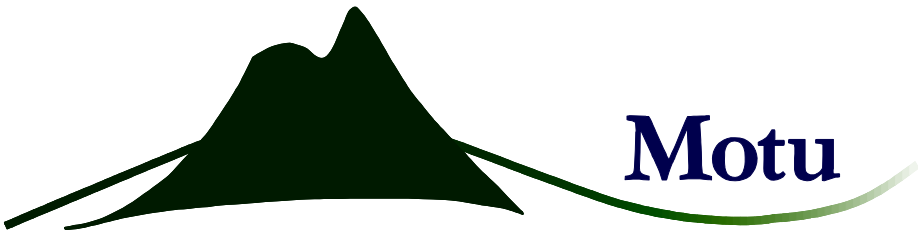

The incidence and persistence of cyclical job loss in New Zealand

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Disclaimer

This paper was undertaken while the authors were on secondment to Statistics New Zealand. The results in this paper are not official statistics, they have been created for research purposes from the Integrated Data Infrastructure prototype (IDI) managed by Statistics NZ. The opinions, findings, recommendations and conclusions expressed in this paper are those of the authors. Statistics NZ, the Ministry of Business, Innovation and Employment, Motu, and the University of Waikato take no responsibility for any omissions or errors in the information contained here.

Access to the data used in this study was provided by Statistics NZ in accordance with security and confidentiality provisions of the Statistics Act 1975. Only people authorised by the Statistics Act 1975 are allowed to see data about a particular person, business or organisation. The results in this paper have been confidentialised to protect individual people and businesses from identification.

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

The results are based in part on tax data supplied by Inland Revenue to Statistics NZ under the Tax Administration Act 1994. This tax data must be used only for statistical purposes, and no individual information may be published or disclosed in any other form, or provided to Inland Revenue for administrative or regulatory purposes. Any person who has had access to the unit record data has certified that they have been shown, have read, and have understood section 81 of the Tax Administration Act 1994, which relates to privacy and confidentiality. Any discussion of data limitations or weaknesses is in the context of using the IDI for statistical purposes, and is not related to the data's ability to support Inland Revenue's core operational requirements.

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Abstract
In New Zealand, the impact of the 2007–2008 Global Financial Crisis (GFC) was milder than in most other developed countries, though still substantial, with employment declining by 2.5 percent between the fourth quarter of 2008 and the fourth quarter of 2009. There were pronounced declines in job and worker turnover rates, signalling a decline in labour market liquidity and difficulties for new entrants and high-turnover groups of workers (Fabling and Maré, 2012). The current paper documents the extent and composition of employment change between 2000 and 2011, focusing particularly on the 2008–2010 period, when the labour market impacts of the GFC were strongest.

As in previous downturns, the incidence of cyclical job loss and unemployment has fallen disproportionately on young and unskilled workers. The paper identifies, for subgroups of workers identified by age, gender and earnings level, the sensitivity of employment growth and labour market flows to aggregate employment fluctuations and also to relative fluctuations across industries and local labour market areas. The rate of job accessions (hiring) is particularly sensitive to the economic cycle and most strongly for young workers.

Most of the differences across groups in the size of cyclical employment fluctuations are due to differing responsiveness to common shocks and not to exposure to different industry and local shocks. Finally, the paper traces outcomes for workers whose jobs end, summarising their duration out of work and the wage increases or reductions they experience when they secure employment. Workers who left or lost jobs spent longer out of work after the GFC and settled for lower earnings growth when they did find a job. Both of these effects had partly but not fully abated within 3 years of the onset of the GFC.

JEL codes
E24; E32; J21

Keywords
Global Financial Crisis; cyclical job loss; unemployment; earnings growth

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Introduction

Following the 2007–2008 Global Financial Crisis (GFC), there was a sustained slowing of employment growth in almost all countries. As in previous downturns, the incidence of cyclical job loss and unemployment has been greatest for young, unskilled and temporary workers. The impact on young workers in particular has been pronounced and possibly more acute than in previous recessions. The current paper examines the uneven incidence of cyclical employment decline across demographic groups, separately analysing changes in job and worker flows to highlight the dynamics of employment adjustment.

We examine the pattern of adjustment in New Zealand, where the impact of the GFC was milder than in most other developed countries. Employment change was nevertheless substantial, declining by 2.5 percent between the fourth quarter of 2008 and the fourth quarter of 2009. There was a decline in the job creation rate and a less pronounced rise in job destruction. There were also pronounced declines in both the accession rate and the separation rate, signalling a decline in labour market liquidity and difficulties for new entrants and high-turnover groups of workers (Fabling and Maré, 2012).

The paper makes four main contributions. First, it documents the extent and composition of employment change between 2000 and 2011, focusing particularly on the 2008–2010 period, when the impacts of the GFC were strongest. The analysis highlights differences in the composition of employment growth in terms of job flows (job creation and job destruction) and worker flows (accessions and separations) across subgroups of jobs defined by industry and location as well as by worker characteristics (age, gender and earnings level).

Second, we examine whether the uneven incidence of employment decline reflects groups' exposure to different shocks across industries and regions or differing responsiveness to common aggregate shocks. Third, we identify, for subgroups of workers, how sensitive employment growth and labour market flows are to aggregate employment fluctuations, and also to relative fluctuations by industry and local labour market area (LMA).

Fourth, we examine the flow dynamics of group-level changes in employment growth and trace their implications for the re-employment experiences of workers who left employment. Specifically, we gauge the persistence of cyclical employment loss for demographic groups by tracing cyclical changes in the duration of non-employment and in monthly earnings upon re-employment relative to prior earnings.

In the next section, we summarise key insights and issues highlighted in previous studies of the incidence of cyclical job loss. We also summarise patterns of cyclical employment variation in New Zealand during recent business cycles, as a benchmark for how different the post-GFC adjustment was from previous recessions. After outlining the data and methods that we use in our empirical analyses, we present our main findings, and conclude with a discussion of their implications.

Background

Deep recession and slow recovery

The global economic downturn that started in late 2007 was the most severe contraction in the world economy for several decades. Global unemployment has increased by nearly 27 million, as employment growth has slowed below the population growth rate. The employment-to-population ratio declined from 61.2 percent in 2007 to 60.2 percent in 2010, and even more sharply in developed economies and the European Union, from 57.1 percent to 55.0 percent (ILO, 2012).

Among OECD economies, employment declined by a historically large 2.2 percent between the fourth quarter of 2008 and the fourth quarter of 2009. The subsequent recovery has been "by far the slowest recovery of the post-war period", with employment growth of 2.5 percent still needed to return employment-to-population rates to pre-crisis level (OECD, 2012a, p.16).

The initial employment decline in New Zealand was slightly larger than the average across the OECD – a decline of 2.5 percent between the fourth quarter of 2008 and the fourth quarter of 2009. This was despite a somewhat lower output decline (-3.1 percent, compared with an average of -5.3 percent across the OECD (Fabling and Maré, 2012 (Table 1); OECD, 2012b).

As in other OECD countries, New Zealand's recovery has been sluggish. Employment returned to pre-crisis levels only after nine quarters, but subsequent employment growth has been slow. GDP has remained below pre-crisis levels for at least four years.

Uneven demographic and industry impacts

As in previous recessions, the incidence of job loss and unemployment across the OECD has fallen most heavily on young, low-skilled and temporary workers. Against the backdrop of the OECD-wide employment decline of -2.2 percent, there were much larger declines for youth aged 15–24 (-8.4 percent), low-skilled workers (-6.4 percent) and temporary workers (-7.7 percent) (OECD, 2010, Figure 1.3). Between 2007 and 2011, unemployment rates for OECD youth increased from 12.0 percent to 16.2 percent, compared with an increase from 5.8 percent to 8.2 percent overall.

Similar unemployment and employment patterns are evident for New Zealand, with youth unemployment increasing between 2007(q4) and 2011(q4) from 8.7 percent to 16.6 percent against an overall increase from 3.3 percent to 6.3 percent. The initial (2008q4–2009q4) employment decline was larger for youth (-9.5 percent) and for workers with no qualifications or with only school qualifications (-5.4 percent) than overall (-2.5 percent).

Growing structural problems in the labour market?

Associated with the slow global recovery, there are concerns that the cyclically high unemployment rates may become structural – consistent with either hysteresis or mismatch between vacancies and the skills and location of unemployed jobseekers.

The OECD note that, during the post-GFC recovery, several countries have experienced an outward shift in the Beveridge Curve,[1] reflecting simultaneous increases in both unemployment and vacancies and signalling a growing mismatch between labour supply and labour demand. The OECD point to a "growing marginalisation among the jobless" (OECD, 2012a, p.24), with young and low-skilled jobseekers being most strongly affected. These groups experienced sharp increases in unemployment early in the crisis. In addition, their subsequent likelihood of exiting unemployment has remained low, leading to a continued rise in unemployment and in long-term unemployment in particular.

In New Zealand, the Household Labour Force Survey shows that the overall unemployment rate doubled between the third quarter of 2007 and the third quarter of 2012 (from 3.5 percent to 7.1 percent). Long-term unemployment – of 52 weeks or more – increased more rapidly (from 0.2 percent to 0.9 percent of the labour force), increasing the share of unemployment that was long term from 5.3 percent to 12.4 percent.

Craigie, Gillmore and Groshenny (2012) analyse changes in the Beveridge curve in New Zealand from 1994 to 2012. They show that, in the early stages of the GFC (2008–2009), the rise in unemployment was accompanied by a sharp drop in the vacancy rate, consistent with an *inward* shift in the Beveridge Curve. Since 2010, they document a rising vacancy rate while the unemployment rate remained high, signalling a drop in matching efficiency.

Prior studies of the incidence and persistence of cyclical job loss

The uneven incidence of cyclical employment and unemployment changes is not unique to the GFC. Similar disparities have been observed in previous business cycles, with relatively strong cyclicality of outcomes for young, low-skilled, temporary and immigrant workers. These differences in cyclical incidence reflect differences in the distribution of workers across different sorts of jobs, as well as group differences in the probability of job separation or of subsequent rehiring.

In an early empirical study, Freeman (1973) examines the strong cyclicality of employment and unemployment for black Americans. His findings are consistent with a 'last in, first out' pattern, whereby black Americans are the first to lose jobs in a downturn and the last to be hired in an upturn, even within occupations. Later studies have found that differences in industry, occupation and geographic composition contribute to group differences in employment and unemployment rate cyclicality (Shin, 2000; Hoynes, Miller and Schaller, 2012). In the US, the distribution of jobs across industries and occupations accounts for almost all of the gender difference in employment rate cyclicality. In contrast, the employment rate decline for young workers in the US between 2007 and 2009 was much stronger than would be expected based on their industry and occupation distribution – declining by 7.3 percentage points compared with a predicted 1.6 percentage point drop.

[1] The Beveridge Curve captures the relationship between unemployment rates and vacancy rates. Cyclical variation traces out a negative relationship, with recessions accompanied by lower vacancy rates and higher unemployment rates. Structural unemployment leads to an outward shift in the curve, reflecting a higher rate of unemployment for any given vacancy rate.

Analysis of flows

The analysis of labour market flows provides insights into the dynamics of cyclical adjustment for different groups. As suggested by Freeman's analysis, greater cyclicality of employment may result from relatively strong increases in separation rates during downturns or from relatively strong decreases in hiring rates.[2] In aggregate, there is a clear pro-cyclical pattern of job starts – upturns are accompanied by a rise in hiring rates and stronger outflows from unemployment (Davis, Faberman and Haltiwanger, 2006; OECD, 2009; Elsby, Hobijn and Sahin, 2010; Shimer, 2012). Job separation rates and inflows into unemployment are counter-cyclical but display smaller cyclical variation than hiring rates. The measured low cyclicality of separations may, however, be somewhat misleading for two reasons. First, separations may be voluntary or involuntary. The rate of voluntary separations (quits) declines slightly in downturns, whereas involuntary separations are clearly counter-cyclical, rising sharply especially in the early stages of a downturn. The second reason is that the response of separation rates to downturns is non-linear, responding strongly to sharp or sustained downturns but not to mild contractions (Davis et al., 2006).

OECD (2009, p.52) report that, "in the majority of countries, changes in the outflow [from unemployment] rate are more important than changes in the inflow rate in explaining cyclical changes in unemployment". The role of unemployment inflows, and thus of job separations, is shown to be particularly low in New Zealand, implying that rising unemployment is relatively strongly linked to increasing unemployment durations. Across all countries, variation in hiring rates (unemployment outflows) accounts for more of the cyclical variation in unemployment for young workers (15–24 years of age) than for other workers. Although unemployment inflows account for a small proportion of youth unemployment variation, the amount of cyclical variation is large, so that the cyclical contributions of involuntary separations and labour market entrants to unemployment inflows are larger for young workers than for other workers. For older workers (55 years of age and over), unemployment changes are more strongly linked to rates of job separation (unemployment inflows) than for young workers but are still dominated by hiring variation.

Gielen and van Ours (2006) confirm these general patterns using data on employment hiring and separations rather than unemployment transitions. They find that "cyclical adjustments of the workforce occur mainly through fluctuations in worker entry for young and prime-age workers while for old workers they occur mainly through fluctuations in separations" (p.503). They extend the literature by decomposing cyclical shocks into aggregate, sectoral and firm-specific components, and estimating the cyclical responsiveness of various demographic groups to each of these. They find that the employment of older workers responds only to firm-specific shocks, whereas young workers are affected by all types of shocks.

In the context of the pronounced declines in employment and increases in unemployment for young, low-skilled and temporary workers following the GFC, a natural question is whether the patterns of

[2] In response to Freeman's analysis, Couch and Fairlie (2010) examine the relative cyclicality of black unemployment rates, separately tracking cyclical patterns of inflows into unemployment and of outflows from unemployment. They find that, between 1989 and 2004, unemployment inflows were more cyclically responsive than outflows, but black workers' chances of exiting unemployment into employment followed the same cyclical pattern as those of white workers. They conclude that black workers are 'last hired', but not 'first fired'.

worker flows and unemployment transition rates are different from those observed in previous recessions. Hoynes et al. (2012) show the response of unemployment in the United States to state unemployment rates by age, gender, race and education. They conclude that "the Great Recession is deeper than previous recessions but otherwise is affecting groups more or less similarly" (p.42). The poor labour market outcomes for cyclically sensitive groups thus reflect the severity of the GFC downturn and the length of the subsequent slow recovery. Whether these circumstances are leading to a rise in the natural rate of unemployment and an increase in matching frictions is an open question (Daly et al., 2012; OECD, 2012a, pp.38ff).

New Zealand labour market context

In order to place New Zealand's post-GFC employment fluctuations in context, Figure 1 and Figure 2 show the cyclical variation in employment rates for various demographic and skill groups since 1986. The time path of the employment rate for each group is plotted against the aggregate employment rate to highlight differences in cyclicality as well as the importance of longer-term trends.

Employment rates for the prime-aged population (those aged 30–50) tend to move similarly to overall employment rates (ie, run parallel to the 45° line), perhaps inevitably given that they account for the majority of the working-age population. Prime-aged men experienced a decline in employment rates between 1986 and 1992 and slow growth since then, with only minor drops in employment rates accompanying the aggregate fluctuations. For prime-aged women, employment rates were relatively stable until 1998, before increasing between 1998 and 2006 together with the aggregate rate. Since 2006, that increase has stalled. For both younger and older workers, the fluctuations have been more pronounced, but with quite distinct patterns.

For young men, there is a trend decline in employment rates throughout the 1986–2012 period. The employment rate for young men declined more rapidly than the aggregate rate during downturns, with particularly sharp declines between 1996 and 1998 and since 2006. It was also more cyclically responsive when aggregate rates rose between 1992 and 1996 but did not share proportionately in the 1998–2006 expansion. Young women were less adversely affected than young men by the 1986–1992 and 1996–1998 declines in the aggregate employment rate and made slightly smaller gains than young men during the intervening recovery. Their experience since 1998 has, however, closely paralleled that of young men, with the employment rate remaining stable between 1998 and 2006, while the aggregate rate rose by almost 6 percentage points, and declining sharply since 2006.

