifts out of their industries being 6.5 to 7 percentage points below the New Zealand average). Industry changes are also relatively low for workers in central and local government.

The second exception is industries with much higher transition rates than average, notably the agricultural industries, the retail and accommodation industries, and to a lesser extent the real estate and rental industries. These industries have much lower than average continuation rates, and higher than average exit rates and transition rates to other industries. These industries are characterised by lower than average pay rates, higher than average part-time employment, and they often hire foreign workers on a temporary basis.

3.4 Time patterns

U.S. evidence indicates that job-to-job transition rates and the rates of wage growth for moving and incumbent workers decline during recessions (Hyatt and McEntarfer 2012; Bjelland et al 2011; Haltiwanger et al 2018). In New Zealand, Fabling & Maré (2012) showed the rate of job destruction increased and the job creation rate decreased after the onset of the Global Financial Crisis. To examine the size of this effect we calculated job-to-job transition rates on an annual basis, and then split the period into three subperiods: 2001-2008; 2008-2012, when unemployment increased sharply; and 2012-2018 when the economy steadily recovered and unemployment reduced to its earlier levels.

Table 6 Job-to-job transition rates by year (2000-2018)

Year	Stay (%)	Same industry (%)			Different industry (%)			Exit (%)	Entry (%)	Number of jobs
		Same location	Different location	Total	Same location	Different location	Total			
2000-2001	59.20	4.70	3.40	8.10	7.70	5.70	13.50	19.20	21.20	1 426 000
2001-2002	59.40	4.80	3.80	8.60	7.50	6.10	13.50	18.50	21.40	1 454 200
2002-2003	61.50	4.40	3.40	7.90	7.00	5.60	12.60	18.00	21.40	1 496 700
2003-2004	60.90	4.60	3.80	8.40	7.20	5.70	13.00	17.70	21.80	1 547 600
2004-2005	60.70	4.50	3.60	8.10	7.50	5.80	13.20	18.00	21.40	1 611 900
2005-2006	59.50	4.80	3.90	8.70	7.30	5.90	13.20	18.60	20.60	1 668 100
2006-2007	59.40	4.70	3.90	8.60	7.20	5.80	13.00	19.00	20.30	1 701 100
2007-2008	59.40	4.60	4.00	8.60	7.30	6.00	13.30	18.80	20.60	1 724 900
2008-2009	60.90	4.20	3.50	7.80	6.40	5.40	11.80	19.50	18.30	1 755 600
2009-2010	60.80	5.70	5.30	11.0	5.50	4.80	10.30	17.90	17.80	1 734 200
2010-2011	61.90	4.80	4.70	9.40	5.90	5.10	11.00	17.70	18.80	1 732 200
2011-2012	62.10	4.50	4.20	8.70	5.80	5.20	11.00	18.30	17.80	1 750 200
2012-2013	63.90	4.30	4.00	8.30	5.60	5.10	10.70	17.00	18.80	1 740 000
2013-2014	64.00	4.20	3.90	8.10	6.00	5.30	11.30	16.60	19.00	1 771 300
2014-2015	63.90	4.50	4.00	8.60	6.00	5.30	11.30	16.30	19.60	1 813 200
2015-2016	63.30	4.50	4.30	8.80	6.00	5.40	11.40	16.50	19.60	1 871 800
2016-2017	62.20	4.40	4.70	9.10	6.20	5.90	12.10	16.60	19.80	1 928 300
2017-2018	61.20	4.30	4.60	8.90	6.30	6.20	12.50	17.50	19.30	1 991 600
2000-2008	60.00	4.60	3.70	8.40	7.30	5.80	13.20	18.50	21.10	12 630 500
2008-2012	61.40	4.80	4.40	9.20	5.90	5.10	11.00	18.30	18.20	6 972 200
2012-2018	63.10	4.40	4.20	8.60	6.00	5.50	11.60	16.70	19.30	11 116 200
New Zealand	61.40	4.60	4.10	8.70	6.50	5.60	12.10	17.80	19.80	30 528 600

Source: Authors' calculations using Linked Employer-Employee Database

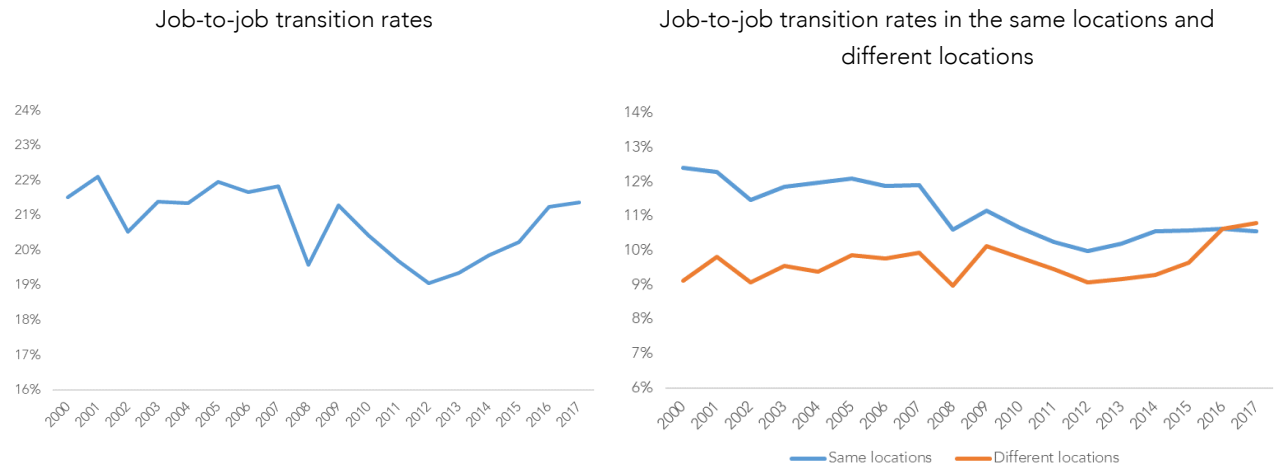
Notes:

1. The numbers of jobs in the last column are rounded randomly for confidentiality. There is thus likely to be some small variation in the total number of person jobs in New Zealand in different tables.

The results reported in Table 6 show that job-to-job transition rates changed modestly. The fraction of workers staying their jobs increased from 60% between 2000 and 2008, to 61% from 2008 and 2012, and

then to 63% between 2012 and 2018. There were corresponding reductions in the entry and exit rates. The job-to-job transition rate (left panel in Figure 3) fell from the peak at 22.1% in 2001 to 19.1% in 2013 and recovered to 21.4% in 2017. The declining job-to-job transition between 2000 and 2013 was heavily driven by the downward trend in job-to-job transition within the same locations (right panel in Figure 3). In the last four year, increasing job transitions across locations helped boost the overall job-to-job transitions. These findings show an interesting trend that New Zealand workers have changed their preferences on job changes from job changes within the same area to job changes across space.

Figure 3 Job-to-job transition rates, 2000-2018



Source: Authors' calculations using Linked Employer-Employee Database

Notes:

1. Job-to-job transition rate in same locations is the sum of job transitions in the same location and same industry and the same location and different industry.
2. Job-to-job transition rate in different locations is the sum of job transition in different location and same industry and different location and different industry.

The post-2008 decline in job-to-job transition rates reported here is lower than that reported by Karagedikli (2018). One reason for the difference is that the transition rates in this paper are calculated on an annual basis and so workers who make multiple transitions within a year are counted only once in our study. Further, Karagedikli (2018) expressed the job-to-job transition rate as job switches as a proportion of continuing employees (thus excluding exits), while the rates in this paper are expressed as a share of total employment at the beginning of the March-year. Nonetheless, both papers indicate that the global financial crisis had an effect on labour market dynamics that persisted for several years.

3.5 Employment transition status

Table 7 shows the job transitions that workers make between two successive time periods (times *t* and *t+1*) by their workforce status.

- Their "previous workforce status" depends on what they were doing at time *t* relative to what they were doing at time *t-1*: were they in the same job in both periods (stayers); if not, had they changed industry or location between *t-1* and *t* (the four categories of movers); or were they new entrants to the workforce at time *t* (entrants)?
- Their "current workforce status" depends on what they were doing at time *t+1* relative to what they were doing at time *t*. In this case workers can be identified as either stayers, movers, or exiters (people who had exited the workforce).

The first row of Table 7 shows the job-to-job transition rates from year *t* to year *t+1* for workers who had the same job in year *t-1* as they did in year *t*, ie, for workers who were in the same job for at least a year. The continuation rate for this group is 73%, relative to 62% for all workers; it is almost identical to that in the US (Golan, Lane and McEntarfer 2007). Workers in this group were 6 percentage points less likely to

exit (12% versus 18%) and 5 percentage points less likely to switch to a different job (16% versus 21%) than average.

The workers who were not employed in the same job in year *t-1* and year *t* can be split according to whether they were previously not in the workforce or previously in the same or a different industry, and the same or different location. In each case the continuation rates were lower than for the more stable workers; but the most interesting aspect of the table is the heightened tendency for workers who make one type of switch one year to make a similar switch in the following year. From Table 7, it is apparent that:

- 37% of entrants to the workforce at time *t* leave by *t+1* (national average 18%);
- 15% of workers who moved jobs but stayed in the same industry and the same city between *t-1* and *t* made a similar move between *t* and *t+1* (national average 5%);
- 17% of workers who switched jobs and stayed in the same industry but moved city between *t-1* and *t* made a similar move between *t* and *t+1* (national average 4%);
- 17% of workers who moved jobs and switched industry but stayed in the same city between *t-1* and *t* made a similar move between *t* and *t+1* (national average 6%); and
- 19% of workers who moved jobs and switched industry and moved city between *t-1* and *t* made a similar move between *t* and *t+1* (national average 6%).

Table 7 Job-to-job transition rates by previous employment status (2000-2018)

Current employment status → Previous employment status ↓	Stayers (%)	Movers (same industry, same location) (%)	Mover (same industry, different location) (%)	Mover (different industry, same location) (%)	Mover (different industry, different location) (%)	Exiters (%)	Number of jobs
Stayers	72.50	3.90	3.40	4.80	3.70	11.70	17 652 300
Mover (same industry, same location)	53.90	15.10	4.50	7.30	3.40	15.80	1 323 200
Mover (same industry, different location)	52.40	4.90	17.00	3.30	7.80	14.60	1 163 300
Mover (different industry, same location)	51.90	5.20	2.30	17.30	6.20	17.10	1 882 000
Mover (different industry, different location)	45.90	2.80	6.10	7.20	19.40	18.60	1 583 200
Entrants	38.60	4.50	3.60	8.30	7.40	37.40	5 694 900
New Zealand	61.50	4.60	4.10	6.50	5.60	17.70	29 298 900

Source: Authors' calculations using Linked Employer-Employee Database

These results suggest that there is a large number of workers who have stable work histories and who change jobs much less frequently than average, and another smaller group of workers who are often changing jobs or move in and out of the workforce.

