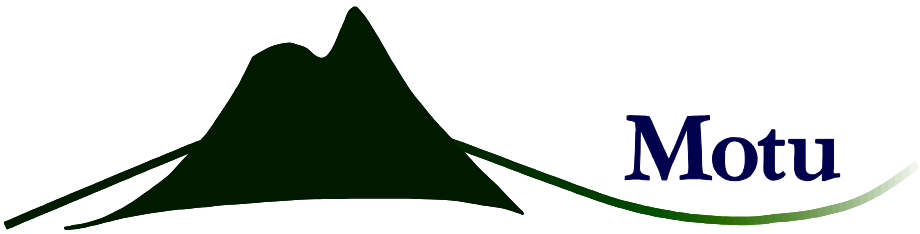

Firm-level Hiring Difficulties: Persistence, Business Cycle and Local Labour Market Influences

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Disclaimer

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

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

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

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

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Abstract
We examine the correlates of reported hiring difficulties at the firm level using linked employer-employee and panel survey data over 2005-2011, focussing on the relative influence of firm-level characteristics, persistence, the business cycle and local labour market liquidity. At both the aggregate and the firm level, hiring difficulties eased after the onset of the Global Financial Crisis. Even in the presence of large cyclical changes in demand and labour market conditions, firm-level persistence is a dominant feature of the data, with one- and two-year lags of reported hiring difficulties both positively related to current difficulties. Firms paying higher wages are more likely to report difficulties when trying to hire skilled workers, while firms with more long tenure workers are less likely to report any difficulty hiring. Local labour market conditions appear unrelated to reported hiring difficulties.

JEL codes
E24, J23, J63, M51

Keywords
Hiring difficulties; hard-to-fill vacancies; local labour market; Global Financial Crisis

1 Motivation

The inability of firms to find workers when they need them may act as a drag on the economy (as in, eg, Haskel and Martin 1993b). In this context, the fact that the majority of New Zealand firms posting a vacancy report some difficulty in hiring,[1] appears troubling.

At least four stories could be told to explain this statistic. Firstly, workers with the skills firms need might not exist – that is, supply may be insufficient to meet demand for particular skills. Secondly, while workers with the necessary skillsets might exist, there could be obstacles to workers and firms making good matches. Thirdly, since firms face competition for skills, some businesses may not be able to meet the market price for a desired skillset. Finally, even in a well-functioning market, short-run shortages could be evident because it takes time, say, for workers to move between industries or regions in response to shocks.

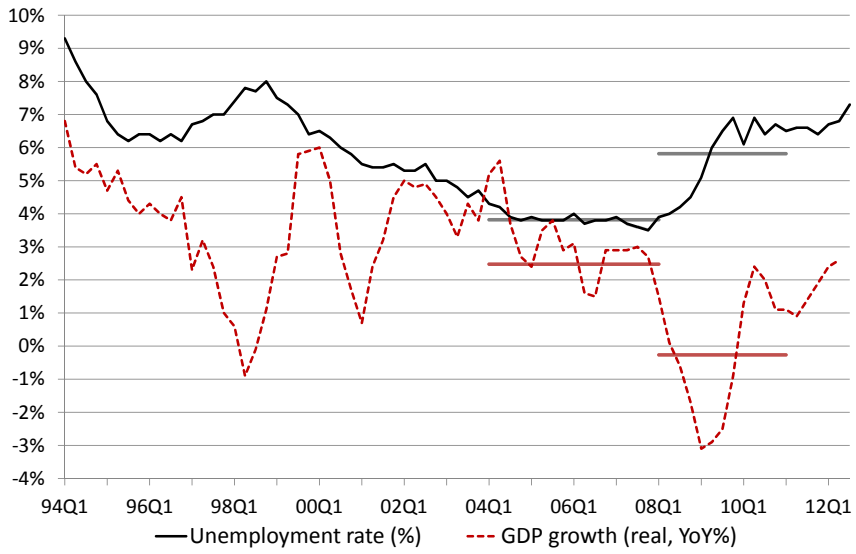
The first of these stories, at least, would pose a potential problem for government, since the publicly-funded education system is a major supplier of skills in New Zealand and because immigration policy exercises control over the inflow rate and skills composition of migrants. As emphasised by Haskel and Martin (2001) in the United Kingdom, the rate of technological progress may be such that, at least for a subset of jobs, skills shortages persist despite large increases in education and training.