In contrast, variation in the employment rates of older workers is dominated by a trend increase, at least since 1992. The employment rate for older women in particular has increased markedly, more than doubling between 1992 and 2012. The employment rate of older men had declined more rapidly than the aggregate rate between 1986 and 1992, but since then, employment rates have been rising for older men and women, in periods of aggregate employment decline as well as growth. The employment rate for older men, however, increased only slightly between 2006 and 2012, against a background of declining overall employment rates.

When examining differences in employment growth for demographic subgroups, the changes in employment rates are magnified by demographic shifts associated with population ageing. In

particular, older workers not only experienced rising employment rates but were also increasing in number, leading to elevated growth in employment.

The cyclicality of employment rates by level of qualification is more muted than cyclicality by age, as shown in Figure 2. The most notable change is the relatively steep decline in the employment rate between 1986 and 1992 for men with no qualifications. Employment rates for those with school qualifications have moved more or less in line with aggregate employment rate changes, apart from a relatively rapid decline around 1989, when the school leaving age was raised from 15 to 16.

For men generally, employment rates have fallen relative to the aggregate rate, resulting in relatively stable employment rates despite the rising aggregate rate. Against the backdrop of this trend decline, there is evidence of cyclicality, with steep declines during downturns. The drop in the overall employment rate between 1996 and 1998 particularly affected men with post-school but no school qualifications. Since 2006, the cyclical drop has been particularly sharp for unqualified men.

For women, employment rates have risen more slowly than for the population as a whole, apart from women with school qualifications, whose employment rates have kept pace. There is less evidence of strong cyclicality for women than for men.[3]

[3] It may seem paradoxical that employment rates for most groups are declining relative to the overall employment rate. The explanation is that the increase in the overall employment rate also reflects a growth over time in the proportion of people in high-employment rate groups – those with higher qualifications.

Figure 1: Cyclical sensitivity of employment rates by age and sex (HLFS: 1986–2012)

a) Men

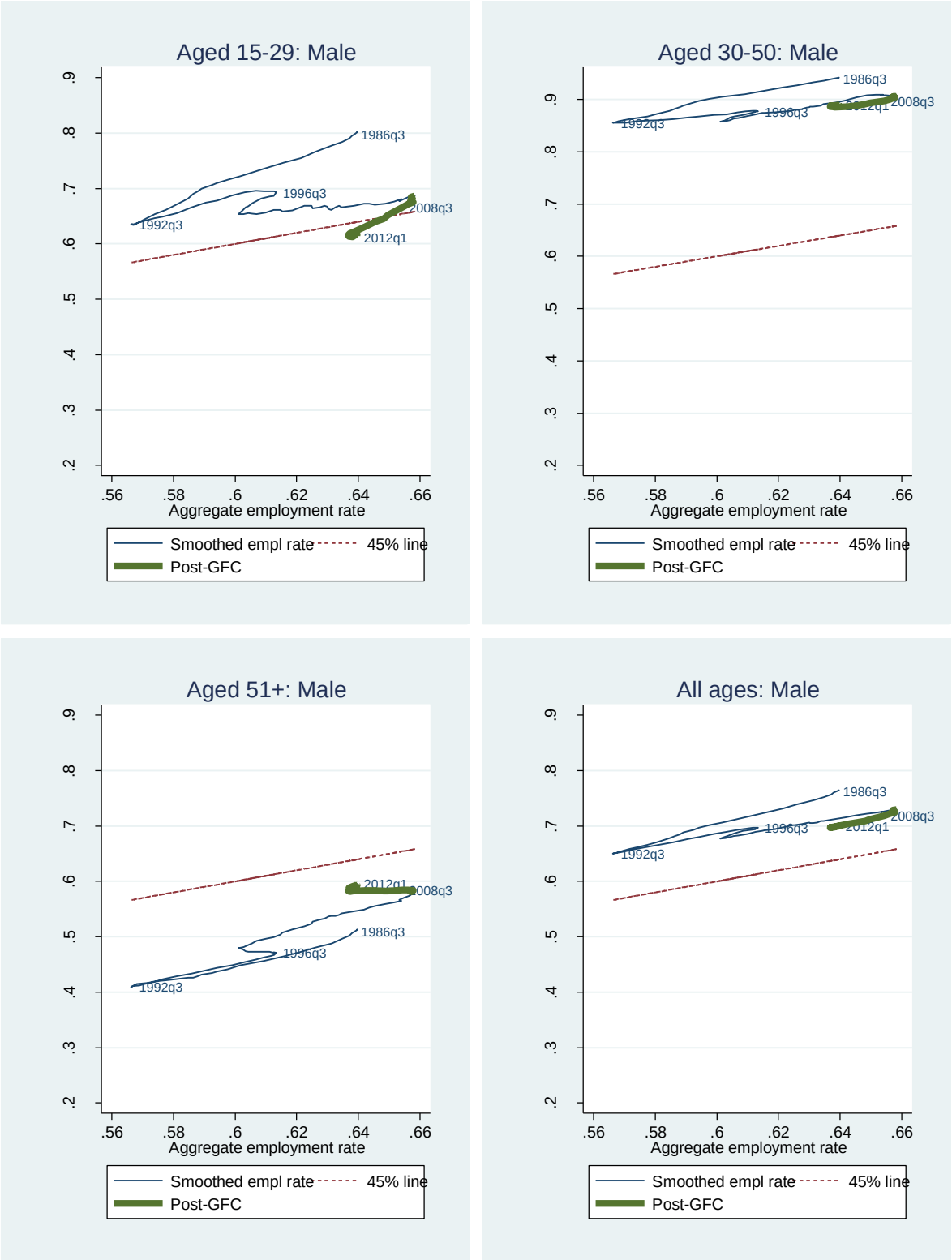
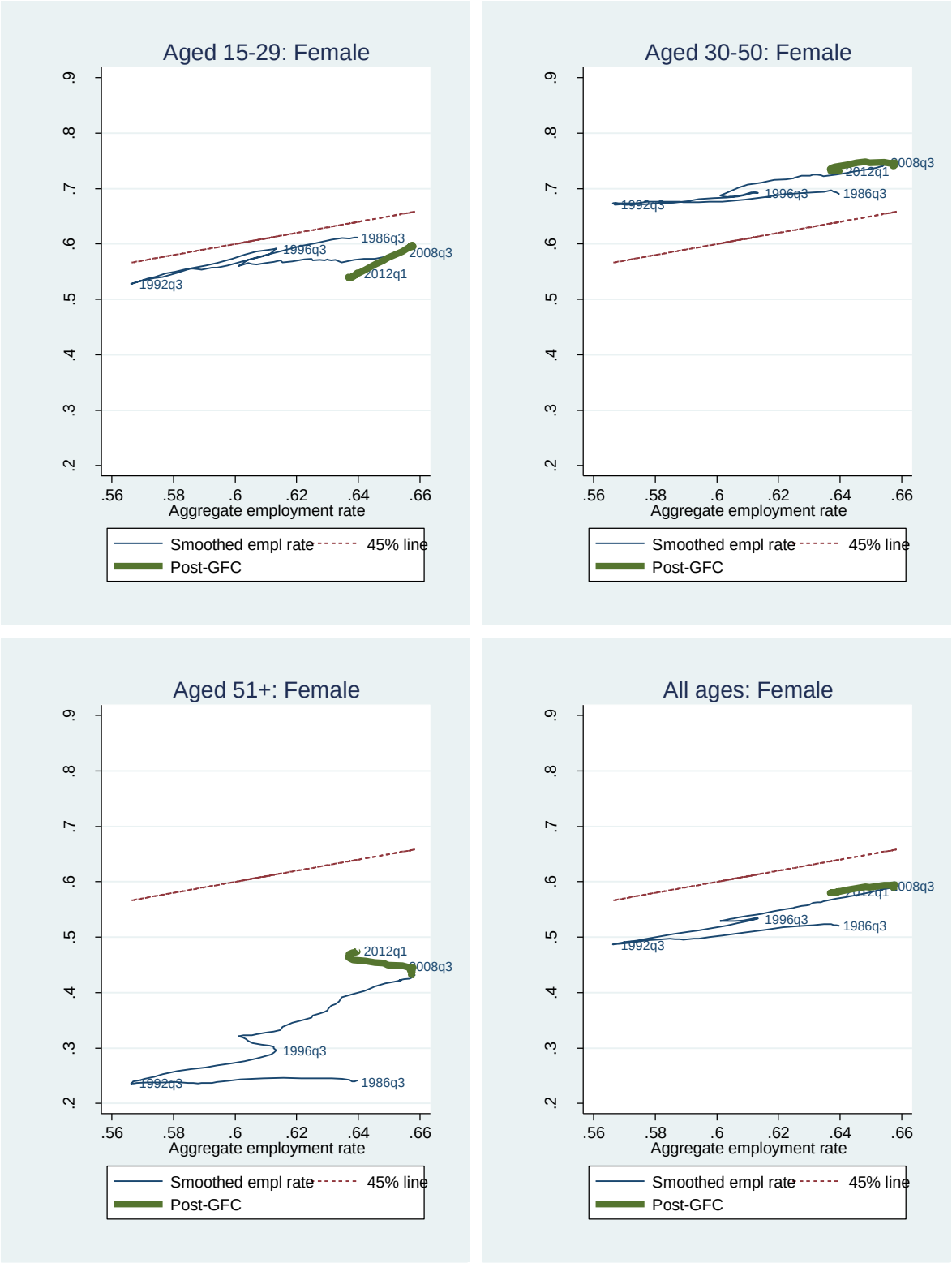


Figure 1: Cyclical sensitivity of employment rates by age and sex (HLFS: 1986–2012) (continued)

b) Women



Source: Statistics New Zealand Household Labour Force Survey. All quarterly employment series have been smoothed as a 7-quarter centred moving average.

Figure 2: Cyclical sensitivity of employment rates by highest qualification and sex (HLFS: 1986–2012)

a) Men

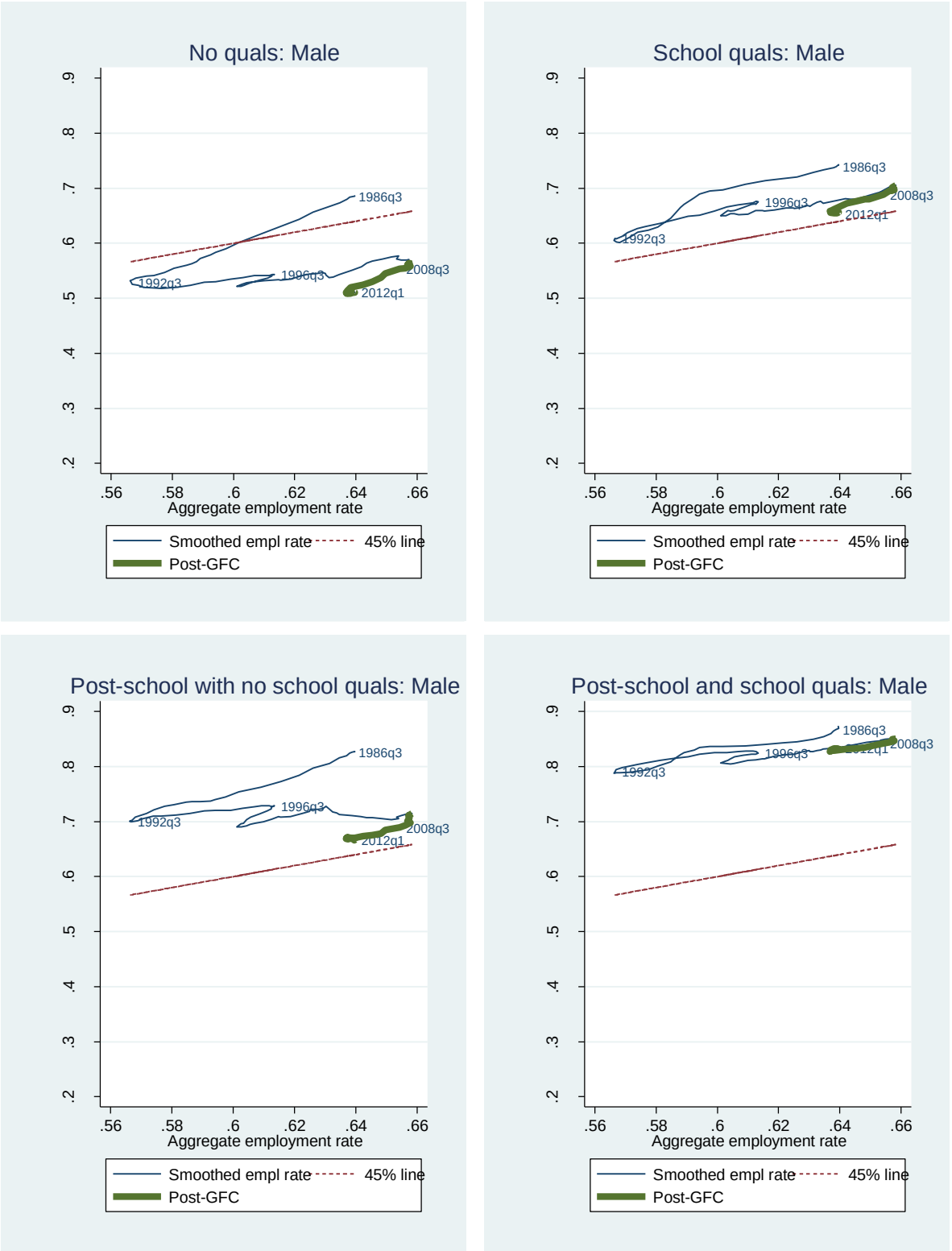
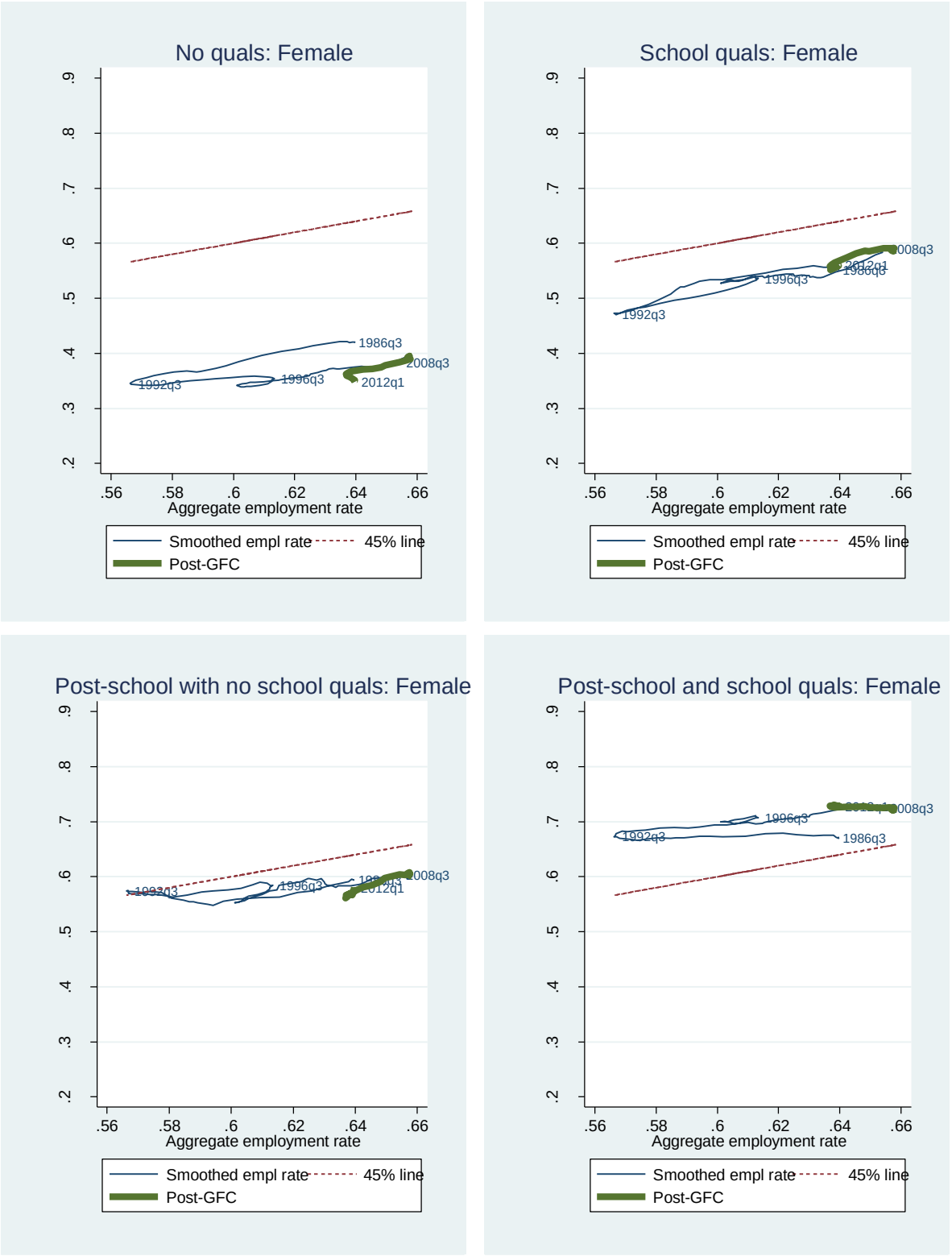


Figure 2: Cyclical sensitivity of employment rates by highest qualification and sex (HLFS: 1986–2012) (continued)

b) Women



Source: Statistics New Zealand Household Labour Force Survey. All quarterly employment series have been smoothed as a 7-quarter centred moving average.