4 Job-to-job transitions and wage premiums

The international literature indicates that a majority of workers changing jobs obtain higher wages (Bjelland et al 2011; Hyatt and McEntarfer 2012; Haltiwanger et al 2018). While a large number of job-to-job transitions involve wage reductions, the average wage increase associated with a job change in the United States in non-recessionary times is between 5% and 10% (Bjelland et al 2011; Hyatt and McEntarfer 2012). This rate is considerably higher than that estimated for New Zealand by Hyslop & Maré, (2009). They estimated that the average wage increase associated with a job-to-job transfer was less than 2% and they further estimated that most workers who changed jobs had smaller wage increases than the workers who did not change. In this section we examine the wage increases associated with job-to-job transitions. Our focus is on the extent that workers who changed cities and industries obtained different wage increases than workers who changed jobs but stayed in the same city or industry.

4.1 Methodology

To estimate the wage premiums associated with job changes, we have selected from all of the job-to-job transitions in the database and regressed the percentage change in wages against a set of explanatory variables that include age and gender, whether the origin and destination jobs are part-time or full-time, whether the person has changed industry or city, the size of the employing firm in both years, the year, and the origin and destination cities and the origin and destination one-digit industries. This is shown in equation (1):

$$\ln\left(\frac{W^d_{it+1}}{W^o_{it}}\right) = a_0 + \sum_m a_m I^m_{it} + \sum_k \pi_k I_{ikt} + \sum_n \lambda_n DFTE^n_{it} + \rho_1 I^o_{ikt} + \rho_2 I^d_{ikt+1} + \sum_c \gamma^o_c I^o_{ict} + \sum_c \gamma^d_c I^d_{ict+1} + \sum_s \delta^o_s I^o_{ist} + \sum_s \delta^d_s I^d_{ist+1} + \sum_f \phi^o_f I^o_{ift} + \sum_f \phi^d_f I^d_{ift+1} + X_{it}\beta + I_t + \varepsilon_{it} \quad (1)$$

The variables are:

- W^o_{it} and W^d_{it+1} are the real wages in the origin and destination jobs for person *i*.
- I^m_{it} is a set of indicator variables indicating one of the four job-to-job transition categories. Workers who change firms but stay in the same city and same industry serves as the reference category.
- I_{ikt} is a set of indicator variables on employment switching between full-time and part-time jobs. There are four categories: full-time to full-time, full-time to part-time, part-time to part-time and part-time to full-time. "Full-time to full-time" serves as the reference category.
- $DFTE^n_{it}$ is a set of indicators of changes of hours of work (FTE or part-time) between jobs. To capture the non-linear relationship between wage growth and hours of work, linear, quadratic and cubic terms of DFTE are included.
- I^o_{ikt} and I^d_{ikt} are indicator variables for short-spelled jobs in origin and destination locations.
- I^o_{ict} and I^d_{ict} are a set of indicator variables for the origin and destination locations of person *i*. All cities and towns are grouped into nine broad geographic locations, including Auckland, Wellington, Christchurch, fast-growing medium cities, slow-growing medium cities, fast-growing small cities, slow-growing small cities, minor urban areas, and rural areas. Christchurch at both original and destination locations serves as the reference category because its industry structure is the most similar to New Zealand as a whole.

- I^o_{ist} and I^d_{ist} are a set of indicator variables for the origin and destination one-digit industries of person *i*. There are 16 industries, including agriculture, mining, manufacturing, electricity, waste and water supply, construction, wholesale, retail trade and accommodation, transport and warehousing, telecommunication, finance and baking, rental and real estate services, professional and administrative business services, central and local government, education, health and recreational and other services. Manufacturing serves as the reference category at both origin and destination industries.
- I^o_{ift} and I^d_{ift} are indicator variables for the size of the firm employing person *i*. The firm size variables include six categories: firms with 1-4 employees; those with 5-9; those with 10-19; those with 20-49; those with 50-99; and those with 100 and over. Firms with 1-5 employees serves as the reference category.
- X_{it} are the personal attributes of person *i*, including their age, gender and ethnicity.
- I_t are time dummies to control for common economic shocks and ε_{it} are idiosyncratic errors, which are assumed to have normal, independent and identical distributions.

The results of these regressions are reported in the sections below. The key parameters are premiums of wage changes associated with (i) different types of job transitions, a_m (ii) origin and destination locations, γ^o_c and γ^d_c, (iii) industries at both origin and destination jobs, δ^o_s and δ^d_s, and (iv) firm sizes at both origin and destination jobs, ϕ^o_f and ϕ^d_f.

4.2 Descriptive statistics

We analyse real wage changes in successive years by deflating a person's nominal change in wages by the annual change in the Consumer Price Index (CPI). Since workers who do not change jobs are likely to be systematically different than those who do change jobs, most of the empirical results we present are restricted to workers who change jobs. Nonetheless, we begin by contrasting the wage changes of workers who did not change jobs with the workers who did change jobs, splitting the latter into four categories according to whether a person changed industries and/or locations when they changed jobs.

The data do not contain information on hours worked. This is problematic as we do not know if a change in wage earnings occurred because of a change in wage rates or a change in hours. The problem is particularly acute if a person moves from part-time work to full-time work or vice-versa. To partially circumvent this issue, we make use of a Full-Time Employment (FTE) indicator variable to indicate whether or not a person earned less than could be earned by a full-time worker on the minimum wage. If someone earned less than this amount, they were deemed to be a part-time worker (FTE<1); otherwise they were deemed to be full-time (FTE=1), even though it is clearly a possibility that they were part-time workers earning a higher hourly wage.[7]

While the full-time status variable is subject to error, the part-time status variable provides a reasonably accurate indication of whether a person earned less than a minimum full-time income in a particular period. The numbers of workers in each category, which are indicated in Table 8, are quite different for workers who stay in the same job and workers who change jobs, and this accounts for some of the difference in average annual wage growth. We use the FTE indicator variable in our analysis to make an adjustment for wage changes involving at least one very low income.

Table 8 shows the annual real wage changes for workers in the four job-to-job transition categories and contrasts these changes with those of workers who stayed in the same job.[8] The data are presented for all workers and for workers sorted into four employment-hours status categories in successive years (full-time both years; part-time then full-time; full-time then part-time; part-time both years). The

[7] The variable was created by Fabling and Maré (2015) and is based on the person's reported earnings. In essence, if a person earns less than can be earned by a full-time worker on the minimum wage, the person is considered to be a part-time worker.

[8] The wage change is log differenced wages. Wage changes that are less than -3% or greater than 3 are excluded

fractions in each employment-hours category differ across the four job-to-job transition categories and this variation is an important determinant of average wage changes. For instance:

- Of the workers who did not change jobs, 71% were always full-time, 17% were always part-time, and 6% each changed from full-time to part-time status or vice versa.
- Of the workers who changed jobs, 48% were always full-time, 23% were always part-time, 11% switched to part-time status and 17% switched to full-time status.
- The workers most likely to switch from part-time to full-time status were those who changed industries when they changed jobs.

Table 8 Real wage growth rates by job-to-job transition status (2000-2018)

	Number	Unadjusted wage growth (%)	Full-time wage growth (%)	Adjusted wage growth (%)	FT to FT (%)	FT to PT (%)	PT to FT (%)	PT to PT (%)
Stayers	18 838 100	3.0	2.9	3.0	71	6	6	17
Movers: same industry, same location	1 403 500	5.8	4.1	3.1	52	10	14	23
Movers: different industry, same location	1 993 200	13.0	4.6	6.5	44	12	20	25
Movers: same industry, different location	1 250 100	4.2	3.6	2.3	57	10	13	20
Movers: different industry, different location	1 636 000	10.9	3.7	5.2	43	13	20	24
All job transitions (all movers)	6 282 800	9.1	4.1	4.6	48	11	17	23

Source: Authors' calculations using Linked Employer-Employee Database

Notes:

1. Nominal wages are deflated by the CPI
2. Wage growth rates over 300% (increases or declines) are classified as outliers and subsequently dropped for our calculations
3. Adjusted wage growth is predicted wage growth after controlling change of FTE and short job spells at both time *t* and *t+1* by an OLS regression

Many job changes are thus likely to involve a change in employment hours. Simple averages of wage changes ignore these changes in hours and so return unreliable measures of wage premiums on job transitions. Table 8 thus presents two alternative measures of wage changes: one based on wage changes for full-time workers only and one based on regression-adjusted wage data.

Estimates based on wage growth for people in full-time employment in both periods are expected to be less affected by changes in hours of work, but exclude nearly half of the sample population and may not be representative for all workers. The regression-adjusted wage growth was estimated by regressing individual wage growth against a set of indicator variables representing short-job spells, the job-to-job transition category and changes of FTE-status between two jobs.[9] These indicator variables were used to control for unobserved work hours and changes in hourly wage rates. However, they only partially capture this missing information and may not produce accurate wage growth statistics.

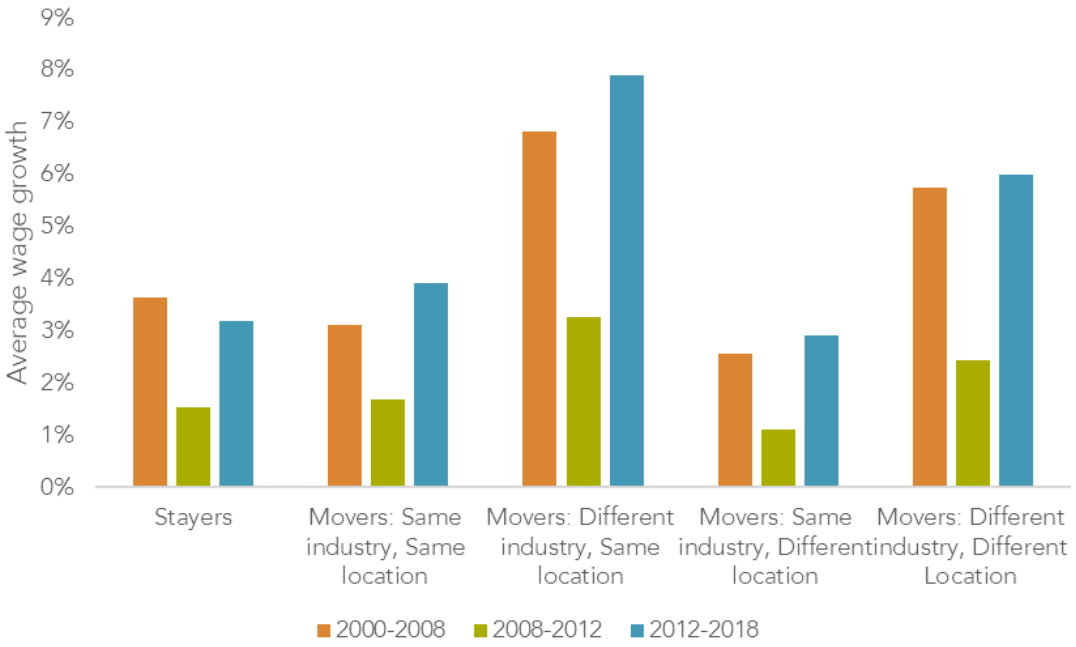
[9] The explanatory variables in the regression include dummy variables of short-job spells in the origin and destination job, four dummy variables on job-to-job transition categories, Linear, quadratic and cubic terms of changes of FTE.