Thin labour markets potentially form the foundation of each of the four stories. It is clear from recent microeconomic studies that labour markets are dynamic, with substantially more worker turnover occurring than is necessary to give effect to net employment growth (a phenomenon labelled "churn"). In the US, at least, firms often need to recruit to fill vacancies created by voluntary departures (quits), rather than through a desire to expand (Davis et al. 2010). For New Zealand, Fabling and Maré (2012) relate net employment growth to hiring and separation rates at the firm-level, demonstrating a comparable level of churn to that seen in the US. Further, they show that churn declined significantly after the onset of the Global Financial Crisis (GFC), suggesting a pronounced reduction in the liquidity of the labour market from 2009 onwards.

Demand conditions for firms, too, potentially affect the degree of competition for skills between firms in the labour market. Figure 1 shows the change in macroeconomic conditions before and after the onset of the GFC. Average

[1] The source and population that this statistic is derived from is explained in section 2.

Figure 1: Unemployment and real gross domestic product growth



Sources: Statistics New Zealand and the Reserve Bank of New Zealand

unemployment and real GDP growth are shown over the pre-GFC (2004Q2-2008Q1) and post-GFC (2008Q2-2011Q1) where reported hiring difficulties are observed. GDP growth in the three years following the GFC averaged close to zero – 2.5 percentage points lower than in the preceding four years. At the same time, average unemployment rose by two percentage points (from four percent to six percent). Such marked changes in macroeconomic conditions are likely to affect both the demand for labour (skills) as well as workers' desire to change jobs.

By using longitudinal data, this study is the first to investigate firm-level changes in reported hiring difficulties over the business cycle. Looking over the business cycle may be important since the composition of firms posting vacancies and/or the characteristics of those vacancies may change during a recession. For example, in the US, worker churn is pro-cyclical because, during recessions, departing workers are less likely to be replaced (a leftward shift in the net employment growth distribution) and because workers are less likely to quit (Davis et al. 2012a; Lazear and Spletzer 2012). While quits and layoffs cannot be separately identified in the New Zealand data, the marked decline in churn evident after the onset of the GFC is consistent

with a similar compression of voluntary departures (Fabling and Maré 2012).[2]

The stories outlined above also suggest a role for firm heterogeneity in determining hiring outcomes, particularly those related to a firms' ability to provide attractive work conditions (both pay and non-pay conditions). Two earlier studies have addressed the question of firm-level heterogeneity in hiring outcomes: previous analysis in New Zealand, focussing on the relationship between skills shortages and firm characteristics in 2008 (Mok et al. 2012); and Haskel and Martin (1993a) who analyse the correlates of reported hiring difficulties for a sample of 149 hiring firms in the UK.[3] Both papers relate hiring difficulties to a range of internal and external factors guided by the literature on matching functions,[4] and are cross-sectional in the sense that they focus on a single year of reported hiring difficulties.[5]

Heterogeneity across industries and/or regions may also be important, particularly if mobility is inhibited across these boundaries. Moretti (2011) summarises why local labour markets might matter, emphasising the role of thick markets in improving match quality, and in reducing the risk that firms can't fill vacancies. The role of adjustment costs could be particularly important during the GFC if the impact of the recession is not uniformly distributed over industry or space. In the presence of frictions preventing workers or firms from moving freely (eg, moving or training costs), sub-national labour markets are likely to be an important source of heterogeneity in hiring outcomes.[6]

Our paper, therefore, attempts to disentangle the relative influence of firm characteristics, persistence, the business cycle and local labour market condi-

[2]Cyclical changes in the search behaviour of firms over the cycle might also lead to observed differences in hiring outcomes. While the actual activities firms undertake to search for and screen applicants are not well understood, there is some direct evidence that firms vary their effort and/or mode of search over the economic cycle (see Oyer and Schaefer 2011 for a review). Using US data, Davis et al. (2012b) also demonstrate that a constructed measure of "recruitment intensity" declines markedly during the recession, with substantial heterogeneity in behaviour across industries.

[3]Haskel and Martin (2001) extend this latter analysis to look at the relationship between reported skills shortages and technical change. Using the same data, Green et al. (1998) also explore the correlates of reported skills shortages, hard-to-fill vacancies and hiring difficulties, though their emphasis is on describing differences between these concepts.