Employment dynamics and the incidence of cyclical job loss

Our more detailed analysis of the cyclicality of employment changes uses firm-level job and worker flows, which are available for a shorter time period than is shown in Figure 1 and Figure 2. Our analysis, therefore, focuses on cyclicality around the GFC-related employment decline, the prior growth phase and the subsequent slow recovery.

Data and methods

We use annual data on employment and earnings, which are sourced from 'Pay-As-You-Earn' (PAYE) income tax returns filed by employers. These data are contained in Statistics New Zealand's Linked Employer-Employee Database (LEED).[4] The unit of observation in the LEED data is a job, defined as a combination of employer and employee, observed monthly. For each year from 2000 to 2011, we select employees who are employed on 15 March.

For these employees, we observe their age and gender and calculate their real average monthly earnings (converted to 2012 dollars) over all months in which they are employed between April 1999 and March 2012. We use average monthly earnings (conditional on being employed) as a coarse indicator of skill, dividing employees into three equally sized groups that we label 'low earners', 'medium earners' and 'high earners'.[5] Similarly, we classify employees into three broad age groups: young workers (younger than 30 years of age); prime workers (30–49 years of age); and older workers (50 years of age and older). Thus, there are up to 18 different worker types within each firm (3 age groups * 2 gender groups * 3 earner groups).

Jobs are classified according to the industry and location of the employer, which we refer to as a plant. Industry is classified by 2-digit ANZSIC96 code. Some small industries are grouped together, leaving 43 distinct industry groupings.[6] Location is defined by functional labour market area (LMA), using the 58-LMA classification defined by Papps and Newell (2002). Where firms operate in more than one LMA, we treat each LMA-firm combination as a separate employer. In the construction of the LEED data, some employees in multi-plant firms are allocated to plants where the actual location is not known. A single PAYE return may cover more than one plant, and in such cases, workers are allocated, and may be reallocated, to plants based on information about worker location and plant-level employment counts (Papadopoulos, 2008). As described below, we discount job and worker flows that are due to apparent intra-firm transfers.

Job and worker flows

We measure job and worker flows at two distinct levels of aggregation – by plant and by 'typed-job', as defined below. We define job flows for a plant (indexed by *j*) during a year (indexed by *y*, with the end of the year indexed as *t*) as:

[4] We use the 201202 snapshot of LEED.

[5] The cut-off points in 2012 equivalents are $1,975 per month and $3,555 per month, equating to annual rates of $23,700 and $42,700.

[6] The following industries are grouped at the one-digit level: B: Mining; D: Electricity, gas and water; and M: Government administration and defence. Other groupings are within industry I (I62, I63, I64 and I65: Transport other than road transport) and industry Q (Q96: Other services and Q97: Private households employing staff).

$$Net\ employment\ growth:\ NEG_{jy} = E_{jt} - E_{jt-1}$$

$$Job\ creation: JC_{jy} = \begin{cases} NEG_{jy} & if\ NEG_{jy} > 0 \\ 0 & otherwise \end{cases}$$

$$Job\ destruction: JD_{jy} = \begin{cases} -NEG_{jy} & if\ NEG_{jy} < 0 \\ 0 & otherwise \end{cases}$$

We refer to the years over which growth and flow rates are measured (*y*) by the end-year. Thus, growth and flows between 15 March 2000 and 15 March 2001 are referred to as flows for 2001. Net employment growth is disaggregated in terms of worker flows, with accessions referring to workers who joined the plant during the year and separations referring to workers who left the plant:[7]

$$NEG_{jy} = Accessions_{jy} - Separations_{jy}$$

Following Davis and Haltiwanger (1992), each of these job and worker flows is expressed as a rate, using average employment as a denominator, to define a net employment growth rate (*NEGR*), job creation rate (*JCR*), job destruction rate (*JDR*), accession rate (*AR*) and separation rate (*SR*):

$$Rate_{jy} = \frac{Flow_{jy}}{(E_{jt} + E_{jt-1})/2}$$

For a particular plant (*j*), the net employment growth rate (*NEGR*) takes on a value from -2 to 2, with -2 representing a move to zero employment and 2 representing a plant that starts employing during the year. These rates can also be calculated for groups of plants or groups of workers. Thus, for plants in a particular group (*G*) which could be defined by industry, location or across all firms, we calculate:

$$Rate_{Gy} = \frac{\sum_{j \in G} Flow_{jy}}{(\sum_{j \in G} E_{jt} + \sum_{j \in G} E_{jt-1})/2}$$

At levels of aggregation above the plant, we can also define an 'excess reallocation rate', which is the amount of job turnover in excess of that which is needed to achieve the observed net employment growth:

$$XRR_{Gy} = JCR_{Gy} + JDR_{Gy} - |NEGR_{Gy}|$$

Intra-firm transfers of workers between plants contribute to job and worker flows in the same way as movements between firms. Unfortunately, apparent intra-firm transfers in the LEED data may arise due to statistical allocation of workers even when no move occurred. It is thus not possible to distinguish reliably true transfers from statistical transfers. To account for this fact, the employment of workers who transfer between plants within the same firm is given a weight of one-half in each of the plants, and these transfers are not counted when calculating accessions and separations.[8] One

[7] This measure counts only workers who were employed at the beginning or end of the year. It thus excludes turnover of workers who join and leave a firm within a year.

[8] In some cases, workers may be reallocated between firms (Papadopoulos, 2008). No adjustment is made for such inter-firm statistical transfers.

consequence of this treatment is that end-of-year employment in a plant may differ from start-of-period employment in the following year.[9]

The second set of measures that we calculate distinguishes flows for different types of workers. Flows are captured between 'typed-jobs', which are defined as a distinct combination of plant, employee-age group, employee-gender and employee-earnings group. This disaggregation is necessary to enable the calculation of group-specific job and worker flow rates and to identify whether groups have different responsiveness to common shocks or face distinct group-specific shocks.

One complication that arises when measuring flows for typed-jobs is that workers move between types purely as a result of ageing. Worker age is measured at the start (15 March) of each year. Net employment growth within a typed-job is adjusted to capture the effect of ageing. A worker who moves between age categories while remaining at the same plant from one year to the next contributes *NEG* = -1 in the year that they reach the age cut-off and *NEG* = +1 (in an older age category) in the subsequent year. They are not, however, counted as an accession or separation if they remain at the same plant. The annual change in employment for an age category is consequently not equal to the difference between accessions and separations for that age category. The difference is material, in that approximately 30,000–40,000 people move between age categories each year. We use the difference between accessions and separations as our measure of net employment growth.

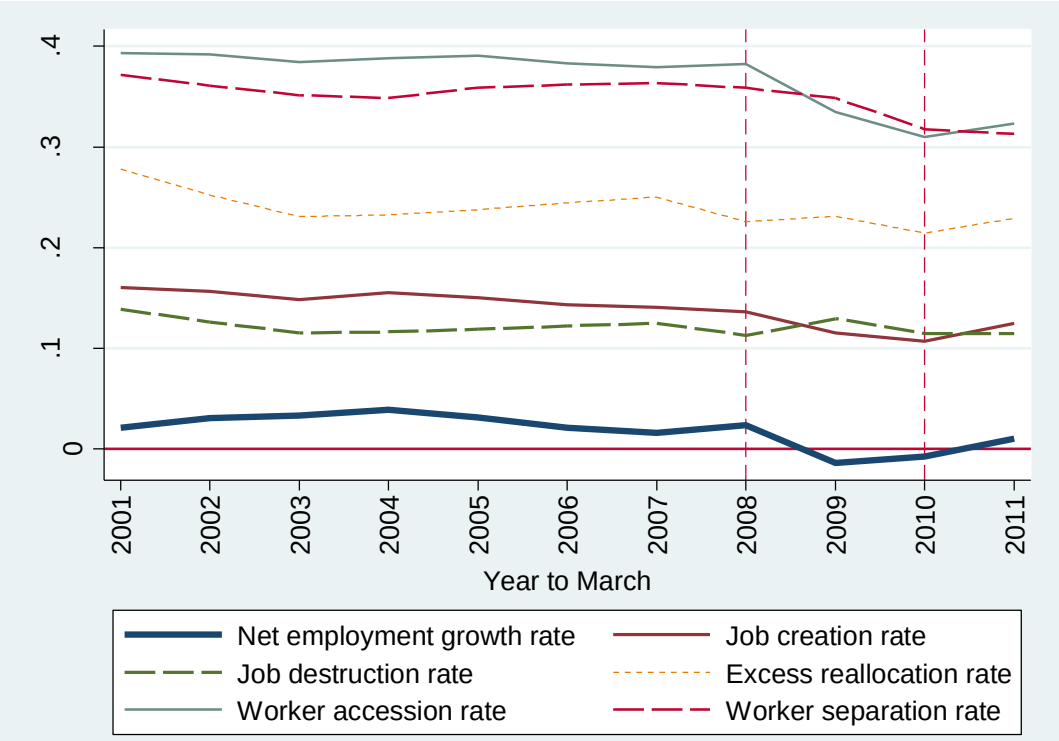
Results

Patterns of net employment growth and worker flows

The aggregate pattern of employment growth is shown in Figure 3, together with measures of job and worker flows. Net employment growth was positive from 2001 to 2008, reaching a peak of 0.039 in 2004. Employment subsequently declined in 2009 and 2010, before growing again by 0.01 in 2011. The 2009 decline in employment was accompanied by a sharp rise in job destruction and a sharp decline in job creation, reflecting the contributions of employment changes in contracting and expanding firms respectively. In contrast, excess reallocation remained relatively stable, indicating that, even during a period of overall contraction, there was still a moderately high degree of job creation in expanding firms.

[9] Overall, apparent intra-firm transfers account for 2–3% of employment each year, except for the final two years of our study (2010 and 2011), when they account for around 4%. The increase may reflect statistical reallocations made in response to improved location information in the IDI.

Figure 3: Job and worker flows – contributions to net employment growth



Note: Figures have been derived from the Integrated Data Infrastructure (IDI) prototype managed by Statistics New Zealand.

The picture from worker flows tells a slightly different story. The 2009 contraction of employment was accompanied by a drop in both the accession rate and the separation rate, although the drop in the separation rate was modest. We are unable to distinguish voluntary from involuntary separations, which, based on international studies, we would expect to have moved in opposite directions. We assume that the slight drop in the separation rate reflects a decline in voluntary quits that is offset by a possibly substantial rise in involuntary separations.

Over the entire sample period, employment growth varied not only by year but also across LMAs, industries and job types. Table 1 summarises the extent of variation at various levels of aggregation.

Table 1: Variation in net employment growth – aggregate, LMA, industry and job type

Level of aggregation	Number of observations	Mean net employment growth	Standard deviation
Total	11	1.8%	1.7%
58 LMAs	638	0 (relative to total)	1.7%
43 industries	473	0 (relative to total)	3.7%
2,437 local industries	26,069	0 (relative to total)	7.6%
39,448 job types	371,497	0 (relative to total)	16.9%

Note: Figures have been derived from the Integrated Data Infrastructure (IDI) prototype managed by Statistics New Zealand. 'Job types' refers to unique combinations of age (3 groups), skill (3 groups) and gender within local industries.

Figure 4 shows net employment growth for subsets of workers, defined by age, gender, skill, location and industry. Mean rates of employment growth and mean job and worker flow rates are shown in Table 2 for two subperiods (2001–2007 prior to the GFC and 2008–2011 post-GFC) and for the entire study period (2001–2011). Over the entire period, net employment growth averaged 1.8 percent. Two groups experienced significantly higher average growth – older workers (5.0 percent) and low earners (4.9 percent). For older workers, this reflects a combination of demographic change as well as an increasing employment rate. The employment growth for low-earning workers is consistently high, with relatively strong and sustained growth over most of the period, which would have drawn in marginal workers (Maré and Hyslop, 2008).[10]

As shown in Figure 4 and Table 3, younger workers faced the sharpest decline in employment in 2009 (-6.2 percent), whereas the employment of older workers continued to grow, albeit at a somewhat slower rate (3.7 percent). The cyclical volatility of employment for young and low-earning workers, which are overlapping groups,[11] is evident in the rebound in employment growth in 2010 and 2011. For low earners, employment growth was again positive and substantial in 2011, whereas for young workers, the gains were not sufficient to restore positive employment growth.

Figure 4 summarises changes in the distribution of net employment growth rates across LMAs, across industries and across 'typed jobs', with more detail shown in Table 4 and Table 5. The impact of the 2009 downturn is evident across a broad range of LMAs, with negative employment growth in LMAs that together account for over three-quarters of employment. There was greater heterogeneity of growth rates across industries, though clear evidence that contraction affected employment across a broad range of industries. The greatest contractions in 2009 were for construction (-8.0 percent), manufacturing (-5.7 percent) and finance and insurance (-4.7 percent).

Summary measures of job and worker flows in Table 2 show that the groups that experienced the most pronounced declines in employment in 2009, young and low-earning workers, are also groups with high average flow rates. Compared with an overall average of around 35 percent, these two groups have average accession and separation rates of between 50 and 60 percent. In contrast, older workers and high-earning workers have rates that are about half that level.