Nonetheless, an advantage of this method is that it uses all available person-job wage information (selection bias is minimised) and more representative estimates are produced.

These alternative measures are materially different from unadjusted wage growth. For example, the unadjusted wage growth for workers who took a new job in a different industry but stayed in the same location was 13%. Of these workers, those who were always full-time only had average wage growth of 4.6%, but those who moved from part-time to fulltime status had an average wage increase of 78.5% and those who moved from full-time to part-time status had an average wage decrease of -71.5%. Once changes in hours were taken into account the adjusted wage growth was calculated to be 6.5%.

Over the whole period, workers who changed jobs earned moderate wage premiums. The average real adjusted wage growth for all job changers was 4.6%, which was 1.6 percentage point higher than those for people who did not change firms. Among the people changing jobs, workers who managed to change industry experienced much higher wage increases. The average change in wages for workers who changed industry was 6.5% if they remained in the same location and 5.2% if they also changed location. They were at least 2 percentage points higher than workers who changed job but stayed in the same industry with and without changing locations.

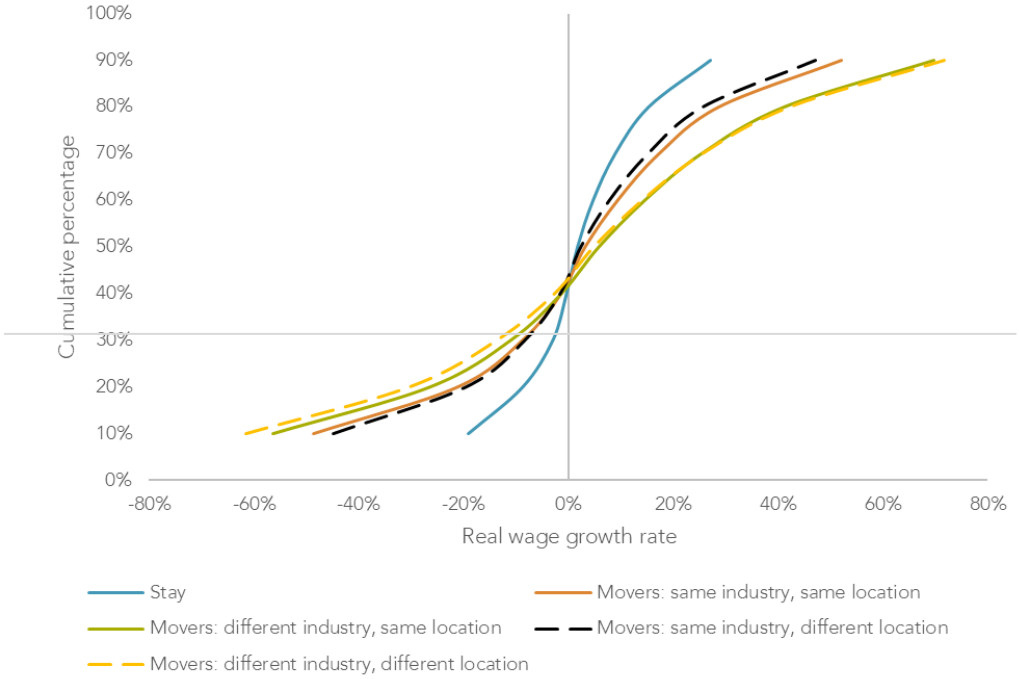
Figure 4 Average adjusted wage changes by job-to-job transitions status



Source: Authors' calculations using Linked Employer-Employee Database

Figure 4 shows the average real adjusted wage increases for each of the job-to-job transition categories over three different periods: 2000-2008, 2008-2012, and 2012-2018. During the recession period (2008-2012) workers in each of the job-to-job transition categories experienced a substantial decline in the average real wage increase they obtained when they moved jobs. The reduction in wage growth was about 1.5 percentage points per year for workers switching jobs but staying in the same industry, and around 3 percentage points for workers who changed industries. The relatively large decline in the average wage growth of workers who changed industries is consistent with the relatively large decline in the number of workers who changed industries during the recession as documented in Table 6. There was a significant rebound in wage growth rates during the 2012-2018 recovery. Real average wage growth was nearly 3 percentage points higher for workers changing jobs between 2013 and 2018 than it was between 2008 and 2012, but only 1.6 percentage point higher for workers staying in the same jobs.

Figure 5 Distributions of real adjusted wage growth by job-to-job transition status (all workers, 2000-2018)



Source: Authors' calculations using Linked Employer-Employee Database

Notes:

1. Real wage growth data is based on regression-adjusted wage data by controlling short-job spells, FTE and job-to-job transition status in linear regressions.

Table 9 Distributions of real wage growth by job-to-job transition status (all workers, 2000-2018)

All workers	Percentage growth in real wages by percentile									
	10th	20th	30th	40th	50th	60th	70th	80th	90th	Total
Stayers	-19.1	-8.8	-3.0	-0.4	1.6	4.6	8.8	15.2	27.0	18 838 100
Movers: same industry, same location	-48.7	-21.2	-8.8	-1.4	3.1	9.3	17.2	28.6	52.0	1 403 500
Movers: different industry, same location	-56.3	-26.4	-11.0	-1.3	5.8	14.5	25.4	41.2	69.8	1 993 200
Movers: same industry, different location	-44.7	-19.4	-8.2	-1.5	2.4	7.8	15.2	25.6	47.1	1 250 100
Movers: different industry, different location	-61.5	-30.3	-13.7	-2.7	4.7	14.0	25.4	42.1	71.6	1 636 000

Source: Authors' calculations using Linked Employer-Employee Database

Table 9 and Figure 5 show the distribution of real wage changes for the five job-to-job transition categories for all workers. Consistent with Bjelland et al (2011) there is a very wide range of wage changes. There are four notable aspects. First, approximately 40% of workers had a decrease in wages while the rest had an increase in wages, irrespective of job-to-job transition status. In Figure 5, zero real adjusted wage growth rate corresponds to the 40 percentage point in the vertical axis. Second, workers changing jobs had a much wider range of outcomes than workers remaining in the same job. Third, workers changing industries were slightly more likely to experience very large increases or decreases in wages than workers changing jobs but remaining in the same industry. Lastly, there was almost no difference in the distribution of wages of workers who changed jobs and stayed in the same location and workers who changed both jobs and locations. The following section presents detailed regression analysis on the wage premiums associated with job-to-job transition status and locations.[10]

[10] Regression analysis in the main paper are based on the full worker population. We also produced regressions analysis based on only full-time workers in Appendix A.

4.3 Regression analysis on wage premiums on job-to-job transitions

Table 8 and Table 9 showed how workers who change industries experience higher average wage increases than workers who change jobs but remain in the same industry. They also show that there is no wage growth premium for workers only changing locations; indeed, wage growth may be slightly lower for workers who change locations relative to those who do not. In this section we examine the wage premium obtained by different subsets of the workers who changed jobs. The premiums are estimated from Equation (1), which examines wage changes conditional on factors such as the origin and destination city and industries and the size of firms and worker characteristics. The coefficients on the job-to-job transition category indicator variables indicate the additional wage growth obtained when workers change industries or cities or both.

The estimated wage growth premiums on the job-to-job transition status are presented in Table 10. These estimates indicate the average relative wage growth premiums compared to those workers who change jobs and remain in the same industry and location.

In broad terms, workers who change industry with and without changing locations earn higher wage premiums than those who do not change industries in most cases. For all workers (row 1), workers who change industry and remain in the same location have a 1.96% wage premium over those who change jobs but not location and industry. The wage premium is slightly lower, 1.7% for those change both industry and location. However, workers who only change location earn small premiums. These results are consistent with Table 8. This pattern holds for most of our sub-sample analysis (rows 2 to 11).

Rows 4 to 6 examine how these premiums have changed over time. These results indicate lower wage premiums for job changes during the recession period (2008-2012) compared to the pre- and post-crisis periods.

Rows 7 and 8 compare the wage premiums for workers living in Auckland and in other New Zealand locations. Aucklanders who stay in Auckland and change industries earn a higher premium (2.44%) relative to workers who change jobs and industries in the rest of the country (1.54%). Aucklanders who move to other cities and change industries made smaller wage changes (1.40%) compared with workers in other locations (1.57%). These results support that there is an Auckland wage premium and Aucklanders leaving the city lose this premium.

Rows 9, 10, 11, and 12, show how the wage premiums differ by board age groups. Estimates are displayed in Figure 6. There is a steep age profile for workers changing industries. The average wage growth premium for workers aged 18–24 who change industries but remain in the same city is 3.37%; this falls to 1.93% for workers aged 25–39, 0.68% for workers aged 40–54, and -1.79% (ie, a decline) for workers aged 55–64. The relatively large wage premiums in 18-24 possibly reflect the "student" story, that part of the large wage increases occurring when workers simultaneous change industries reflects workers (including students) who move from a temporary period of part-time employment to a full-time career position. The age profile is very similar for workers who change industries and move locations, but there is a negligible age profile for workers who change cities and stay in the same industry: none of the latter earn much of a wage increase.