[4]Petrongolo and Pissarides 2001 review the matching function literature.

[5]Mok et al. (2012) make use of lagged firm characteristics in their study.

[6]Holzer (1994) represents an early attempt to relate labour market conditions to hiring outcomes (job vacancy rates). Both he and Haskel and Martin (1993a) exploit regional variation to estimate the impact of the unemployment rate, and demand from other firms, on firm-level hiring difficulties.

tions on reported hiring difficulties. We begin by describing aggregate trends in hiring outcomes, noting a clear decline in reported hiring difficulties after the onset of the GFC. We then document strong persistence in reporting over time at the firm-level – a pattern that is weakened by the recession.

Following the guidance of the matching function literature, we relate reported hiring difficulties to variations in aggregate industry demand (represented by industry-year fixed effects) and local labour market effects (measured through regional employment shares and additional variables designed to capture localised demand for workers and labour market liquidity). We also explore the relationship between firm characteristics and hiring difficulties, where we are particularly interested in whether "better performing" firms have less difficulty recruiting.

Because of the large number of firm characteristics available, we adopt a two-stage approach. In the first stage, we show that – in a univariate setting – most measures of "better" performance are associated with a greater likelihood of reporting hiring difficulties. These measures are also positively correlated with two variables which capture the ability of the firm to attract workers by meeting the market wage rate (a firm wage premium) and/or by providing attractive non-wage conditions (proxied by the share of moderate-tenure workers who go on to become long-tenure workers). At the second stage, in a multivariate setting, we focus on these two latter variables together with other workforce characteristics (such as the occupational composition and the size of the firm) and lagged hiring outcomes.

Regressions confirm that firm-level persistence is a dominant feature of the data, with one- and two-year lags of reported hiring difficulties both positively related to current difficulties. We find that firms paying higher wages are also more likely to report difficulties when trying to hire skilled workers, while firms with more long tenure workers are less likely to report any difficulty hiring. Local labour market conditions appear unrelated to reported hiring difficulties.

Section 2 outlines the specifics of the dataset, while section 3 reports results. Sections 4 and 5 summarise our findings and suggest future research directions, respectively.

2 Data

We make use of two components of Statistics New Zealand's prototype Integrated Data Infrastructure – the Linked Employer-Employee Data (LEED) and the prototype Longitudinal Business Database (LBD).[7] From LEED, we use monthly pay information for all wage-earners over the 2004 through 2012 years,[8] excluding wage-earners who are also owners of the firm, or who are not employed on the 15th of the month.[9] From the LBD, we make use of data from the Business Operations Survey (BOS), run annually from 2005 to 2011, and the Longitudinal Business Frame (LBF).[10] The LBF supplies longitudinal firm identifiers, repaired using the method of Fabling (2011), and the firm industry classification.

The BOS provides firm-level data on hiring difficulties and other business characteristics. It is a sample survey of private-for-profit businesses over six employment, stratified by industry (largely two-digit ANZSIC) and firm size. Statistics New Zealand achieves a response rate of over 80 percent, yielding a useable sample of between six and seven thousand responses per annum, drawn from a population of around 35,000 firms. The survey design includes a longitudinal component, so that 69 percent of respondents (from 2006 onward) also responded in the prior year, and 50 percent (from 2007 onward) responded in both the prior two years. It is this strong panel dimension that allows us to consider the relationship between current and past hiring difficulties.

In the remainder of the section, we explain the construction of the variables drawn from these datasets, starting with the dependent variable.

2.1 Vacancy posting and hiring difficulties

Reported hiring difficulties are elicited for each of four occupational groups, defined in detail in the immediately preceding survey question. Figure 2 shows the question together with the occupational group definitions.[11]

[7] We use the November 2012 LBD archive together with the 2012Q2 LEED snapshot.