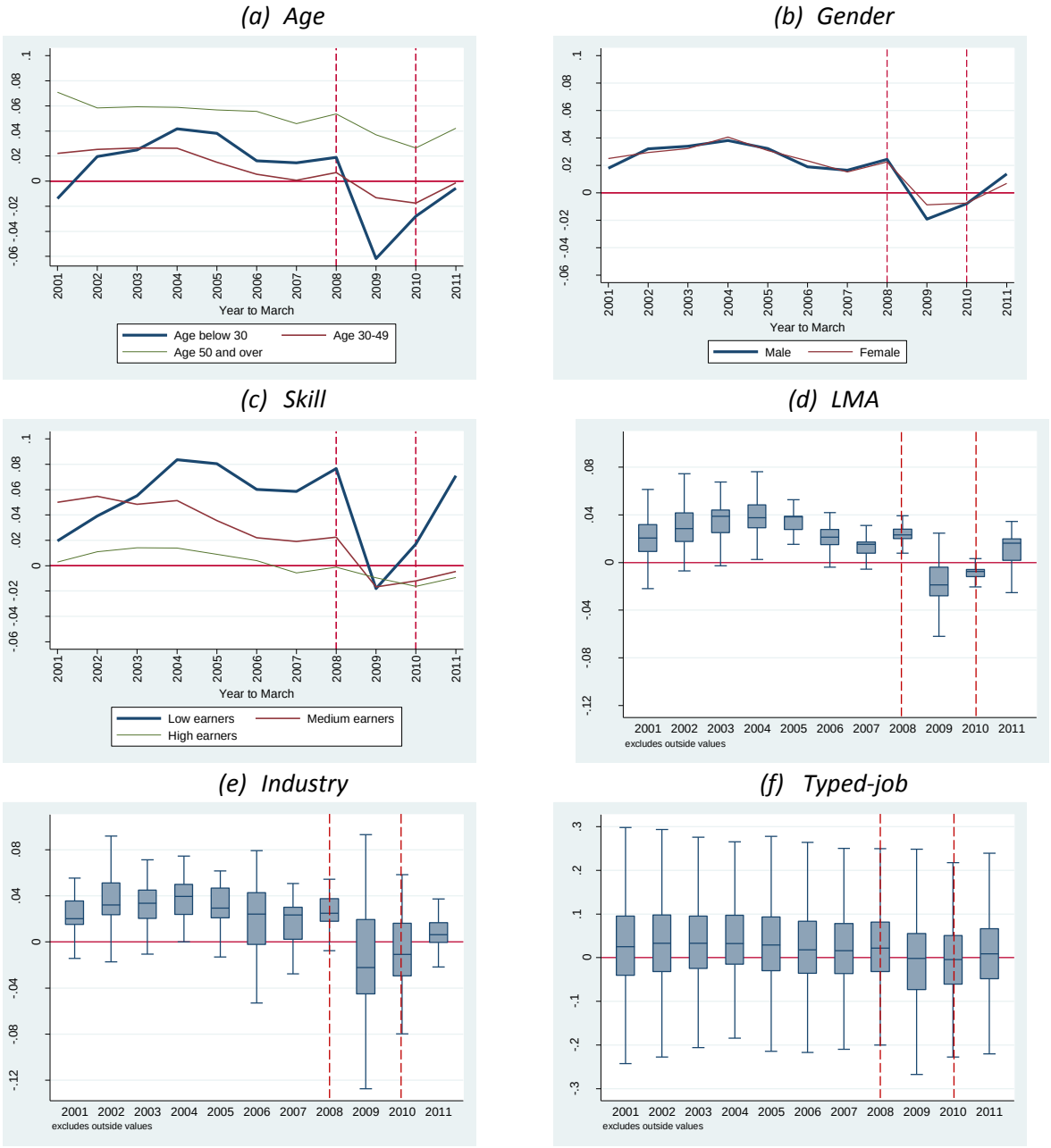
The initial employment impact of the GFC was not due to increased job losses but reflected increased difficulty of finding jobs. Accession rates declined in 2009 for all age, gender and skill groups as firms stopped hiring, with particularly large declines for the high-turnover young and low-earning groups (see Figure 5). Separation rates remained relatively stable in 2009 and actually declined for most groups in the following year (2010), presumably reflecting a drop in voluntary separations. Declines in all growth and flow rates affected all groups, as is evident in the comparison of pre-GFC and post-GFC rates shown in Table 2.

Craigie et al. (2012) interpret the 2010–2012 rise in the vacancy rate while unemployment remained high as evidence of skill mismatches, though such a rise may merely reflect the return of labour market liquidity to normal levels.

[10] While workers are divided equally between the three income groups, worker-month observations are clearly not, with lower earners only accounting for 19.1 percent of observations.

[11] Appendix Table A1 summarises the overlaps between demographic subgroups. Almost half (48 percent) of the low earners are young, though only 31 percent of young workers are low earners.

Figure 4: Net employment growth rate by age, gender, skill, LMA, industry and job type



Note: Figures have been derived from the Integrated Data Infrastructure (IDI) prototype managed by Statistics New Zealand. All statistics are employment-weighted. The boxes in the box plots in panels (d) to (f) show upper and lower quartiles, with median values shown as a line. The 'whiskers' indicate the value adjacent to the upper or lower quartile.

Table 2: Average job and worker flow rates by worker type (2001–2011)

	Average employment share	Net employment growth rate	Job creation rate	Job destruction rate	Excess job reallocation rate	Worker accession rate	Worker separation rate
				(a) Pre-GFC (2001–2007)			
Total	100.0%	2.7%	15.1%	12.3%	24.6%	38.7%	35.9%
Male	50.0%	2.7%	16.8%	14.1%	28.2%	37.4%	34.7%
Female	50.0%	2.8%	15.9%	13.1%	26.3%	40.0%	37.2%
Age <30	30.1%	2.0%	22.1%	20.1%	39.8%	59.1%	57.0%
Age 30–49	47.7%	1.7%	15.6%	13.9%	27.8%	38.1%	36.4%
Age 50+	22.2%	5.7%	17.7%	12.0%	24.0%	31.8%	26.0%
High earners	46.6%	0.7%	12.7%	12.0%	23.8%	26.5%	25.8%
Medium earners	35.7%	3.9%	20.5%	16.6%	33.1%	44.5%	40.6%
Low earners	17.7%	5.8%	28.4%	22.6%	45.3%	59.1%	53.3%
				(b) Post-GFC (2008–2011)			
Total	100.0%	0.3%	12.1%	11.8%	22.5%	33.8%	33.5%
Male	49.8%	0.3%	13.9%	13.6%	25.9%	32.7%	32.4%
Female	50.2%	0.3%	12.8%	12.5%	24.1%	34.9%	34.5%
Age <30	28.6%	-1.9%	18.8%	20.7%	36.7%	53.2%	55.1%
Age 30–49	44.8%	-0.6%	12.8%	13.4%	25.2%	33.9%	34.5%
Age 50+	26.6%	4.0%	14.6%	10.7%	21.3%	28.4%	24.4%
High earners	42.4%	-0.9%	9.6%	10.5%	19.1%	21.3%	22.2%
Medium earners	36.3%	-0.3%	15.5%	15.8%	30.0%	35.5%	35.7%
Low earners	21.4%	3.7%	24.4%	20.7%	40.5%	55.5%	51.9%
				(c) Full study period (2001–2011)			
Total	100.0%	1.8%	13.9%	12.1%	23.8%	36.8%	35.0%
Male	49.9%	1.8%	15.7%	13.9%	27.3%	35.6%	33.8%
Female	50.1%	1.8%	14.7%	12.9%	25.4%	38.0%	36.2%
Age <30	29.5%	0.6%	20.9%	20.3%	38.6%	56.9%	56.3%
Age 30–49	46.6%	0.8%	14.5%	13.7%	26.8%	36.6%	35.7%
Age 50+	23.9%	5.0%	16.4%	11.4%	22.8%	30.3%	25.3%
High earners	45.0%	0.1%	11.5%	11.4%	22.1%	24.6%	24.5%
Medium earners	35.9%	2.3%	18.5%	16.3%	31.9%	40.9%	38.7%
Low earners	19.1%	4.9%	26.7%	21.8%	43.2%	57.6%	52.7%

Note: Figures have been derived from the Integrated Data Infrastructure (IDI) prototype managed by Statistics New Zealand.

Table 3: Net employment growth by worker type

Worker type	Average employment share	Time period				
		2001–07	2008	2009	2010	2011
Total	100.0%	2.7%	2.4%	-1.4%	-0.8%	1.0%
Male	49.9%	2.7%	2.4%	-1.9%	-0.8%	1.4%
Female	50.1%	2.8%	2.3%	-0.9%	-0.7%	0.7%
Age <30	29.5%	2.0%	1.9%	-6.2%	-2.8%	-0.6%
Age 30–49	46.6%	1.7%	0.7%	-1.3%	-1.8%	-0.1%
Age 50+	23.9%	5.7%	5.4%	3.7%	2.6%	4.2%
High earners	45.0%	0.7%	-0.1%	-1.0%	-1.6%	-0.9%
Medium earners	35.9%	3.9%	2.2%	-1.7%	-1.2%	-0.5%
Low earners	19.1%	5.8%	7.7%	-1.8%	1.7%	7.1%

Note: Figures have been derived from the Integrated Data Infrastructure (IDI) prototype managed by Statistics New Zealand. Years refer to the 12 months ending in March of the stated year.

Table 4: Net employment growth by industry

Industry	Average employment share	Time period				
		2001–07	2008	2009	2010	2011
Manufacturing	14.5%	1.0%	-1.1%	-5.7%	-4.1%	-0.7%
Retail Trade	12.0%	2.7%	1.4%	-3.5%	-1.4%	-0.4%
Property and Business Services	10.8%	4.1%	4.0%	-3.6%	-1.4%	4.6%
Health and Community Services	10.6%	2.8%	3.3%	5.3%	2.1%	0.4%
Education	9.1%	2.4%	2.2%	0.3%	4.5%	0.6%
Wholesale Trade	5.9%	2.6%	2.7%	-3.2%	-1.8%	1.0%
Accommodation, Cafés and Restaurants	5.5%	3.3%	1.8%	-4.1%	-0.6%	-0.1%
Construction	5.4%	7.0%	4.6%	-8.0%	-5.4%	0.9%
Transport and Storage	5.3%	1.6%	4.0%	-0.4%	-2.1%	2.8%
Agriculture, Forestry and Fishing	5.2%	1.3%	1.9%	3.2%	1.2%	2.1%
Government Administration and Defence	4.5%	3.2%	4.0%	8.6%	-3.6%	3.7%
Personal and Other Services	3.8%	3.9%	3.3%	0.8%	3.3%	-0.5%
Finance and Insurance	3.0%	2.3%	1.6%	-4.7%	-1.7%	3.6%
Cultural and Recreational Services	2.4%	3.1%	2.5%	2.6%	0.8%	-3.3%
Communication Services	1.4%	-0.2%	3.3%	-1.6%	-2.6%	1.4%
Electricity, Gas and Water Supply	0.4%	3.2%	8.0%	7.0%	5.8%	6.1%
Mining	0.3%	6.4%	10.6%	4.6%	5.1%	0.8%
Total	100%	2.7%	2.4%	-1.4%	-0.8%	1.0%

Note: Figures have been derived from the Integrated Data Infrastructure (IDI) prototype managed by Statistics New Zealand. Years refer to the 12 months ending in March of the stated year.

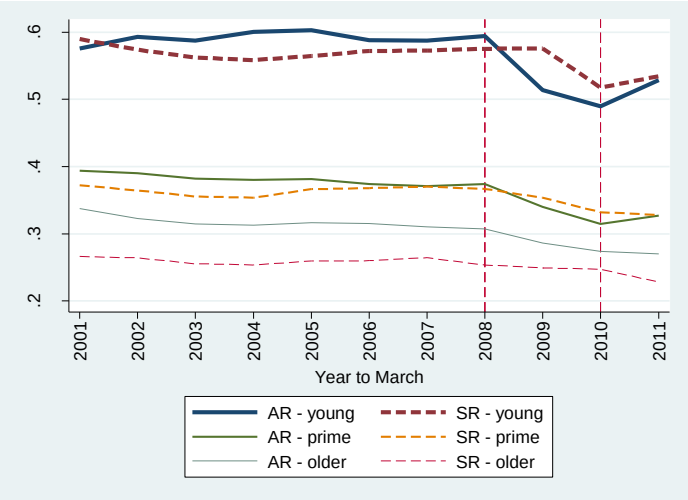
Table 5: Net employment growth by labour market area

Labour market area	Average employment share	Time period				
		2001–07	2008	2009	2010	2011
Auckland	19.4%	2.9%	2.3%	-2.8%	-0.8%	2.5%
South Auckland	13.3%	3.1%	2.8%	-1.9%	-0.6%	1.7%
Christchurch	11.3%	2.8%	2.5%	-1.7%	-1.1%	-0.5%
Wellington	8.6%	2.2%	2.8%	0.3%	-1.2%	1.9%
Hamilton	4.9%	3.7%	2.0%	-2.1%	-0.9%	2.0%
Dunedin	3.1%	2.4%	1.9%	-1.3%	-2.6%	0.4%
Hutt Valley	3.0%	1.9%	1.4%	-2.1%	-1.5%	-1.1%
Palmerston North	2.9%	2.1%	1.3%	0.9%	-2.2%	0.3%
Tauranga	2.7%	4.6%	3.4%	-2.8%	1.0%	0.9%
Nelson	2.1%	2.4%	2.4%	-1.5%	0.7%	1.6%
Hastings	2.0%	3.2%	0.4%	1.6%	-2.3%	1.0%
Invercargill	1.9%	2.2%	2.1%	0.9%	-1.5%	-0.4%
New Plymouth	1.8%	3.4%	3.4%	1.6%	-1.9%	1.4%
Rotorua	1.6%	2.0%	1.0%	-2.7%	-0.1%	0.4%
Napier	1.6%	2.6%	2.1%	-0.4%	-1.2%	-2.2%
Whangarei	1.6%	3.6%	3.9%	-1.1%	-1.9%	0.2%
Waimate	1.2%	2.1%	2.2%	0.7%	-0.7%	0.2%
Gisborne	1.0%	1.8%	0.2%	-1.1%	-0.2%	-0.8%
Wanganui	1.0%	1.8%	0.7%	-3.2%	0.2%	-0.2%
Blenheim	0.9%	4.5%	5.7%	3.8%	-9.0%	0.0%
Other NI	9.5%	2.2%	1.6%	-1.9%	1.1%	0.0%
Other SI	4.5%	2.7%	3.4%	0.2%	0.8%	1.1%
Total	100%	2.7%	2.4%	-1.4%	-0.8%	1.0%

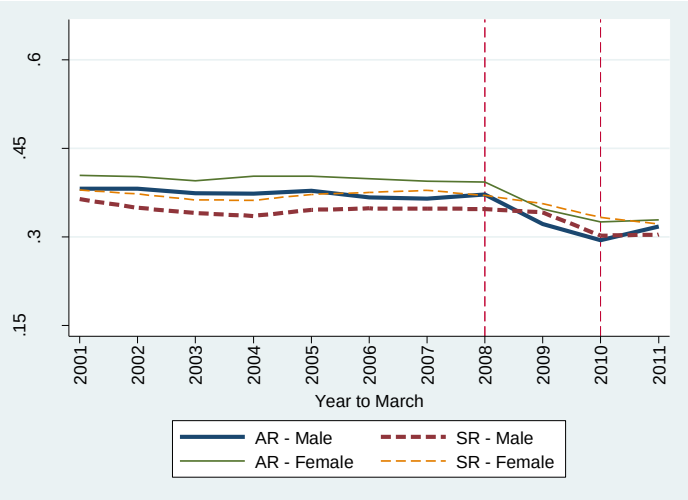
Note: Figures have been derived from the Integrated Data Infrastructure (IDI) prototype managed by Statistics New Zealand. Years refer to the 12 months ending in March of the stated year.

