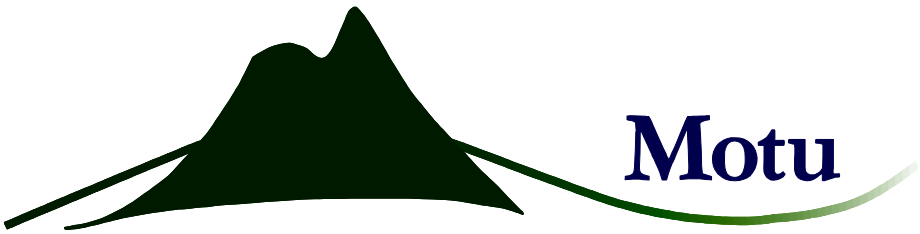

Cyclical Labour Market Adjustment in New Zealand: The Response of Firms to the Global Financial Crisis and its Implications for Workers

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The opinions, findings, recommendations and conclusions expressed in this report are those of the authors. Statistics New Zealand, the OECD, the Department of Labour, Motu and the University of Waikato take no responsibility for any omissions or errors in the information contained here. The paper is presented not as policy, but with a view to inform and stimulate wider debate. This paper has been prepared with funding from the NZ Department of Labour and the OECD.

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Abstract
This paper examines the dynamics of employment adjustment in New Zealand, focusing on the response of firms to the 2008/09 Global Financial Crisis. We use data from Statistics New Zealand's prototype Longitudinal Business Database (LBD) to examine firms' employment responses to output shocks before and after the crisis, and to investigate variations in job and worker flows. We discuss the resilience of the NZ labour market to economic shocks, and the possible role of labour market policy settings. Finally, we discuss preliminary findings on the differential impact of labour market adjustment on workers – by earnings level, age, gender, and tenure – and outline potential further work along these lines. Our analysis of firm microdata highlights three key features of New Zealand labour market adjustment to the 2008/09 crisis. First, there was considerable heterogeneity across firms, both before and after the crisis, in the size of output shocks that firms faced, the amount of employment adjustment in response to any given output shock, and in the size of worker flows given the firm's employment adjustment. Second, the crisis not only moved the distribution of output shocks faced by firms, but also altered the relationship between output shocks and changes in job and worker flows and employment. Third, the impact of the observed firm-level dynamics had an uneven impact on workers, with greater employment losses for low wage workers, young workers, and workers with low job tenure.

JEL codes
E24; E32; J63

Keywords
Global Financial Crisis; labour market adjustment; output shock; unemployment; job flows; worker flows

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1. Introduction

A resilient labour market is one that can recover from adverse shocks with minimum disruption in the form of long-term unemployment. The labour market features that promote resilience will depend on the nature of labour market shocks. For a labour market that experiences only cyclical shocks, resilience is achieved by some form of smoothing across the cycle. This may take many forms, such as long-term contracts (with countercyclical productivity/ labour hoarding; pro-cyclical wages), unemployment insurance and benefits, or active labour market policies. The degree of cyclical flexibility may be reflected in cyclicality of employment, hours, wages, profits, and productivity. The mix of institutions and policies to achieve this smoothing will also affect the sharing of the costs of cyclical downturns. Optimally, smoothing should be greater for more risk-averse groups.

A labour market that is resilient to cyclical shocks may be ill-suited to shocks that require a reallocation of employment across industries, occupations, or regions. In order to respond effectively to such shocks, labour market institutions and policies are needed that facilitate retraining, job turnover and reallocation, and geographic and industry mobility.

The next section of the paper discusses the nature of labour market resilience and what can be learnt from the analysis of labour market flows. This is followed by a summary of recent cyclical variation in New Zealand, paying particular attention to developments since the onset of the Global Financial Crisis (GFC). After describing the data in section 4, we analyse the microeconomic sources of aggregate employment and earnings fluctuations (section 5) and patterns of adjustment conditional on output shocks faced by firms, or on net employment change within firms. We extend this analysis in section 6 to examine the distributional consequences of labour market adjustment across workers. The paper concludes with a summary of the main findings and a discussion of their implications.

2. Labour Market Resilience

Recessions impose costs. Reductions in labour demand lead to reductions in wages or employment, or to lowered productivity and profitability. Fluctuations in earnings make risk-averse workers worse off. Firms, especially small and young firms, may also be risk averse due to their limited ability to absorb sustained losses.

Labour market institutions promote resilience by spreading the costs of labour demand fluctuations and by facilitating a rapid recovery of employment and earnings when labour

demand expands. Faced with purely cyclical variation in labour demand, workers and firms have an incentive to maintain their employment relationship during downturns, to avoid hiring, firing and retraining costs, and to smooth incomes. Risk-averse workers would accept lower average wages over the cycle in exchange for a smoother earnings path, making stable employment attractive to employers as well. The absence of a complete insurance market to cover income risks leaves a demand for income smoothing through employment contracts. Such an arrangement of "job-based insurance" may, however, break down in unexpectedly severe downturns when it becomes too costly (relative to turnover costs) to continue the employment relationship. It also breaks down if labour demand fluctuations are characterised by a process of creative destruction, and require a reallocation of capital and labour between firms or industries. In this case, a resilient labour market should facilitate rapid and low-cost transitions that do not impose unnecessary costs, delays or income fluctuations. In practice, there is an inevitable tension between providing stability and flexibility.

In recent years, the European Commission has advanced the Danish notion of *flexicurity* to characterise the balance that needs to be struck between flexibility of adjustment and security of income and employment (European Commission, 2010). Their approach emphasises the need for flexibility in the labour market, together with income support policies to smooth incomes, and active labour market and training policies to aid reallocation. In a dynamic and changing economy, *de facto* (social) insurance is provided through the tax system rather than through employment contracts. The Danish, and more generally European, labour institutions reflect a combination of relatively generous provisions supported by relatively high tax rates.

In New Zealand, labour market policies are directed more towards fostering flexibility and maintaining work incentives than in many other countries. In 2008, New Zealand had one of the lightest systems of employment protection in the OECD (Venn, 2009), despite modest increases in protections as part of the 2000 Employment Relations Act (*ERA*). In 2009, protections were reduced by allowing a 90-day trial period for employees in firms with 19 or fewer employees, during which time employers could dismiss an employee without the employee being able to take a personal grievance for reasons of unjustified dismissal. From April 2011, all employers were eligible to use such trial periods. Despite the internationally low level of employment protection, most employees are covered by protections against unjustified dismissal that make dismissing workers a costly and potentially lengthy process, putting downward pressure on job destruction rates.

The majority of employees have their terms and conditions governed by individual contracts with employers. The prevalence of collective bargaining in New Zealand declined

markedly in the 1990s, following significant legislative reforms (*Employment Contract Act*, 1991), Private sector collective bargaining coverage dropped from 48 percent of employment in 1990 to 21 percent in 2000 (Foster et al, 2011). Despite legislative change in 2000 (*Employment Relations Act*, 2000) that explicitly promoted collective bargaining and facilitated union membership growth (Rasmussen, 2009),[1] private sector collective bargaining coverage has remained at about 10 percent since 2004. Economy-wide union membership declined from 43 percent in 1991 to 21 percent in 2000 and has remained at that level since.

New Zealand has less extensive active labour market policies than in European countries and has income support policies that emphasise in-work benefits, with only moderate replacement rates for unemployment benefits, providing limited scope for income smoothing. New Zealand also has relatively light regulatory controls, making it the easiest country in the world to start a new business and one of the easiest in which to do business (World Bank and IFC, 2012). We might therefore expect firm entry and exit to play a relatively strong role in New Zealand's employment dynamics.

2.1. What do we Learn from Job and Worker Flows?

There is a well established literature examining differences in job and worker flows across the business cycle, following the seminal US work of Davis and Haltiwanger (1992). A key insight from this literature is that job and worker flow rates are large compared with net employment changes, reflecting an ongoing dynamic process of reallocation of jobs and workers. In the US, Canada and the UK, job reallocation, and job destruction in particular, is higher in downturns. Recessions can be seen as periods of heightened "creative destruction" in which new innovative firms replace less-productive existing firms (Schumpeter, 1947). In European countries, job reallocation rates are less cyclical, and somewhat lower, than in the US.

[1] Among the provisions of the *ERA* were the reintroduction of union registration; a requirement for 'good faith' bargaining; extension of union access to workplaces; restriction of direct employer communication with employees during bargaining; automatic extension of non-union collective agreement coverage to union members; and extending the right to strike over collective agreements. Amendments in 2004 to the *Employment Relations Act* extended regulation of the bargaining process by strengthening good faith bargaining requirements. Following a change of Government in 2009, further amendments were introduced in 2010 that partially reversed some of the *ERA* changes. The 2010 amendments strengthened the employer's ability to control union access to the workplace and to communicate directly with employees, and promoted mediation in personal grievance cases, as well as extending the use of trial periods. The Government was re-elected in November 2011with a policy of further reductions in the regulation of bargaining and removal of selected *ERA* provisions that promote unions and collective bargaining (NZ National Party, 2011).

In trying to account for cross-country differences in unemployment and job flows, a key focus has been on the role of different labour institutions and policies.[2] Employment protection serves to raise firing costs, lowering job destruction rates and, in equilibrium, job creation rates, as employers are more cautious about hiring. By lowering the speed of job reallocation, employment protection can also slow the speed of adjustment to a new equilibrium, even though the impact on equilibrium employment and unemployment is ambiguous. (Nickell, 1978; Bertola, 1990; Bentolila and Bertola, 1990). Differences in firing costs can thus contribute to different patterns of cyclical adjustment, including the sort of cross-country differences in the cyclicality of job destruction noted above (Garibaldi, 1998).

The impact of unemployment benefit generosity is less clear cut. Lower replacement rates increase job search intensity and lower reservation wages, leading to higher equilibrium employment and lower equilibrium unemployment. With a lower reservation wage, some workers will accept lower quality matches. As a result, the rate of job-to-job flows may increase as workers try to improve the match. The low reservation wage may also discourage the creation of higher productivity but more risky jobs, with an adverse impact on employment levels.[3]

Drawing on these insights, New Zealand's system of relatively light employment protections, low unemployment benefit levels, and ease of firm entry suggest that New Zealand will have relatively high firm, job, and worker flow rates that are responsive to cyclical demand fluctuations.

A high rate of firm births and deaths is expected as a consequence of the ease of firm entry, which lowers the productivity hurdle that new firms must overcome. There will therefore be a larger pool of low-productivity young firms that are vulnerable to going out of business when faced with an unanticipated reduction in demand. With a low hurdle, firm birth rates will be stronger when demand growth resumes.

Job flows will be high due to the relatively light employment protection. The high flows facilitate the reallocation of jobs, improving the speed with which the labour market is able to reach a new equilibrium and recover from a downturn.

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[2] A recent review of theoretical and empirical findings on the impact of labour market institutions on job and worker flows, including the impact on cyclical adjustment patterns, can be found in Bassanini et al (2010). See also Martin and Scarpetta (2011). Other relevant studies include Messina and Vallanti (2007); Gómez-Salvador et al (2004), and Salvanes (1997).

[3] Acemoglu and Shimer (2000) argue that social insurance can encourage workers and firms to establish more-productive jobs that require investments in specific and risky skills. Without such insurance, workers would favour less risky and less productive jobs.

High worker flows are expected as a consequence of low benefit levels and the consequently greater prevalence of on-the-job search. However, we might expect a pronounced decline in worker flows during recessions. During a downturn, workers will prefer to remain employed rather than become unemployed, leading to a drop in quit rates and possibly greater reliance on hours adjustment and wage flexibility. Hiring rates will also drop as positions remain filled by existing workers. Young workers entering the labour market for the first time, and workers in high turnover industries may be particularly disadvantaged by the cyclical decline in worker flows. Workers whose jobs do end involuntarily during a recession are at risk of earnings declines, as a consequence of their low reservation wages.

3. Recent Cyclical Variation in New Zealand

Prior to the GFC, New Zealand had experienced a prolonged period of growth. Leading up to the business cycle peak of 2007q4, output had been increasing for almost ten years, since 1998q1. This was the longest upswing in New Zealand since 1966, although the rate of growth had been slowing since 2005, reflecting a decline in activity in the tradables sector. Growth was starting to pick up again in 2007, until the economy went into recession in the first quarter of 2008, reflecting not only the onset of the GFC, but also the effects of an overdue cooling of the housing market. The contraction was sharp and its effects were widespread. Output had dropped by 3.1% by the first quarter of 2009 and there were steep declines in business and consumer confidence, retail sales, and investment. Growth stalled in the non-tradables sector, while tradables activity declined.

In comparison with other OECD economies, the recession in NZ was relatively mild – no doubt buoyed by the fact that in Australia, our largest trading partner, GDP declined in only one quarter (2008q4). In New Zealand, aggregate growth resumed weakly in the second quarter of 2009, and real GDP was still marginally below its 2007q4 level in the first quarter of 2011.

The recession had a clear impact on the New Zealand labour market, albeit with a lag. Prior to the recession, employment had been increasing since the fourth quarter of 1998. Like output growth, growth in employment had been slowing since late 2005, although it continued rising for several quarters after output contracted, before contracting for four quarters. Employment growth resumed three quarters after output began growing again. The employment fluctuations were less pronounced than output changes, leading to pro-cyclical labour productivity changes. In contrast, wage growth held up until late in 2008, but eventually slowing in 2009, in concert with employment growth.

Compared with previous recessions in New Zealand, the 2008 recession was initially less severe but was more prolonged. The impact on the labour market was roughly commensurate with the output changes, a pattern seen in recent recessions but in contrast to the major changes that occurred in New Zealand in the 1980s and 1990s.

Figure 1 shows cyclical variation in output and employment in New Zealand over the past 60 years, highlighting the timing of peaks and troughs for each series.[4] Employment declines have lasted longer than output declines in the previous three recessions, and have been more severe – especially for the contractions starting in 1987/88, when employment dropped by over 7% in seven quarters.

The relationship between output and employment is shown graphically in Figure 2. Visually, the patterns in Figure 2 are dominated by periods when output and employment growth diverged – notably in the 1980s and 1990s. In 1977, output declined with only a small reduction in employment, whereas in 1987/88, there was a substantial drop in employment accompanied by a relatively small output decline. Table 1 summarises the peak-to-trough declines in output and employment for these and other recent cycles, together with the duration of each downturn, and the length of time before the previous peak levels were regained. The 2008 recession appears more significant on this basis. The output drop, in particular, is the longest-duration contraction since the 1976q2 recession,[5] and also the most sustained, taking at least 13 quarters (to date) to regain the 2007q4 level of output. The contraction in output (-3.1%) is the deepest since 1982q2 (-3.1%). The lower panel of Figure 2 shows the joint evolution of output and employment between 2006 and 2011. The graph traces a counter-clockwise adjustment path, commonly observed around business cycle turning points, where employment changes follow output changes with a lag.

Figure 3 compares trajectories of output and employment around the peaks of eight business cycles, highlighting the 2008 recession as the thickest line. Whereas the level of real output had regained its peak level within five to eight quarters in five of the last seven recessions, the 2008 recession had still not reached its previous peak after 13 quarters. The HLFS total employment measure in the lower panel shows employment peaking four quarters after output,

[4] Turning points were identified using the Bry-Boschan quarterly algorithm outlined in Harding and Pagan (2002), with (window=2 quarters; minimum phase=3 quarters; minimum cycle=5 quarters). This was applied to seasonally adjusted real production GDP, and seasonally adjusted total employment derived by splicing the historical series in Chapple (1994) with the latest revision of the Household Labour Force Survey.

[5] The recession starting in 1950q4 took 14 quarters to regain its previous peak, and the recession starting in 1976q2 took 18 quarters.

declining by 2.5%, and then regaining its peak level within nine quarters. Compared with other cycles, employment is still relatively low 13 quarters after output peaked.

The volatility in HLFS employment around the turning point makes us cautious about interpreting the specifics of the observed patterns. We therefore compare the path of HLFS employment with the paths implied by two other leading employment indicators – one derived from a survey of firms (Quarterly Employment Survey, or QES) and one from comprehensive administrative data covering all employees (Linked Employer-Employee Database, or LEED). The series differ in a number of respects, including coverage, scope, and sampling error (see Table 2 for more details) and so are not expected to coincide exactly. The right hand panel of Figure 4 shows smoothed (centred five-quarter moving average) time series of the three alternative employment variables over the entire period covered by LEED, together with the employment measure derived from prototype Longitudinal Business Database (LBD) microdata, as described in section 4.[6] Although the employment series show the same broad trends over time, the pictures that they paint of the timing and depth of the cyclical downturn and subsequent recovery differ somewhat (as shown in the left panel). The least-volatile LEED measure shows employment peaking two quarters after GDP and then declining by 3.4%; slightly greater than the output decline of 3.1%. The implied pattern of countercyclical productivity growth was also evident in the previous three recoveries.

The main disadvantage of the LEED measure is that it is available for only nine quarters after the peak of GDP, and is thus uninformative about the nature of the extended recovery. Beyond that point, the HLFS and QES measures show quite different employment change – the HLFS measure regained its peak level in 2011q1, whereas the QES measure remained about 3% below its peak level.

3.1. Labour Market Adjustment during the GFC

While employment growth provides a useful summary indicator of the labour market responses to the cyclical downturn, the impacts are also evident in other labour market indicators. The labour force continued to grow and the participation rate remained high while employment growth slowed, leading to an increase in unemployment. Unemployment rose sharply, increasing from below 4% in early 2008 to stabilise at around 7% from late 2009. Employment intentions dropped almost immediately when output declined and remained negative until mid-2009, shortly before employment growth resumed. Average weekly hours of

[6] The LBD employment measure shows the strongest decline. This is in part due to excluding the public sector from the population. Public sector employment had a relatively small post-peak decline.

work had been dropping steadily since 2005, and continued to do so until 2010, when employment growth resumed, despite stronger growth in full-time than part-time employment. At the start of the recession, growth in full-time employment stalled and part-time employment grew more rapidly. By late 2009, part-time employment growth slowed and full-time employment growth picked up. Wage growth remained positive throughout the early stages of the recession, but slowed markedly in 2009, and has remained low.

As shown in Figure 5, the unemployment rate has remained higher than pre-peak levels, particularly for young people. Since 2007q4, the overall unemployment rate rose from 3.5% to 6.5% for all workers, and from 13.1% to 27.6% for 15-19 year olds.[7] Youth participation has also shifted – down from 65% to 45%, in contrast to relatively stable participation rates overall. Long-term unemployment has grown faster than unemployment overall – rising from 4.5% to 9.2% of overall unemployment.