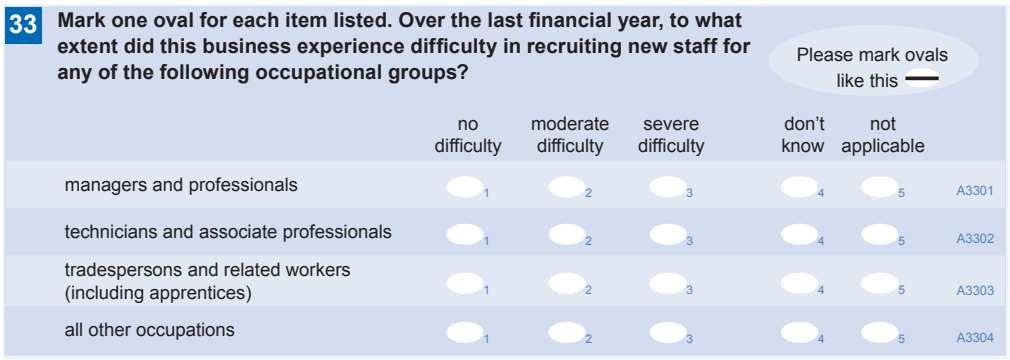
[8] We use March year-ends (ie, we use the period April 2004 through to March 2012) as this is the dominant balance date for New Zealand firms.

[9] The 15th of the month restriction removes workers with very short spells of continuous employment.

[10] Fabling (2009) describes the various components of the LBD.

[11] This question and the accompanying definition of occupational groups are identical in each year of the survey.

Figure 2: Recruitment difficulties question



Occupational groups are defined in the immediately preceding survey question as:
Managers lead organisations, departments or divisions and determine the policy of the organisation or department (eg General Manager, Finance Manager). **Professionals** perform analytical, conceptual or creative tasks with skills equivalent to a bachelor degree or higher (eg accountant, engineer, journalist, computer programmer)
Technicians and associate professionals perform complex technical or administrative tasks, often in support of professionals or managers (eg technical officer, building inspector, legal executive)
Tradespersons and related workers perform tasks requiring trade specific technical knowledge. Include all apprentices and trade supervisors (eg electrician, mechanic, hairdresser, baker)
All other occupations include: *Clerical, sales and service workers* who perform administrative, organisational, liaison, sales and clerical tasks and may provide support services in the fields of finance etc (eg secretary, receptionist, sales representative, waiter); *Production and transport workers* who operate vehicles or complex equipment (eg bulldozer operator, bus driver, store person); *Labourers and related workers* who perform routine tasks, either manually or using equipment (eg cleaner, factory hand, trades assistant); and *All other occupations.*

We exclude observations where any occupational group response was "don't know" to ensure a robust measure of overall hiring difficulties. This restriction results in the loss of 16 percent of the sample.[12,13] The dataset has an average 3.3 observations per firm over the seven years of the survey (36,783 observations from 11,277 firms).[14]

In most analyses we then pool moderate and severe responses together, so that occupational group-specific responses are mapped into two binary variables, posting a vacancy and reporting a hiring difficulty, as follows

	Imposed coding	
Response	Posted vacancy	Hiring difficulty
No difficulty	YES	NO
Moderate or severe difficulty	YES	YES
Not applicable	NO	NO

We interpret "no difficulty" as an indication of posting a vacancy, and "not applicable" (N/A) as an indication of no vacancy posting. Potentially, respondents in firms without vacancies might check "no difficulty" instead of N/A, either because N/A is not explicitly "no vacancy posted," or because the respondent reads left-to-right and selects the *first* applicable response rather than the *most* applicable response. Being able to distinguish between no vacancy posted, and a vacancy being filled with no difficulty is desirable. For example, when we consider the macroeconomic trends in section 3.1, we show a distinct decline in both vacancy postings and difficulty of hiring. If some firms incorrectly report "no difficulty" instead of N/A, then we have

[12]Most questions in BOS have low non-response/"don't know" response rates, around the one-two percent level, reflecting the level of care taken by respondents, and the outcome of substantial field-testing of the survey by Statistics New Zealand. The non-response rate to the hiring difficulties question declines over time – except in 2007 when changes to the (industry) sample design introduced new respondents to the survey – consistent with repeat respondents learning how to answer the questionnaire. Looking at firm characteristics used in regressions, non-responding firms have significantly lower (log) employment, long tenure share, and employment share in trade-related occupations, and significantly higher shares of managers and part-time employees (at the 5% level).

[13]We lose a further 0.8 percent of the full sample because of the absence of employment split by occupational group or full-time/part-time; 0.4 percent because the firm has no employees in LEED; and 1.2 percent due to out-of-scope industries. This latter group is largely made up of firms that became in-scope in 2007 when the population was broadened under ANZSIC'06 (Australian and New Zealand Standard Industrial Classification 2006). We restrict to the ANZSIC'96 industry coverage for consistency over time.