Figure 5: Accession and separation rates by age, gender and skill

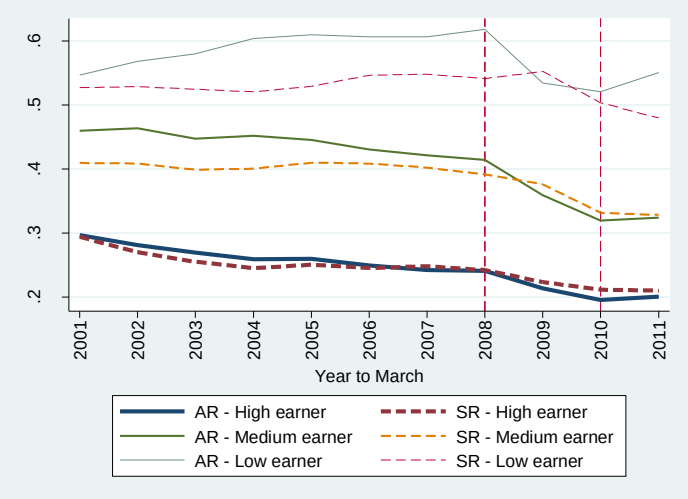
(a) Age group



(b) Gender



(c) Earnings group



Note: Figures have been derived from the Integrated Data Infrastructure (IDI) prototype managed by Statistics New Zealand. AR = accession rate; SR = separation rate as defined in text.

Identifying the sources of cyclical employment variation

In this section, we examine whether differences across gender, age and skill groups in the incidence of cyclical employment decline can be accounted for by differences in employment composition across industries and regions. As noted above, international studies have found that gender differences in industry composition can explain the greater cyclicality of male employment – that is, men tend to be employed in more cyclical industries.

The contribution of industry and local composition

The cyclical fluctuations experienced by different groups may reflect the differing cyclicality of the jobs in which each group is disproportionately employed. For instance, employment in the construction industry is highly cyclical. The over-representation of males in construction jobs may contribute to the greater cyclicality of male employment compared with that of women. An alternative source of cyclicality, which we examine in more detail below, is that groups differ in their responses to cyclical shocks rather than in their exposure to different shocks.

Table 6 summarises the estimated contribution of differing employment composition to the incidence of cyclical employment change. We focus our attention on the size of the employment decline experienced by different groups of workers in the two years immediately following the onset of the GFC (March 2008 to March 2010). The first column of the table shows the average annual growth rate across the two years for each group. The two years are pooled to allow for the differing timing of declines, which is evident in Table 3 and Figure 4. Against an overall decline of -1.1 percent per year, employment of young workers declined by -4.5 percent per year, whereas employment for older workers continued to grow, at 3.2 percent. The contraction in the employment of low-earning workers is small (-0.2 percent per annum), reflecting the net impact of a decline in 2009 and an almost commensurate recovery in 2010.

Table 6: Contribution of industry and LMA distribution to 2009–2010 decline

Worker type	Actual annual net employment growth rate (2009–2010)	Due to industry distribution	Due to LMA distribution	Due to combined LMA-industry distribution
Total	-1.1%	0.0%	0.0%	0.0%
Male	-1.4%	-1.0%	0.0%	-1.0%
Female	-0.9%	0.8%	0.0%	0.8%
Age <30	-4.5%	-0.5%	0.0%	-0.5%
Age 30–49	-1.5%	0.0%	0.0%	0.0%
Age 50+	3.2%	0.3%	0.0%	0.3%
High earners	-1.1%	0.0%	0.0%	-0.1%
Medium earners	-1.7%	-0.2%	0.0%	-0.2%
Low earners	-0.2%	0.9%	0.1%	0.9%

Note: Figures have been derived from the Integrated Data Infrastructure (IDI) prototype managed by Statistics New Zealand. Years refer to the 12 months ending in March of the stated year. The contributions capture how much higher or lower net employment growth was for a group because their distribution across local industries differs from the overall distribution. Details are provided in the text.

The subsequent columns of Table 6 show the contribution to the annual net employment growth rate of employment composition across industries, across LMAs, and across local industries (industry-LMA combinations). The contributions are calculated using the following formula:

$$Contribution\ of\ z = \sum_t \sum_z (\lambda_{zt}^G - \lambda_{zt}) NEGR_{zt}^G \quad (1)$$

where $\lambda_{zt}^G = (E_{zt}^G / E_t)$, *G* refers to a gender, age or skill group, and *z* denotes industry, LMA or industry*LMA. Note that the net employment growth rate ($\mathrm{NEGR}_{\mathrm{zt}}^{\mathrm{G}}$) is the rate experienced by group *G*. The contribution thus reflects whether the group is disproportionately in LMAs, industries or local industries where their group experienced growth.

By construction, the contribution is zero if a group's employment composition perfectly matches the overall composition, as is the case for total employment shown in the first row of Table 6. Men, young workers and medium earners are disproportionately employed in industries in which they have relatively large employment declines, contributing declines of -1.0 percent, -0.5 percent and -0.2 percent respectively. Only for men is the contribution a significant proportion of the overall decline. In contrast, women, older workers and low earners are disproportionately employed in industries with relatively small employment declines for their group. Had their industry composition matched the overall composition, they would have had larger declines, or smaller increases, with contributions of 0.8 percent, 0.3 percent and 0.9 percent respectively.

Differences in the geographic composition of employment contribute almost nothing to group differences in net employment growth rates. Cross-LMA differences in demographic composition are relatively small and, as seen in panels (d) and (e) of Figure 4, the dispersion of growth rates across LMAs is also smaller than the dispersion across industries. The contribution of differences across LMA-industry combinations is thus almost entirely due to industry differences.

Cyclicality within local industries

The remainder of the empirical analysis in this section investigates whether, within local industries, employment growth and job and worker flows are equally responsive to aggregate, industry and local employment fluctuations (making use of the full time period available to us, 2001–2011). In order to focus on responsiveness, we control for the compositional effects that are documented in Table 6 and analyse the co-movement of employment growth and flow rates within local industries. Table 7 reports estimates from employment-weighted regressions of the following form:

$$F_{iy} = \alpha_i + \beta_1 * NEGR_y^{TOT} + \beta_2 * \left(NEGR_{iy}^{LMA} - NEGR_y^{TOT}\right) + \beta_3 * \left(NEGR_{iy}^{IND} - NEGR_y^{TOT}\right) + e_{iy} \quad (2)$$

where *i* denotes a local industry (combination of industry and LMA), *y* denotes year and F_{iy} denotes the net employment growth rate or a job or worker flow rate.

This specification shows the responsiveness of local industry employment growth or flows to aggregate, local and industry growth. Local and industry growth are measured relative to the aggregate growth rate. The inclusion of local industry fixed effects ensures that the identification of responsiveness (β_j) is based on time variation within local industries.

Table 7: Cyclicality of job and worker flows within local industries

	Net employment growth rate	Job creation rate	Job destruction rate	Excess job reallocation rate	Worker accession rate	Worker separation rate
Aggregate NEGR	1.041***	0.946***	-0.095*	0.744***	1.587***	0.546***
	[0.033]	[0.038]	[0.037]	[0.069]	[0.062]	[0.062]
LMA NEGR	0.857***	0.437***	-0.421***	-0.098	0.481***	-0.377***
	[0.114]	[0.065]	[0.072]	[0.071]	[0.066]	[0.075]
Industry NEGR	0.968***	0.443***	-0.525***	-0.161***	0.598***	-0.370***
	[0.042]	[0.031]	[0.029]	[0.039]	[0.041]	[0.036]
R-squared	0.247	0.445	0.418	0.486	0.764	0.743
N	26,069	26,069	26,069	26,069	26,069	26,069

Notes: Figures have been derived from the Integrated Data Infrastructure (IDI) prototype managed by Statistics New Zealand. Each column is from a separate least squares regression. There is one observation for each combination of local industry and year. 'Local industry' is a combination of industry and LMA. Regressions are weighted by local industry employment. Regressions contain separate intercepts for each local industry. Standard errors are clustered by local industry.

The estimates in the first column of Table 7 show that net employment growth within local industries is strongly related to aggregate, local and industry growth, with none of the coefficients significantly different from one, although industry changes appear to have a somewhat stronger influence than LMA growth. There is, in addition, a good deal of idiosyncratic growth within local industries. Aggregate, local and industry growth together explain only about a quarter of the variation in local industry growth.

The response of job and worker flows to the different sources of employment change is more varied. Increases in job creation are strongly linked to the aggregate cycle (β_1=0.946), whereas job destruction is only weakly counter-cyclical (β_1=-0.095). Aggregate employment contractions are associated with a pronounced decline in the creation of new jobs, while the rate at which jobs are destroyed (in contracting firms) remains relatively stable. The combined effect leads to a reduction in gross job reallocation (β_1=0.744) during downturns.

The response of worker flows (accessions and separations) to aggregate employment changes is even more pronounced. The accession rate declines strongly when aggregate employment growth slows (β_1 =1.587). So too does the separation rate (β_1=0.546). Employed workers are less likely to leave their jobs during downturns, possibly due to a decline in voluntary quits that outweighs any increase in involuntary quits. Employment contractions make it difficult to find jobs but do not appear to increase the probability of job loss.

In response to slowing aggregate employment growth, the labour market becomes less liquid, decreasing the ease with which workers and jobs can be reallocated to more productive activities. It may be that, faced with an aggregate shock, it is less evident where jobs and workers should be reallocated.

In contrast, the responses of job and worker flows to industry or LMA employment growth show more evidence of reallocation. A relatively large employment contraction in an LMA is associated

with declines in job creation (β_2=0.437) and worker accessions (β_2=0.481) and an increase in job destruction (β_2=-0.421) and worker separation (β_2=-0.377). Similarly, there is reallocation between industries in response to relatively strong industry contractions. Contracting industries experience declines in job creation (β_3=0.443) and worker accessions (β_3=0.598) and an increase in job destruction (β_2=-0.525) and worker separation (β_2=-0.370).

Cyclicality of typed jobs within local industries

In order to test for differences across groups in responsiveness to aggregate, local or industry employment changes, we examine employment changes and flows for different groups within each local industry, using a panel of job types. Each observation represents a unique combination of age, gender and skill (18 combinations of 3 age groups, 2 genders and 3 skill groups) within a local industry in a given year.

Initially, we estimate overall responsiveness to cyclical employment change, as in Table 7, but allowing average flow and growth rates to vary by demographic characteristics. Specifically, Table 8 reports estimates from regressions of the following form:

$$F_{iGy} = \alpha_{iG} + \beta_1 * NEGR_y^{TOT} + \beta_2 * \left(NEGR_{iy}^{LMA} - NEGR_y^{TOT}\right) + \beta_3 * \left(NEGR_{iy}^{IND} - NEGR_y^{TOT}\right) + e_{iGy} \qquad (3)$$

It is feasible to identify a separate intercept for each job type (α_{iG}). In order to provide more readily interpretable results, we constrain the specification to allow a separate intercept for each local industry (α_i) and a set of five parameters capturing relative growth and flow rates for demographic groups.[12] These effects are all measured relative to those of men aged 30–49 with medium e*arnings.*

$$\alpha_{iG} = \alpha_i + \alpha_k^{Age<30} + \alpha_k^{Age\ 50+} + \alpha_k^{Female} + \alpha_k^{High\ earner} + \alpha_k^{Low\ earner} \qquad (4)$$

The slowest net employment growth rates (controlling for cyclical variation) are evident for young workers ($\alpha_{\mathrm{k}}^{\mathrm{Age<30}} = -0.020$), women ($\alpha_{\mathrm{k}}^{\mathrm{Female}} = -0.015$) and high earners ($\alpha_{\mathrm{k}}^{\mathrm{High\ earner}} = -0.035$).

There are also clear differences in rates of job and worker flows. Young and low-earning workers have relatively high accession and separation rates, reflecting high rates of job mobility for these groups. They also face high job creation and destruction rates, reflecting their prevalence in firms that are changing their employment levels and mix. Older workers and high-earning workers have relatively low accession and separation rates, as well as facing relatively low job destruction rates. Job creation rates are relatively low (-0.073) for high earners but are less so for older workers, suggesting that older workers are more likely to be in firms that are expanding their employment of older workers.

[12] Although there is correlation in some of these classifications, such as youth and low earning (see Appendix Table A1), there is sufficient independent variation that we are able to estimate separate coefficients.

Table 8: Cyclicality of job and worker flows within job type

	Net employment growth rate	Job creation rate	Job destruction rate	Excess job reallocation rate	Worker accession rate	Worker separation rate
Aggregate NEGR	1.161***	1.329***	0.168***	1.217***	1.750***	0.588***
	[0.028]	[0.026]	[0.020]	[0.030]	[0.036]	[0.028]
LMA NEGR	0.814***	0.435***	-0.378***	-0.035	0.450***	-0.364***
	[0.051]	[0.028]	[0.031]	[0.028]	[0.028]	[0.032]
Industry NEGR	0.931***	0.469***	-0.463***	-0.055**	0.580***	-0.352***
	[0.023]	[0.015]	[0.014]	[0.017]	[0.019]	[0.017]
Age <30	-0.020***	0.045***	0.064***	0.052***	0.124***	0.143***
	[0.002]	[0.002]	[0.002]	[0.003]	[0.002]	[0.002]
Age 30–49	.	.	.	.	.	.
Age 50 and over	0.000	0.009***	-0.031***	-0.046***	-0.108***	-0.108***
	[0.001]	[0.002]	[0.001]	[0.002]	[0.002]	[0.002]
Female	-0.015***	-0.018***	-0.003	-0.016***	-0.016***	-0.001
	[0.002]	[0.001]	[0.002]	[0.002]	[0.002]	[0.002]
Male	.	.	.	.	.	.
High earners	-0.035***	-0.073***	-0.038***	-0.105***	-0.112***	-0.077***
	[0.002]	[0.001]	[0.002]	[0.002]	[0.002]	[0.002]
Medium earners	.	.	.	.	.	.
Low earners	0.035***	0.089***	0.054***	0.095***	0.134***	0.099***
	[0.003]	[0.002]	[0.003]	[0.004]	[0.003]	[0.002]
R-squared	0.086	0.431	0.386	0.546	0.621	0.622
N	371,497	371,497	371,497	371,497	371,497	371,497

Notes: Figures have been derived from the Integrated Data Infrastructure (IDI) prototype managed by Statistics New Zealand. Each column is from a separate least squares regression. There is one observation for each combination of job type and year. Job type is defined as a combination of industry, LMA, age group, gender and earnings group. Regressions are weighted by job type employment. Regressions contain separate intercepts for each local industry. Standard errors are clustered by job type.

The estimates of responsiveness to aggregate, local and industry growth show a similar, though stronger, pattern to that seen in Table 7 – aggregate employment growth is associated with within-job type increases in all job and worker flow rates, consistent with pro-cyclical labour market liquidity. The estimated within-job type responsiveness to aggregate growth is higher than responsiveness within local industry as reported in Table 7. The estimated responsiveness to LMA and industry growth is very similar across the two tables.[13]

In order to test for differences across groups in responsiveness to aggregate, local or industry employment changes, we allow for group-specific coefficients on each of the employment growth measures. The extended regression specification is shown in equation 5, in which *G* denotes a

[13] Allowing for job type fixed effects, rather than the constrained specification in equation 4, yields very similar estimates of responsiveness.

unique combination of age, gender and skill (18 combinations of 3 age groups, 2 genders and 3 skill groups). A separate intercept is included for each job type (α_{iG}).

$$F_{iGy} = \alpha_{iG} + \beta_1^G * NEGR_y^{TOT} + \beta_2^G * \left(NEGR_{iy}^{LMA} - NEGR_y^{TOT}\right) + \beta_3^G * \left(NEGR_{iy}^{IND} - NEGR_y^{TOT}\right) + e_{iGy} \quad (5)$$

Rather than estimate a separate slope for each of the 18 unique combinations of age, gender and skill, we summarise the patterns of responsiveness with six additive age, gender and skill parameters. For each set of responsiveness parameters (β_k^G) shown in equation 5 (*k*=1,2,3), we estimate 6 parameters as follows:

$$\beta_k^G = \beta_k^{Age<30} + \beta_k^{Age\ 30-49} + \beta_k^{Age\ 50+} + \beta_k^{Female} + \beta_k^{High\ earner} + \beta_k^{Low\ earner} \quad (6)$$

There is a separate parameter for each of the three age groups, which shows the responsiveness for medium-earning men within each age group. The female parameter reveals whether women's employment outcomes differ from men's in response to aggregate, local and industry changes. Separate parameters for high-earning and low-earning groups are measured relative to medium earners.