The first row of Figure 6 shows GDP, LEED employment, and hours change around the 2007q4 GDP peak (left column) and for the entire period when LEED data are available (right column). Two hours measures are shown – one derived from QES, which reflects average paid hours per employee, and one from the HLFS, showing hours worked per person. Both show declines following 2007q4, though the HLFS measure of average hours had been declining for some time prior to the GDP peak. Both series show a recovery in hours from around five quarters after 2007q4. The second row of Figure 6 shows growth in QES real hourly earnings per full-time equivalent employee, and growth in real monthly earnings, from the microdata sample described in section 4. Monthly earnings declines before hourly earnings, reflecting the drop in average hours. Real monthly earnings growth subsequently resumes as hours pick up, but real hourly earnings continue to decline.

Aggregate employment fluctuations are the net result of large gross flows of jobs and of firms. Section 5 of this paper examines changes in job and worker flows across firms. In the current section, we summarise the changes in aggregate job flows (job creation and job destruction rates) and worker flows (accession and separation rates) that occurred during the 2008 recession. The quarterly job creation rate (JCR) and job destruction rate (JDR) are calculated following the approach of Davis et al (1996) as the net change in employment, expressed as a proportion of average employment.[8] The job creation rate reflects employment

[7] The relative rise in youth unemployment started at around the same time as the 1 April 2008 increase of the minimum wage for 16-17 year olds to the level of the adult minimum (from $9 to $12 per hour) and the introduction of a new entrants wage ($9.60 per hour).

[8] Specifically, the measure compares employment on the 15th of the month in the middle of a quarter to employment at the same point in the middle of the previous quarter.

changes in entering and expanding firms and the job destruction rate reflects employment changes in exiting and contracting firms. Like the job creation and destruction rates, the worker flow rates are measured quarterly. They reflect the number of employees who had not been at the firm three months earlier (accession rate or AR), or the number of previous employees who were no longer at the firm (separation rate or SR).

The bottom half of Figure 6 provides information on the changes in job and worker flows that generate the aggregate employment changes. The dark line in the third-row graphs shows the path of net employment growth (NEG), which is the quarterly change in aggregate employment expressed as a proportion of average employment during the quarter. The decline in net employment growth resulted from a rise in the JDR and a decline in the JCR. The third-row graphs show the pronounced rise in the job destruction rate in the six quarters after the GDP peak, together with the slight decline in the job creation rate. The job creation rate had, however, been gradually declining for the previous 30 quarters. The job destruction rate had been following a similar slow decline until 2005 – about ten quarters before the 2007q4 peak. It then stabilised before its rise during the recession.

The patterns of worker turnover are markedly different from those of job turnover. The fourth row of Figure 6 shows changes in the worker accession and separation rates, together with the quarterly net employment growth rate. Prior to the 2007q4 peak, both the accession and separation rates were relatively stable. Immediately following the peak, the rates of both accessions and separations declined markedly, signalling a pronounced reduction in labour market liquidity. By 2010q2, six quarters after the peak, the worker accession rate had declined by four percentage points (from 17.9% to 13.7%). Despite the rise in job destruction, the worker separation rate dropped by 2.8 percentage points (from 17.0% to 14.2%) over eight quarters.

3.2. Variation across Industry and Region

The impact of the recession varied across industries, though it appears to have affected geographical regions similarly. Figure 7 provides a summary of output and employment growth, and job and worker flows by industry. Industries have been grouped as shown in Table 3.[9] Output declines were particularly strong in the manufacturing, construction, and combined wholesale/ retail/ accommodation industries. These industries collectively accounted for around

[9] We use official LEED statistics at the two-digit ANZSIC 2006 industry reallocated to ANZSIC 1996 industries using the algorithm in Grimes et al. (2009). Each ANZSIC2006 industry is allocated to an ANZSIC1996 industry provided at least 82% of the source industry's employment is in the target industry, otherwise it is omitted. The resulting concordance omits 3.2 % of employment and misallocates up to 1.5% of employment.

45% of employment and experienced a 14% reduction in output and a 9% reduction in employment. In agriculture and mining, network industries (electricity, gas & water, transport & storage, and communications), and government, output growth slowed but did not decline appreciably. In the business services industries, output growth resumed relatively strongly after only four quarters of weak growth. The same was not true of employment growth, which declined by around 8% in business services. Agriculture and mining also experienced declining employment in the face of stable or rising output. Employment in community & personal services industries continued to grow throughout the recession, though output data are not available for these industries. For other industries, employment growth followed a similar path to output growth, albeit with a lag. For wholesale trade, retail trade, and accommodation, cafes & restaurants, the decline in employment was small relative to the output decline.

The second panel of Figure 7 shows net employment growth rates together with job flow rates. Industries with the greatest employment declines, manufacturing, construction, and trade & accommodation, experienced the expected pattern of rising job destruction and declining job creation, which reversed as the contraction eased. In business services, the fluctuation in job destruction was particularly strong, accounting for most of the change in quarterly net employment growth. Three industry groups show atypical patterns. Job creation and job destruction rates both declined during the recession for agriculture and mining, and in network industries, job creation and job destruction both increased. Job creation and destruction rise and then fall together in government, perhaps reflecting ongoing public sector reorganisation. There was minimal variation in job flows in the community & personal services industries. The bottom panel of Figure 7 show worker flows. The general pattern is one of decreasing labour market liquidity. Accessions and separation rates both declined during the recession, as firms reduced hiring rates and workers' quit rates dropped.[10]

Finally, Figure 8 summarises net employment growth and flow rates by region. Patterns are summarised for five regional groupings; Auckland, Wellington, the rest of the North Island, Canterbury, and the rest of the South Island. Panel (a) shows the expected pattern of procyclical job creation and countercyclical job destruction. The exception is the Wellington region, where job creation continued to grow during the early stages of the recession, perhaps due to the concentration of public sector jobs in the region. Auckland experienced the strongest decline in employment but is the only region to have more than recovered its 2007q4 level of employment. The recovery reflects the fact that Auckland had the strongest recovery in job creation coming

[10] The sharply rising worker flow rates that are shown for government industries reflects changing seasonality in the education industry, which has large seasonal fluctuations in accessions and separations.

out of the recession. Job reallocation within each of the regions was achieved with greatly reduced worker reallocation rates. Accession rates in particular fell by 2% to 3% within five to ten quarters of the output peak, and did not rise again until after employment growth resumed.

3.3. Policy Changes during the Recession

Following the onset of the recession, New Zealand fiscal and monetary policies have both been stimulatory, although were not brought together as a formal stimulatory package. The 2007/08 government budget surplus of 3.6% of GDP was lowered to 0.1% of GDP in 2008/09, with a projected deficit of 2.8% of GDP by 2010/11. This change in fiscal position represented a fiscal impulse of 6.4% of GDP over four years, largely as a result of reductions in personal (4.1%) and business (0.4%) tax, and a programme of infrastructure spending (0.9%) (New Zealand Treasury, 2008; Giesecke and Schilling, 2010). Monetary policy remained expansionary throughout the recession, with the official cash rate – the main monetary policy instrument – staying at record low levels of 2.5% for most of the 2008-2011 period.

In October 2008, the government introduced the 'retail deposit guarantee scheme', to guarantee deposits in New Zealand financial institutions and maintain confidence in the financial system. The scheme was extended in 2010. Although the New Zealand and (closely related) Australian financial sectors fared relatively well in the GFC, there have nevertheless been payouts under the guarantee scheme.

There have been ongoing incremental changes to labour market and benefit policies since 2007, including the expansion of active labour market policies directed at youth, the introduction of 90-day trial periods and the abolition of the youth minimum wage rate. There have not, however, been any major policy changes to date. The government-appointed Welfare Working Group reported back in February 2011 and the government is currently considering its response to the Group's recommendations for welfare reform.

4. Data

We use quarterly data from Statistics New Zealand's prototype Longitudinal Business Database (LBD), which contains longitudinally-linked information on all employing enterprises in New Zealand from 1999q2 until 2010q1, thus covering all employees in New Zealand. The database brings together a broad range of administrative data collected for tax purposes and data from a range of business surveys.

For the current study, we restrict attention to private sector enterprises operating for profit. Such enterprises account for 94.7% of employing enterprises, and 75.8% of employees. The excluded enterprises are mostly public sector agencies that have disproportionately large employment. We further restrict attention to enterprises that ever employ three or more employees, to avoid problems encountered in longitudinally linking very small firms.[11] We also exclude a very small number of observations where key variables are missing and drop quarterly observations for which mean employment is zero. With these restrictions, the data covers 96.6% of employees in private-for-profit enterprises (55.1% of employing private-for-profit enterprises). On average, the quarterly data has around 98,000 enterprises employing around 1.2 million employees.

The main variables of interest are quarterly employment and earnings, obtained from monthly "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). The unit of observation in the LEED data is a job (an employer-employee combination, observed monthly). We use LEED-based measures that are aggregated to enterprise-level quarterly observations. Employment is measured as the number of employees being paid by an enterprise on the 15th of the middle month of a quarter. The monthly earnings rate is calculated as the average gross monthly earnings of employees employed on the 15th of a month, deflated by the industry-specific "All wage and salary" Labour Cost Index (LCI). We use an employment-weighted average of the monthly earnings rate, averaged across the three months in each quarter.

LEED data are also the source of information for worker and job flows. Accessions are identified as current employees who were not employed at the firm on the 15th of the middle month of the previous quarter. Separations are those who were employed at the firm on the 15th of the middle month of the previous quarter but are not employed in the middle of the current quarter. It is not possible to separately identify voluntary and involuntary separations. Accession and separation rates are calculated as a ratio to average quarterly employment ($(E_t + E_{t-1})/2$). Net employment growth is also measured as a ratio to average employment, to give a measure that is bounded by -2 (for firm exit) and +2 (for firm entry).[12] This can be decomposed into the positive contribution from expanding firms (Job Creation rate) and the negative contribution from contracting firms (Job Destruction rate). We measure wage growth using an analogous formula: $\Delta w=((w_t - w_{t-1})/((w_t + w_{t-1})/2)$.

[11] We refine the longitudinal links in the LBD, making use of plant-level data, as outlined in Fabling (2011).

[12] Net employment growth (N) is related to the more familiar percentage growth rate ($g=(E_t - E_{t-1})/E_{t-1}$) by the formula $N = 2g/(2+g)$.

LEED also provides data on the demographic composition of each enterprise's workforce. We use information on workers' age and sex, and on workers' tenure at the enterprise. These are measured as the proportion of male and female employees in each of four broad age bands (under 15 years, 15-24 years, 25-55 years, and over 55 years) and the proportion of all employees with completed tenure of zero, one, two, three and four years. The final tenure category relates to workers who have completed five or more years of tenure. Because this measure is left-censored, we restrict all regression analyses to the period from 2004q3 to 2010q1 for consistency. We use annual data on the number of working proprietors and contractors engaged at each enterprise and express these as a proportion of total employment (sum of employees, contractors, and working proprietors).

Sales data are used to construct a measure of the output shock facing each firm. Sales data are obtained from monthly GST sales, aggregated to quarterly frequency. To accommodate the pronounced seasonality in sales data, and to reduce the influence of quarter-to-quarter volatility, we use an annual change in quarterly sales, measured analogously to the wage and employment changes. In order to ensure that the output shock precedes the measured employment and wage dynamics, we use the annual sales change lagged by two quarters. The two-quarter lag ensures that the year over which the output shock is measured entirely precedes the two quarters used for calculating employment and wage changes, as illustrated in Figure 9. Firms entering employment during the reference period almost never have lagged sales, so are omitted from the analysis of output shocks.

Changes in aggregate GDP and employment suggest that employment changes lag GDP by one to three quarters. If employment responds quickly, our approach may understate the negative response to output shocks, since a proportion of exiting firms will leave the population before the employment reference period. Conversely, if labour market lags are particularly long, we will fail to detect employment responses to output shocks.

We include in the analysis indicators of firm performance that are potentially related to firms' labour dynamics and adjustment. An employment-based predominant two-digit ANZSIC96 industry is calculated for each enterprise, and we examine heterogeneity across industries by including intercepts for different combinations of firm size and industry, or by including averages of key characteristics by firm size and industry.[13] These characteristics include the proportion of employment in exporting firms, in firms with foreign direct investment, and in

[13] Industry and firm size categories are defined to match the survey strata for the Business Operations Survey, from which industry-firm-size characteristics are drawn.

firms with some employees on collective employment agreements.[14] We also use employment-weighted average responses to subjective questions on whether the enterprise's profitability is high relative to that of competitors, and whether profitability has increased or remained stable in the previous year. Finally, we use information on whether firms sought finance and, if so, whether finance was available on acceptable or unacceptable terms. All of these indicators are drawn from Statistics New Zealand's annual Business Operations Survey (BOS), which is available from 2004/05 (i.e., for the entire tenure-restricted period of 2004q3 to 2010q1). The Business Operations Survey has slightly narrower industry coverage[15] than the private-for-profit scope used for our other analyses. It also excludes enterprises with fewer than six employees, and those that have been in operation for less than a year. From a target population of around 34,000, information is collected from a sample, stratified by firm size and industry, yielding useable responses for between 5,500 and 6,000 enterprises (>80% response rate). Using firm-level responses to BOS variables results in a small sample that does not support robust analysis of labour adjustment. We therefore calculate average responses (with non-response coded as zero) by the (firm-size by industry) sample strata and apply the contemporaneous annual averages to quarterly enterprise observations.

5. Microeconomic Sources of Aggregate Adjustment

The aggregate decline in employment following the 2007q4 peak in GDP is the net outcome of heterogeneous patterns of adjustment at the firm level. We examine three dimensions of this heterogeneity. First, firms experienced different output shocks; second, conditional on the size of the output shock, firms had different net changes in employment; third, conditional on the size of the firm's employment change, there is heterogeneity in the pattern of workers flows (accessions and separations). Analysis of firm-level adjustment provides a richer understanding of the microfoundations of aggregate cyclical dynamics, as summarised by Davis and Haltiwanger (1999) and Davis et al (2006).

Table 5 compares employment growth, and job and worker flows after the 2007Q4 peak with those in the 34-quarter period up to and including the peak, using LBD data. This shows

[14] This measure of collective employment agreement coverage overstates the true measure of around 10 percent (Foster et al, 2011) because it counts all employees at affected firms – not just those on collective contracts.

[15] Using ANZSIC 96, the excluded industries are M (Government administration & defence), P92 (Libraries, museums & the arts), and Q95-Q97 (Personal & other services, and Private households employing staff). Using ANZSIC 06, excluded industries are O (Public administration & safety) R89-R90 (Heritage & artistic services) and S95-S96 (Personal & other services, and Private households employing staff).

similar patterns to those observed using published aggregate statistics (Figure 6). Net quarterly employment growth slowed from 0.85% to -0.64%. This reflects almost constant job destruction (of -6.7%) combined with a decline in job creation (from 7.6% to 6.0%). As in the published data, both accession and separation rates were lower following the GDP peak.

5.1. Heterogeneity of Adjustment

The first panel of Figure 10 shows average net employment growth and job flow rates conditional on the size of the output shock experienced by firms. The output shock measure is divided into 181 discrete bins, each containing approximately the same proportion of employment. The figure restricts attention to output shocks between -0.5 and 0.5, since this range captures 82.6% of average employment. The employment response of firms to a change in output will be more pronounced when output growth is strongly related to an expected sustained increase in labour demand. Output growth may be a weak signal of changing labour demand if there is uncertainty about future growth prospects, as is the case around cyclical turning points, or if output growth is highly volatile. In such cases, there is likely to be a weak relationship between observed output changes and subsequent employment change.

The first panel of Figure 10 shows a clear positive relationship between (*lagged*) output growth and net employment growth for output shocks between -0.05 and +0.05 (elasticity of 0.2). For larger output increases or decreases, the elasticity is close to zero (0.03 or less), with the somewhat implausible implication that, on average, employment does not respond to output change. The lack of a relationship between large output shocks and current employment growth may be a consequence of volatile output fluctuations. For some firms, a negative output shock is a sign of reduced demand and consequently lowered labour demand. For others, a contraction in output reflects an unusually poor year, which is followed by subsequent growth in employment. On balance, a negative output shock is associated with relatively slow subsequent employment growth (-0.013 on average), whereas average employment growth following any positive output shock is fairly constant at around zero.

The dashed lines show the empirical 25^{th} and 75^{th} percentiles of net employment growth for each output shock bin. The average response of employment to output shocks, as captured by net employment growth, conceals systematic patterns of response at different points of the employment change distribution. For firms experiencing a positive output shock, the upper quartile of employment growth rises linearly with the size of the output shock. In contrast, the lower quartile employment change for firms experiencing a positive shock is around -0.03,

regardless of the size of the shock. The positive output shock is transmitted to employment growth for firms with high levels of employment growth, but not for many firms whose employment continued to decline. A similar pattern is observed for firms experiencing a negative output shock. On average, the output shock feeds through to a decline in employment, but firms at the upper quartile of employment growth maintained employment growth of 0.03 to 0.04 regardless of the size of output shock. These patterns are consistent with behaviour predicted by *Ss* models of adjustment – expanding firms respond to positive shocks and contracting firms respond to negative shocks.

The other pattern evident in Figure 10 is that job creation and job destruction rates are *both* higher among firms experiencing large output shocks, regardless of whether the output shock is positive or negative. Again, this is suggestive of heterogeneous responses to output shocks, even within narrowly defined ranges of output shock. The slightly lower employment growth among firms facing negative output shocks is the net effect of some firms with sizeable increases in employment and some with sizeable decreases.

There is also considerable heterogeneity in accession and separation rates among firms with the same net employment growth. The second panel of Figure 10 shows average worker flow rates conditional on net employment growth. Net employment growth is also divided into 181 discrete bins, each containing approximately the same share of total employment. The figure is restricted to net employment changes in the range of -0.3 to 0.3 (capturing almost 90% of average employment). The two curves have the familiar 'hockey-stick' shape, with a low and relatively stable accession rate for contracting firms, and a near-linear increase in the accession rates as net employment increases for expanding firms. Similarly, the separation rate increases with the size of employment contractions but is low and stable for expanding firms. The dashed lines show the empirical 25th and 75th percentiles of worker flow rates. There is a sizeable 0.07 to 0.15 interquartile range evident for each level of employment growth, reflecting considerable variation in turnover rates.

The third panel of Figure 10 investigates whether the hetereogeneity of worker flows is related to differences in wage levels across firms. Within each net employment growth bin, we rank firms according to their worker turnover and calculate mean wages for each quartile of the worker turnover distribution.[16] There is a clear inverse relationship between wage levels and worker turnover. The firms with the highest turnover rates (fourth quartile of the accession rate)

[16] We rank by accession rate. The results are very similar using separation rates, since we are conditioning on a narrow net employment growth range. Quartiles are employment weighted so that each quartile contains approximately the same number of jobs.

have significantly lower mean wages than other quartiles. The two lowest turnover quartiles have a similar level of relatively high wages. The wage profiles also show markedly higher wages among firms experiencing small absolute changes in employment. This reflects firm-size wage premiums, since large firms are over-represented among firms with small absolute changes in employment.[17] The patterns highlight the importance of controlling for differences in firm size, and other attributes such as industry, in subsequent regression analysis.