[14]All firm counts are random-rounded (base three) in concordance with Statistics New Zealand confidentiality rules.

underestimated the reduction in the vacancy posting rate, and the change in recruitment difficulties, conditional on posting a vacancy, is unknowable.

Two tests provide evidence in support of interpreting "no difficulty" responses as an indication of having posted a vacancy. First, in BOS 2008, the survey contained an additional question asking for a count of vacancies by occupation.[15] For firms that completed this count question (ie, that had at least one vacancy), their occupational group response agrees with our constructed posted vacancy binary 84 percent of the time. If "no difficulties" is instead interpreted as not posting a vacancy, the two survey questions agree 74 percent of the time.

The second validity test relies on LEED data. Specifically, if a "no difficulty" response equates to a firm posting and filling a vacancy, then we expect to see at least one new worker join the firm during the year. Using LEED, only 3.8 percent of firms that report "no difficulty" hiring in all four occupational groups have no worker join the firm during the year.[16]

Overall, both tests support the hypothesis that a "no difficulty" response is equivalent to a posted vacancy that was easy to fill, over the alternative that such a response is equivalent to a firm not posting a vacancy. While neither test is conclusive, we maintain that former interpretation throughout the remainder of the paper.

Consistent with the wording of the question, we also interpret reported hiring difficulties as representing an *average* level of difficulty across all vacancies posted within an occupational group. This interpretation precludes the possibility that better firms are more likely to report hiring difficulties simply because they post more vacancies (eg, because firms report hiring difficulties when some absolute *level* of bad hiring experiences is reached).[17]

[15]This question had six occupational classes (managers and professionals separately, and clerical, sales and service workers split out from other), which we collapse back to the four categories used in the hiring difficulties question.

[16]This compares to 17.4 percent for firms that report "'N/A" in all four categories, and 1.6 percent for all other firms. The rate for firms reporting N/A in all categories is much lower than might be expected, but this may be due to differences in the reference year we use for all firms (March year) and the period respondents use. This latter period is supposed to be the firm's financial year, though in practice it could be a more variable length reference period up to the time they mail back the survey (generally August-October).

[17]Ideally, we would control for the numbers of vacancies posted, but these are available only in 2008. For that year, the coefficient on the occupation-specific (log) vacancy count (divided by total employment) is significant at the 10 percent level for only one occupational group (all other occupations, $p = 0.054$) when added to the matching occupational group regression in table 15. Two of the four point estimates are positive, while the other two

2.2 Employment, tenure and earnings

From LEED, plant employment is summed to create log total employment at the firm level, $\ln(L)$, and used together with the LBF to allocate firms to a predominant (employment-weighted, all years pooled) two-digit ANZSIC'96 industry. Total employment is used as a control for firm size, while the permanent industry forms the basis for the aggregate demand shocks (industry-year fixed effects). Plant-level employment is also used to construct the share of employment that a firm has in each Labour Market Area (LMA), which are also included in regressions directly.[18]

We use a firm wage premium estimated from a two-way fixed effect model similar to Hyslop and Maré (2009), but constructed at the firm level and with the same worker restrictions applied as in our measure of total employment (as in Maré et al. 2013). This measure picks up whether a firm tends to pay higher wages, relative to other firms, controlling for the fact that some workers are paid more than others, regardless of where they work.[19]

Theoretically, the relationship between the firm wage premium and hiring difficulties is ambiguous. Firms may pay above average wages in the hope of making it easier to secure the workers they need (implying a negative relationship, if such a strategy succeeds). Alternatively, because they pay higher wages, they may reject more candidates (implying a positive relationship).

We also construct a measure of how well firms retain staff – the long tenure share – by using LEED to calculate the proportion of workers who attain two years of tenure at a firm, that also reach four years of tenure. By excluding workers who never attain two years of tenure we, hopefully, remove any immediate reverse causation from hiring difficulty to the tenure profile. To further mitigate this issue, we pool workers over all time so that, like the firm wage premium, this is treated as a time-invariant characteristic of the firm.[20]

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are negative. Overall, these results support the interpretation of the reported outcome variable not being directly related to the number of vacancies posted.