Young workers, aged below 30 years of age, are the most cyclically sensitive group (Table 9). Their employment growth rates, as well as job and worker flow rates, almost always respond more strongly to aggregate, local or industry growth than do those of other groups. The exceptions are that, faced with an aggregate decline in net employment growth, worker separation rates and job destruction rates for young people respond relatively weakly. Overall, separation and job destruction rates decline when aggregate employment growth drops – as the labour market becomes less liquid. For young people, the decline in the separation rate is slightly smaller than that faced by prime-aged workers (30–49 years of age), suggesting that an increase in involuntary separations may be offsetting the decline in voluntary quits. Young people are the only group for which job destruction rates rise when aggregate employment growth slows ($\beta_1^{Age<30}$=-0.250). Cyclical employment loss for young people entails not only a slower increase in youth jobs within firms that are expanding youth employment but also greater reductions in youth jobs within firms that are reducing their employment of youth.

Women's employment growth is more cyclically sensitive to aggregate employment change than that of men (β_1^{Female} >0). This reflects the trend decline in male employment rates even during periods of aggregate growth, as documented in Figure 1. In contrast, men's job and worker flows are more cyclically sensitive to aggregate employment changes than those of women. Flows for high-earning workers also have relatively low sensitivity to aggregate employment changes ($\beta_1^{High\ Earner}$<0).

The reallocative consequences of LMA and industry employment changes are evident for all subgroups. Local and industry employment contractions are associated with increased job destruction and worker separation and decreased job creation and worker accessions. As for aggregate employment changes, responsiveness is greatest for young workers, for whom the overall effects are magnified. There is somewhat less of a reallocation effect for women and high-earning workers, who experience smaller increases in separation and destruction rates and smaller decreases in accession and creation rates.

Table 9: Differing cyclicality of job and worker flows by job type

	Net employment growth rate	Job creation rate	Job destruction rate	Excess job reallocation rate	Worker accession rate	Worker separation rate
Aggregate NEGR						
Age <30	2.722***	2.472***	-0.250***	2.113***	3.809***	1.087***
	[0.067]	[0.058]	[0.049]	[0.073]	[0.067]	[0.058]
Age 30–49	0.911***	1.306***	0.395***	1.465***	2.050***	1.140***
	[0.053]	[0.046]	[0.042]	[0.067]	[0.056]	[0.053]
Age 50+	0.894***	1.192***	0.298***	0.803***	1.352***	0.458***
	[0.055]	[0.048]	[0.043]	[0.068]	[0.062]	[0.057]
Female	0.189***	-0.120**	-0.309***	-0.193**	-0.192***	-0.381***
	[0.047]	[0.041]	[0.040]	[0.061]	[0.054]	[0.051]
Male	.	.	.	.	.	.
High earners	-0.029	-0.375***	-0.347***	-0.511***	-0.710***	-0.682***
	[0.048]	[0.044]	[0.040]	[0.063]	[0.058]	[0.056]
Medium earners	.	.	.	.	.	.
Low earners	0.232***	0.479***	0.248***	-0.066	0.03	-0.202***
	[0.070]	[0.060]	[0.056]	[0.092]	[0.072]	[0.058]
LMA NEGR						
Age <30	1.141***	0.631***	-0.510***	-0.057	0.724***	-0.417***
	[0.087]	[0.055]	[0.052]	[0.065]	[0.061]	[0.051]
Age 30–49	0.983***	0.542***	-0.441***	-0.009	0.568***	-0.415***
	[0.108]	[0.062]	[0.063]	[0.064]	[0.063]	[0.065]
Age 50+	0.852***	0.486***	-0.366***	-0.054	0.468***	-0.385***
	[0.098]	[0.060]	[0.058]	[0.064]	[0.058]	[0.066]
Female	-0.349***	-0.186***	0.163**	0.039	-0.208***	0.141*
	[0.094]	[0.055]	[0.056]	[0.062]	[0.057]	[0.060]
Male	.	.	.	.	.	.
High earners	-0.322**	-0.226***	0.096	-0.037	-0.236***	0.086
	[0.109]	[0.062]	[0.065]	[0.066]	[0.065]	[0.068]
Medium earners	.	.	.	.	.	.
Low earners	0.500***	0.266***	-0.234***	-0.077	0.264***	-0.236***
	[0.100]	[0.062]	[0.063]	[0.076]	[0.061]	[0.065]
Industry NEGR						
Age <30	1.185***	0.585***	-0.600***	-0.070*	0.659***	-0.527***
	[0.040]	[0.027]	[0.025]	[0.035]	[0.032]	[0.027]
Age 30–49	1.057***	0.507***	-0.549***	-0.167***	0.544***	-0.512***
	[0.046]	[0.030]	[0.028]	[0.037]	[0.035]	[0.032]
Age 50+	0.945***	0.491***	-0.453***	-0.260***	0.471***	-0.473***
	[0.050]	[0.033]	[0.030]	[0.038]	[0.038]	[0.036]
Female	-0.090*	-0.006	0.084**	0.107**	0.100**	0.190***
	[0.042]	[0.027]	[0.027]	[0.037]	[0.035]	[0.033]
Male	.	.	.	.	.	.
High earners	-0.302***	-0.206***	0.095***	0.069	-0.147***	0.155***
	[0.042]	[0.028]	[0.026]	[0.036]	[0.035]	[0.031]
Medium earners	.	.	.	.	.	.
Low earners	0.443***	0.313***	-0.131**	0.042	0.257***	-0.186***
	[0.080]	[0.043]	[0.049]	[0.050]	[0.046]	[0.050]
R-squared	0.121	0.506	0.496	0.622	0.690	0.682
N	371,497	371,497	371,497	371,497	371,497	371,497

Notes: See notes to Table 8.

Contributions to GFC changes

Differences in the incidence of cyclical employment change depend on a combination of how responsive different groups are to aggregate, LMA and industry cycles, and also on the exposure of different groups to differing cyclical patterns. As an indication of the relative importance of cyclical variation for different groups, we estimate the impact of aggregate, local and industry growth patterns during the GFC (2009–2010) on the net employment growth and worker flows for different groups. The resulting estimates are shown in Table 10.

The first step in estimating the impact is to define a baseline level of employment growth for 2009–2010. We calculate, for each job type, the average growth in employment over the entire 2001–2011 period. The baseline growth for a group is defined as the employment-weighted mean across job types, weighting by the employment mix in 2009–2010. This baseline growth is slightly higher than the mean growth rate for 2001–2011. The average annual net employment growth rate over the entire 2001–2011 period was 1.7 percent.[14] However, the 2009–2010 period is towards the end of our overall sample, and employment in this period is therefore disproportionately for job types that had higher than average employment growth. In fact, employment in 2009–2010 was for job types that had (employment-weighted) average growth of 3.1 percent over the entire 2001–2011 period. This is shown as the baseline growth rate in the second column of Table 10. The actual annual net employment growth rate in 2009–2010 was -1.1 percent – 4.2 percentage points below the baseline growth rate. On average, the job types observed in 2009–2010 had employment growth that was 4.2 percentage points lower than the 2001–2011 average growth rate for their job type.

We use the estimates of responsiveness in Table 9 to derive the contributions of aggregate, local and industry growth experiences of different groups.

For each job type (defined by industry, LMA, age group, sex and skill), aggregate, local and industry growth rates are measured relative to the employment-weighted average for that job type over the 2001–2011 period: $\tilde{Z}_{iGy} = Z_{iGy} - \hat{E}_{iG}\left[Z_{iGy}\right]$, where *Z* refers to one of aggregate, local and industry growth rates and $\hat{E}_{iG}[*]$ is an employment-weighted average (across years) for a group defined by local industry (*i*) and demographic group (*G*).

The contributions are calculated as the effects of aggregate, local and industry growth, weighted by group employment for each year of 2009 and 2010, expressed as an annual average:

$$Aggregate\ contribution\ for\ group\ G = \beta_1^G * \frac{E_{Gy}}{E_y}\left[\widetilde{NEGR}_y^{TOT}\right]$$

$$Local\ contribution\ for\ group\ G = \sum_{i=LMA} \beta_2^G * \frac{E_{Giy}}{E_y}\left[\left(\widetilde{NEGR}_{iy}^{LMA} - \widetilde{NEGR}_y^{TOT}\right)\right]$$

$$Industry\ contribution\ for\ group\ G = \sum_{i=industry} \beta_3^G * \frac{E_{Giy}}{E_y}\left[\left(\widetilde{NEGR}_{iy}^{IND} - \widetilde{NEGR}_y^{TOT}\right)\right] \qquad (7)$$

[14] The comparable number in Table 1 is 1.8 percent. The estimate of 1.7 percent is based on job type data, which yields different estimates because of the treatment of worker ageing, as detailed in the data and methods section above.

Table 10: Impact of cyclical variation on different groups (2008/09–2009/10)

	Average annual rate (2001–11)	Actual annual rate (2009–10)	Baseline annual rate (2009–10)	Actual relative to Baseline	Impact of aggregate growth	Impact of local growth	Impact of industry growth
				Net employment growth			
Total	1.7%	-1.1%	3.1%	-4.2%	-4.4%	0.0%	-0.1%
Male	1.7%	-1.4%	3.2%	-4.6%	-4.1%	0.0%	-0.8%
Female	1.8%	-0.9%	3.0%	-3.8%	-4.6%	0.0%	0.6%
Age <30	0.6%	-4.5%	3.6%	-8.1%	-8.1%	0.0%	-0.6%
Age 30–49	0.8%	-1.5%	1.2%	-2.8%	-3.0%	0.0%	0.0%
Age 50+	5.0%	3.2%	5.6%	-2.5%	-2.8%	0.0%	0.3%
High earners	0.2%	-1.1%	1.8%	-2.9%	-3.2%	0.0%	-0.2%
Medium earners	2.1%	-1.7%	2.8%	-4.5%	-4.8%	0.0%	-0.3%
Low earners	4.8%	-0.2%	6.0%	-6.2%	-6.0%	0.0%	0.3%
				Accession rate			
Total	41.1%	36.5%	41.9%	-5.4%	-5.6%	0.0%	0.0%
Male	39.8%	35.0%	40.9%	-5.9%	-5.7%	0.0%	-0.4%
Female	42.3%	37.9%	42.8%	-4.9%	-5.5%	0.0%	0.4%
Age <30	56.9%	50.2%	60.2%	-10.0%	-10.1%	0.0%	-0.4%
Age 30–49	36.6%	32.8%	37.1%	-4.4%	-4.5%	0.0%	0.0%
Age 50+	30.3%	28.0%	30.1%	-2.1%	-2.4%	0.0%	0.2%
High earners	29.7%	25.4%	29.0%	-3.6%	-3.5%	0.0%	0.0%
Medium earners	45.0%	38.4%	44.9%	-6.6%	-6.9%	0.0%	-0.1%
Low earners	60.4%	55.3%	62.2%	-7.0%	-7.3%	0.0%	0.2%
				Separation rate			
Total	39.3%	37.6%	38.8%	-1.2%	-1.2%	0.0%	0.1%
Male	38.1%	36.4%	37.7%	-1.3%	-1.6%	0.0%	0.4%
Female	40.6%	38.8%	39.8%	-1.0%	-0.8%	0.0%	-0.2%
Age <30	56.3%	54.7%	56.7%	-2.0%	-2.0%	0.0%	0.3%
Age 30–49	35.7%	34.3%	35.9%	-1.6%	-1.6%	0.0%	0.1%
Age 50+	25.3%	24.8%	24.5%	0.4%	0.4%	0.0%	-0.1%
High earners	29.6%	26.6%	27.2%	-0.7%	-0.3%	0.0%	0.1%
Medium earners	42.9%	40.1%	42.1%	-2.0%	-2.1%	0.0%	0.2%
Low earners	55.6%	55.4%	56.2%	-0.8%	-1.4%	0.0%	-0.1%
				Job creation rate			
Total	22.1%	18.7%	22.8%	-4.1%	-4.2%	0.0%	0.0%
Male	22.4%	18.9%	23.2%	-4.3%	-4.2%	0.0%	-0.4%
Female	21.9%	18.5%	22.3%	-3.8%	-4.2%	0.0%	0.3%
Age <30	28.8%	24.0%	31.0%	-6.9%	-7.1%	0.0%	-0.3%
Age 30–49	18.9%	16.1%	19.3%	-3.2%	-3.2%	0.0%	0.0%
Age 50+	20.0%	17.3%	19.9%	-2.6%	-2.7%	0.0%	0.2%
High earners	15.3%	12.5%	15.4%	-2.9%	-2.8%	0.0%	-0.1%
Medium earners	24.4%	20.1%	24.6%	-4.5%	-4.7%	0.0%	-0.1%
Low earners	33.7%	28.5%	34.3%	-5.8%	-6.2%	0.0%	0.2%

	Average annual rate (2001–11)	Actual annual rate (2009–10)	Baseline annual rate (2009–10)	Actual relative to Baseline	Impact of aggregate growth	Impact of local growth	Impact of industry growth
				Job destruction rate			
Total	20.4%	19.8%	19.7%	0.1%	0.2%	0.0%	0.1%
Male	20.6%	20.3%	20.1%	0.2%	-0.1%	0.0%	0.4%
Female	20.1%	19.3%	19.3%	0.0%	0.4%	0.0%	-0.3%
Age <30	28.3%	28.5%	27.4%	1.2%	1.0%	0.0%	0.3%
Age 30–49	18.1%	17.6%	18.0%	-0.4%	-0.2%	0.0%	0.0%
Age 50+	15.0%	14.1%	14.2%	-0.1%	0.0%	0.0%	-0.1%
High earners	15.2%	13.7%	13.6%	0.1%	0.5%	0.0%	0.1%
Medium earners	22.3%	21.8%	21.8%	0.1%	0.1%	0.0%	0.1%
Low earners	28.9%	28.7%	28.3%	0.4%	-0.2%	0.0%	-0.1%

Notes: Figures have been derived from the Integrated Data Infrastructure (IDI) prototype managed by Statistics New Zealand. The baseline is the employment-weighted average of 2001–2011 growth within job types, weighted by the 2009–2010 job type distribution. The impacts show the deviation from baseline that results from group-specific responsiveness to observed 2009–2010 changes in aggregate, local or industry growth, based on the regression estimates from Table 9. Details are provided in the text.

The first row of Table 10 shows the estimated overall impact (for *G* = all groups). Consistent with the regression specification in equation 5, the impact is based on the average impact within each job type. It thus does not include the impact that aggregate, local or industry growth has on the composition of employment. Nevertheless, the overall estimated impact of aggregate growth (-4.4 percent) is close to the -4.2 percent difference between actual and baseline growth. The first panel of Table 10 shows the estimated contributions for subgroups of workers. The contribution of national growth reflects the responsiveness of different groups to aggregate employment change, with large estimated contributions for young people (-8.1 percent) and low earners (-6.0 percent).

The estimated contributions of industry growth are small, and those of LMA growth are negligible. A negative contribution from industry (LMA) growth reflects either a higher than average responsiveness to industry (LMA) growth or over-representation in industries (LMAs) with relatively large employment declines in 2009–2010. Industry growth patterns contribute -0.8 percent to net employment growth for men, reflecting a combination of their greater exposure to contracting industries and a greater responsiveness to contraction. In contrast, industry growth patterns contributed +0.6 percent to women's net employment growth, due to exposure to industries with smaller than average contractions. Industry growth patterns contributed negatively to young people's net employment growth, reflecting their high responsiveness and exposure to industry employment contractions.