5.2. Changes during the Global Financial Crisis

Table 6 provides a decomposition of the average changes in job flows summarised in Table 5, together with a decomposition of changes in average monthly wage growth. Specifically, Table 6 shows how much of the observed change was due to changes within contracting as opposed to expanding firms, or to changes within firms experiencing positive as opposed to negative output shocks.

The upper panel shows the contributions to overall employment change from subgroups of firms defined according to the size of their firm-level employment change. Contracting firms are divided into 'large contractions' (net employment growth $\in$ (-2;-0.3)), and other contractions (net employment growth $\in$[-0.3;0)). Similarly, expanding firms are categorised as large expansions and other expansions. Firm entry and exit is identified separately, although they are included in job creation and destruction respectively in most other results.

Comparing contributions before and during the crisis, the main changes come from a substantial reduction in the contribution from expanding firms – both large and other expansions – and a slightly larger negative contribution from small contractions. When classified by the size of output shocks, the employment reduction came mainly from negative contributions from firms with small positive or negative output shocks.

A similar decomposition is used to identify contributions to the reduction in wage growth, which dropped from 1.1% per quarter (nominal wage growth) before the crisis, to 0.01% after the crisis. The largest contributors to the reduction were from the changing contribution of firms with small employment expansions or contractions, or from firms facing small positive or negative output shocks.

[17] Using the formula $(E_t - E_{t-1})/((E_t + E_{t-1})/2)$ the smallest non-zero net employment growth for a firm of initial size n is an increase of $1/(n+0.5)$ or a decrease of $-1/(n-0.5)$. For a firm with employment of 20, the smallest non-zero change is an increase of 0.049 or a decrease of -0.051.

In the following sections, we summarise graphically the changes in the distribution of firms across the different growth bins and the changing patterns of employment and wage changes within bins. For those analyses, we define much finer employment and output shocks bins than those shown in Table 6.

The impact of the crisis on net employment growth is assessed by examining the changing distribution of output shocks before and after 2007q4, and the changing response of employment change to a given level of output shock. Figure 11 summarises the observed patterns. The first panel shows that the distribution of output shocks shifted to the left – an increasing share of employment was in firms that experienced negative output shocks.[18] The second panel shows the changing profile of net employment growth, conditional on the size of the output shock. Post-peak, employment change is less systematically related to output shocks than it was prior to the crisis, even for small changes in output – the elasticity of employment with respect to output for output shocks in the -0.05 to 0.05 range is only 0.02, compared with 0.2 prior to the crisis. Post-peak, employment declines were somewhat smaller for firms experiencing negative output shocks of -0.3 or more, due to a larger decline in job destruction rates than job creation rates, though both declined. Paradoxically, firms with positive output shocks of around 0.3 or greater show employment declines (around -0.02). For a given output shock, job creation was lower and job destruction higher during the crisis than before it. It may be that output shocks were unexpectedly short-lived, leading to reversals of employment growth in the year following an expansion of output.

Consistent with the declines in overall accession and separation rates shown in the lower panel of Figure 6, the third panel of Figure 11 shows that, conditional on the size of the output shock, both accessions and separations are lower during the GFC, especially among firms facing larger negative shocks.

The first panel of Figure 12 shows that not only did the distribution of employment changes become more peaked, it also shifted to the left. There was a particularly sharp rise in the share of employment in firms with small employment declines, with a compensating reduction in the share with low to moderate increases. These distributional changes contribute to lower worker flows. However, as shown in the second panel of Figure 12, there is an additional reason

[18] The output shock distribution excludes firms who entered during the quarter over which employment change is measured, because lagged sales is almost always unavailable for such firms. It also excludes firms that exited during the four-quarter period over which the output shock is measured, since such firms are not part of the sample for which employment change is observed (though firms with an output shock of -2 remain in the sample). Consequently, the proportion of employment in firms with -2 output shocks is underestimated.

that overall worker flow rates dropped. Both accession rates and separation rates declined, even conditional on the net employment growth rate. Although the changes are small, they appear to be most pronounced for firms making small employment reductions.

The pattern of wage changes conditional on the size of employment change or output shock is relatively weak, as shown in the final panels of Figure 11 and Figure 12. Wage growth is slightly lower for firms in which employment is growing (Figure 12). The wage measure is a monthly wage, so the slower growth may reflect reduced hours of work or greater use of part-time workers. Prior to the crisis, moderately large negative output shocks are associated with slower wage growth. During the downturn, this pattern is no longer evident, with wage growth being small and negative for a broad range of negative output shocks. Changes in average wage growth may arise not only from changes in wage growth but also from changes in the composition of the firm's workforce, and changes in average hours of work. We are unable to control for hours of work changes, but it is possible to control for the changing composition of the workforce using a regression specification.

5.3. Modelling Heterogeneous Adjustment

The changing profile of worker flows and wages conditional on employment change, or of job and worker flows, employment and wage change conditional on output shocks does not necessarily represent a change in firms' reactions to the GFC. An alternative explanation is that the composition of firms within employment bins or output shock bins has changed. For instance, job and worker flow rates differ across industries for reasons unrelated to the crisis. The impact of the crisis also differed across industries. The GFC may have led to a re-ordering of firms across employment or output shock bins, leading to changes in average rates within a bin.[19]

In order to test the robustness of our main findings to firm heterogeneity, we adopt a parsimonious regression specification that captures the key shifts. The regression can be readily extended to test whether particular firm characteristics are more strongly associated with shifts in the conditional profiles. Equation (1) shows the structure of the estimating equation

$$Flow_{gt} = \alpha_g + \beta_t X_{gt} + \left[1(t=1) * \begin{vmatrix} \gamma^+ + \delta^+ G & \text{if G>0} \\ \gamma^0 & \text{if G=0} \\ \gamma^- + \delta^- G & \text{if G<0} \end{vmatrix} \right] + e_{gt} \qquad (1)$$

[19] This is, at best, a partial explanation. It cannot account for *uniformly* lower worker flow rates conditional on net employment growth.

Estimation is at the bin level, using one observation for each bin in each of two time periods – pre- and post-peak (t=0,1 respectively). The dependent variable is a job or worker flow rate, a measure of wage growth, or net employment growth (conditional on output shocks). Change bins (either net employment growth or output shock) are indexed by *g*. The shape of the profile across bins is non-parametrically identified by a full set of intercepts, α_g. The vector X_{gt} contains average employment-weighted industry or firm characteristics. The term inside the square brackets captures deviations of the post-peak profile from the pre-peak profile. The specification allows for a level-shift, which can be different for negative bins (γ^-), positive bins (γ^+), or at the point of zero change (γ^0).[20] Away from zero, the rise or decline in the profile is allowed to vary linearly with the bin value, *G* (employment growth or output shock). This is implemented by adding two slope parameters – one for negative bin values (δ^-), and one for positive bin values (δ^+). A residual term (e_{gt}) completes the specification. All regressions are weighted by the share of total average employment accounted for by the cell (*g*).

Table 8 reports the estimates of profile changes for worker flows and wage growth, conditional on net employment growth. The first column summarises the shifts in the accession rate (seen in Figure 12(b)). For very small negative changes in employment, the accession rate was -2.3% lower after the crisis than before. There was a smaller decline (-1.2%) for small positive changes. There was also a significant change in the slope of the profile for negative values of net employment growth, meaning that the drop was larger for firms experiencing relatively small employment declines. A similar pattern is evident in the third column of the table for the separation rate, although the slope coefficient is not significant. These estimates provide a good summary of the visual patterns evident in Figure 12. Similarly, column 5 of Table 8 summarises the profile of wage growth across employment bins (Figure 12(c)), revealing the overall drop in wage growth, which is slightly greater for expanding firms. The second, fourth, and sixth columns of the table show the impact of controlling for changes in industry, region, and firm-size composition within each cell. For accession and separation rates, controlling for cell composition narrows the difference between the positive and negative shift coefficients and reduces the estimated slope effect. It does not, however, change the qualitative pattern. Controlling for cell composition in the wage-growth regression raises the estimated decline within expanding firms and makes the decline for contracting firms insignificant. This suggests that industries with high average wage growth rates became more prevalent among expanding firms.

[20] The last of these only appears for net employment growth bins, since output shocks are seldom zero and, consequently, there is no separate zero bin for output shocks.

Table 9 presents regression estimates to summarise profiles conditional on the size of output shock (analogous to Figure 11(b-d)). All of the regressions in Table 9 control for changes in industry region and firm-size composition. Apart from the lowering of accession and separation rates across the full range of output shocks, the only other significant (at 5% level) effect is a drop in the job destruction rate and net employment change among firms experiencing a positive output shock, consistent with the tilting of the job destruction rate profile evident in Figure 11(b).

As noted in section 5.1, there is considerable heterogeneity around the mean profiles that are summarised by these regressions. While the industry employment shares account for some of this variation, their coefficients are uninformative. In Table 10 and Table 11, we present estimates from regressions where industry shares have been replaced by a range of firm and industry characteristics. The coefficients on these indicate whether there are significant differences in the behaviour of firms conditional on either employment growth or output shock.[21] Table 10 and Table 11 present results conditional on output shock and employment growth respectively. The results show the effects of average tenure composition, working proprietor and contractor share, and the share of workers who are female, young (less than 25 years of age), or old (55 or over), and industry averages derived from BOS data, as described in the Data section. Means of the BOS variables are presented in Table 7, separately for the pre- and post-peak periods. The largest changes are that the proportion of employment in firms reporting stable or increasing profitability dropped during the crisis, and firms were more likely to face problems when seeking finance.

Overall, there are relatively few statistically significant coefficients across the two tables. Prior to the cyclical peak, the job creation and accession rates were significantly higher in export industries, and in industries in which firms reported high relative profitability, controlling for the size of output shocks (Table 10). However, these patterns were absent post-peak. Conditional on output shocks, few firm characteristics were significantly related to job and worker flows. Worker flow rates are higher in firms with a high proportion of low-tenure workers, though this is not surprising if there is persistence in employee turnover rates over time. Low-tenure firms also have higher job-creation rates and lower job destruction rates, as expected. Firms in which working proprietors account for a high proportion of employment have higher worker accession rates, conditional on the size of their output shock, as do large firms. The only other significant

[21] The industry and firm characteristics may also be related to which output shock or employment growth bin the firm is in but this relationship is not investigated in the current paper.

pattern is that firms with a presence in the Wellington region experienced the lowest job creation and worker accession rates.

Due to the inclusion of both pre- and post-peak industry-level covariates, the level-shift coefficients (γ^- and γ^+) are not interpretable, although the difference between them is interpretable. For the output shock (Table 9), only in the case of the separation rate are the positive and negative shifts different from each other. Furthermore, none of the slope-change coefficients are significantly different from zero.

Table 11 shows the role of industry and firm characteristics in explaining patterns of job flows and wage growth, conditional on employment growth. As in Table 10, the post-peak shift parameters (γ) are not interpretable due to the inclusion of pre- and post-peak industry means. The difference between $\gamma-$ and $\gamma+$ is significant for the accession and separation rates implying a wedge between the two, consistent with Table 8. The increase in slope of the wage-growth curve for positive employment change ($\delta+$), which was also evident in Table 8 and Figure 12, remains significant, though only at the 10% level. Few firm characteristics are significantly related to worker flows or wage growth, conditional on employment growth cell. Accessions and separation rates are higher for firms with relatively high prevalence of low-tenure-workers, as would be expected in high turnover firms. Worker flows are lowest for firms in the North Island outside of Auckland or Wellington. Similarly, industry characteristics do not account for the heterogeneity of worker flow rates within employment growth cells. The only industry characteristics associated with heterogeneity of wage growth are finance-related. Wage growth was lower in industries where a high proportion of firms sought finance, though only post-peak. Puzzlingly, in industries where a high proportion of firms reported that finance terms were not acceptable, wage growth was lower.

6. Distributional Impacts on Workers

The recession has clearly had a disproportionate impact on young workers, for whom unemployment rates have risen and participation rates declined. In this section, we investigate whether young workers or recently hired workers were disproportionately employed in expanding or contracting firms, and the impact that their uneven distribution has had on overall employment composition. An alternative source of relatively poor outcomes is that firms may have become more reluctant to hire or retain young or recently-hired workers. In this case, we would observe a changing relationship between net employment growth and the impact on

employment composition. We also present analogous summaries of the impact of employment changes on different parts of the monthly wage distribution.

For wage, tenure and age/sex distributions, we construct a counterfactual distribution that represents what would have resulted if each firm had maintained the pre-crisis composition of its workforce while experiencing its actual expansion or contraction of employment. We implement this procedure by grouping firms according to their net employment growth bin (g), and then constructing the weighted sum of their pre-crisis wage, tenure or age/sex distribution, using the bin's share of post-peak employment. Equation (2) shows the reweighting formula, where E_{gt} is the employment in bin g in period t, $f_0(y_g)$ is the pre-crisis distribution and f^* is the counterfactual distribution

$$f^*(y_g) = \sum_k \left(\frac{E_{k1}}{E_{\bullet 1}} \right) f_0(y_k) \tag{2}$$

We report the implied distributional impact as the difference between the counterfactual distribution and the initial distribution. This can be decomposed into the contributions from expanding firms ($G>0$) and contracting firms ($G<0$), as shown in equation (3). Because both f^* and f_0 are density functions, the implied change must sum to zero across all bins.

$$\begin{aligned} \text{Implied change} = \Delta^* f &= f^*(y_g) - f_0(y_g) \\ &= \sum_k \left(\frac{E_{k1}}{E_{\bullet 1}} - \frac{E_{k0}}{E_{\bullet 0}} \right) f_0(y_k) \\ &= \sum_{k \in Contracting} \Delta \frac{E_{k1}}{E_{\bullet 1}} f_0(y_k) + \sum_{k \in Expanding} \Delta \frac{E_{k1}}{E_{\bullet 1}} f_0(y_k) \end{aligned} \tag{3}$$

Results are shown in Figure 13, Figure 14 and Figure 15 for the wage, tenure, and age/sex distributions respectively. For each distribution, we present three graphs. The first shows the change in distribution from the pre- to the post-peak average ($f_1(y) - f_0(y)$). The second and third graphs are based on the application of equation 3 to quarterly changes. Panel (b) shows the average implied quarter-to-quarter change, with a separate average for the pre- and post-peak period. Panel (c) decomposes the impact of net employment growth on the wage distribution into the contributions from expanding and contracting firms.

Real (June 2001, LCI-deflated) monthly wage growth between the pre- and post-peak average moved the wage distribution to the right, as shown in panel (a) of Figure 13. The lower line shows the change in the density, with a relative reduction of employment in firms with low mean wages and an increase in the share of employment in firms paying high wages. The wage distribution has two local peaks – one for monthly earnings of around NZ$1,500 per month and

one for monthly earnings of around NZ$3,000 per month. Both of these peaks shifted right, producing two regions of increased density – one to the right of each initial peak.

Panel (b) shows the counterfactual contribution of quarterly employment growth before and after the peak (labelled 'Pre' and 'Post' respectively). Before the crisis, average quarterly employment growth was strongest for firms paying high average wages of around $2,000 to $3,000 per month, as reflected in an increase in the density within this range. During the crisis, quarterly growth was still strongest for firms paying average wages of $3,000 per month but below that level, employment growth was stronger at relatively low wage levels ($1,500 per month). This may reflect greater use of part-time workers or reduced monthly hours of work among expanding firms.

An increase in the wage density at a given level of wages may result from expanding firms disproportionately hiring at that wage, or from contracting firms disproportionately shedding jobs from *other* wage levels. The final panel of Figure 13 separates the contributions of expanding and contracting firms. Firms paying relatively low average wages grew more if expanding and shrank more if contracting. Strikingly, the profiles are close-to-mirror images of each other, and are relatively similar before and during the GFC (apart from the impact of overall increasing average real wages).

To gauge whether the difference between the pre- and post-peak profiles in panel (b) are due to the changing share of expanding and contracting firms, or alternatively, reflect the changes in the profiles shown in panel (c), we calculate two counterfactual density changes. The first ("change in share") represents the quarterly change in density that would have resulted in the pre-crisis period if the mix of expanding and contracting firms were as observed during the crisis. The second counterfactual ("change in schedule") applies the post-peak profiles from panel (c) to the pre-crisis wage distribution.

Let E_{ict} denote employment at wage level i for group c (expanding or contracting firms) in quarter t. Trivially, this is equivalent to the product of lagged aggregate employment, the share of lagged employment accounted for by group c (s_{ct-1}), the share of lagged group c employment paid at wage i (λ_{ict-1}), and the growth in employment at wage i in group c (g_{ict-1}).

$$E_{ict} = E_{t-1} * \left[\frac{E_{ct-1}}{E_{t-1}}\right] * \left[\frac{E_{ict-1}}{E_{ct-1}}\right] * \left[\frac{E_{ict}}{E_{ict-1}}\right] = E_{t-1} * s_{ct-1} * \lambda_{ict-1} * g_{ict-1} \quad (4)$$

Each of these quantities can be calculated separately for quarters in the pre- and post-peak periods. For the "change in share" counterfactual, we calculate

$E^1_{ict} = E^{PRE}_{t-1} * s^{POST}_{ct-1} * \lambda^{PRE}_{ict-1} * g^{PRE}_{ict-1}$ and for the "change in schedule" counterfactual, we calculate $E^2_{ict} = E^{PRE}_{t-1} * s^{PRE}_{ct-1} * \lambda^{PRE}_{ict-1} * g^{POST}_{ict-1} = E^{PRE}_{ict-1} * g^{POST}_{ict-1}$. To derive the implied change in density at wage level *i*, we calculate:

$$\text{Change in density}^j = \frac{\sum_{\substack{c=\text{expand,}\\ \text{contract}}} E^j_{ict}}{\sum_{\substack{c=\text{expand,}\\ \text{contract}}} \sum_{wage=i} E^j_{ict}} - \frac{E^{PRE}_{it-1}}{E^{PRE}_{t-1}} \quad (5)$$

where j=1,2.

Both counterfactual density changes are plotted in panel (b) of Figures 13-15. The changing shares of expanding and contracting firms, and the change in schedules, make similar contributions to the wage density changes. Both imply stronger growth post-peak than pre-peak in the share of employment accounted for by workers earning between $2,000 and $4,000 per month – a higher increase than was actually observed. Neither counterfactual generates the observed slower post-peak growth in employment at wage levels of around $2,000.