Table 10 Estimated wage growth premiums relative to workers who change jobs and remain in the same industry and location (all workers, 2000-2018)

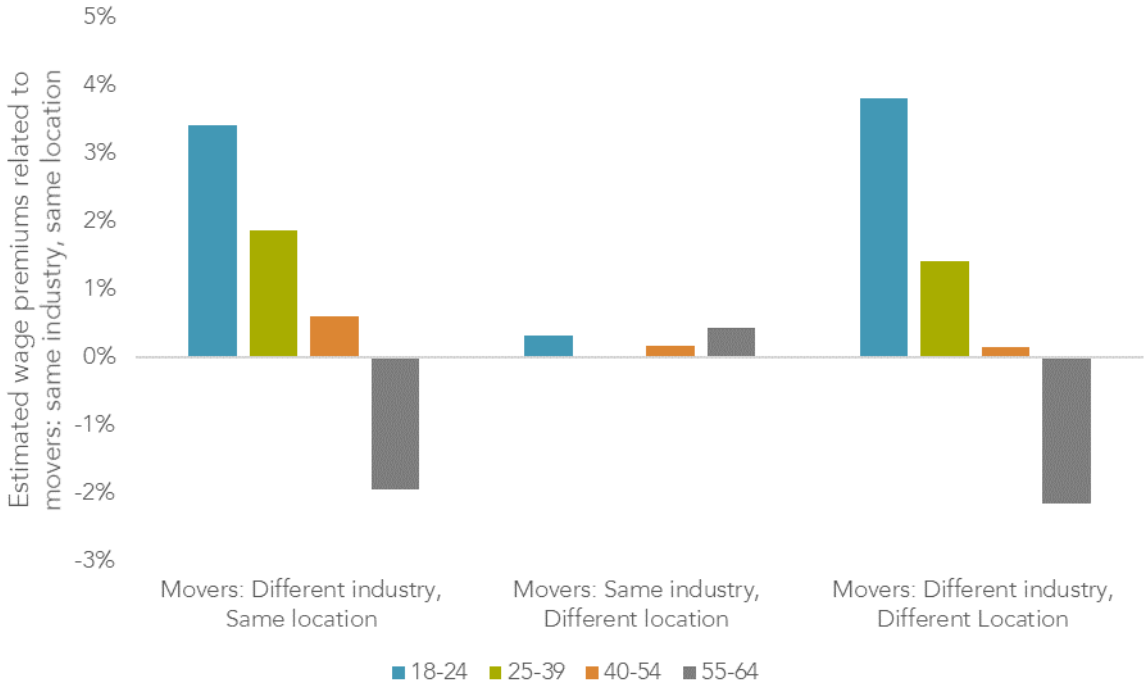
All workers	Movers: different industry, same location	Movers: same industry, different location	Movers: different industry, different location	Observations	Adjusted R-square
1. All job changers	1.96%***	0.31%***	1.69%***	6 282 606	0.421
	0.06	0.08	0.07		
2. Male job changers	1.30%***	0.83%***	1.19%***	3 200 991	0.379
	0.08	0.08	0.08		
3. Female job changers	2.60%***	-0.21%**	2.24%***	3 081 612	0.464
	0.08	0.09	0.1		
4. Job changers in 2000-2008	2.35%***	0.29%***	2.14%***	2 681 742	0.408
	0.09	0.1	0.1		
5. Job changers in 2008-2012	0.89%***	0.21%*	0.89%***	1 385 217	0.429
	0.12	0.12	0.12		
6. Job changers in 2012-2018	2.15%***	0.48%***	1.66%***	2 215 644	0.435
	0.1	0.1	0.11		
7. Job changers in Auckland	2.44%***	0.85%***	1.40%***	2 050 527	0.41
	0.09	0.21	0.22		
8. Job changers in non-Auckland	1.54%***	-0.03%	1.57%***	4 232 076	0.427
	0.08	0.08	0.08		
9. Job changers aged between 18 and 24	3.37%***	0.27%*	3.80%***	1 501 497	0.535
	0.13	0.15	0.14		
10. Job changers aged between 25 and 39	1.93%***	-0.04%	1.51%***	2 419 644	0.392
	0.09	0.1	0.1		
11. Job changers aged between 40 and 54	0.68%***	0.11%	0.20%*	1 820 172	0.319
	0.11	0.1	0.12		
12. Job changers aged between 55 and 64	-1.79%***	0.41%**	-2.00%***	541 287	0.314
	0.21	0.19	0.23		

Source: Authors' calculations using Linked Employer-Employee Database

Notes:

1. ***, **, * are statistical significance at 1%, 5% and 10% critical values

Figure 6 Average relative wage premiums by age groups to workers who changes job but remain in the same industry and location



Source: Authors' calculations using Linked Employer-Employee Database

To further explore workers' premiums when changing industry, we estimated the average difference in the initial wage of workers who changed jobs conditional on FTE, location, industry and firm size in the origin job. This is shown in equation (2).

$$\ln(W_{it}^{o}) = a_0 + \sum_m a_m I_{it}^{m} + \lambda_1 FTE_{it}^{o} + \lambda_2 FTE_{it}^{o2} + \lambda_3 FTE_{it}^{o3} + \rho_1 I_{ikt}^{o} + \sum_c \gamma_c^{o} I_{ict}^{o} + \sum_s \delta_s^{o} I_{ist}^{o} + \sum_f \phi_f^{o} I_{ift}^{o} + X_{it}\beta + I_t + \varepsilon_{it} \quad (2)$$

The coefficient a_m indicates the relative difference of wages to those who change jobs but remain in the same industry and location. The estimated coefficients show the discount (or premium) earned by a worker in their initial job and who subsequently changes jobs are:

- -8.2% for workers who change jobs to a different industry and the same location;
- 1.5% for workers who change jobs in the same industry and move to a different location; and
- -5.6% for workers who change industry and location.

These numbers indicate that workers who changed industries earn relatively lower wages in their initial jobs. Several possible reasons may explain why these workers start with lower-paid jobs initially. One possibility is that those initial jobs are temporary taken by students or people who need flexible employment. The other possibility is those initial jobs are associated with lower-paid industries. Many young workers may start their careers in the retail trade or hospitality industries which are often paid at lower rates compared to other industries. Once these workers move a new job in a different industry, they may be able to receive higher earnings due to transition to a full-time employment or into a higher-paid industry.

4.4 Wage premiums on locations, industries and firm sizes

Wage premiums on locations

The above results show that workers who change jobs and simultaneously change cities get little wage premium over workers who change jobs and remain in their original cities. However, this result does not mean that workers moving to or from a particular location may not benefit from wage changes. The origin city may have lower wages than average, or the destination city may have higher wages than average. Table 11 shows the estimated coefficients of the location indicator variables. There are 9 origin and destination groupings; in each case Christchurch is the omitted reference city. These groupings include Auckland; Wellington; fast and slowly growing medium cities; fast and slowly growing small cities; minor urban areas; and rural areas.

Table 11 Estimated wage premiums by origin and destination locations (all workers, 2000-2018)

Origin location	Estimated wage premiums	Destination location	Estimated wage premiums
Slow-growing small cities	-0.39% ***	Slow-growing small cities	-0.21%
Fast-growing small cities	-2.31% ***	Fast-growing small cities	0.44% **
Slow-growing medium cities	0.75% ***	Slow-growing medium cities	-1.03% ***
Fast-growing medium cities	0.40% ***	Fast-growing medium cities	-0.66% ***
Auckland	-1.41% ***	Auckland	1.47% ***
Wellington	-0.93% ***	Wellington	1.32% ***
Minor urban	-0.40% ***	Minor urban	-0.30% **
Rural areas	-1.88% ***	Rural areas	1.11% ***

Source: Authors' calculations using Linked Employer-Employee Database

Notes:

1. ***, ** and * are statistical significance at 1%, 5% and 10% critical values

The results are of interest because they reveal the extent of the wage premium earned by moving to or from a particular location among the group of workers changing jobs. This provides an estimate of the marginal productivity premium of different locations, as it reflects the wage premiums that workers earn in different cities, considering their observed and unobserved characteristics. The estimates also take into account some of the selection issues that plague comparisons of this type since the comparison population only consists of workers who move jobs.

Wage premiums associated with the two largest locations, Auckland and Wellington, are particularly large. When workers left either location they lost on average 1.41% and 0.93% of their wages respectively compared to those workers who left Christchurch. In the other direction, workers tend to earn their largest wage growth once they relocate to these locations, 1.47% and 1.32%, respectively. These results suggest that bigger cities generally offer better paid jobs for all workers.[11]

For other locations, estimated wage premiums are relatively moderate, with the exception of fast-growing small cities, including Queenstown, Rangiora and Taupo, which are associated with large wage losses for leaving workers.

[11] There are several reasons why large cities offer better paid jobs. First, large cities value more highly skilled workers of particular types, such as IT professionals. Second, highly competitive business environments in large cities offer higher pay to attract talent. Thirdly, higher wages compensate for the higher cost of living in large cities.

Wage premiums by firm size and industry

Table 12 presents the wage premiums for firm sizes in origin and destination jobs. There are six firm size categories, 1–4, 5–9, 10–19, 20–49, 50–99 and 100 and over employees. The 1–4 employee firm category is the omitted reference firm size group. These results show a decreasing premium with firm size at origin jobs and an increasing premium with firm size at destination jobs. It implies that workers lose greater wage premiums by leaving a larger firm and gain greater wage premiums by joining a large firm. For example, workers leaving (moving to) the largest firms lost (gained) on average 8.6% (8.1%) more on their wages compared to workers who left (joined) the smallest firms.

Table 13 presents wage premiums associated with 15 one-digit industries. These estimated premiums are relative to wage paid in the manufacturing industry. The mining and banking industries provide larger premiums at 11.2% and 2.7%. On the other hand, retail trade and hospitality, agriculture and education have relatively lower premiums. These wage premiums mimic the pattern of industry-level productivity in New Zealand. Conway and Meehan (2013) compared labour productivity level (GDP per hour paid) at the one-digit industry level and found the mining and banking industries are among the highest productive industries. Combing these results, it suggests that higher productivity industries generally offer higher wages.

Table 12 Estimated wage premiums by firm sizes at origin and destination jobs (all workers, 2000-2018)

Firm size at origin jobs	Estimated wage premiums	Firm size at destination jobs	Estimated wage premiums
5–9 employees	-2.61%***	5–9 employees	2.73%***
10–19 employees	-4.80%***	10–19 employees	4.51%***
20–49 employees	-6.15%***	20–49 employees	5.85%***
50–99 employees	-7.66%***	50–99 employees	6.90%***
100 and over employees	-8.58%***	100 and over employees	8.14%***

Source: Authors' calculations using Linked Employer-Employee Database

Notes:

1. ***, **, and * are statistical significance at 1%, 5% and 10% critical values

Table 13 Estimated wage premiums by industries at origin and destination jobs (all workers, 2000-2018)

Industry at time *t*	Estimated wage premiums	Industry at time *t+1*	Estimated wage premiums
Agriculture	8.06%***	Agriculture	-6.80%***
Mining	-8.50%***	Mining	11.21%***
Utility	1.37%***	Utility	0.81%***
Construction	1.32%***	Construction	0.34%***
Wholesale Trade	1.06%***	Wholesale trade	-1.12%***
Retail trade & hospitality	10.57%***	Retail trade & hospitality	-8.87%***
Transport	3.34%***	Transport	-1.07%***
Telecommunication	5.97%***	Telecommunication	-3.21%***
Bank & finance	-1.80%***	Bank & finance	2.66%***
Rental & real estate services	5.43%***	Rental & real estate services	-3.58%***
Professional & admin services	8.94%***	Professional & admin services	-5.28%***
Government	6.30%***	Government	-1.91%***
Education	14.89%***	Education	-11.16%***
Health	10.52%***	Health	-6.00%***
Recreational & other services	10.79%***	Recreational & other services	-8.12%***

Source: Authors' calculations using Linked Employer-Employee Database

Notes:

1. ***, ** and * are statistical significance at 1%, 5% and 10% critical values

5 House prices and worker mobility

Sections 3 and 4 showed that New Zealand workers have increasingly relocated to new locations for better job opportunities. Some of these workers may be able to experience higher wage growth by moving to larger and more productive cities, such as Auckland and Wellington (Maré, 2016).