Observed changes in accession and separation rates in 2009–2010 are also largely a response to aggregate employment changes, as shown in the second and third panels of Table 10. As a result of the relatively small 2009–2010 declines in separation rates (Figure 3) and the smaller estimated responsiveness of separation rates to aggregate, local and industry employment growth (Table 9), the estimated contributions of growth to groups' separation rates is smaller than their contributions to accession rates or net employment growth.

The patterns for job creation and job destruction rates are generally similar to those for accessions and separations, although the underlying rates are, of course, lower. Job creation rates varied more markedly than job destruction rates, with most of the variation in job creation driven by aggregate rather than industry or local growth. Because the cyclical change in job destruction is relatively small (0.2 percentage points relative to the baseline rate), the modest impacts of industry growth are large relative to the observed change. For men and young workers, the impact of industry growth was to raise job destruction rates by 0.4 and 0.3 percentage points respectively. There were similar sized impacts of industry growth on raising separation rates and on reducing job creation and accession rates for men and young workers.

The persistence of cyclical job loss

Variation in employment growth rates and job and worker flows captures only part of the heterogeneous impact of the GFC. The varying impact of GFC-related job loss is also evident in group-level differences in the ability of job leavers to secure new jobs. For young workers and low earners in particular, unemployment was more persistent following the GFC – it took longer for these groups to secure a new job. Faced with more difficult job search, we might expect that workers would be more willing to accept a lower paid job in order to secure employment. We therefore document not only the length of time spent out of work but also the earnings changes upon re-employment, relative to what was observed in 2007, prior to the GFC.

Data and methods

In order to analyse the persistence of cyclical job loss, we focus attention on those workers who separated from a job in March of any year. We examine both the length of their subsequent unemployment spell and the wage that they earn if they are re-employed. The impact of the GFC is evident for workers who separate in March 2009 or later.

The data contain information on many very short (one-month) job spells and many instances of job spells with the same employer that are broken by a month of non-employment. We treat such broken spells as continuous and ignore any spells that last for less than three months. The three-month minimum is imposed to ensure that earnings information provides a consistently measured full-month earning rate. Earnings reported for the first or last month of a job will generally be for only part of the month, and will therefore understate the worker's monthly earnings rate.[15] The earnings rate prior to a separation is therefore measured in the penultimate month in the job, and the starting rate in a new job is measured in the second month of the job. Earnings are all measured as real monthly earnings, in CPI-deflated 2012 dollars.

Hazard analysis

Re-employment probabilities for separated workers are analysed by means of a stratified proportional hazard model:

$$h_i(t) = h_{0G}(t)exp(X_i\beta) \qquad (8)$$

where *G* refers to a unique combination of age, skill, gender, LMA and industry. Stratification is necessary owing to the non-proportionality of hazards across groups.[16] A separate baseline hazard is specified for each subgroup, and we focus attention on time variation across years in the re-employment hazard.

[15] Conversely, final payments related to accrued leave and so on may also inflate the apparent earnings rate in the last month of employment.

[16] Proportionality was tested using Schoenfeld residuals, as described in Grambsch and Therneau (1994). Proportionality is strongly rejected for age, skill and gender. Hazards are close to proportional across LMAs.

Re-employment wage gains

For those workers who are re-employed, we examine changes across years in the growth in their monthly earnings upon re-employment relative to their pre-separation earnings. We condition on the length of time taken to regain employment, to capture the dynamics of job search. We do this in a relatively unrestricted way, including a separate intercept for each single month of unemployment duration, top-coded at 13 months.[17] Specifically, we estimate a regression of the following form:

$$ln(w_{i,t+j}) - ln(w_{i.t}) = \beta_G + \delta_j + \tau_t + \epsilon_{it} \quad (9)$$

where $\ln(w_{i.t})$ is the log of monthly earnings prior to separation and $\ln(w_{i,t+j})$ is the log of monthly earnings upon re-employment, after being unemployed for *j* months. We allow for separate intercepts by subgroup (β_G), by unemployment duration (δ_j) and by year (τ_t).

Results

The raw patterns of re-employment probabilities and wage gains are presented in Table 11. The top panel shows the number of separations included in the analysis sample overall and for population subgroups. There are approximately 50,000–60,000 separations each year.

Re-employment probabilities

The second panel in Table 11 summarises variation in re-employment probabilities across years and across subgroups. The panel shows the probability of re-employment within six months of a job separation. Overall, a little over half of the workers experiencing a job separation regained employment within six months.[18] Probabilities were slightly higher for 30–49 year olds and for high earners and lower for other age and skill groups. Men and women had similar re-employment probabilities.

There was only a slight decline in re-employment prospects between 2007 and 2008. Whereas GDP peaked in the fourth quarter of 2007, employment did not contract until four or five quarters later, although job and worker turnover slowed almost immediately (Fabling and Maré, 2012). Re-employment prospects for workers separating in March 2008 are only slightly lower than those of workers separating a year earlier. However, all groups experienced a marked decline in the probability of re-employment after separation in March 2009, with probabilities that were 7–12 percentage points lower than in the previous year.

[17] The raw relationship between mean earnings growth and unemployment duration is similar across years. When plotted, the annual profiles are parallel, suggesting that an additive year-specific intercept adequately captures the year-to-year variation in wage growth. Because we focus on separations that occur in March only, the shape of the hazard function over 12 months reflects a combination of duration dependence and seasonal employment prospects.

[18] Measuring re-employment rates at durations other than six months shows qualitatively similar patterns. The month-specific duration patterns across the years 2000–2011 for all groups combined is shown in Appendix Table A2.

Table 11: Re-employment and wage gains if re-employed within six months

Separation in March	All	Age <30	Age 30–49	Age 50+	Male	Female	High earners	Medium earners	Low earners
				Number of separations					
2000	54,100	27,200	21,000	6,000	28,400	25,700	21,700	19,700	12,700
2001	51,300	25,600	20,000	5,600	26,600	24,700	19,300	19,700	12,200
2002	47,600	23,500	18,400	5,700	24,700	22,800	16,000	19,300	12,300
2003	53,100	25,600	20,800	6,800	27,300	25,800	17,900	21,400	13,800
2004	55,300	26,000	21,800	7,600	29,200	26,100	18,600	22,200	14,600
2005	59,600	27,900	23,100	8,600	29,400	30,100	18,600	24,400	16,500
2006	60,900	28,400	23,400	9,200	30,900	30,000	18,800	24,100	18,100
2007	57,600	26,700	22,300	8,600	29,600	28,000	17,800	22,200	17,500
2008	58,100	27,100	22,100	8,900	29,900	28,200	17,600	21,700	18,900
2009	51,100	24,100	18,800	8,400	27,100	24,100	13,800	19,500	17,900
2010	47,000	21,800	17,200	7,900	24,800	22,200	13,300	17,600	16,100
2011	53,100	25,000	19,000	9,100	27,400	25,700	14,800	19,000	19,200
				Percent re-employed within six months					
2000	53%	51%	57%	45%	53%	53%	65%	54%	32%
2001	54%	52%	59%	48%	55%	53%	65%	56%	34%
2002	54%	52%	58%	49%	56%	52%	66%	57%	34%
2003	58%	55%	62%	56%	59%	57%	70%	61%	38%
2004	58%	55%	63%	54%	60%	56%	71%	60%	38%
2005	60%	55%	65%	60%	60%	60%	72%	64%	41%
2006	58%	54%	63%	59%	58%	57%	70%	62%	40%
2007	58%	55%	62%	56%	59%	57%	69%	62%	42%
2008	57%	52%	62%	57%	58%	56%	69%	61%	41%
2009	47%	43%	53%	46%	46%	48%	59%	51%	34%
2010	52%	49%	58%	49%	53%	52%	64%	57%	37%
2011	52%	47%	58%	51%	52%	51%	62%	55%	40%
				Median wage gain upon re-employment within six months					
2000	4%	7%	2%	-1%	4%	4%	3%	5%	4%
2001	8%	11%	5%	2%	8%	7%	6%	10%	10%
2002	7%	11%	4%	2%	7%	6%	5%	9%	10%
2003	6%	10%	4%	1%	6%	5%	4%	8%	8%
2004	3%	6%	2%	-1%	4%	2%	2%	5%	4%
2005	5%	10%	4%	0%	6%	4%	3%	6%	10%
2006	6%	10%	4%	1%	6%	5%	3%	8%	12%
2007	7%	13%	5%	1%	9%	6%	3%	10%	14%
2008	3%	8%	2%	0%	3%	3%	2%	5%	9%
2009	-1%	3%	-1%	-1%	-1%	0%	-1%	1%	1%
2010	3%	8%	2%	0%	4%	2%	0%	5%	9%
2011	3%	8%	2%	-1%	4%	2%	1%	4%	9%

Note: Figures have been derived from the Integrated Data Infrastructure (IDI) prototype managed by Statistics New Zealand. All statistics are restricted to employment in jobs that last at least three months.

Hazard regressions confirm the cyclical pattern of re-employment probabilities, with a slightly lower probability of re-employment following displacement in March 2008, followed by a substantial deterioration in 2009. Regression estimates are presented in Table 12. Estimates are presented as hazard ratios, which show the ratio of each year's re-employment hazard to that faced by 2007 separations. The relative hazards are also shown graphically in the first column of Figure 6. Hazard rates in 2008 were around 2–6 percent lower than those in the March 2007 year immediately preceding the GFC.

Hazard rates for workers separating in 2009 were between 79 and 84 percent of the 2007 rate, indicating a significantly lower probability of finding a job once employment started contracting. Re-employment hazards had been increasing between 2000 and 2005, reflecting sustained strong aggregate employment growth. Re-employment hazards had been rising particularly strongly for young workers and low earners. Between 2005 and 2007, re-employment probabilities stabilised together with employment growth.

The largest declines in re-employment hazards are evident for older workers – a group that, as shown in Table 11, had relatively low re-employment rates, reflecting the transition to retirement for some. For older workers separating in March 2009, the re-employment hazard dropped to 80 percent of its 2007 level and remained low in 2010 and 2011, in contrast to the recovery that is evident for other groups. Hazards for low earners and young workers recovered relatively strongly following 2010 and 2011 separations.

Earnings when re-employed

The lower panel of Table 11 shows the median gains in monthly earnings for workers who are re-employed within six months of a job separation. Prior to 2008, median earnings gains were between 3 and 8 percent, meaning that half of the workers who started a new job within six months had real monthly earnings in their new job that were 3–8 percent higher than in the final full month of their previous job. We are unable to distinguish the contributions of lower hours or lower hourly wages. In 2008, the median wage gain dropped to 3 percent – at the lower end of the pre-GFC range. Workers separating in March 2009 achieved markedly lower wage gains when starting a new job compared with those separating in March 2007, with a median wage drop of 1 percent. Not only was there a lower probability of re-employment, but new jobs were secured with less of a wage increase or even a decline. This pattern is consistent with a higher proportion of job separations being involuntary separations. There was only a partial recovery in wage gains after 2009, with all groups having gains that are at the lower end of their pre-GFC levels.

Reduced wage gains are evident for all subgroups. Only young workers had median wage gains of more than 1 percent in 2009. Even then, at 3 percent, these gains were considerably below the 6–13 percent gains that they experienced from 2000–2007. Younger workers generally have relatively high wage growth, reflecting not only early-career wage gains but also the relatively large earnings gains that young workers make when they change jobs (Neal, 1999; Farber, 1999; Hyslop and Maré, 2009). A similar pattern of earnings gains is evident for low earners, many of whom would be young. In contrast, older workers (aged 50 and above) do not generally increase their earnings when changing jobs, as shown in the small (2 percent or less) gains throughout the study period, with only slightly lower post-GFC gains.

Regression analysis of the re-employment wage gains confirms the general patterns in Table 11, which were restricted to workers re-employed within six months. Regression estimates are summarised in Table 13 and shown graphically in the right column of Figure 6. Re-employment wage gains peaked for all groups in 2007, at the end of a period of sustained employment growth and a consequently tight labour market. Mean wage gains upon re-employment slowed in 2008 by 6.3 percent relative to the gains achieved by workers separating in 2007. Young workers experienced a slightly larger decline (of 9.0 percent), though from a higher initial rate. A similar-sized overall drop in re-employment wage gains occurred in 2009, resulting in wage gains that were 12.0 percent lower than those achieved in 2007. In 2010 and 2011, re-employment wage gains returned to 2008 levels but remained well below the peak levels experienced of 2007.

Table 12: Probability of re-employment for different groups

	All	Age <30	Age 30–49	Age 50+	Male	Female	High earner	Medium earner	Low earner
March 2000	0.876***	0.817***	0.928***	0.982	0.847***	0.910***	0.950***	0.850***	0.799***
	[0.006]	[0.008]	[0.010]	[0.020]	[0.008]	[0.009]	[0.010]	[0.009]	[0.013]
March 2001	0.906***	0.848***	0.953***	1.017	0.902***	0.911***	0.971**	0.888***	0.837***
	[0.006]	[0.008]	[0.010]	[0.020]	[0.008]	[0.009]	[0.010]	[0.009]	[0.013]
March 2002	0.921***	0.876***	0.954***	1.006	0.928***	0.914***	0.986	0.913***	0.840***
	[0.006]	[0.009]	[0.010]	[0.020]	[0.009]	[0.009]	[0.011]	[0.010]	[0.013]
March 2003	0.976***	0.935***	1.002	1.058**	0.965***	0.988	1.016	0.972**	0.928***
	[0.006]	[0.009]	[0.010]	[0.019]	[0.009]	[0.009]	[0.011]	[0.010]	[0.014]
March 2004	0.988	0.954***	1.016	1.021	1.011	0.962***	1.056***	0.967**	0.927***
	[0.006]	[0.009]	[0.010]	[0.018]	[0.009]	[0.009]	[0.011]	[0.010]	[0.013]
March 2005	1.014*	0.981*	1.034***	1.069***	1.007	1.020*	1.042***	1.013	0.974
	[0.006]	[0.009]	[0.010]	[0.018]	[0.009]	[0.009]	[0.011]	[0.010]	[0.013]
March 2006	0.987*	0.966***	0.996	1.036*	0.979*	0.996	1.005	0.985	0.967*
	[0.006]	[0.009]	[0.010]	[0.017]	[0.009]	[0.009]	[0.010]	[0.010]	[0.013]
March 2007	1	1	1	1	1	1	1	1	1
March 2008	0.961***	0.945***	0.979*	0.966*	0.954***	0.968***	0.978*	0.957***	0.943***
	[0.006]	[0.009]	[0.010]	[0.016]	[0.009]	[0.009]	[0.010]	[0.010]	[0.013]
March 2009	0.814***	0.807***	0.828***	0.803***	0.789***	0.843***	0.841***	0.790***	0.814***
	[0.006]	[0.008]	[0.009]	[0.014]	[0.007]	[0.008]	[0.010]	[0.009]	[0.011]
March 2010	0.907***	0.918***	0.923***	0.840***	0.903***	0.912***	0.916***	0.886***	0.922***
	[0.006]	[0.010]	[0.010]	[0.015]	[0.009]	[0.009]	[0.011]	[0.010]	[0.013]
March 2011	0.877***	0.892***	0.895***	0.800***	0.886***	0.869***	0.861***	0.830***	0.950***
	[0.006]	[0.009]	[0.010]	[0.014]	[0.009]	[0.008]	[0.010]	[0.009]	[0.013]
Chi-sq (p-value=0 for all)	2077.099	1109.095	733.206	705.517	1400.335	815.02	790.18	1199.789	544.624
N	648,800	308,800	247,800	92,200	335,300	313,500	208,100	250,800	189,900

Note: Figures have been derived from the Integrated Data Infrastructure (IDI) prototype managed by Statistics New Zealand. Each column is from a separate stratified Cox proportional hazard regression. There is one observation for each job separation. Parameters are reported as hazard ratios. Robust standard errors are reported. Significance indicators show whether hazard ratio is different from one: * p<0.05, ** p<0.01, *** p<0.001.