Figure 14 shows the results of a similar analysis of the impact of employment changes on the distribution of worker tenure. There was a very slight decline in the share of employment accounted for by firms with low tenure workers (panel a), and an increase in the long-tenure share. Recall, however, that the sample used for the analysis of distributional changes excludes entering firms, so the observed pattern understates the true rise in low-tenure employment. The pattern of net quarterly employment growth was similar before and during the GFC (panel b), though with a slightly greater relative decline in low tenure workers post-peak, reflecting lower worker turnover rates. When decomposed into the contributions from expanding and contracting firms, we again find symmetry of contributions. Expansions favour low tenure workers, for obvious reasons – expansion entails a net increase in new workers, who by definition enter at low tenure. The incidence of contractions is also disproportionately on low-tenure workers, reflecting a combination of lower turnover and higher retention of longer-tenure employees. The 'change in share' and 'change in schedule' counterfactuals shown in panel (b) confirm that the changing mix of contracting and expanding firms had the strongest impact on the tenure distribution – especially on the proportion of employment with tenure of less than one year.

Finally, Figure 15 shows the impact on the age and sex distribution of employment. Overall, there was a higher proportion of older workers (over the age of 55 years) after the peak than before, with a decline in the prime-age share. Population ageing and the continued rise in

the participation rate of older workers contributed to this change. The proportion of employment accounted for by young workers (younger than 25 years) was relatively stable. Panel (b) of the figure shows marked differences in the demographic impact of quarterly employment growth pre- and post-peak. Prior to the crisis, quarterly employment growth was strongest in firms that disproportionately employed prime aged males. Their share increased at the expense of all other groups, particularly young females. During the GFC, there was a stronger relative decline in young male employment, with stronger growth among prime aged males and females. Firm expansions strongly favoured young males, with the distributional impact among expanding firms similar pre- and post-peak. Contractions disproportionately disadvantaged young male workers. Although the changes in the schedules in panel (c) appear small, they are large enough to imply a sizeable relative increase in the 15-24 year old male share of employment. This is shown by the 'change in schedule' line in panel (b). The changing employment shares of contracting and expanding firms generates counterfactual density changes similar to those actually observed ('change of shares' line in panel (b)).

7. Summary of Main Results

New Zealand's labour market institutions favour flexibility and work incentives, and have relatively light levels of protection for those out of work. Given these settings, we hypothesised that the output and employment declines associated with the 2008-2009 financial crisis would have been accompanied by lowered worker flows (accessions and separations), and raised rates of firm exit. The first of these hypotheses is supported by the data but we found no evidence of significant adjustment in the form of firm exit. It is possible that this margin is important for firms outside the scope of the analysis – namely, very small (less than three employee) and potentially working proprietor-only businesses.

More generally, our analysis of firm microdata highlights three key features of New Zealand labour market adjustment during the GFC. First, there was considerable heterogeneity across firms, both before and during the crisis, in the size of output shocks that firms faced, the amount of employment adjustment in response to any given output shock, and in the size of worker flows given the firm's employment adjustment. For small changes in output (net change between -5% and 5%), the elasticity of employment change with respect to output change was, on average, 0.2 prior to the crisis. For larger output changes, the employment response was less systematic – perhaps reflecting transitory volatility in output. Output growth was, however, transmitted into employment growth for faster growing firms (those at the upper quartile of net employment growth for a given output shock), and output declines led to employment declines

for slower growing firms. Conditional on the level of net employment growth, there is a clear relationship between worker turnover rates and wage levels. Firms with low worker turnover tend to have higher wage levels.

Second, the crisis not only moved the distribution of output shocks faced by firms, but also altered the relationship between output shocks and changes in job and worker flows and employment. Worker and job turnover rates, as well as wage growth, were lower during the crisis, even controlling for the size of firms' output shock or net employment growth.[22,23]

Third, the impact of the observed firm-level dynamics had an uneven impact on workers, with greater employment losses for low wage workers, young workers, and workers with low job tenure. Expanding and contracting firms have different impacts on the distribution of employment across worker types. The observed distributional impacts reflect both the changing share of expanding/ contracting firms, and changes in the composition of employment change within expanding or contracting firms.

We interpret slower worker turnover and wage growth post-peak as a reflection of workers' desire to retain jobs in the crisis. The uneven distributional impact of employment decline points to the fact that some types of workers were disproportionately employed in firms where employment declined. For workers who lost employment, the lower turnover rates would have made it more difficult to find jobs. Increased use of active labour market policies targeted at affected workers, such as youth, serves as a mechanism for ameliorating the impact on them. Recent studies have argued for increased generosity of unemployment benefit levels during recessions, on the grounds that the payment levels or durations help to fund extended job search, without smaller adverse work disincentives than would accompany generous payments in non-recessionary times.[24]

8. Next Steps

There are a number of directions in which the study could be extended. The analysis of distributional impacts in particular could make use of worker-level information that is available as part of the LEED dataset. Rather than relying on firm-level average composition, as in section 6, we could directly observe the characteristics of workers who join or leave expanding and contracting firms. The data would also support the analysis of outcomes for such workers,

[22] The puzzling exception is that firms facing a given large positive output shocks had lower net employment growth post-peak, resulting from lower job creation and higher job destruction.
[23] We estimated the impact of selected industry and firm characteristics on heterogeneous flow rates but found few statistically significant relationships.
[24] See, for instance, Chetty (2008);Schmieder et al (2011); or Kroft and Notowidigdo (2011).

including the length of time that workers remain out of work and the change in monthly earnings for workers when they start a new job. Given New Zealand's institutional settings, including relatively low unemployment benefit levels, we might expect workers to remain out of work for relatively short periods and to accept lower wages in a new job if they have left involuntarily.

This extension could shed light on the dynamics of unemployment for young workers, which rose particularly sharply during the recession. It could examine whether lowered aggregate worker flows made it particularly difficult for young workers to find re-remployment. Furthermore, it would show the extent to which young unemployed workers were accepting employment with lower monthly earnings rather than remaining out of work.

In related work, we are extending the analysis to derive and analyse annual rather than quarterly employment flows. This has the advantage of being more comparable with existing international studies, and serves to simplify the event timing used in the current study.

Finally, there are a number of minor extensions that could be made to the current analysis, such as analysing geographical differences in more detail to identify whether the resumption of job creation occurs more readily in the thick labour markets of dense urban areas.

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Table 1

Maximum cumulative decline in output and employment

Peak	Output decline (peak to trough) % change	Peak to trough duration (quarters)	Time to regain peak level (quarters)	Peak	Employment decline (peak to trough) % change	Peak to trough duration (quarters)	Time to regain peak level (quarters)
1950q4	-8.9%	6	14				
1966q4	-2.5%	4	8				
				1967q1	-1.4%	3	7
1976q2	-4.2%	7	18				
				1977q1	-0.1%	3	4
				1980q1	-1.5%	2	6
1982q2	-3.2%	3	5				
				1982q3	-1.3%	3	5
				1987q3	-7.2%	7	29
1988q1	-1.3%	3	4				
				1990q2	-2.8%	6	13
1990q4	-2.6%	2	9				
				1996q3	-1.2%	9	11
1997q3	-0.9%	2	5				
2007q4	-3.1%	5	at least 13				
				2008q4	-2.5%	4	9

Table 2

Comparison of alternative employment measures

	LEED	QES	HLFS
Frequency	Quarterly	Quarterly	Quarterly
Reference period	Counts of jobs at 15th of middle month of reference period. Full quarter earnings measures.	Snapshot of pay week ending on or immediately before the 20th of the middle month of the quarter - February, May, August, and November.	Quarterly averages based on responses collected throughout the quarter - March, June, September and December.
Timeliness of publication	12 months after the end of the reference period.	Within 13 weeks of the reference date.	Within 6 weeks after the end of the reference period of the quarter
Collection unit	Businesses and workers in the tax data and on the BF. This includes some businesses which are not on the BF.	Economically significant enterprises with employees in surveyed industries on the BF.	Households
Statistical unit	Jobs and geographic units.	Geographic units.	Individuals and households.
Purpose of the output	To measure labour market dynamics.	To measure quarterly changes and levels of average hourly and weekly (pre-tax) earnings, average weekly paid hours and the numbers of filled jobs.	To provide a comprehensive range of statistics relating to employment, unemployment and people not in the labour force. Provides Statistics NZ's official employment measures.
Type of collection	Integrated data from the tax system and BF obtained for all employees who receive income from employers with tax deducted at source.	Sample survey of approximately 18,000 business locations with enterprises on the BF which have employees.	Sample survey of approximately 16,000 households in private dwellings. All working-age persons living in selected households are surveyed.
Sampling errors	No	Yes	Yes
Non-sampling errors	Errors in base data. Errors resulting from methods processes.	Inaccurate respondent replies. Errors in processing.	Biases in the pattern of response and non-response. Inaccurate respondent replies. Errors in processing.
Employment measures	Employee filled jobs Job and worker flows.	Filled jobs belonging to employees and working proprietors.	Employed persons including working proprietors (a person with multiple jobs is counted once).
Earnings measures	Mean and median full quarter earnings. Excludes some part employment. Includes lump sums.	Average hourly and weekly earnings. Includes all part employment. Includes some types of lump sums	None
Employee coverage	Those aged 15 years and over, excluding invalid IRD identifiers. Exception is total earnings which covers all.	Employees in economically significant businesses on BF. Excludes non-civilian employees.	Those aged 15 years and over in the usually resident, non-institutionalised, civilian population.
Part-time/ full-time	No measure of hours worked available.	Included	Included but based on total hours, not each job.
Industry coverage	All	Some excluded, for example: Agriculture and Services to agriculture.	All, but includes industry of main job only.
Industry coding	Employer sourced.	Employer sourced.	Respondent sourced.
Region	Detailed information at regional council level.	Limited regional information available.	Key measures by regional council.

Adapted from Statistics New Zealand (2005)

Table 3

Grouping of ANZSIC96 industries

ANZSIC 1996 Industry Group		Grouped Industry
A	Agriculture, Forestry & Fishing	1. Ag&Mining
B	Mining	1. Ag&Mining
C	Manufacturing	2. Mfrg_etc
D	Electricity, Gas & Water Supply	4: Network
E	Construction	3. Constr
F	Wholesale Trade	5: Trade_Accom
G	Retail Trade	5: Trade_Accom
H	Accommodation, Cafes & Restaurants	5: Trade_Accom
I	Transport & Storage	4: Network
J	Communication Services	4: Network
K	Finance & Insurance	6. BusServ
L	Property & Business Services	6. BusServ
M	Government Administration & Defence	7: Govt
N	Education	7: Govt
O	Health & Community Services	8. Services
P	Cultural & Recreational Services	8. Services
Q	Personal & Other Services	8. Services

Table 4

Grouping of regions

	Region	Grouping
A	Northland	2. Other North Island
B	Auckland	1. Auckland
C	Waikato	2. Other North Island
D	Bay of Plenty	2. Other North Island
E	Gisborne, Hawke's Bay	2. Other North Island
F	Taranaki, Manawatu-Wanganui	2. Other North Island
G	Wellington	3. Wellington
H	Tasman, Nelson, Marlborough, West Coast	5. Other South Island
I	Canterbury	4. Canterbury
J	Otago	5. Other South Island
K	Southland	5. Other South Island

Table 5

Changes in Job and Worker Flows

	Pre-peak 1999q3 - 2007q4	Post-peak 2008q1-2010q1
Net Employment growth	0.85%	-0.64%
Job Creation rate	7.58%	6.02%
Job Destruction rate	-6.73%	-6.66%
Accession rate	17.68%	14.76%
Separation rate	16.83%	15.40%

Note: Reported values are employment-weighted averages of quarterly rates.

Table 6

Decomposition of growth in employment and wages

	Employment		Average Wage	
	Pre	Post	Pre	Post
EMPLOYMENT BINS				
Exit	-1.51%	-1.23%	0.56%	0.47%
Large contraction	-2.71%	-2.62%	1.29%	1.20%
Contraction	-2.51%	-2.81%	1.16%	0.71%
Static	0.00%	0.00%	0.28%	-0.01%
Expansion	3.06%	2.53%	-0.22%	-0.72%
Large Expansion	3.02%	2.47%	-1.39%	-1.20%
Entry	1.50%	1.02%	-0.58%	-0.44%
TOTAL	0.85%	-0.64%	1.10%	0.01%
LAGGED SALES BINS				
Exit	-0.01%	-0.02%	0.00%	0.00%
Large contraction	-0.06%	-0.20%	0.05%	-0.09%
Contraction	-0.34%	-0.54%	0.39%	-0.06%
Static	0.00%	0.00%	0.00%	0.00%
Expansion	-0.06%	-0.27%	0.61%	0.18%
Large Expansion	0.15%	-0.12%	0.18%	0.08%
Entry	0.17%	0.05%	0.09%	0.04%
Zero (both periods)	1.00%	0.46%	-0.22%	-0.16%
TOTAL	0.85%	-0.64%	1.10%	0.01%

Notes: Large contractions (expansions) relate to net changes of less than -0.3 (larger than 0.3).

Table 7

Changes in industry means

	Pre-peak	Post-peak	Total	Change
Exporting	21.0%	19.8%	20.5%	-1.2%
Foreign Direct Investment	14.4%	15.5%	14.8%	1.1%
Collective Employment Contracts	30.5%	31.1%	30.8%	0.6%
High relative profitability	20.3%	21.2%	20.6%	0.9%
Stable or increasing profitability	62.8%	54.4%	59.6%	-8.4%
Sought finance	30.4%	30.1%	30.3%	-0.3%
* Finance terms acceptable	88.9%	84.8%	87.3%	-4.1%
* Finance terms unacceptable	6.7%	15.2%	9.9%	8.5%

Note: Reported values are employment-weighted averages based on quarterly data.

Table 8

Modelling worker flows conditional on employment growth: Regression results

	Accession Rate		Separation Rate		Monthly Wage Change	
shift if neg (γ–)	-0.0229***	-0.0253***	-0.0218***	-0.0240***	-0.0108***	-0.0086
	[0.002]	[0.002]	[0.002]	[0.002]	[0.004]	[0.006]
shift if zero (γ0)	-0.0161***	-0.0225***	-0.0161***	-0.0229***	-0.0151***	-0.0133
	[0.002]	[0.002]	[0.002]	[0.002]	[0.005]	[0.008]
shift if pos (γ+)	-0.0117***	-0.0167***	-0.0124***	-0.0169***	-0.0157***	-0.0200***
	[0.002]	[0.002]	[0.002]	[0.002]	[0.004]	[0.006]
Δslope if neg (δ-)	-0.0233***	-0.0189***	-0.0128*	-0.0078	0.0160	0.0172
	[0.007]	[0.005]	[0.007]	[0.005]	[0.015]	[0.017]
Δslope if pos (δ+)	0.0076	0.0000	0.0153**	0.0068	0.0308*	0.0546***
	[0.007]	[0.006]	[0.007]	[0.006]	[0.016]	[0.020]
Industry effects	No	Yes	No	Yes	No	Yes
Region effects	No	Yes	No	Yes	No	Yes
Firm size effects	No	Yes	No	Yes	No	Yes
Observations	358	358	358	358	358	358
R-squared	0.999	1.000	0.999	0.999	0.745	0.839
p(equal slope effects)	0.002	0.015	0.005	0.068	0.501	0.154
p(uniform level shift)	0.000	0.000	0.000	0.002	0.599	0.257

*Notes: Standard errors in brackets. All regressions are employment weighted using average quarterly employment. Significance: *=10%; **=5%; ***=1%. Observations are period-bin combinations, with two periods ("pre peak"=2004q3-2007q4; "post peak"=2008q1-2010q1)*

Table 9

Modelling the response to output shocks: Regression results

	Net Emp Growth	Job Destruction	Job Creation	Accession Rate	Separation Rate	Monthly Wage Change
shift if neg (γ-)	-0.0061	-0.0071	0.0010	-0.0254***	-0.0193***	-0.0118
	[0.008]	[0.005]	[0.005]	[0.005]	[0.005]	[0.008]
shift if pos (γ+)	-0.0110**	-0.00719**	-0.0038	-0.0236***	-0.0126***	-0.0061
	[0.005]	[0.003]	[0.003]	[0.003]	[0.003]	[0.005]
Δslope if neg (δ-)	0.0093	0.0099	-0.0006	-0.0031	-0.0125	0.0007
	[0.012]	[0.007]	[0.007]	[0.008]	[0.008]	[0.012]
Δslope if pos (δ+)	0.0038	0.0013	0.0025	0.0020	-0.0018	-0.0080
	[0.008]	[0.005]	[0.005]	[0.005]	[0.005]	[0.008]
Industry effects	Yes	Yes	Yes	Yes	Yes	Yes
Region effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm size effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	362	362	362	362	362	362
R-squared	0.722	0.921	0.895	0.956	0.929	0.738
p(equal slopes)	0.695	0.314	0.715	0.582	0.262	0.545
p(uniform level shift)	0.463	0.981	0.232	0.671	0.132	0.389

*Notes: Standard errors in brackets. All regressions are employment weighted using average quarterly employment. Significance: *=10%; **=5%; ***=1%. Observations are period-bin combinations, with two periods ("pre peak"=2004q3-2007q4; "post peak"=2008q1-2010q1)*

Table 10

Firm and industry characteristics conditional on output shocks

	Net Emp Growth	Job Creation	Job Destruction	Accession Rate	Separation Rate	Monthly Wage Change
shift if neg (γ-)	0.296	0.045	0.251	0.102	-0.194	-0.154
	[0.355]	[0.219]	[0.234]	[0.236]	[0.242]	[0.386]
shift if pos (γ+)	0.288	0.042	0.246	0.102	-0.186	-0.148
	[0.357]	[0.221]	[0.236]	[0.238]	[0.244]	[0.389]
Δslope if neg (δ-)	0.003	0.003	0.000	0.002	-0.001	-0.014
	[0.013]	[0.008]	[0.008]	[0.008]	[0.009]	[0.014]
Δslope if pos (δ+)	0.007	0.005	0.001	0.004	-0.003	0.002
	[0.008]	[0.005]	[0.006]	[0.006]	[0.006]	[0.009]
Industry means (*Pre-Peak)						
Exporting	0.209	0.188**	0.021	0.216**	0.007	0.156
	[0.136]	[0.084]	[0.090]	[0.090]	[0.093]	[0.148]
Foreign Direct Investment	-0.363	-0.303**	-0.060	-0.267*	0.096	-0.168
	[0.223]	[0.138]	[0.147]	[0.148]	[0.152]	[0.242]
Collective employment contracts	-0.262	-0.181*	-0.082	-0.200*	0.063	-0.157
	[0.165]	[0.102]	[0.109]	[0.110]	[0.112]	[0.179]
Increase in relative profitability	0.441	0.384**	0.057	0.331*	-0.110	0.136
	[0.294]	[0.181]	[0.194]	[0.196]	[0.200]	[0.319]
Increased profitability	0.163	0.042	0.121	0.104	-0.059	0.010
	[0.255]	[0.158]	[0.169]	[0.170]	[0.174]	[0.278]
Sought finance	-0.044	0.136	-0.179*	-0.031	0.013	0.029
	[0.150]	[0.093]	[0.099]	[0.100]	[0.102]	[0.163]
Finance terms acceptable	0.148	-0.077	0.225	-0.003	-0.151	0.368
	[0.225]	[0.139]	[0.149]	[0.150]	[0.154]	[0.245]
Finance terms not acceptable	-0.319	-0.423	0.105	-0.348	-0.029	0.195
	[0.547]	[0.338]	[0.361]	[0.364]	[0.373]	[0.594]
Industry means (*Post-Peak)						
Exporting	-0.079	-0.021	-0.058	-0.030	0.049	0.107
	[0.109]	[0.067]	[0.072]	[0.073]	[0.074]	[0.119]
Foreign Direct Investment	0.119	0.068	0.051	0.024	-0.096	-0.395*
	[0.189]	[0.117]	[0.125]	[0.126]	[0.129]	[0.205]
Collective employment contracts	-0.061	-0.049	-0.012	0.021	0.082	0.153
	[0.133]	[0.082]	[0.088]	[0.089]	[0.091]	[0.145]
High relative profitability	-0.144	-0.076	-0.069	-0.264	-0.120	0.283
	[0.291]	[0.180]	[0.192]	[0.194]	[0.199]	[0.317]
Stable or increasing profitability	-0.017	-0.060	0.043	-0.095	-0.079	0.113
	[0.166]	[0.103]	[0.110]	[0.111]	[0.113]	[0.181]
Sought finance	-0.035	0.065	-0.100	-0.021	0.013	0.119
	[0.162]	[0.100]	[0.107]	[0.108]	[0.110]	[0.176]
Finance terms acceptable	-0.029	-0.012	-0.017	0.019	0.048	0.335*
	[0.168]	[0.104]	[0.111]	[0.112]	[0.115]	[0.183]
Finance terms not acceptable	-0.102	-0.118	0.016	0.094	0.196	0.232
	[0.189]	[0.116]	[0.124]	[0.126]	[0.129]	[0.205]