Workers consider many factors when deciding to move. Their moves depending on the relative labour market opportunities in the origin and destination areas, local amenities, population characteristics, and housing and relocation costs. Chen & Rosenthal (2008) studied the inter-state migration in the U.S and found that households and workers prefer moving to either warmer areas or large metropolitan areas. In particular, highly educated households tended to move to areas with better quality business environments which offer better job opportunities, skill matching and higher wages. But living in a large city and/or a more temperate climate tends to mean a higher cost of living which may offset the social and economic benefits from internal migration.

One dominant cost of living is house prices. Gabriel, Shack-Marquez, & Wascher (1992) suggested that house price differentials in the U.S are an important determinant of household motivations and can offset the incentive to migrate to some regions. In another study, native British workers in the south of England suffered housing pressures (along with competition from migrants) and increasingly moved to other parts of the UK (Hatton & Tani, 2005).

Compared to other advanced economies New Zealand has one of the least affordable housing markets. It is less affordable than Australia and the UK[12]. Severe housing affordability problems are likely to slow down worker mobility, leading to inefficient labour adjustment. In the following section, we explore the relationship between house prices and worker mobility across 30 major cities in New Zealand and highlight which types of workers tend to suffer more heavily from high house prices.

5.1 Data and method

The worker mobility data is built from a subset of the job-to-job data described in Section 2.1. The data has additional restrictions to that of the earlier chapters. It is limited to workers aged 25 to 54 and to transitions involving both changes in jobs and locations. 30 cities are included (minor urban and rural are excluded).[13] The origin and destination cities are job locations at t and $t+1$.

The data is for 17 years (from 2001-2002 to 2017-2018) and we use 18 one-digit ANZSIC06 industries. After these restrictions, we have 18 054 600 remaining person-jobs. We allocate person-job observations into 266 220 cells representing the job transitions between origin and destination locations for each year and industry[14]. Each cell represents a specific type of bilateral movement, such as retail trade workers in Auckland in 2001 who relocate to Hamilton in the next period. Some cells have no observations, indicating no cross-city move from a particular city, industry and time, and are replaced by 0s.

This section uses a gravity model to analyse bilateral worker mobility over time. Gravity models were first introduced in economics to model international trade and have been extended to migration (Ramos, 2016) and many other fields (Erlander & Stewart, 1990). In our basic model specification bilateral worker mobility is determined by city size, travel distance, house price, quality of life and business, and several other observable factors and fixed-effects. The equation is shown on the following page.

[12] Housing affordability information can be found on page 11 in the 14th annual edition of Demographia International Housing Affordability Survey http://www.demographia.com/db-dhi-index.htm

[13] These cities include Ashburton, Auckland, Blenheim, Christchurch, Dunedin, Feilding, Gisborne, Greymouth, Hamilton, Hawera, Invercargill, Kapiti, Levin, Masterton, Napier and Hastings, Nelson, New Plymouth, Oamaru, Palmerston North, Queenstown, Rangiora, Rotorua, Taupo, Tauranga, Timaru, Tokoroa, Wanganui, Wellington, Whakatane and Whangarei.

[14] The industry information is based on the staring period. We do not distinguish workers change jobs in the same or different industries at the end period. In this exercise, we try to explain worker mobility given observable information at the start period.

$$F_{ijt+1}^{k} = a_1 P_{it} + a_2 P_{jt} + a_3 D_{ij} + a_4 S_{ij} + \gamma HP_{ijt} + \beta_1 QL_i + \beta_2 QL_j + \beta_3 QB_i + \beta_4 QB_j + \sum \theta X_{ijt} + \mu_k + \mu_i + \mu_j + \mu_t + \varepsilon_{ijt}^{k} \quad (3)$$

where

- $F_{ijt}{}^{k}{}_{+1}$ = the log percentage of local workers in industry k and origin city i moving to destination city j at year *t+1*. If 2 per cent of Wanganui retail trade workers moved to Auckland, the log percentage = ln(0.02 x 100%) ≈ 0.693. For zeros, we impute a very small positive number, log(0.000001), to make them appear in regression estimations.
- P_{it} = city size of the origin city *i* at year *t* as a fraction of total number of jobs in New Zealand.
- P_{jt} = city size of the destination city *j* at year *t* as a fraction of total number of jobs in New Zealand.
- D_{ij} = log travel time (in seconds) between the centroid of the origin city *i* and the centroid of the destination city *j*.
- S_{ij} = 1 if city *i* and city *j* are in the same island, otherwise 0.
- QL_i, QL_j, QB_i and QB_j are average of quality of life and business indicators in 2001, 2006 and 2013 from (Grimes et al., 2018). Measures of quality of life and business capture amenity values. They are normalised to mean 0 and standard deviation 1.
- HP_{ijt} = the relative house price differences between the destination and origin cities. It is calculated as log median house price in the destination city *j* minus the log median house price of the origin city *i* at year *t*. The house price data were from the Real Estate Institute of New Zealand.
- X_{ijt} = additional lagged explanatory variables. They are lagged log median monthly income and unemployment rate at the origin and destination city. Income and unemployment are extracted from LEED and HLFS respectively.[15]
- $\mu_k, \mu_i, \mu_j, \mu_t$ are industry, origin city, destination city and time fixed effects.

The key variable of interest in the gravity model is the log lagged differences of median house prices between the origin and destination cities, HP_{ijt-1}. The corresponding coefficient provides the estimated impact of house prices to worker mobility from the origin city *i* to the destination city *j*. If the coefficient is negative, it implies a relative higher house price at the destination city will dampen migration flows of workers from the origin city. To interpret this, a 1% increase in the relative house price will result in γ percent increase/decrease in the worker mobility rate.

The gravity model (3) assumes constant effects for all industries and cities. This assumption is restrictive as different types of work may have different responses to house prices. The first extension is to estimate the impact of house prices on workers in 18 one-digit ANZSIC 2006 industries. The second extension is to estimate the house price effects for eight types of cross-city movements. These movements are 1) Auckland to medium cities, 2) Auckland to small cities, 3) medium cities to Auckland, 4) medium to medium cities, 5) medium cities to small cities, 6) small cities to Auckland, 7) medium cities to small cities, and 8) small to small cities. Medium cities have populations of at least 30,000, and small cities have populations between 10,000 and 29,999.[16]

All regression models are estimated by Weighted Least Squares (WLS). Weights are set to the regional share of the industry employment at *t*, employee numbers in city *i* and industry *k* divided by total employee numbers in industry *k*. Larger local industries receive higher weights. For example, if both

[15] HLFS provides unemployment rates at the broad regional council level. Cities within the same regional councils are assumed to have same unemployment rate.

[16] The list of urban cities in New Zealand is based on the classification of urban area in Census 2013.

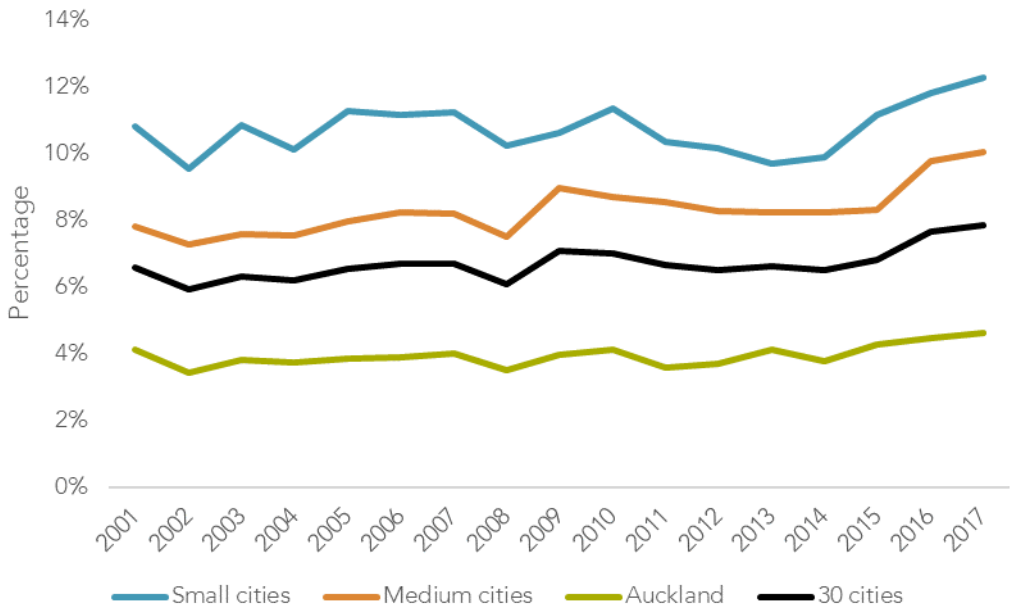
Wellington and Wanganui cities lose 2% of their accountants to Auckland, Wellington would receive a larger weight as it had more accountants than Wanganui.

The residual term, ε_{ijt}^{k}, is a random error clustered at the origin city-destination city-industry level. In addition, serial correlation in this term can be controlled by an auto-regressive lag one (AR1) specification, $\varepsilon_{ijt}^{k} = \rho\varepsilon_{ijt-1}^{k} + \mu_{ijt}^{k}$. The AR1 specification imposes a common auto-correlation in the data. We use the the Prais-Winsten estimation (Prais and Winsten, 1954) into WLS. The Praise-Winsten transforms all time-variant variables by $(Y_{t+1} - \rho Y_t)$ from 2002 and $\sqrt{1-\rho^2}Y_{t=2001}$ in year 2001.

5.2 Exploratory analysis on house prices and worker mobility

Figure 7 shows the worker mobility rates for three broad regions (Auckland, medium and small cities) and all 30 cities. Worker mobility rates in Figure 7 are generally smaller than those in Figure 3 as we restrict between-city movements among 30 cities and do not capture workers moving to areas outside of the 30 cities. On average, 3.9% of Auckland workers change jobs to other locations. The rates in medium and small cities are higher, 8.3% and 10.7% respectively. The worker mobility rates were relatively static over the 2001-2013 period then accelerated across three broad regions. Particularly, medium and small cities experienced more rapid loss of workers in the last four years of the sample period, from 8.1% to 9.1% in medium cities and from 10.6% to 11.3% in small cities.