[18] LMAs are defined following Papps and Newell (2002), using the 58 LMA grouping, and reflect Census-based commute-to-work patterns.

[19] We renormalise Maré et al.'s estimate of the firm wage premium to be zero-mean for our weighted population. These two-way fixed effects estimates were compiled on an earlier vintage of LEED, meaning that there are a very small number of firms for which the measure does not exist. For those firms, we set the premium to zero, and include an (unreported) dummy in regressions set to one for firms with missing data.

[20] Pooling workers across years increases the number of firm-year observations for which this measure can be calculated. Despite this, there remain a small number of firms for which this measure cannot be derived either because the firm has not been an employer for four

The expected sign on this variable, too, is ambiguous. The coefficient on the long tenure share could be positive if firms achieve better long-term matches by being more selective at recruitment. Alternatively, the estimated relationship could be negative if the long tenure share reflects non-wage job characteristics that keep workers with the firm (ie, the firm offers good non-wage conditions), if a high share provides a positive signal to potential hires (ie, a reputation effect), or if having a larger share of long tenure workers means that the firm does not need to recruit experienced staff and such staff are relatively hard to hire.

The BOS also includes broad measures of occupational mix (employment shares in each occupational group) and hours (the share of workers who are part-time). Including the first of these in regressions controls for variation in the incidence of vacancy posting by occupation, while the latter controls for any hours effect on wages not removed by the estimation of the firm-level wage premium.[21]

2.3 Measures of high-performance

We present simple statistics on the correlation of various high-performance firm characteristics with reported hiring difficulties, and with the firm wage premium and long tenure share. These characteristics come from the BOS, and are firm age plus binary variables capturing whether, in the year, the business:[22]

- performed research & development
- was party to a merger or acquisition
- had a collective employment agreement
- made major technological change
- was a dominant competitor
- had overseas direct investments
- exported
- exported to a new market
- invested in expansion
- innovated
- was foreign-owned

years in the LEED data, or because the firm has never had a worker with a two year tenure. The measure is set to zero for these firms and there is a separate (unreported) dummy variable, set to one for these observations, included in regressions.

[21] LEED does not include hours worked, but the two-way fixed effect estimate makes an hours adjustment to the wages of workers who appear to be part-time (eg, multiple job-holders, beneficiaries, and where wages fall below the statutory minimum for a 40 hour week).

[22] Innovation is defined in the survey as the development or introduction of new or significantly improved products, operational or organisational processes, or marketing methods. Dominant competitors self-report having no more than one or two competitors.

In addition we examine the relationship between hiring difficulties and self-reported relative performance metrics covering the following outcomes:

- profitability
- productivity
- cost
- time to supply
- quality
- flexibility
- customer satisfaction
- employee satisfaction

and captured as binary variables, set equal to one for respondents reporting better than average performance.

2.4 Local labour market variables

We construct three LMA-level variables: excess turnover, which captures liquidity in the hires market as measured by the gross flows of workers between firms; net employment growth, which picks up external demand for labour (ie, whether local firms are expanding or contracting); and (log) average total employment in the LMA, which captures any benefit arising from larger labour markets. These are defined initially at the industry-LMA level as follows

$$\text{excess turnover}_t = \frac{2\min(\text{acc}_t, \text{sep}_t)}{L_{t-1} + L_t}$$

$$\text{net employment growth}_t = \frac{2(\text{acc}_t - \text{sep}_t)}{L_{t-1} + L_t}$$

$$\text{log average } L_t = \ln((L_{t-1} + L_t)/2)$$

where acc_t is the industry-LMA-level sum of accessions (workers at firms during t, but not $t-1$), sep_t is summed separations (workers at firms during $t-1$, but not t), and L_t is total employment during the year.[23]

To get from the industry-region to the firm-level, we apply a weighting scheme. Recognising that a firm in a particular industry is unlikely to source new employees equally from other industries, we use an industry-transition matrix calculated from all workers who change jobs to weight each LMA-industry statistic. Consider a dairy farm as an example – new workers at

[23] Worker movements across LMAs, but within firms (eg, staff relocations), are excluded from flow measures because these may reflect reallocation of workers by Statistics New Zealand, rather than actual employee moves. Papadopoulos (2008) summarises the issues of administrative churn at the plant-level. In unreported regressions, we re-estimated all regressions with LMA-level variables constructed excluding multi-location firms entirely. Results were very similar.