(continued)

Table 10 (continued)

	Net Emp Growth	Job Creation	Job Destruction	Accession Rate	Separation Rate	Monthly Wage Change
Firm characteristics						
tenure_lt_1yr_share	0.008	0.149***	-0.141**	0.282***	0.274***	-0.083
	[0.091]	[0.056]	[0.060]	[0.061]	[0.062]	[0.099]
tenure_lt_2yr_share	0.221*	0.170**	0.051	0.195**	-0.026	-0.032
	[0.113]	[0.070]	[0.074]	[0.075]	[0.077]	[0.122]
tenure_lt_3yr_share	-0.176	-0.094	-0.082	-0.183**	-0.007	0.012
	[0.129]	[0.080]	[0.085]	[0.086]	[0.088]	[0.140]
tenure_lt_4yr_share	0.268	0.154	0.114	0.173	-0.095	0.143
	[0.191]	[0.118]	[0.126]	[0.127]	[0.131]	[0.208]
tenure_lt_5yr_share	0.054	0.005	0.048	-0.015	-0.069	-0.267
	[0.186]	[0.115]	[0.123]	[0.124]	[0.127]	[0.202]
wp_share	0.620	0.792	-0.171	1.466**	0.846	-0.155
	[0.917]	[0.566]	[0.605]	[0.611]	[0.626]	[0.997]
contract_share	0.499	0.307	0.192	0.211	-0.289	0.526
	[0.304]	[0.188]	[0.201]	[0.202]	[0.207]	[0.330]
female_share	-0.022	-0.0696*	0.047	0.016	0.038	-0.034
	[0.067]	[0.0413]	[0.044]	[0.045]	[0.046]	[0.073]
young_share	-0.190	-0.109	-0.081	-0.067	0.123	0.158
	[0.116]	[0.072]	[0.077]	[0.077]	[0.079]	[0.126]
old_share	0.148	0.214	-0.065	-0.068	-0.216	-0.086
	[0.245]	[0.151]	[0.162]	[0.163]	[0.167]	[0.267]
Med-sized firm share [20,50)	0.033	-0.060	0.092	0.110	0.077	0.209
	[0.207]	[0.128]	[0.137]	[0.138]	[0.141]	[0.225]
Large-sized firm_share (50+)	0.154	0.086	0.069	0.248**	0.094	0.060
	[0.174]	[0.107]	[0.115]	[0.116]	[0.119]	[0.189]
Auckland region share	0.041	-0.023	0.064	-0.017	-0.057	-0.066
	[0.071]	[0.044]	[0.047]	[0.047]	[0.048]	[0.077]
Wellington region share	-0.163	-0.179**	0.016	-0.164**	-0.001	0.200
	[0.120]	[0.0742]	[0.080]	[0.080]	[0.082]	[0.131]
Christchurch region share	-0.120	-0.116	-0.003	-0.072	0.048	0.099
	[0.121]	[0.074]	[0.080]	[0.080]	[0.082]	[0.131]
Other North Island share	0.030	-0.003	0.033	0.035	0.005	-0.140*
	[0.076]	[0.047]	[0.050]	[0.051]	[0.052]	[0.083]
Observations	362	362	362	362	362	362
R-squared	0.707	0.914	0.866	0.951	0.922	0.678
p(char effects are zero)	0.229	0.000	0.010	0.000	0.000	0.266
p(equal slope effects)	0.857	0.871	0.903	0.878	0.908	0.426
p(uniform level shift)	0.160	0.469	0.147	0.959	0.036	0.388

*Notes: Standard errors in brackets. All regressions are employment weighted using average quarterly employment. Significance: *=10%; **=5%; ***=1%. Observations are period-bin combinations, with two periods ("pre peak"=2004q3-2007q4; "post peak"=2008q1-2010q1)*

Table 11

Firm and industry characteristics conditional on employment change

	Accession Rate	Separation Rate	Monthly Wage Change
shift if neg (γ-)	0.241*	0.249*	-0.180
	[0.128]	[0.129]	[0.413]
shift if zero (γ0)	0.242*	0.249*	-0.177
	[0.128]	[0.129]	[0.413]
shift if pos (γ+)	0.249*	0.256*	-0.180
	[0.128]	[0.130]	[0.415]
Δslope if neg (δ-)	-0.005	0.009	0.001
	[0.007]	[0.008]	[0.024]
Δslope if pos (δ+)	-0.004	-0.001	0.0464*
	[0.008]	[0.008]	[0.027]
Firm characteristics			
tenure_lt_1yr_share	0.205***	0.204***	0.093
	[0.031]	[0.031]	[0.099]
tenure_lt_2yr_share	0.116**	0.110**	-0.046
	[0.045]	[0.045]	[0.144]
tenure_lt_3yr_share	0.064	0.069	0.066
	[0.049]	[0.050]	[0.160]
tenure_lt_4yr_share	0.120*	0.120*	0.324
	[0.063]	[0.064]	[0.203]
tenure_lt_5yr_share	-0.021	-0.026	0.322
	[0.076]	[0.077]	[0.245]
wp_share	-0.313	-0.405	-0.463
	[0.288]	[0.291]	[0.931]
contract_share	0.124	0.122	-0.039
	[0.115]	[0.116]	[0.372]
female_share	0.015	0.020	0.105
	[0.026]	[0.026]	[0.085]
young_share	0.065	0.060	-0.137
	[0.049]	[0.049]	[0.157]
old_share	0.062	0.039	-0.225
	[0.100]	[0.101]	[0.322]
medfirm_share	-0.003	0.013	-0.167
	[0.044]	[0.045]	[0.143]
lgefirm_share	-0.009	-0.001	-0.129
	[0.047]	[0.047]	[0.151]
akl_share	-0.008	0.001	0.058
	[0.026]	[0.027]	[0.085]
wlg_share	-0.017	-0.002	0.139
	[0.044]	[0.045]	[0.142]
chc_share	-0.040	-0.039	-0.023
	[0.043]	[0.043]	[0.137]
oni_share	-0.067**	-0.057**	0.085
	[0.028]	[0.028]	[0.090]

(continued)

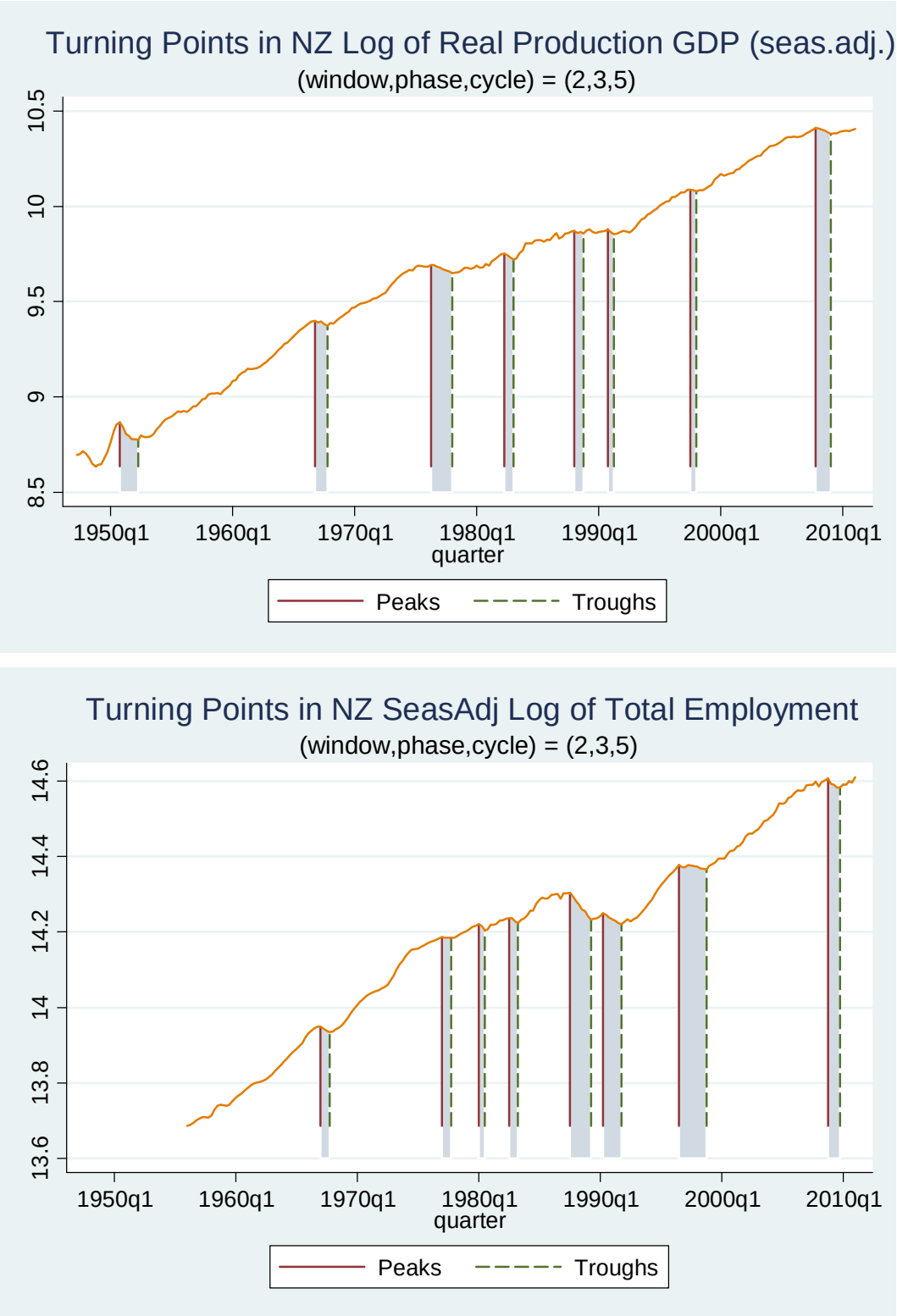
Table 11 (continued)

	Accession Rate		Separation Rate		Monthly wage change	
Industry means	*Pre	*Post	*Pre	*Post	*Pre	*Post
Exporting	0.043	0.012	0.039	0.011	0.012	0.047
	[0.044]	[0.038]	[0.044]	[0.038]	[0.141]	[0.122]
Foreign Direct Investment	-0.043	-0.010	-0.033	-0.006	-0.199	0.371
	[0.073]	[0.070]	[0.074]	[0.071]	[0.236]	[0.226]
Collective employment contracts	-0.048	-0.045	-0.035	-0.040	0.288	0.026
	[0.057]	[0.048]	[0.058]	[0.048]	[0.184]	[0.154]
High relative profitability	-0.049	-0.060	-0.096	-0.089	0.119	0.486
	[0.094]	[0.116]	[0.095]	[0.117]	[0.303]	[0.375]
Stable or increasing profitability	0.153	-0.044	0.179*	-0.039	-0.074	-0.426*
	[0.103]	[0.078]	[0.104]	[0.079]	[0.332]	[0.252]
Sought finance	-0.075	-0.029	-0.096*	-0.043	-0.144	-0.697***
	[0.056]	[0.067]	[0.056]	[0.068]	[0.180]	[0.216]
Finance terms acceptable	0.032	-0.133*	0.029	-0.134*	0.095	0.402*
	[0.071]	[0.069]	[0.071]	[0.070]	[0.228]	[0.222]
Finance terms not acceptable	0.148	0.016	0.129	0.023	-0.866	0.741***
	[0.164]	[0.076]	[0.166]	[0.077]	[0.531]	[0.245]
Observations	358		358		358	
R-squared	0.999		0.999		0.818	
p(char effects are zero)	0.000		0.000		0.011	
p(equal slope effects)	0.916		0.509		0.324	
p(uniform level shift)	0.001		0.005		0.927	

*Notes: Standard errors in brackets. All regressions are employment weighted using average quarterly employment. Significance: *=10%; **=5%; ***=1%. Observations are period-bin combinations, with two periods ("pre peak"=2004q3-2007q4; "post peak"=2008q1-2010q1).*

Figure 1

New Zealand Output and Employment cycles: 1947q2 – 2011q1

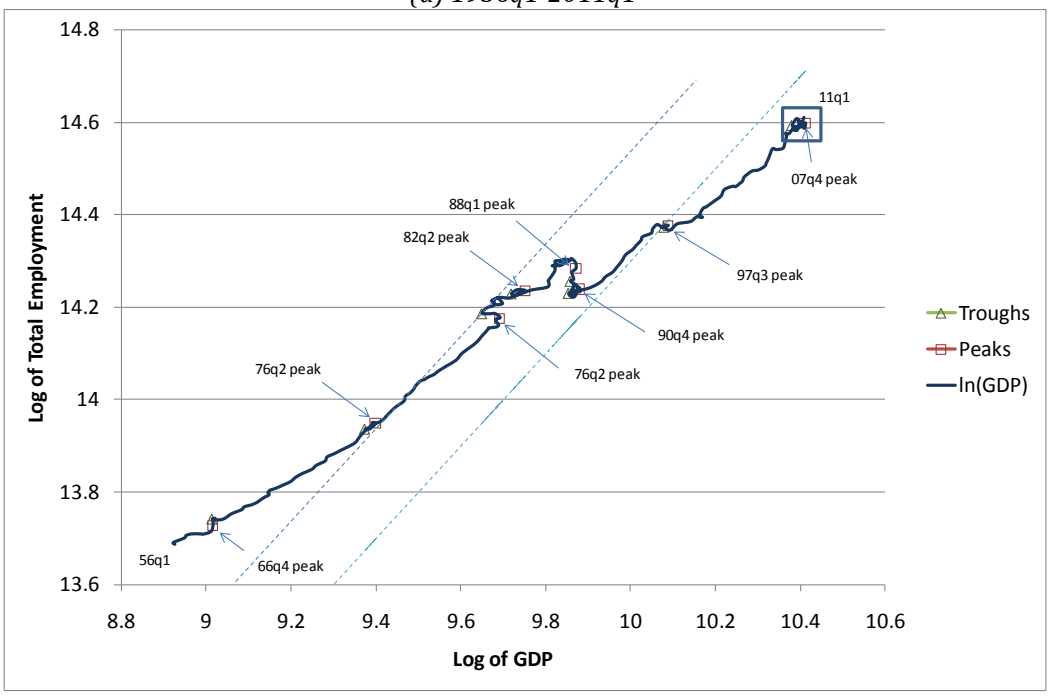


Notes: Turning points were identified using the Bry-Boschan quarterly algorithm outlined in Harding and Pagan (2002), with (window=2 quarters; minimum phase= 3 quarters; minimum cycle= 5 quarters). This was applied to seasonally adjusted real production GDP, and seasonally adjusted total employment derived by splicing the historical series in Chapple (1994) with the latest revision of the Household Labour Force Survey.