Figure 7 Worker mobility rate at broad regions and 30 cities, 2001-2017



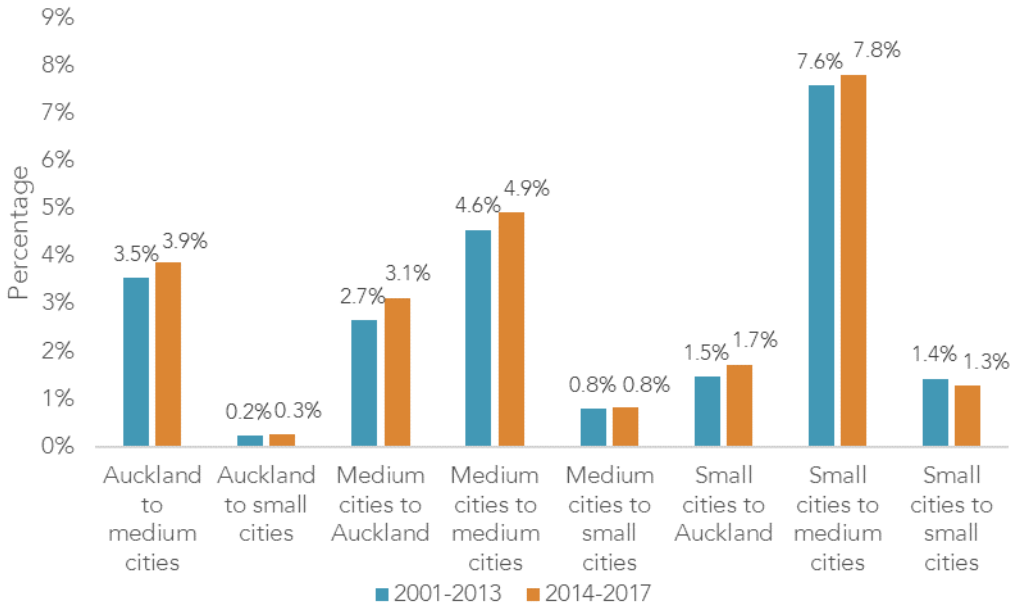
Source: Authors' calculations using Linked Employer-Employee Database

Notes:

1. Worker mobility rate in different locations is the sum of job transition rates from (1) workers who change cities but stay in the same industry and (2) workers who change cities and industries

To understand where workers move to, we break down the job-to-job transition rates by regions. Figure 8 shows increasing proportions of workers moving to more populous areas. For example, job transition rates moving from medium cities to Auckland increases from 2.7% in the 2001-2013 period to 3.1% in the 2014-2017 period. Similarly, job transition rates moving from small cities to medium cities increase from 7.6% to 7.8%. The figure also reveals a stepwise migration trajectory in which workers tend to work their way up to the "destination" by taking incremental steps in migrating, often migrating from smaller (poorer) to larger (richer) areas. Workers from small cities are more likely to move up to medium cities, rather than move to Auckland directly. Such stepwise worker movement in New Zealand fits the literature on stepwise international migrations (Conway, 1980; Liu, Didham, & Lu, 2017; Pardede, McCann, & Venhorst, 2016; Paul, 2011).

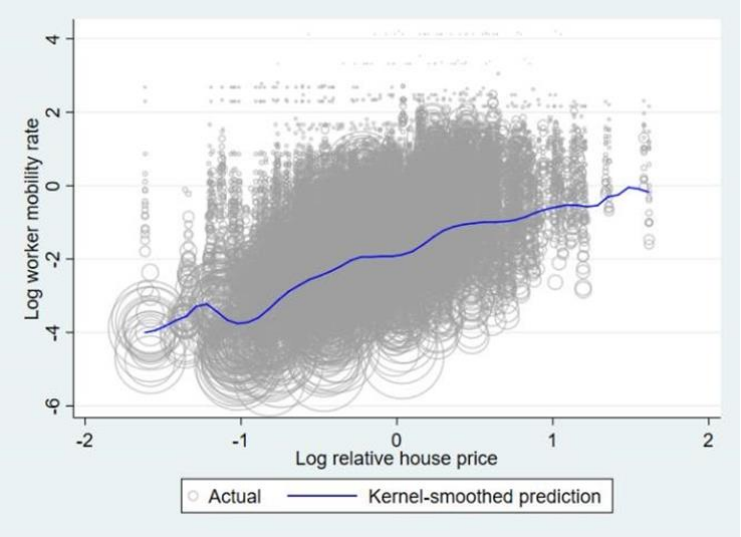
Figure 8 Worker mobility rates by regions



Source: Authors' calculations using Linked Employer-Employee Database

Figure 9 shows the relationship between median house prices and worker mobility. Each dot in the figure shows the relative house price differences between two locations and the corresponding worker mobility rate for a specific local industry (origin region) at a point in time. Observations are weighted by the local industry employment weights to control for the heterogenous size of the industry. The larger the dot the bigger the local industry weight. The figure shows a positive relationship between worker mobility and house prices, suggesting higher relative house prices in destination cities lead to higher inflows of workers from other cities. On the face of it, this finding is surprising and is contrary to a number of overseas studies (Donovan & Schnure (2011) and Rabe & Taylor (2010)), which suggest that high house prices are negatively related to workers' movement across states or regions in the US and the UK.

Figure 9 Scatter plot of worker mobility and house prices

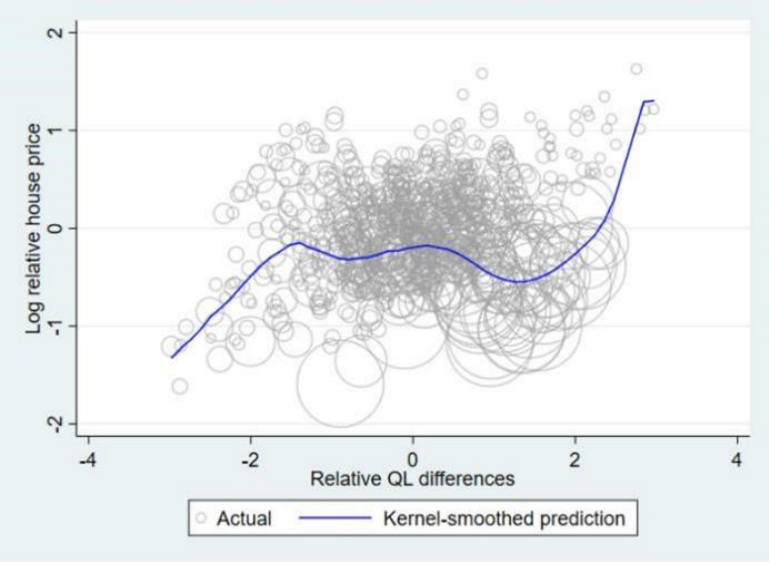


Source: Authors' calculations using Linked Employer-Employee Database

However, one possible explanation for this finding is that urban areas with relatively high house prices also have relatively high amenities, including better infrastructure, warmer climates, and well-functioning labour markets. For instance, Grimes, Apatov, Lutchman, and Robinson (2014) find four factors tend to drive population growth in urban areas: land-use capability; human capital; sunshine

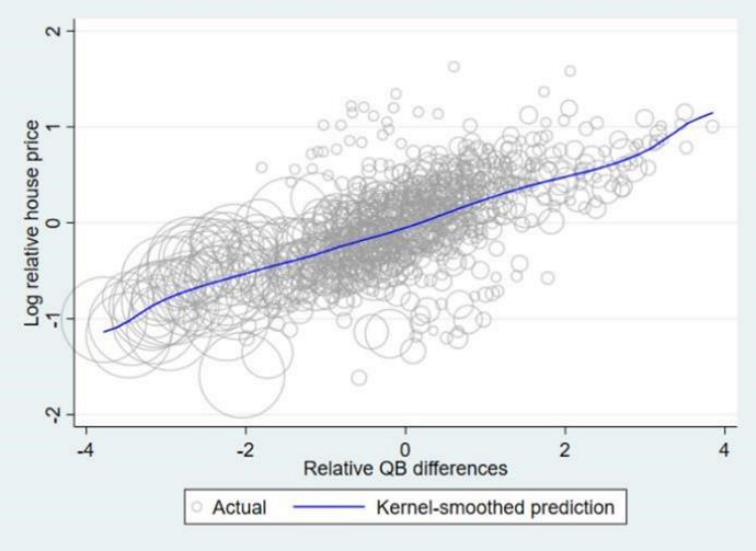
hours; and proximity to Auckland. More recently Grimes et al. (2018) and Grimes et al. (2019) constructed indicators of quality of life and of the business environment. They found high rates of migration of local New Zealand residents to urban areas offering better consumption and/or productive amenities. These local features could be expected to feed into property values and to influence local house prices. Figure 10 and Figure 11 thus show the relationship between house prices and indicators of quality of life and of the business environment for 30 New Zealand urban areas. These are based on the average of the estimates of the quality of life and the business environment for 2001, 2006, and 2013.

Figure 10 House prices and quality of life indicators



Source: Authors' calculations using Linked Employer-Employee Database

Figure 11 House prices and quality of business indicators

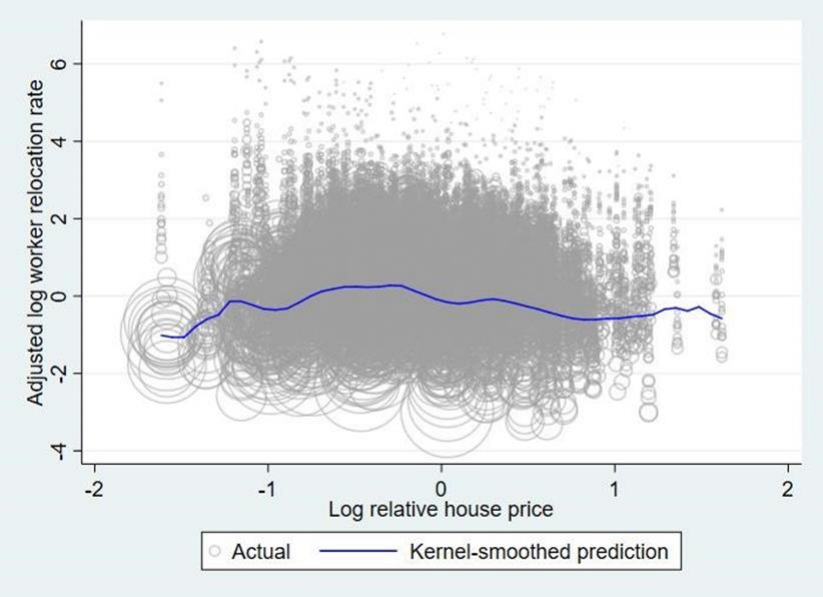


Source: Authors' calculations using Linked Employer-Employee Database

Both graphs show positive relationships between amenity values and house prices, although the relationship with quality of life is somewhat weaker. These relationships are consistent with other New Zealand studies. For example, Fleming et al., (2018) found that properties with longer sunlight hours had higher sale prices in Wellington. Similarly, the proximity to the city centre and coastal areas were associated with higher residential property values in Auckland (Nunns, Hitchins, & Balderston, 2015).