Table 13: Wage gains conditional on re-employment for different groups

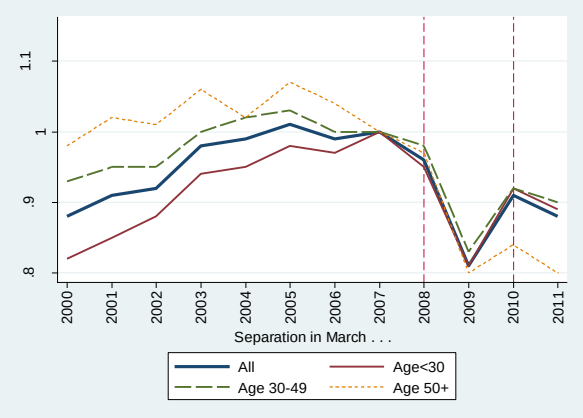
	All	Age <30	Age 30–49	Age 50+	Male	Female	High earner	Medium earner	Low earner
March 2000	-0.048***	-0.053***	-0.036***	-0.074***	-0.054***	-0.042***	-0.012	-0.025*	-0.131***
	[0.006]	[0.009]	[0.009]	[0.018]	[0.008]	[0.009]	[0.008]	[0.010]	[0.017]
March 2001	-0.01	-0.019*	-0.005	-0.001	-0.005	-0.015	0.023**	0.007	-0.088***
	[0.006]	[0.009]	[0.009]	[0.017]	[0.008]	[0.009]	[0.007]	[0.010]	[0.017]
March 2002	-0.025***	-0.027**	-0.028**	-0.02	-0.016*	-0.036***	-0.005	-0.011	-0.068***
	[0.006]	[0.010]	[0.009]	[0.017]	[0.008]	[0.010]	[0.008]	[0.010]	[0.017]
March 2003	-0.032***	-0.047***	-0.019*	-0.016	-0.031***	-0.033***	0.005	-0.030***	-0.081***
	[0.006]	[0.009]	[0.008]	[0.015]	[0.007]	[0.009]	[0.007]	[0.009]	[0.015]
March 2004	-0.054***	-0.069***	-0.041***	-0.042**	-0.050***	-0.057***	-0.013	-0.061***	-0.102***
	[0.006]	[0.009]	[0.008]	[0.015]	[0.007]	[0.009]	[0.007]	[0.009]	[0.015]
March 2005	-0.029***	-0.043***	-0.020*	-0.01	-0.027***	-0.031***	-0.004	-0.035***	-0.046**
	[0.006]	[0.009]	[0.008]	[0.014]	[0.007]	[0.008]	[0.007]	[0.009]	[0.014]
March 2006	-0.028***	-0.033***	-0.023**	-0.032*	-0.028***	-0.028***	-0.013	-0.030***	-0.044**
	[0.005]	[0.009]	[0.008]	[0.014]	[0.007]	[0.008]	[0.007]	[0.008]	[0.014]
March 2007	0	0	0	0	0	0	0	0	0
March 2008	-0.063***	-0.090***	-0.039***	-0.053***	-0.065***	-0.062***	-0.020**	-0.068***	-0.114***
	[0.005]	[0.009]	[0.008]	[0.013]	[0.007]	[0.008]	[0.007]	[0.008]	[0.014]
March 2009	-0.120***	-0.159***	-0.084***	-0.088***	-0.140***	-0.099***	-0.072***	-0.120***	-0.179***
	[0.006]	[0.010]	[0.009]	[0.015]	[0.008]	[0.009]	[0.008]	[0.009]	[0.015]
March 2010	-0.068***	-0.091***	-0.049***	-0.045**	-0.061***	-0.077***	-0.027***	-0.089***	-0.098***
	[0.006]	[0.010]	[0.008]	[0.015]	[0.008]	[0.009]	[0.008]	[0.009]	[0.015]
March 2011	-0.057***	-0.088***	-0.025**	-0.043**	-0.055***	-0.060***	-0.018*	-0.082***	-0.079***
	[0.006]	[0.010]	[0.008]	[0.014]	[0.008]	[0.009]	[0.008]	[0.009]	[0.014]
Adj-R^2	0.024	0.029	0.018	0.028	0.028	0.024	0.022	0.027	0.029
N	447,600	211,700	177,900	58,000	231,700	215,900	159,100	183,700	104,900

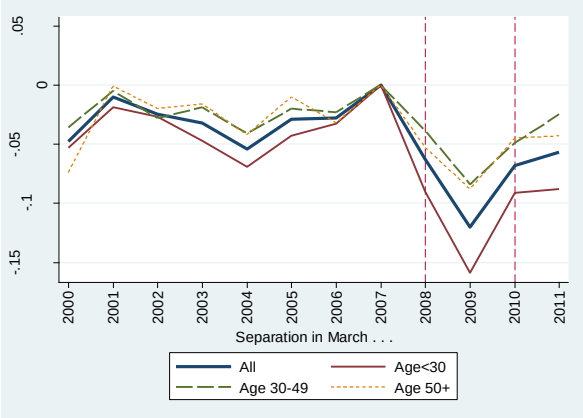
Notes: Figures have been derived from the IDI prototype managed by Statistics New Zealand. Each column is from a separate linear regression, which also contains intercepts by duration and demographic group. There is one observation for each person who is re-employed. Parameters are reported as hazard ratios. Robust standard errors are reported. Significance indicators show whether ratio is different from one: * p<0.05, ** p<0.01, *** p<0.001.

Figure 6: Re-employment and wage growth when re-employed

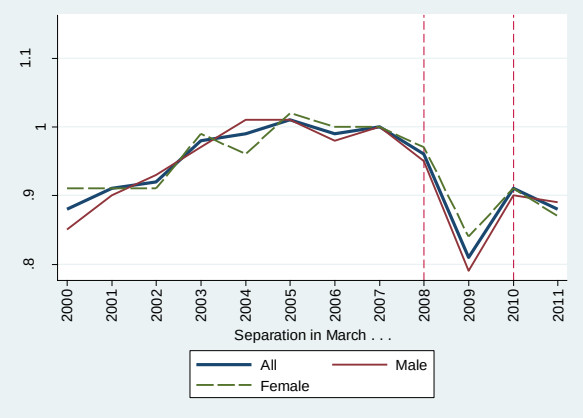
Probability of re-employment	Wage growth conditional on re-employment

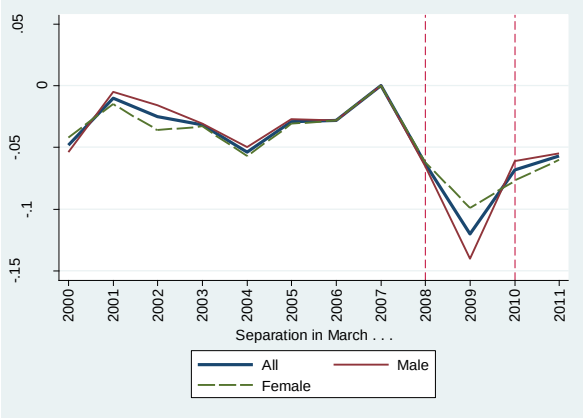
(a) Age



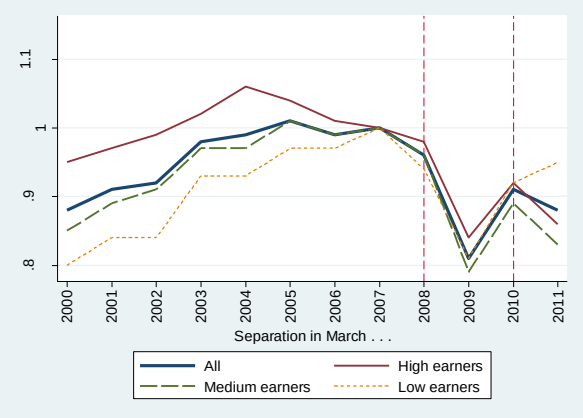


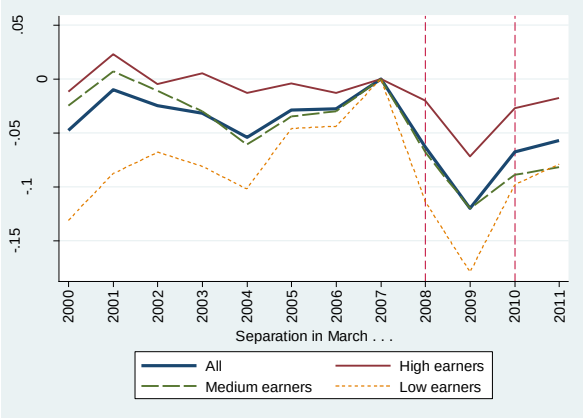
(b) Gender





(c) Earnings groups





Note: Figures have been derived from the Integrated Data Infrastructure (IDI) prototype managed by Statistics New Zealand. The left column of figures shows relative hazard ratios from a stratified proportional hazard regression, relative to the 2008 hazard. The right column of figures shows the coefficients on year dummies in a wage growth regression, where 2008 is the omitted year. The underlying coefficients are shown in Table 12 and 13.

Overall summary and discussion

The Global Financial Crisis resulted in a reduction in employment of 2.2 percent between March 2008 and March 2010. The reduction was considerably worse for workers aged under 30 years of age (-9.0 percent) and somewhat worse for men (-2.7 percent) than for women (-1.6 percent). In contrast, employment growth remained positive for older workers (aged 50 years and above) (6.3 percent) although below the growth rate prior to the GFC.

The size of the employment contraction over the two years varied across industries and to a lesser extent across local labour market areas. Contractions were particularly strong in construction (-13.4 percent), manufacturing (-9.8 percent) and finance and insurance industries (-6.4 percent).

However, differences in the distribution of workers across different industries and labour market areas contributed relatively little to group differences. The industry composition of employment somewhat favoured women, older workers and low earners. Employment growth for men was 1.0 percent lower as a result of being over-represented in industries with low growth in male employment, whereas over-representation in high-growth (low-contraction) industries contributed +0.8 percent to women's employment growth and +0.9 percent to growth in employment for low-earning workers. Employment growth for young workers was reduced by 0.5 percent due to their concentration in industries with low youth employment growth. In contrast, regional differences in employment composition contributed almost nothing to group differences in employment growth.

The changes in labour market dynamics that followed the GFC were as pronounced as the change in employment growth rates. Employment declines were not a result of higher worker separation rates. Separation rates actually declined – presumably reflecting a drop in voluntary separation that more than outweighed a rise in involuntary separations, although we are unable to distinguish these two flows in the data. There was a sharp drop in worker accessions for all groups, which more than offset the effect of lower separations. The overall impact was a reduction in labour market liquidity, making it harder for jobseekers to find employment and impeding the reallocation of jobs and workers. The drop in liquidity was particularly pronounced for young workers, who face the highest rates of worker and job turnover.

The regression analyses in Table 7, Table 8 and Table 9 show that almost[19] all measures of growth and flow rates are responsive to cyclical variation in aggregate, industry and local employment growth. The worker accession rate shows the highest degree of responsiveness. When responsiveness is estimated separately for subgroups (Table 9), we show that the flow rates of young workers are relatively strongly responsive to employment growth at all three levels – aggregate, industry and local. However, almost all of the observed differences across groups in growth and flow rates after the GFC is due to different responsiveness to common aggregate shocks rather than to their distribution across industries and labour market areas or their differing responsiveness to changes by industry or labour market area (Table 10).

[19] The only exception is that the excess job reallocation rate does not vary significantly in response to local labour market area growth.

The combined effect of lower employment growth and lower labour market liquidity is clearly evident in the persistent impact of job loss for workers separating after the GFC. The probability of re-employment after leaving or losing a job declined for all groups following the GFC. Re-employment probabilities were around 15–20 percent lower in the year to March 2009

All groups faced a 10–20 percent lower probability of re-employment after losing or leaving a job in March 2009 than they had faced if separating in March 2007, when re-employment probabilities peaked. Although later separations faced somewhat higher re-employment probabilities, they were still well below 2007 levels, even following separations in March 2011. Re-employment rates for older workers remained around 20 percent below the 2007 peak even as late as 2011, reflecting a prolonged period of adjustment for this group and possibly transitions to early retirement for some.

Re-employment rates understate the burden of job loss, as re-employment after the GFC was secured with lower earnings gains than in earlier periods. The decline in monthly earnings upon re-employment was particularly large for young workers and for low earners. For each of these groups, the median earnings gains were 15 percentage points lower for workers re-employed after a March 2009 separation than they were following a pre-GFC separation in March 2007. As with re-employment rates, there was only a partial recovery by March 2011.

The analysis of re-employment probabilities and wage gains upon re-employment do not capture the impact of the GFC on labour market entrants – young entrants, graduates and immigrants – for whom the reduction in labour market liquidity and the decline in accession rates in particular would have made job search more difficult.

As is evident in Figure 3 and Figure 4, aggregate employment had started growing again by March 2011. There was, however, still a small contraction for workers under the age of 50 and for high and medium earners. Furthermore, the resumption of employment growth was accompanied by lower rates of worker and job turnover than prevailed prior to the GFC, signalling continued low labour market liquidity and reduced scope for job reallocation. The recovery will not be complete until there is also a recovery in turnover rates. This will signal a more vigorous labour market in which workers and jobs are more readily reallocated and in which job loss has a less persistent impact on workers who leave employment.

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Appendix

Table A1: Co-variation of demographic characteristics

	Male	Female	Age <30	Age 30–49	Age 50+	High earners	Medium earners	Low earners
Shares of total employment	50%	50%	30%	47%	24%	45%	36%	19%
Column percentages								
Male	100%		52%	50%	48%	64%	43%	30%
Female		100%	48%	50%	52%	36%	57%	70%
Age < 30	31%	28%	100%			15%	38%	48%
Age 30 to 49	46%	47%		100%		59%	40%	30%
Age 50 +	23%	25%			100%	27%	22%	22%
High earners	57%	33%	22%	57%	50%	100%		
Medium earners	31%	41%	46%	31%	32%		100%	
Low earners	12%	27%	31%	12%	17%			100%

Notes: Figures have been derived from the Integrated Data Infrastructure (IDI) prototype managed by Statistics New Zealand.

Table A2: Changing duration profile

% re-employed	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Within a month	16%	17%	18%	17%	18%	18%	17%	18%	17%	13%	17%	17%
After 1 month	20%	19%	19%	22%	22%	22%	23%	21%	24%	17%	18%	17%
After 2 months	6%	6%	6%	6%	6%	8%	6%	6%	5%	5%	5%	5%
After 3 months	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	6%	5%
After 4 months	4%	4%	4%	4%	3%	4%	4%	4%	4%	4%	4%	5%
After 5 months	3%	3%	3%	3%	3%	3%	3%	3%	2%	3%	3%	3%
After 6 months	2%	3%	3%	2%	2%	2%	2%	2%	2%	3%	2%	2%
After 7 months	2%	2%	2%	2%	2%	2%	2%	2%	2%	3%	2%	2%
After 8 months	3%	3%	3%	2%	3%	2%	2%	2%	2%	3%	3%	3%
After 9 months	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
After 10 months	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
After 11 months	2%	2%	2%	1%	1%	1%	1%	1%	1%	2%	1%	1%
After 12 months	1%	2%	1%	1%	1%	1%	1%	1%	1%	2%	1%	1%
After 13 months	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
After more than 13 months	32%	31%	31%	28%	28%	28%	29%	29%	31%	37%	34%	35%
Number of separations	54,100	51,300	47,600	53,100	55,300	59,600	60,900	57,600	58,100	51,100	47,000	53,100

Notes: Figures have been derived from the Integrated Data Infrastructure (IDI) prototype managed by Statistics New Zealand.

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