Figure 2

New Zealand Output and Employment cycles: 1956q1 – 2011q1

(a) 1956q1-2011q1



(b) 2006q1-2011q1

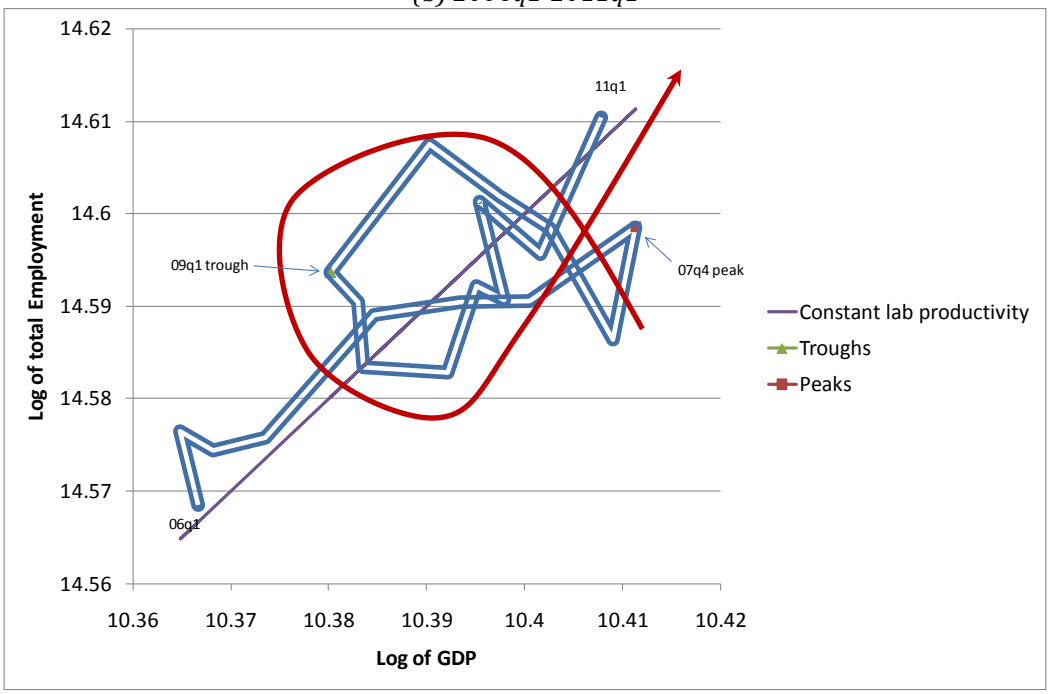
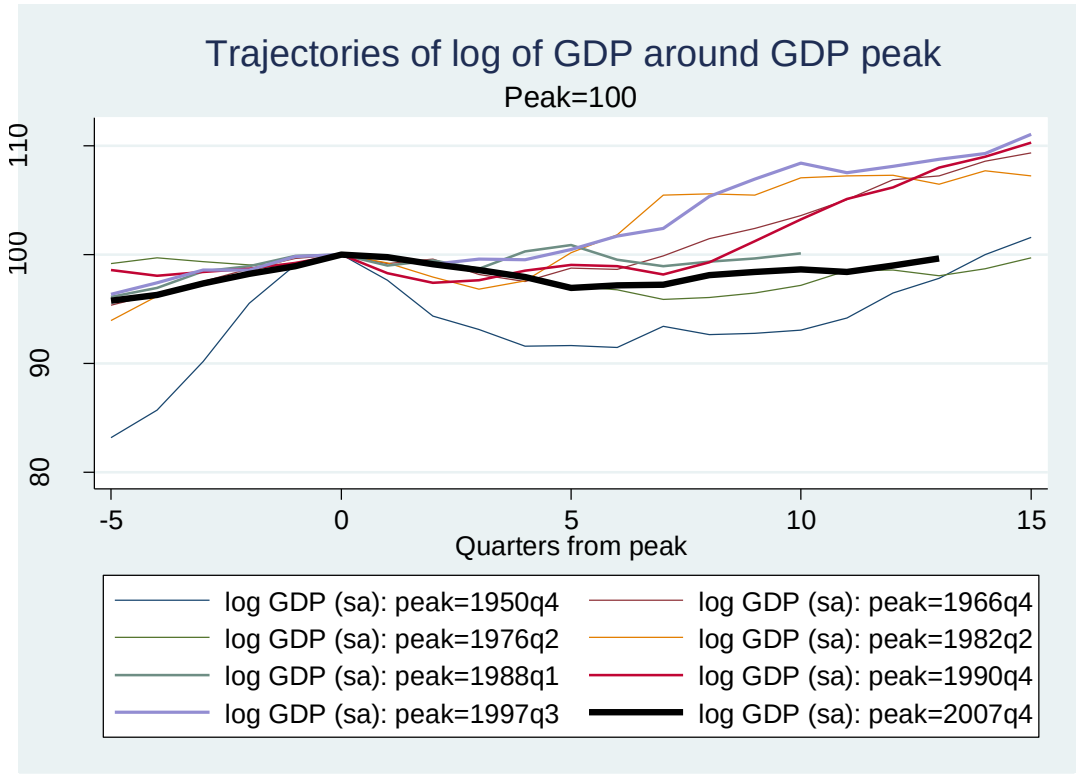
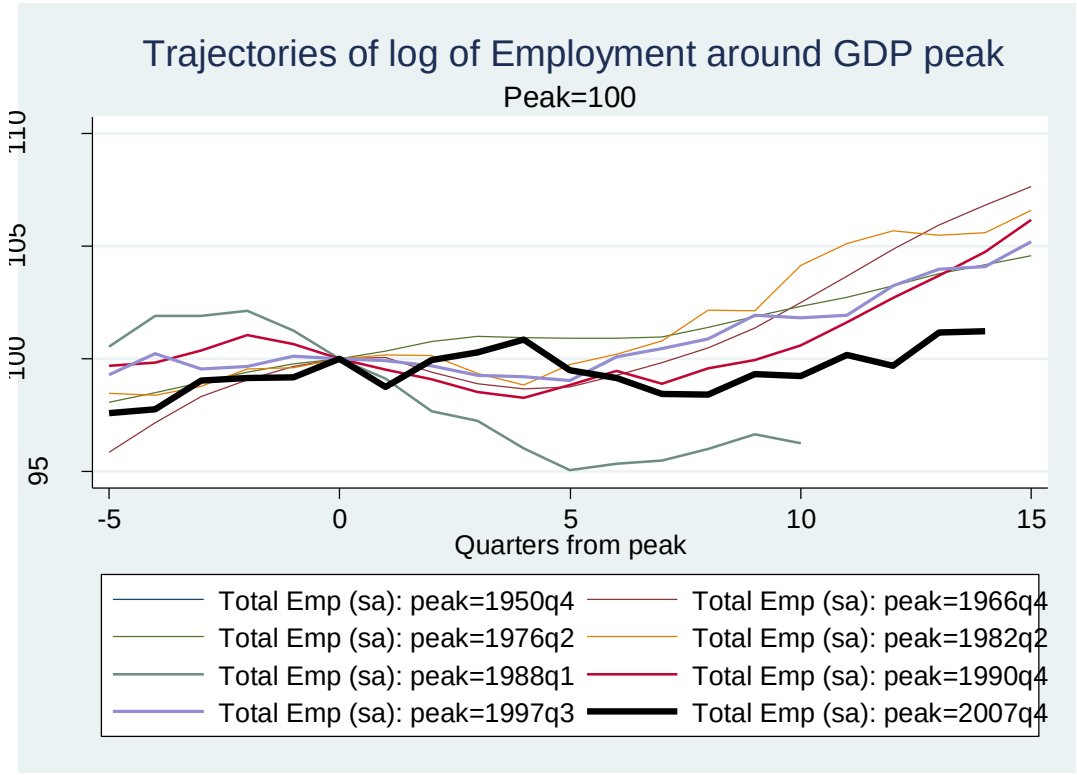


Figure 3

Comparing across cycles





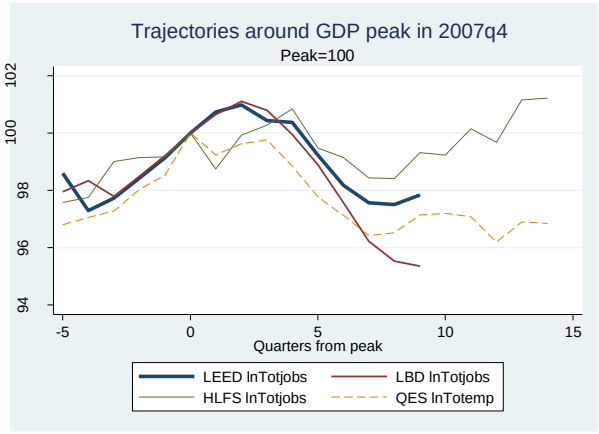
Note: All series are seasonally adjusted by the authors using the US Census Bureau's Win-X12 program.

Figure 4

Alternative employment measures

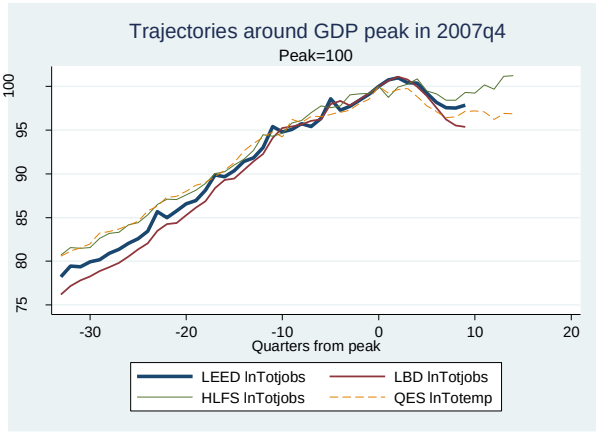
5qtrs before to 15 after peak

(2005q4-2011q1)



Full LEED/LBD period

(1999q2-2011q1)

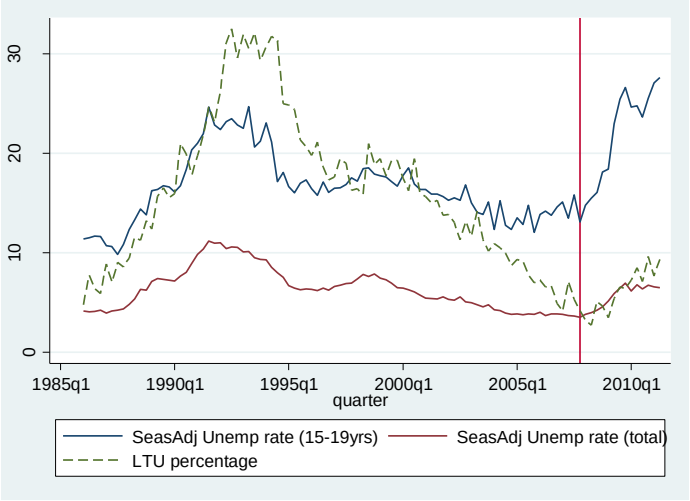


Note: All series are seasonally adjusted by the authors using the US Census Bureau's Win-X12 program. Series in the right hand column are subsequently smoothed using a centred 5-period moving average, to aid presentation.

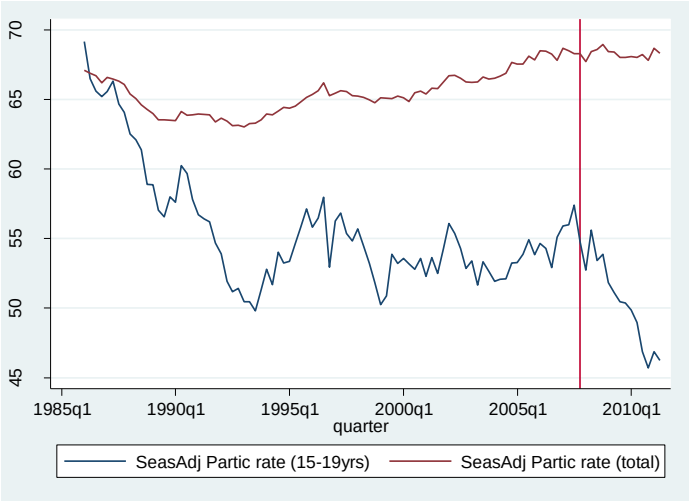
Figure 5

Unemployment and Participation rate changes

(a) Unemployment rates and long-term unemployment



(b) Participation rates



Note: All series are seasonally adjusted by the authors using the US Census Bureau's Win-X12 program.

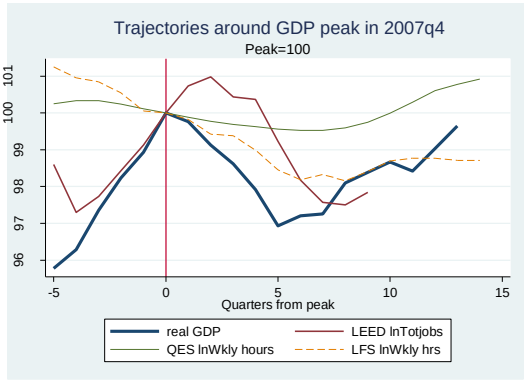
Figure 6

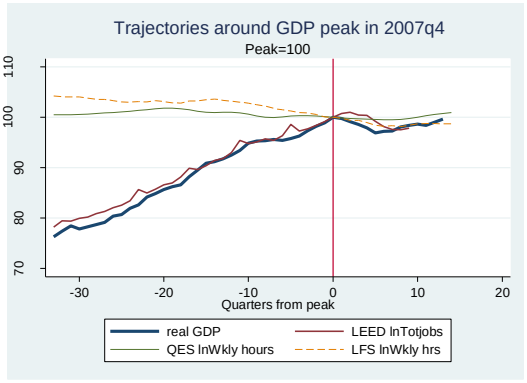
Labour adjustment around the 2008 recession

5 quarters before to 15 quarters after peak 2005q4 – 2011q1

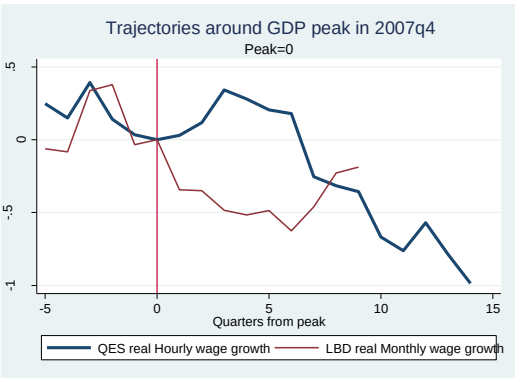
All periods with LEED data 1999q2 – 2011q1

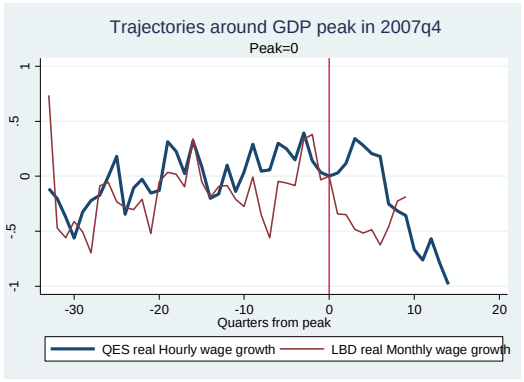
GDP & Employment



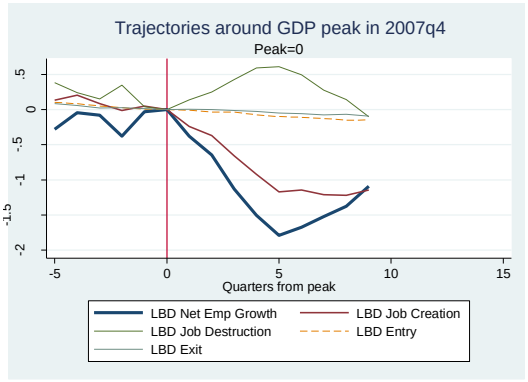


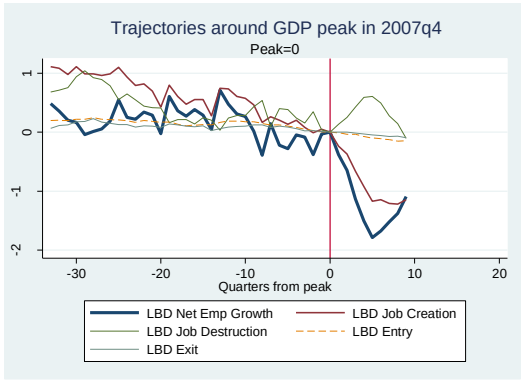
Wage growth rate (ppt deviation from peak)



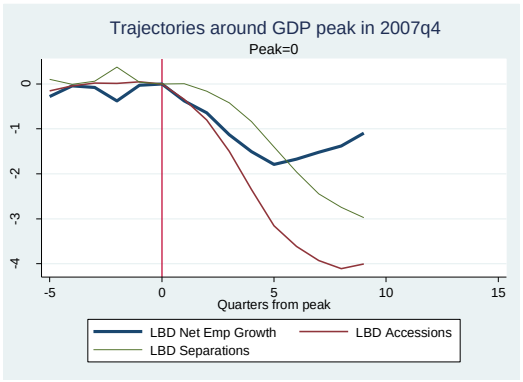


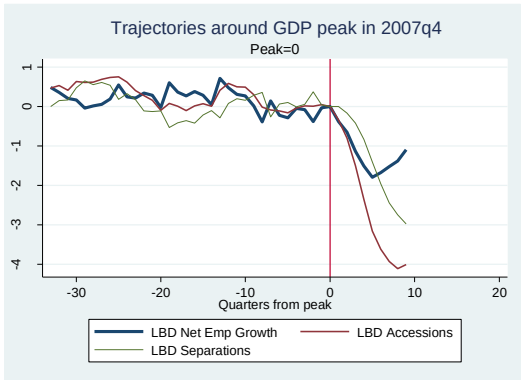
Emp growth, JC & JD rates (ppt deviation from peak)





Emp growth Accession & Sep rates (ppt deviation from peak)



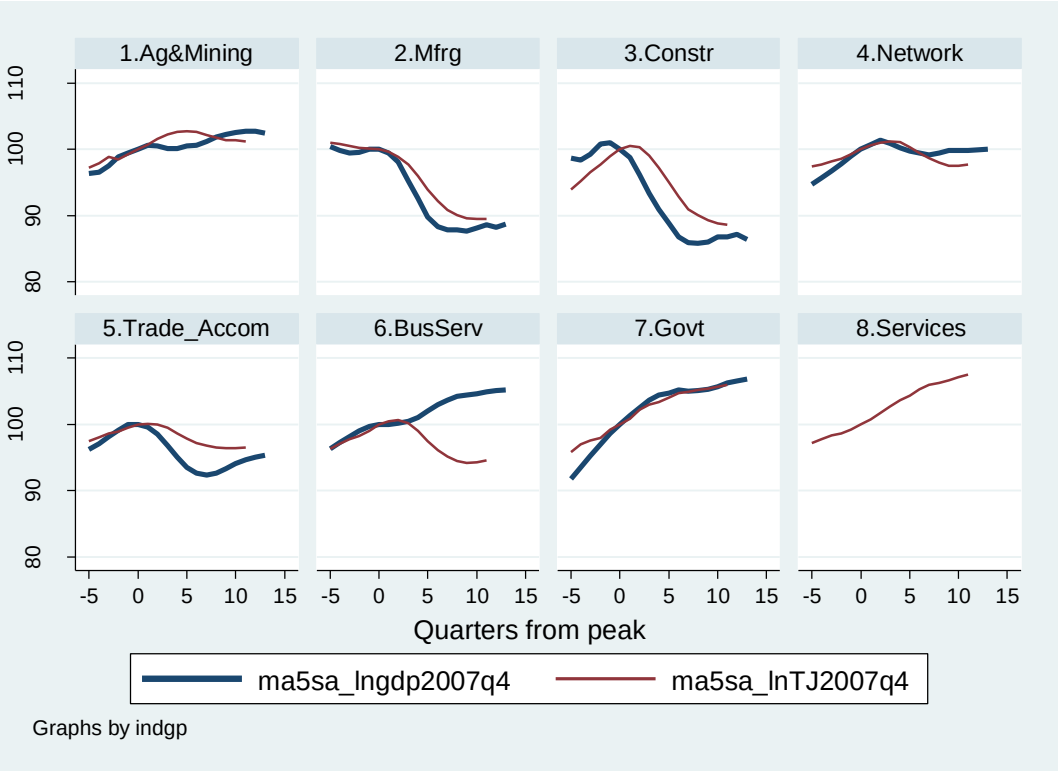


Note: All series are seasonally adjusted by the authors using the US Census Bureau's Win-X12 program. Series in the right hand column are subsequently smoothed using a centred 5-period moving average, to aid presentation.