Figure 12 adjusts the worker mobility rate by controlling for quality of life and the business environment in different urban areas.[17] The adjusted worker mobility rates are worker mobility rates accounting for the amenity values. This is then plotted against median house prices. The result is a relatively flat line between worker mobility and house prices. The mobility of average workers thus does not appear to be sensitive to higher house prices.

Figure 12 Adjusted worker mobility and house prices



Source: Authors' calculations using Linked Employer-Employee Database

5.3 Regression results

Effects of house price on worker mobility

The results are shown in Table 14. Model (1) is the simplest specification of the gravity model, which has only city size, distance, house price, industry and time fixed-effects. Model (2) controls for quality of life and business variables at the origin and destination cities. Model (3) adds origin and destination dummy variables to control for other unobservable city-specific fixed effects. This model specification has a full set of fixed-effect dummies. Model (4) builds on model (3) and has additional explanatory variables, particularly median city income and the regional unemployment rate. Model (5) has the same specification of Model (4) but restricts the sample to observations with positive worker mobility. In this specification the number of observations drops nearly 60%. The last specification, model (6), is the Prais-Winsten estimation, which corrects for serial correlation in the residuals.

[17] The adjustment is done by a partial regression, $F^k_{ijt} = \beta_1 QL_i + \beta_2 QL_j + \beta_3 QB_i + \beta_4 QB_j + \varepsilon^k_{ijt}$. The residual term is the adjusted worker mobility rate as the regression removes measured amenity information.

Table 14 Regression results of gravity models

	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)
P_{it}	-.396***	-.413***	-.274***	-.314***	-.225***	-.419***
P_{jt}	.848***	.826***	.787***	.779***	.851***	.737***
D_{ij}	-.694***	-.613***	-.676***	-.676***	-.668***	-.304***
S_{ij}	2.894***	.097***	.054**	.054**	.092***	.020*
HP_{ijt}	.143***	-.086***	-0.055**	-.049*	-.038	-0.031
QLi		.043*	-.228**	-.184*	-.174	-.006
QLj		.147***	.213**	.217**	.134	.122***
QBi		-.013	-.374***	-.283***	-.274*	-.040**
QBj		.170***	.091	.107	-.014	.077***
ρ						0.569***
Observations	266 220	266 220	266 220	266 220	107 311	266 220
Adjusted R^2	.763	.767	.785	.785	.826	.505
Origin & destination city Fes	No	No	Yes	Yes	Yes	Yes
Control serial correlation	No	No	No	No	No	Yes
Additional explanatory variables	No	No	No	Yes	Yes	Yes

Source: Authors' calculations using Linked Employer-Employee Database

Notes:

1. Selected explanatory variables in regressions are total city employment (rows 1 and 2), travel distance (row 3), moving within the same island (row 4), relative median house prices (row 5), quality of life (rows 6 and 7) and quality of business (rows 8 and 9) at the origin and destination locations
2. All regression results are estimated by Weighted Least Square

With the exception of model (1), all models returned negative coefficients on the house price variable. The positive coefficient in model (1) was upward-biased as omitted city fixed-effects are positively related to house prices. As discussed above, these omitted city fixed-effects can be explained by quality of life and the business environment. Other model specifications considered these amenity values. We conducted Hausman tests between model (1) and the other specifications and found very small p-values, which suggested models (2)-(6) perform better. Among models (2) – (6), Model (6) was chosen as the best model specification to control both quality of life and business environment and serial correlation.

The estimated coefficient of the house price variable is -0.031. But it is statistically insignificant at 5%. It implies that a 1% increase in the relative house price will not decrease worker mobility rates holding other variables constant.

For the effects of life and business amenities on worker mobility, coefficients in origin cities are generally negative and coefficients in destination cities are positive. These results highlight that cities with better life or business amenity values tend to lose lesser proportions of workers to other cities and attract higher proportions of workers from other cities. A one standard deviation increase in life and business quality in a destination city increase mobility rate by 0.12 and 0.08 percentage points respectively.

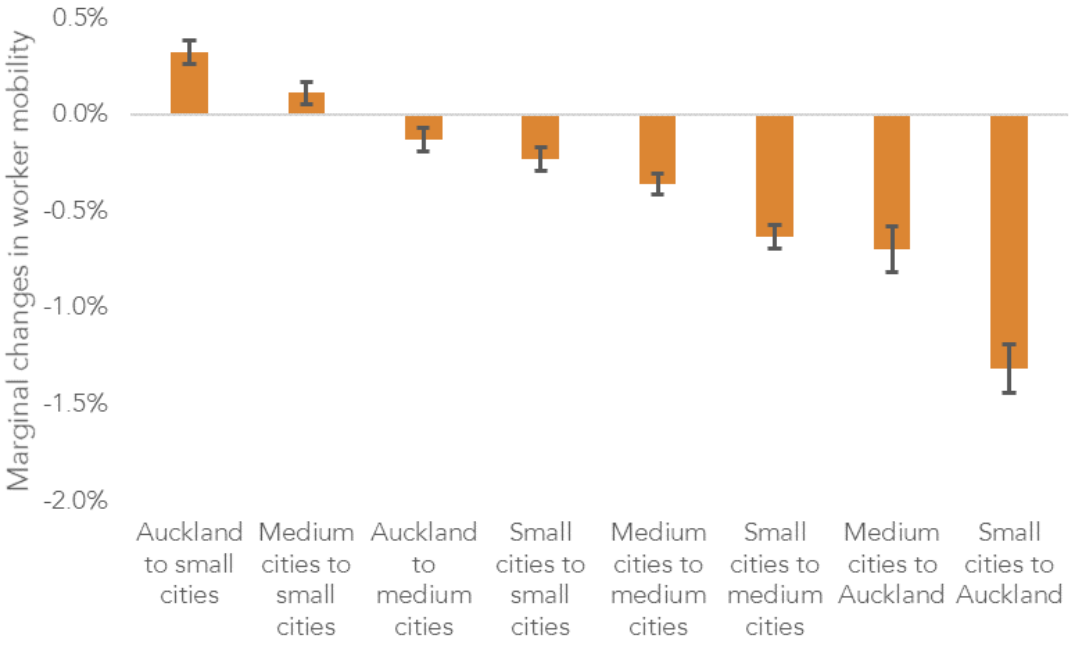
For other variables, we found negative coefficients on the city size of the origin location and positive coefficients on the city size of the destination location. This indicates that large urban areas generally lose smaller fractions of their workers to other cities and gain bigger fractions of workers from other cities. Negative coefficients on travel time and positive coefficients on the indicator of same-island movements suggest that a closer distance between cities leads to higher fraction of inter-flows of workers.

The regression analyses in Table 14 impose identical effects of relative house prices on workers from different locations and industries. This is a rather restricted condition. The following analyses relaxes this condition and allow varying effects of house prices on worker mobility rates by different cities and industries.

The effect of house prices by cities

This section discusses the effect of relative house prices on between-city worker mobility rates. Between-city movements are grouped into eight broad categories, 1) moving from Auckland to small cities, 2) moving from Auckland to medium cities, 3) moving from medium cities to Auckland, 4) moving from medium cities to medium cities, 5) moving from medium cities to small cities, 6) moving from small cities to Auckland, 7) moving from small cities to medium cities and 8) moving from small cities to small cities.

Figure 13 Marginal change in worker mobility rates by between-city moves (1% increase in relative house prices)



Source: Authors' calculations using Linked Employer-Employee Database

Notes:

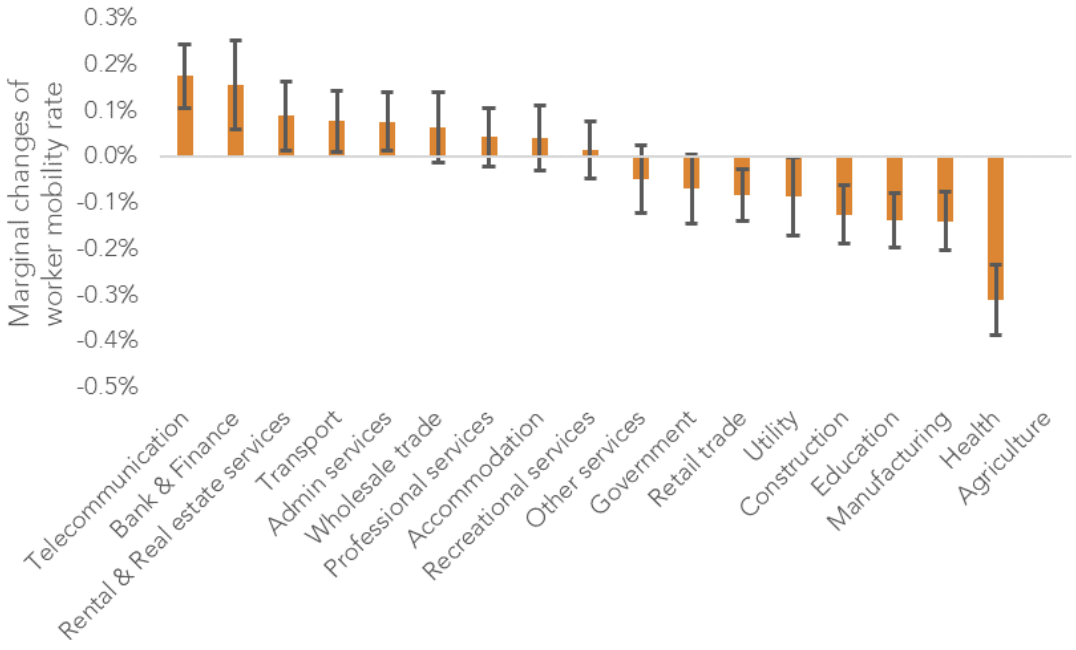
1. Black vertical bars are 95% confident intervals of marginal changes of worker mobility

Figure 13 shows how the worker mobility rate changes if house prices in the destination increased by 1% relative to the origin for eight categories of between-city movements. In six out of the eight categories of between-city movements, the effects of higher house prices are statistically negative. The effects are strongest for workers who move to larger cities. When house price differentials between Auckland and other cities increases by 1%, worker mobility rates for small and medium-sized cities are expected to decline by 1.38% and 0.75% respectively. Similarly, migration from small to medium sized cities is expected to decline by 0.66%. Migration between similar-sized cities (eg, moves between small urban areas) appears to be less affected by house prices. For Aucklanders, higher house prices in other cities boost their mobility, particularly when they move to small cities.