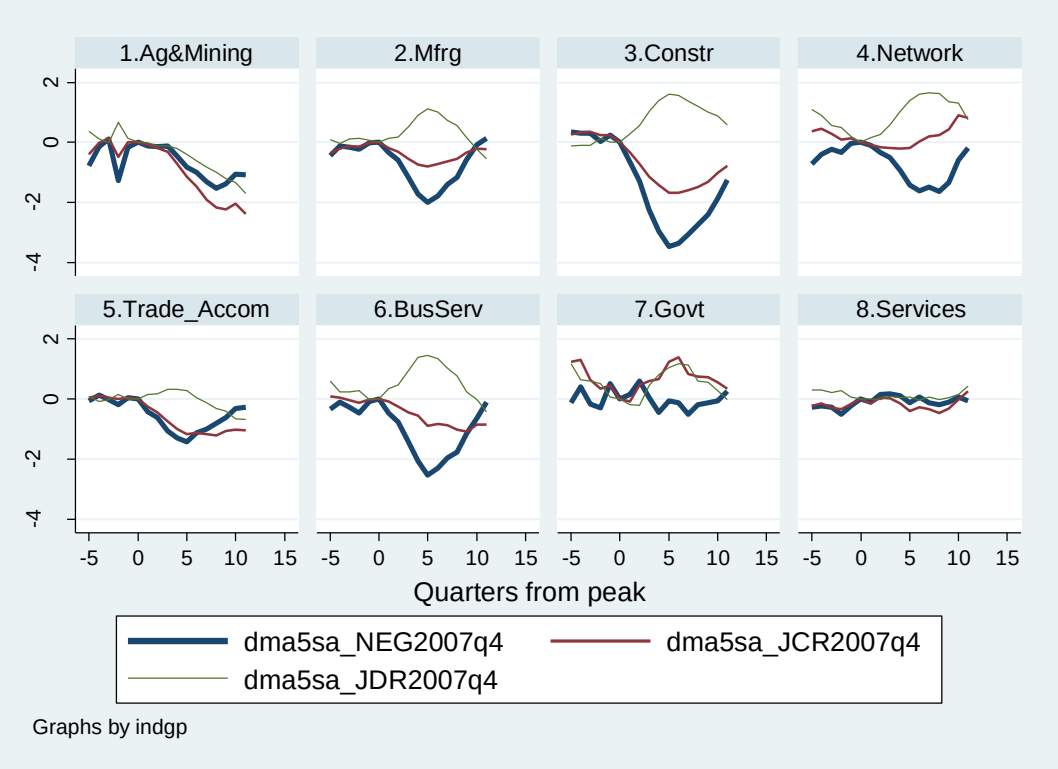
Figure 7

Job and worker flows by industry

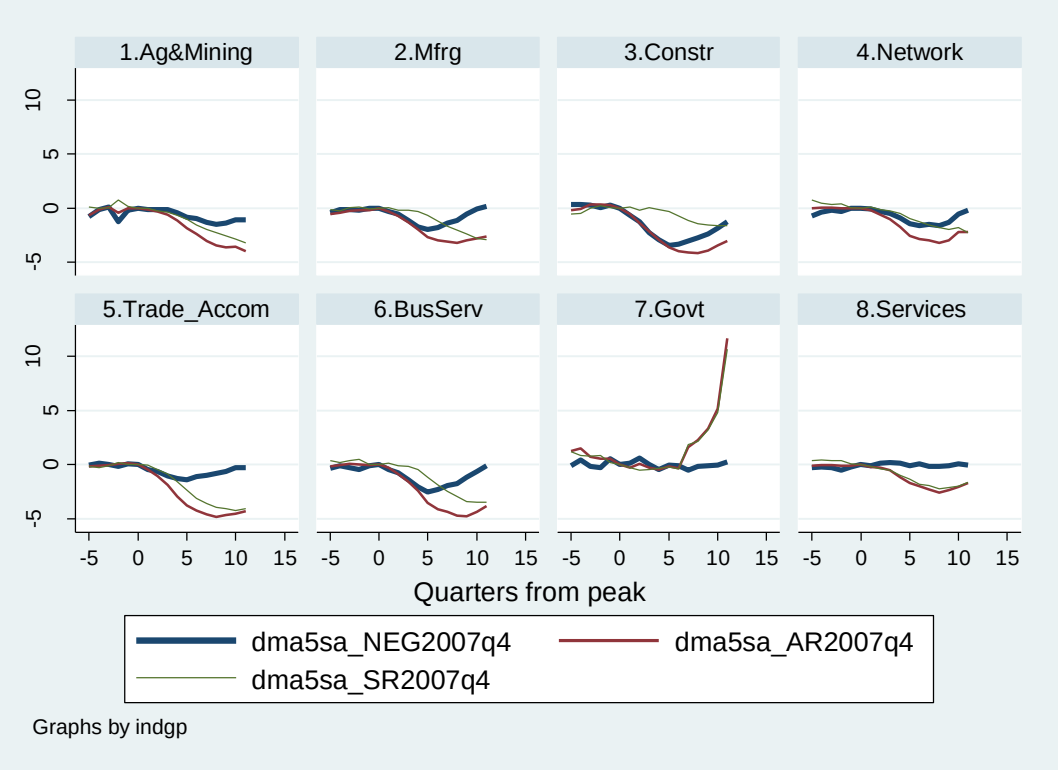
(a) Output and employment



(b) Net employment growth and job flows



(c) Net employment growth and worker flows

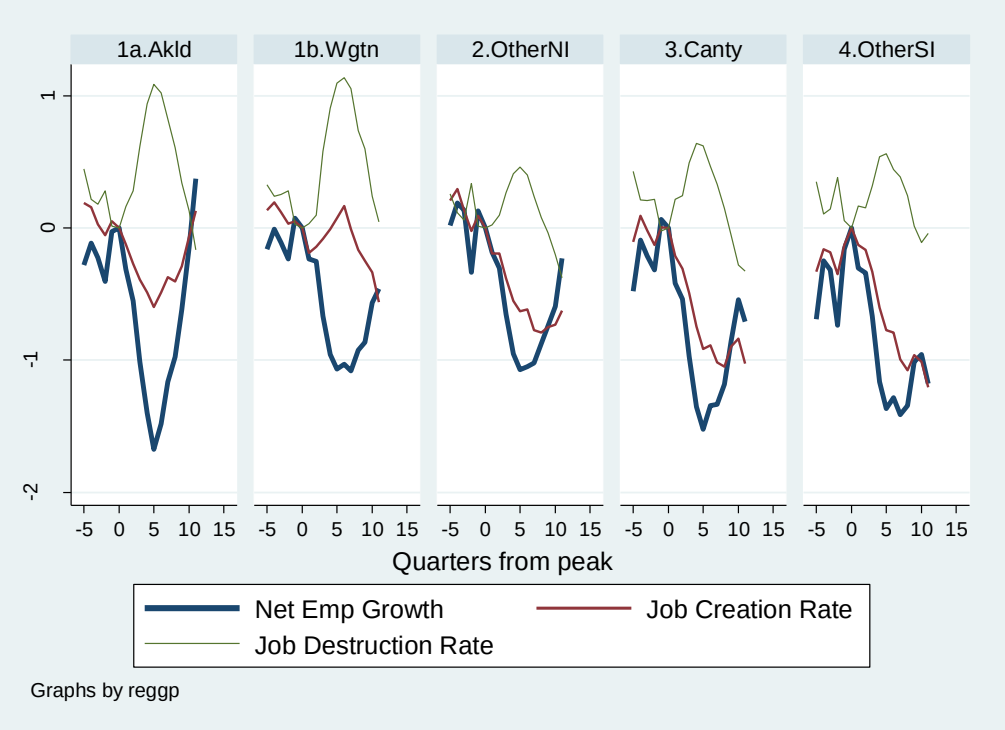


Source: LEED quarterly tables from www.stats.govt.nz
Notes: All series are seasonally adjusted by the authors using the US Census Bureau's Win-X12 program and subsequently smoothed using a centred, 5-quarter moving average. JCR=Job Creation rate; JDR = Job Destruction Rate; NEG = Net employment growth; TJ=Total jobs; AR=Accession rate; SR=Separation rate. In panel (a), all series are indexed to a value of 100 in 2007q4. In panels (b) and (c), series are expressed as percentage point deviations from 2007q4 values.

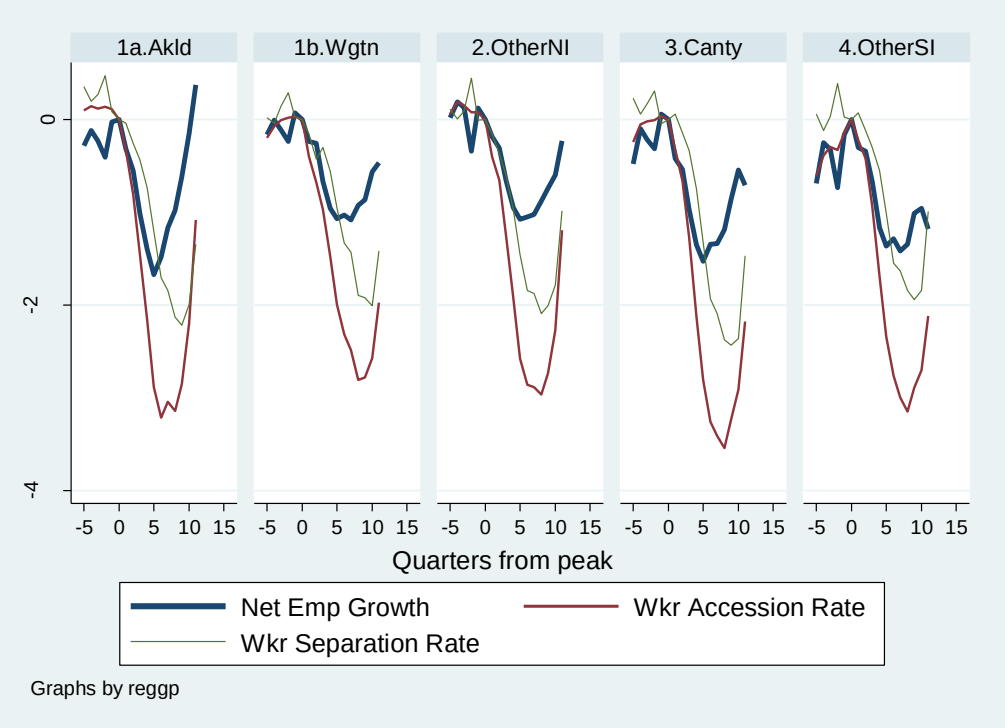
Figure 8

Job and worker flows by region

(a) Net employment growth and job flows



(b) Net employment growth and worker flows



Source: LEED quarterly tables from www.stats.govt.nz

Notes: All series are seasonally adjusted by the authors using the US Census Bureau's Win-X12 program and subsequently smoothed using a centred, 5-quarter moving average. JCR=Job Creation rate; JDR = Job Destruction Rate; NEG = Net employment growth; AR=Accession rate; SR=Separation rate. In panel (a), all series are indexed to a value of 100 in 2007q4. In panels (b) and (c), series are expressed as percentage point deviations from 2007q4 values.

Figure 9

Variable definition: Data timing

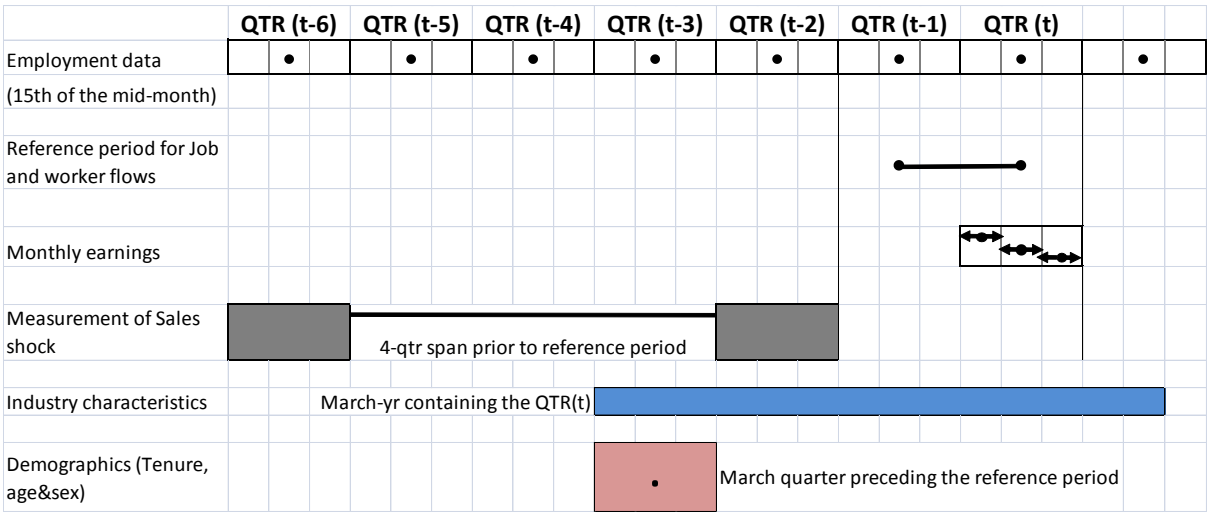
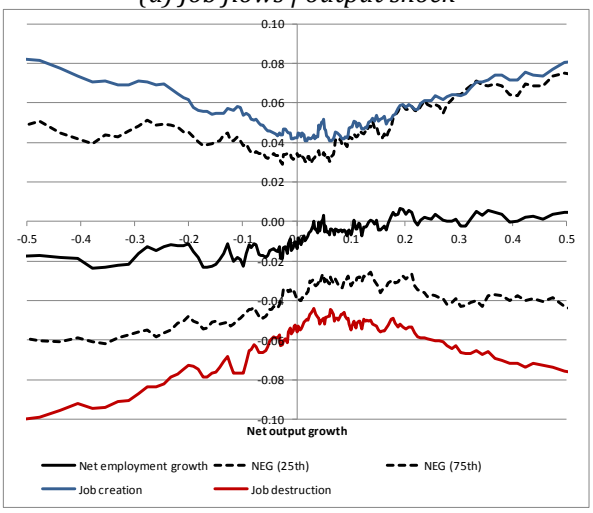


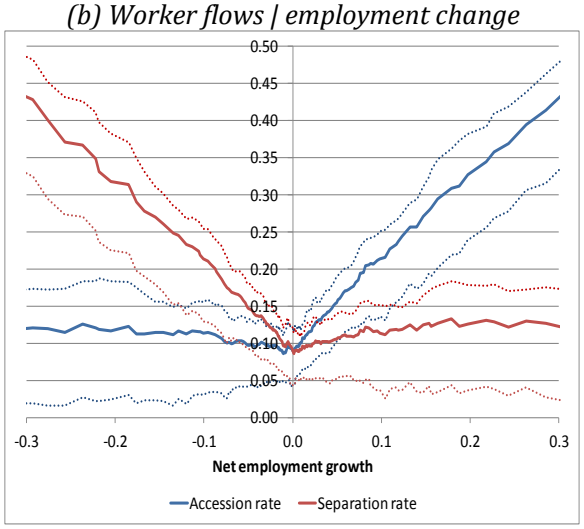
Figure 10

Heterogeneous adjustment

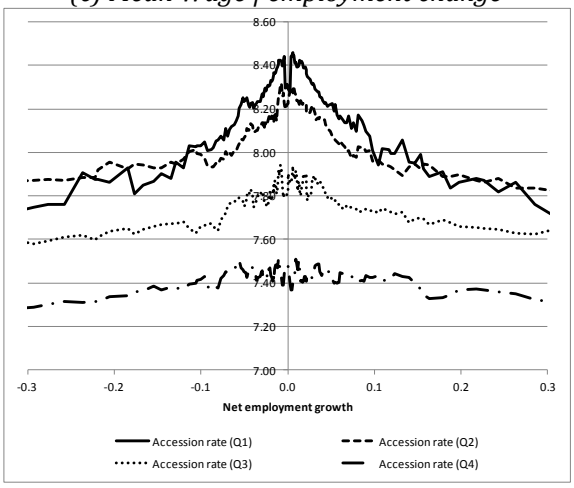
(a) Job flows | output shock



(b) Worker flows | employment change



(c) Mean Wage | employment change

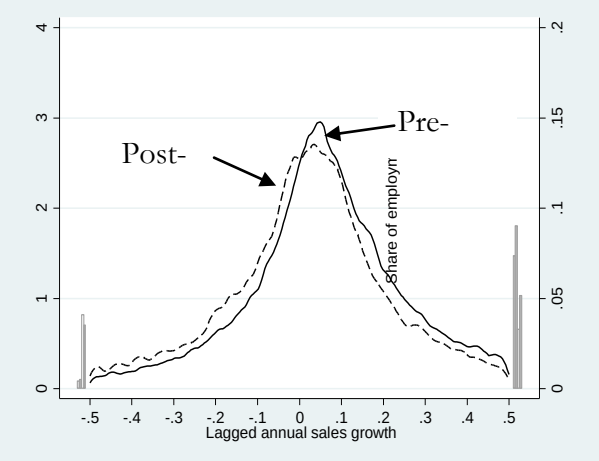


Notes: Output shocks are measured as lagged annual growth in sales, as described in the text. Figures are plotted using 181 discrete ranges ("bins") of net employment growth or output shocks, each containing approximately the same employment. Plotted lines are centred 5-bin moving averages. Dashed lines in panel (b) are empirical 25th and 75th percentiles

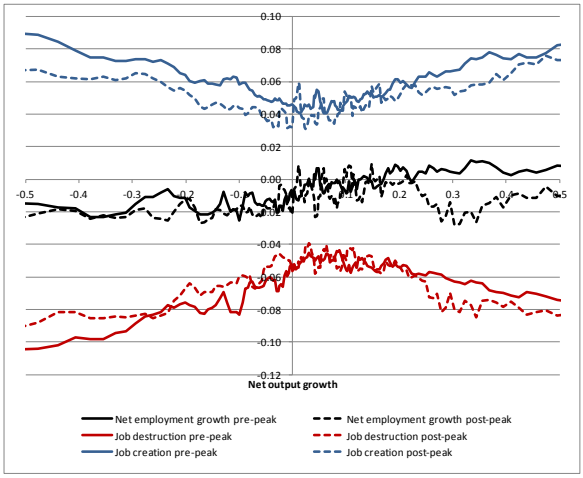
Figure 11

Post-peak changes conditional on output shock

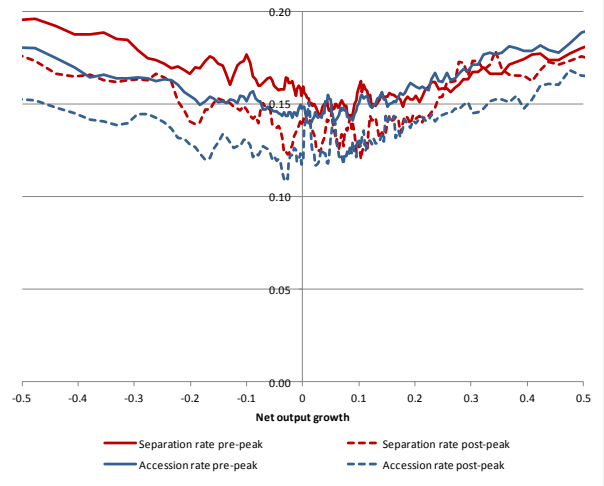
(a) Distribution of Output shocks



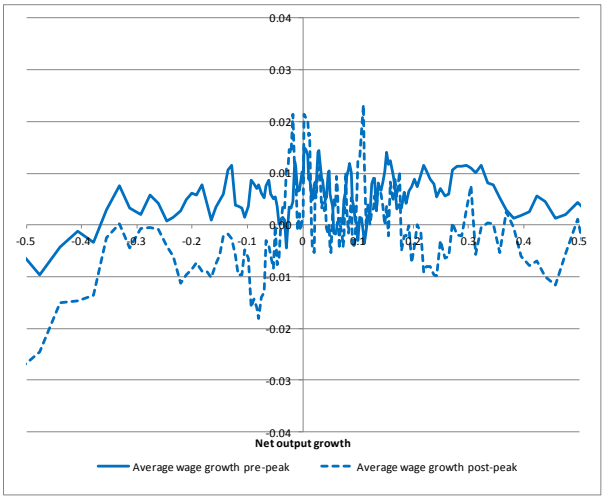
(b) Employment change | output shock



(c) Worker flows | output shock



(d) Wage growth | output shock

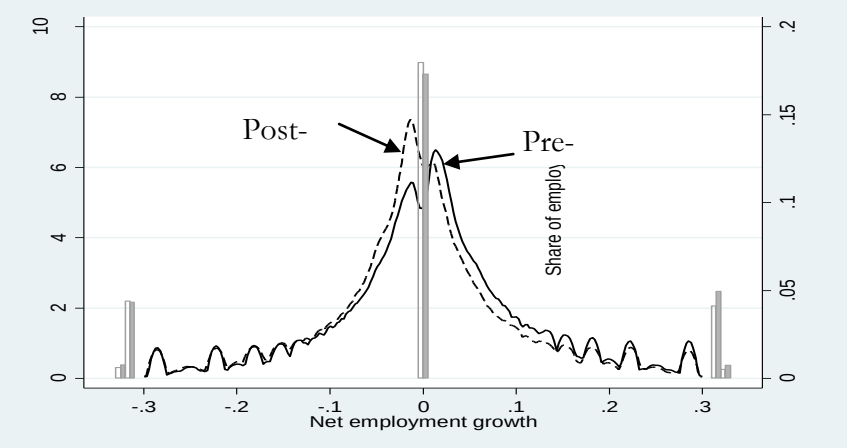


Notes: Output shocks are measured as lagged annual growth in sales, as described in the text. Figures are plotted using 181 discrete ranges ("bins") of output shocks, each containing approximately the same employment. Plotted lines are centred 5-bin moving averages. Dashed lines are for the post-peak period.

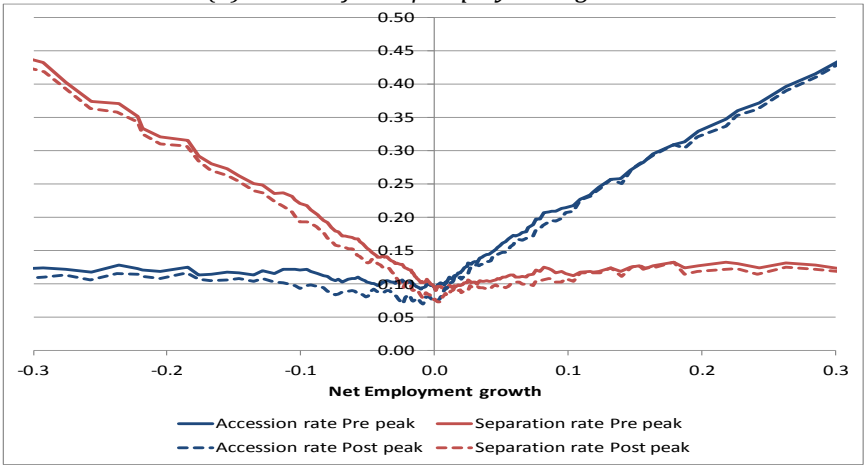
Figure 12

Post-peak changes conditional on employment growth

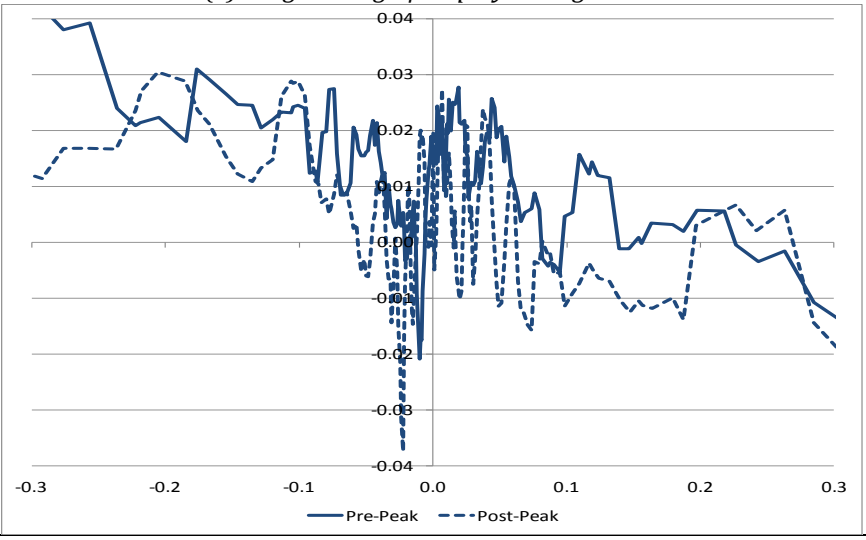
(a) Distribution of employment growth



(b) Worker flows | employment growth



(c) Wage change | employment growth

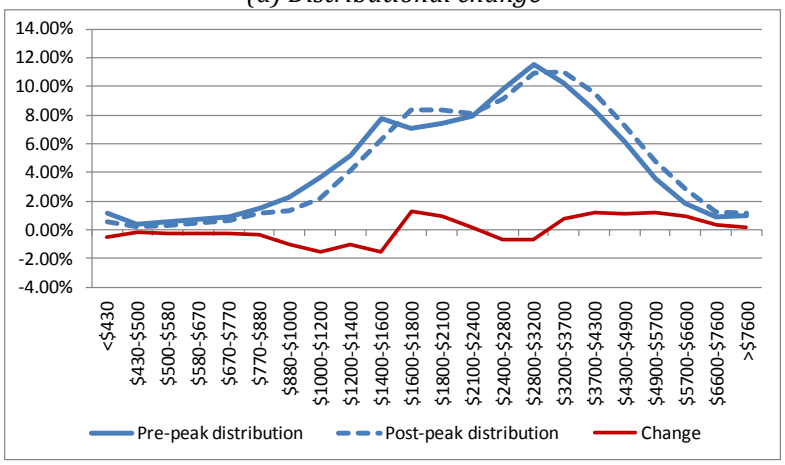


Notes: Figures are plotted using 181 discrete ranges ("bins") of net employment growth, each containing approximately the same employment. Plotted lines are centred 5-bin moving averages. Dashed lines are for the post-peak period.

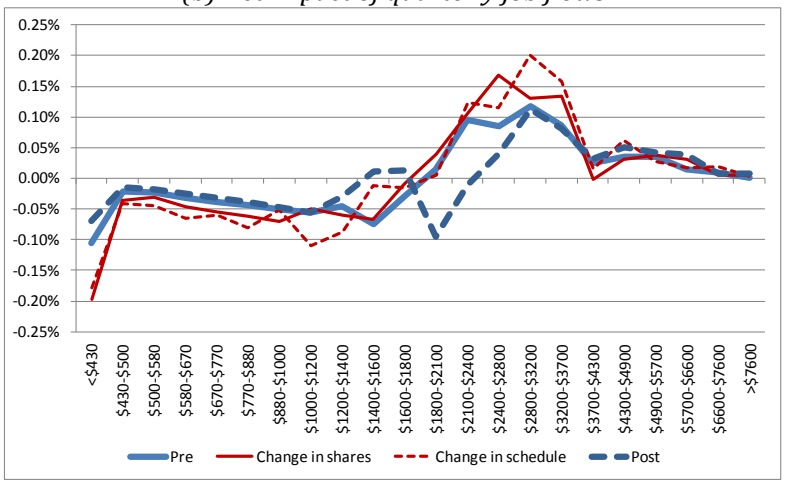
Figure 13

Distributional impacts: Monthly wage distribution

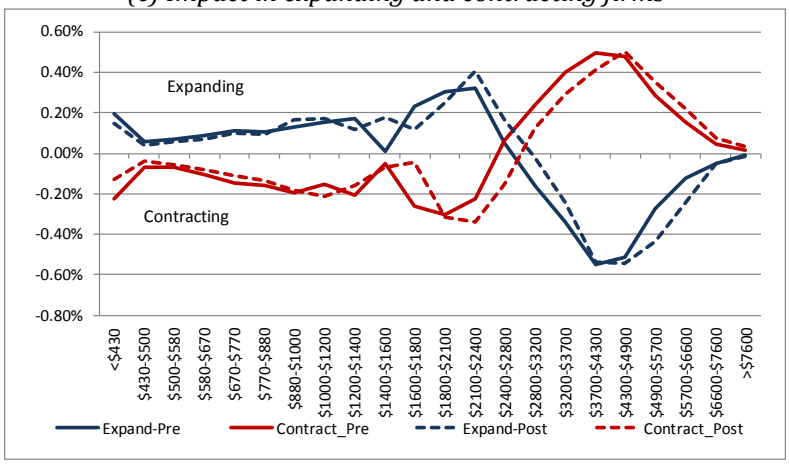
(a) Distributional change



(b) Net impact of quarterly job flows



(c) Impact in expanding and contracting firms

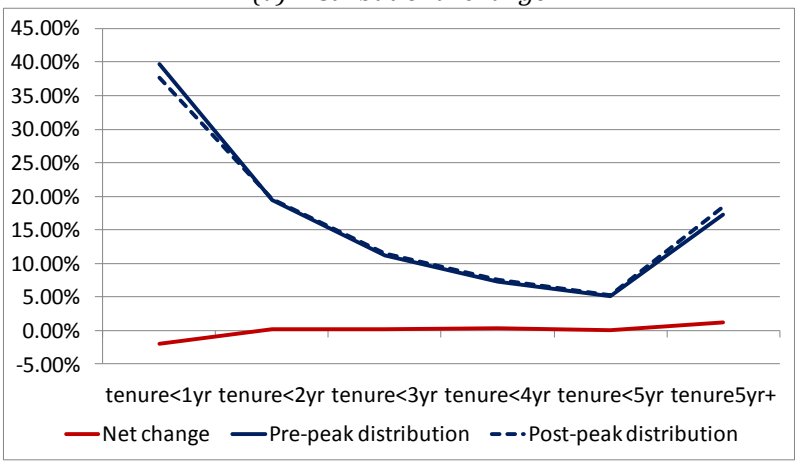


Notes: Monthly wages are deflated by industry-specific Labour Cost Index. The first panel shows the average pre-peak and post-peak distribution and the change between the two periods. The second and third panels are based on quarterly employment changes, averaged separately over the pre-and post-peak periods. The net quarterly employment change in panel (b) is the sum of corresponding expansion and contraction curves in panel (c). Plotted lines are centred 5-bin moving averages. Dashed lines are for the post-peak period.

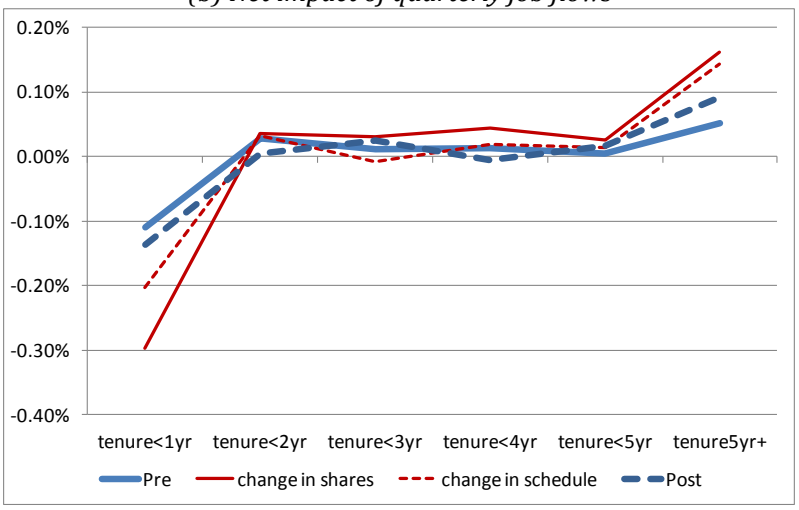
Figure 14

Distributional impacts: Tenure distribution

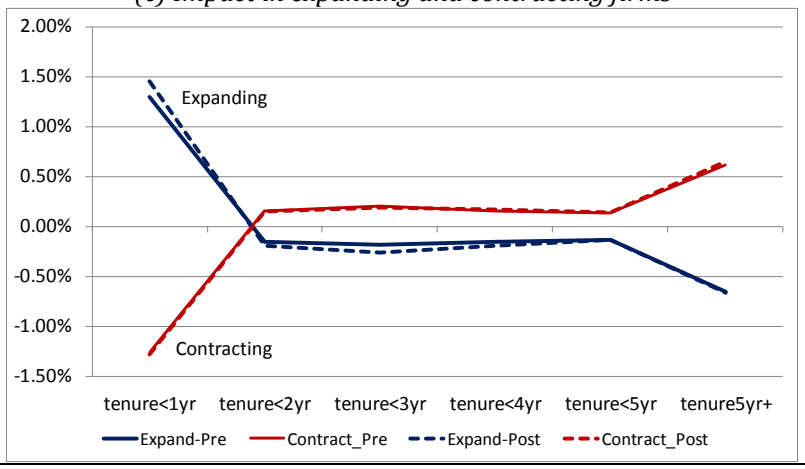
(a) Distributional change



(b) Net impact of quarterly job flows



(c) Impact in expanding and contracting firms

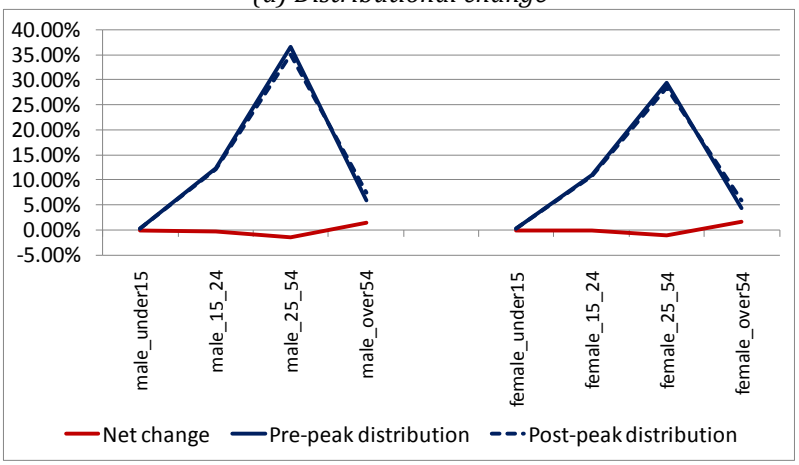


Notes: The first panel shows the average pre-peak distribution and post-peak distribution and the change between the two periods. The second and third panels are based on quarterly employment changes, averaged separately over the pre-and post-peak periods. The net quarterly employment change in panel (b) is the sum of corresponding expansion and contraction curves in panel (c). Plotted lines are centred 5-bin moving averages. Dashed lines are for the post-peak period.

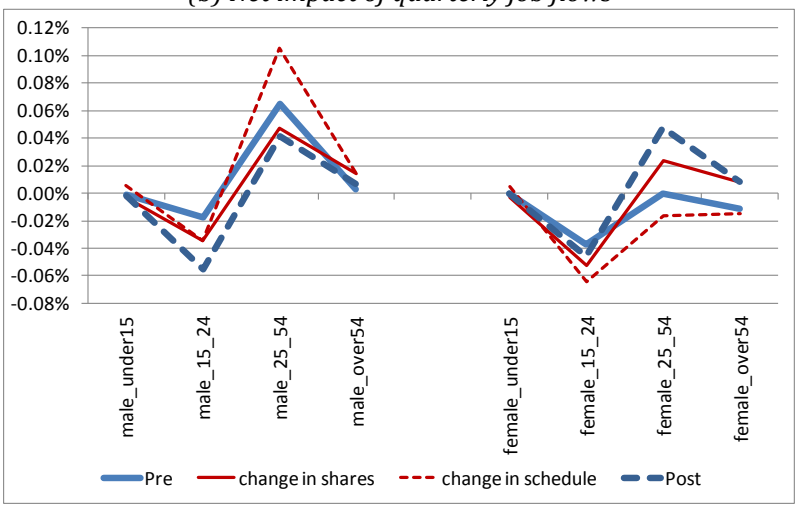
Figure 15

Distributional impacts: Age-sex distribution

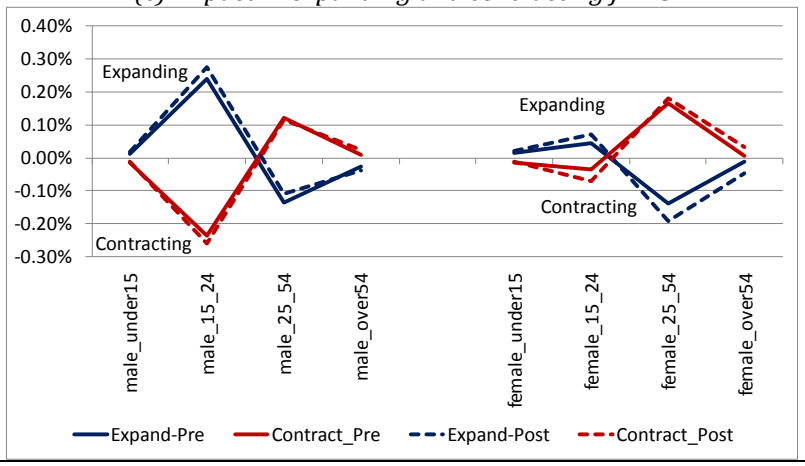
(a) Distributional change



(b) Net impact of quarterly job flows



(c) Impact in expanding and contracting firms



Notes: The first panel shows the average pre-peak distribution and post-peak distribution and the change between the two periods. The second and third panels are based on quarterly employment changes, averaged separately over the pre-and post-peak periods. The net quarterly employment change in panel (b) is the sum of corresponding expansion and contraction curves in panel (c). Plotted lines are centred 5-bin moving averages. Dashed lines are for the post-peak period.

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