Effects of house prices by industries

This section considers how workers in different industries vary in their response to house prices (Figure 14). Six out of 18 industries show statistically significant and negative coefficients, including workers whose origin industries were agriculture, health, manufacturing, education and construction, electricity-gas-water, retail trade and public administration and safety industries. Agriculture workers were most affected, where worker mobility declines by 0.35% if relative house prices between origin and destination cities increase by 1%. Health, manufacturing and education workers are next most affected group, with the average decline in worker mobility being around 0.15%. In contrast, higher relative house prices encourage mobility among workers in the information and telecommunication, financial services and rental and real estate industries. This could reflect the concentration of employment and job creation in the information and telecommunication and financial service industries in Auckland, which saw faster house price growth than many other cities from 2000s to mid-2010s.

Figure 14 Marginal changes in worker mobility rate by industry (1% increase in relative house prices)



Source: Authors' calculations using Linked Employer-Employee Database

Notes:

1. Black vertical bars are 95% confident interval of marginal changes of worker mobility rate

6 Conclusion

This paper has presented evidence on regional job-to-job transitions in New Zealand from 2000 to 2018. In many ways the results should provide some comfort to workers living in New Zealand's smaller cities and towns. They indicate that the fraction of workers continuing in their jobs, changing jobs or exiting or entering the workplace is quite similar across all size cities. Medium-sized towns do not have substantially different turn-over rates than other cities.

The results also indicate that if workers move to other locations, including Auckland, to take up new jobs the wage premiums they earn on average are not particularly large (around 1.4%). Of course, workers may move because wages increase more rapidly in big cities, as Glaeser and Maré (2001) suggest, but the wage discount for living in a smaller city, as measured by the increase in wages that workers earn when they move to a large city, appears small.

There is one major difference in the job-to-job transition rates for workers living in small and medium sized cities and those living in larger cities. The fractions of workers who move to a job in a different firm in the same industry, or a different firm in a different industry, differs little across cities. However, the fraction of workers simultaneously changing cities when they move firms is much larger for workers in small cities than large cities. If a worker lives in small city and moves jobs, he or she is much more likely to change cities than if he or she lives in a large city and moves jobs. However, as there is very little wage premium associated with changing cities, they gain little additional return from shifting locations.

More generally, the results further our understanding of the job-to-job transitions process. They indicate that many workers change from full-time to part-time jobs, or from part-time to full-time jobs, when they change jobs, particularly if they also move cities. Not surprisingly, a large change in hours may be one of the reasons for changing jobs. This also means that the distribution of changes in earnings that occur when workers change jobs is very large. Perhaps surprisingly, approximately 40% of workers changing jobs experience a reduction in wage earnings, although some of these reductions are presumably due to a change in the number of hours worked.

The results also indicate that workers who are not always full-time and who change industries obtain larger average wage increases than those who stay in the same industry, whether or not they change cities. This is not the case for full-time workers, who earn slightly less if they change industries. There is evidence that workers who change industries obtain these premiums because they are relatively badly paid in their initial jobs, so moving industries may be part of the process of finding a better job match. It is also possible that the large wage increases that occur when workers move from part-time to full-time status and change industries occur because workers move to a full-time career position.

One of the mysteries of the New Zealand economy is the relatively low productivity premium associated with its largest city, Auckland. Maré (2016), for example, estimated that Auckland only has a 2% productivity premium relative to the rest of the country, once the population characteristics and the different industrial mix of Auckland are taken into account.

This paper uses a very different approach to come to a similar answer. It calculates the average real wage premium earned by workers who change jobs and move to Auckland relative to workers who change jobs and move to other cities and shows that it is also only 2%. This is a measure of wages rather than a direct measure of productivity, but it has the advantages that (i) it compares wage changes of workers changing jobs, rather than the whole population; and (ii) it is based on the wage change of the same person in different locations and thus automatically adjusts for the person's unobserved characteristics. The small size of this estimate raises additional questions about the performance of New Zealand's largest city.

This paper also investigates the relationship between house prices and worker mobility in New Zealand by using a gravity model. It finds that increasing house prices in the destination city relative to the origin city is not associated with slower worker mobility. The insignificant effect of house prices is

masked by heterogenous responses from different sub-groups of workers. House price effects are significantly negative for workers moving from smaller to larger cities, while house price effects are significantly positive for workers relocating from Auckland to medium and small cities. Workers from smaller cities face greater difficulties to move into larger cities in which house prices and other cost of living are more expensive. When looking at different industries, high house prices in the destination city significantly slow down worker mobility in agriculture, manufacturing, health and education industries.

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Appendix A Additional analysis on the impacts on wage premiums

This appendix contains reruns of the regression analysis presented in section 4, but for full-time workers only. LEED records gross monthly earnings but does not collect hours worked or wage rates. This can pose a challenge when analysing wages changes in regression models as they can be influenced by changes on hours worked and/or wage rates.

To mitigate these issues, in section 4 we controlled for FTE, short-job spells and job-to-job transition status. An alternative approach is to study wage changes for full-time workers only. These workers are expected to be less affected by these issues, although there is of course the challenge in identifying who is in full-time employment and restricting the population in this way means that nearly half of the worker population is dropped. Full-time employment is defined as those workers with gross earnings equal to or higher than full-time employment on the minimum wage. Some part-time workers may be deemed to be full-time when they earn relatively high hourly wages.

Table A.1 presents estimated wage growth premiums associated with job-to-job transition status for full-time workers only. It shows different results from those in Table 9. The results for full-time workers show that small negative wage loss when they change jobs in different industries with and without changing locations. Results in Table 9 suggest these job changes leading high wage growth. A possible explanation on these differenced finding is worker earn wage premiums by switching industries as they may be able to increase hours worked (part-time to full-time for instance) and/or pay rate (from low-paid industries to high-paid industries). Such job transitions lead to bigger wage increase. Given missing hours worked in EMS, we cannot disentangle these effects.

Table A.3 and Table A.4 present estimated wage premiums by locations, firm size and industries. These results are broadly similar to results shown in Chapter 4, but generally smaller marginal premiums. This suggests that wage premiums associated to these factors are not heavily affected by unobserved hours worked and hourly rate.

Table A.1 Estimated wage growth premiums relative to workers who change jobs and remain in the same industry and location (all workers, 2000-2018)

	Movers: different industry, same location	Movers: same industry, different location	Movers: different industry, different location	Observations	Adjusted R-square
1. All job changers	-0.15%***	-0.06%	-0.62%	3 019 200	0.037
	0.043	0.043	0.048		
2. Male job changers	-0.29%***	-0.03%	-0.62%***	1 799 499	0.043
	0.056	0.056	0.062		
3. Female job changers	0.02%	-0.09%	-0.67%***	1 219 599	0.032
	0.066	0.065	0.078		
4. Job changers in 2000-2008	-0.14%**	0.01%	-0.62%***	1 258 299	0.039
	0.069	0.073	0.079		
5. Job changers in 2008-2012	-0.34%***	0.24%***	-0.32%***	678 600	0.035
	0.089	0.084	0.102		
	-0.03%	-0.31%***	-0.75%***	1 082 199	0.038

	Movers: different industry, same location	Movers: same industry, different location	Movers: different industry, different location	Observations	Adjusted R-square
6. Job changers in 2012-2018	0.067	0.066	0.075		
7. Job changers in Auckland	0.19%**	-0.16%	-1.85%***	1 046 598	0.039
	0.063	0.139	0.148		
8. Job changers in non-Auckland	-0.55%***	-0.40%***	-0.66%***	1 972 500	0.038
	0.058	0.054	0.06		
9. Job changers aged between 18 and 24	0.07%	-0.49%***	-0.09%	453 798	0.041
	0.106	0.114	0.118		
10. Job changers aged between 25 and 39	0.17%*	-0.19%**	-0.34%***	1 293 198	0.027
	0.064	0.068	0.074		
11. Job changers aged between 40 and 54	-0.49%***	0.02%	-0.96%***	993 000	0.024
	0.076	0.072	0.085		
12. Job changers aged between 55 and 64	-1.44%***	0.31%***	-2.05%***	279 000	0.022
	0.151	0.13	0.166		

Source: Authors' calculations using Linked Employer-Employee Database

Notes:

1. ***, ** and * are statistical significance at 10%, 5% and 1%.

Table A.2 Estimated wage premiums by origin and destination locations (full-time workers, 2000-2018)

Origin location	Estimated wage premiums	Destination location	Estimated wage premiums
Slow-growing small cities	-0.01%	Slow-growing small cities	-0.43%***
Fast-growing small cities	-0.05%	Fast-growing small cities	-0.24%
Slow-growing medium cities	0.09%	Slow-growing medium cities	-0.46% ***
Fast-growing medium cities	0.22% ***	Fast-growing medium cities	-0.28% ***
Auckland	-0.98% ***	Auckland	1.36% ***
Wellington	-0.62% ***	Wellington	1.26% ***
Minor urban	0.16% *	Minor urban	-0.61% ***
Rural areas	-0.83% ***	Rural areas	0.26% ***

Source: Authors' calculations using Linked Employer-Employee Database

Notes:

1. ***, ** and * are statistical significance at 10%, 5% and 1%.

Table A.3 Estimated wage premiums by firm sizes at origin and destination jobs (full-time workers, 2000-2018)

Firm size at origin jobs	Estimated wage premiums	Firm size at destination jobs	Estimated wage premiums
5–9 employees	-2.63%***	5–9 employees	2.59%***
10–19 employees	-4.04%***	10–19 employees	4.08%***
20–49 employees	-5.02%***	20–49 employees	5.19%***
50–99 employees	-5.70%***	50–99 employees	5.80%***
100 and over employees	-6.47%***	100 and over employees	6.20%***

Source: Authors' calculations using Linked Employer-Employee Database

Notes:

1. ***, ** and * are statistical significance at 10%, 5% and 1%.

Table A.4 Estimated wage premiums by industries at origin and destination jobs (full-time workers, 2000-2018)

Industry at time *t*	Estimated wage premiums	Industry at time *t+1*	Estimated wage premiums
Agriculture	4.54%***	Agriculture	-4.12%***
Mining	-6.49%***	Mining	9.14%***
Utility	0.76%***	Utility	0.58%***
Construction	1.94%***	Construction	-0.22%***
Wholesale trade	1.03%***	Wholesale trade	-0.42%***
Retail trade & hospitality	5.33%***	Retail trade & hospitality	-6.01%***
Transport	0.92%***	Transport	-0.01%
Telecommunication	1.62%***	Telecommunication	-1.48%***
Bank & finance	-0.72%***	Bank & finance	1.50%***
Rental & real estate services	2.41%***	Rental & real estate services	-1.41%***
Professional & admin services	5.94%***	Professional & admin services	-3.04%***
Government	2.85%***	Government	-1.13%***
Education	7.46%***	Education	-5.71%***
Health	5.96%***	Health	-5.06%***
Recreational & other services	5.37%***	Recreational & other services	-4.57%***

Source: Authors' calculations using Linked Employer-Employee Database

Notes:

1. ***, ** and * are statistical significance at 10%, 5% and 1%.


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