dairy farms are substantially more likely to have worked in agriculture previously, than in finance and insurance (or any other industry). The weighting scheme uses those transition probabilities to provide greater weight to labour market conditions in industries which are more relevant to the receiving industry.[24,25]

3 Analysis

3.1 Macro trends

Figure 3 plots aggregate (survey-weighted) trends in vacancy posting and hiring difficulties over time, for any vacancy (bold line), and by occupational group. Across all metrics, there is a clear decline between 2008 and 2009 coinciding with the onset of the GFC. Focussing on the overall statistics, the share of firms posting vacancies dropped roughly 10 percentage points (panel A), while those reporting any hiring difficulty dropped 20 percentage points (panel B). Conditioning on posting a vacancy, this converts into a 15 percentage point drop (from 75 to 60 percent) in firms with any hiring difficulty (panel C). This drop is similar in level whether we look at any hiring difficulty (panel C) or only severe difficulties (panel D), though in the latter case this implies a larger proportionate decline in the rate. By 2011, neither vacancy nor hiring difficulty rates had returned to pre-GFC levels, consistent with the weakness of the New Zealand economic recovery.

Occupational groups show similar patterns of decline in reported hiring difficulties, though the magnitude of the drop differs across groups. Conditional on posting a vacancy, firms found it easier to hire in all occupational groups post-2008, with declines in the 15-25 percentage point range (panel B). The less-skilled "all other occupations" group (OTH) stands out as the group with both the highest vacancy posting rate, the lowest "any difficulty" rate (post-GFC and conditional on posting), and by far the least severe difficulties in hiring. Managers & professionals (MAP), and technicians & associate professionals (TAP) groups show no decline in vacancy posting, compared with "less skilled" jobs.

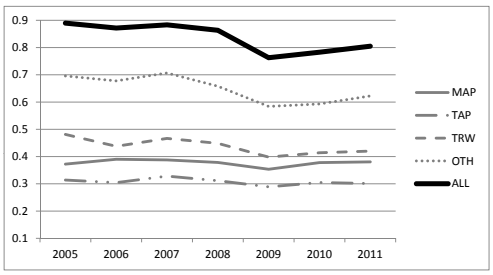
[24] In practice, while this weighting affects coefficients on LMA-level variables, it produces the same overall pattern of results as measures at the aggregate LMA level.

[25] Firms in multiple regions have labour market variables that are weighted by firm-level LMA employment shares. For example, a firm with nine employees in Hamilton, and one employee in central Auckland, will have firm-level LMA variables that are 0.9 of the Hamilton LMA value plus 0.1 of the Auckland LMA value.

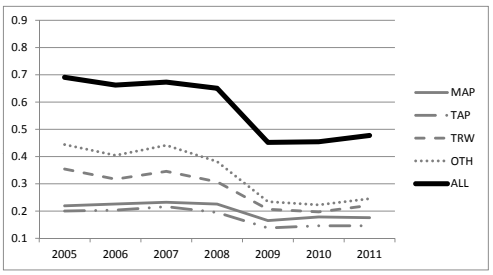
Figure 3: Aggregate trends in vacancy posting and hiring difficulties – overall and by occupational group

Share of all firms

A. Posting a vacancy

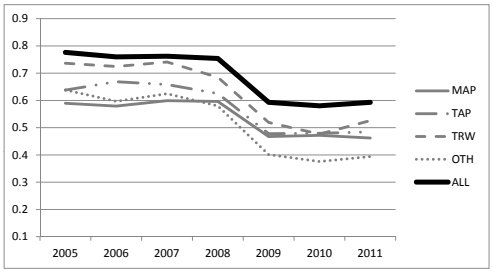


B. With any hiring difficulty

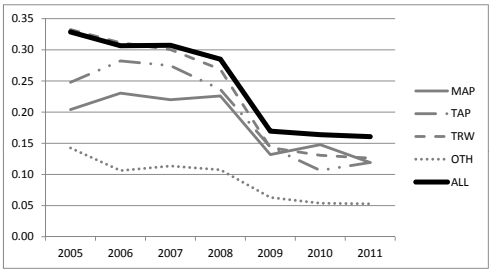


Share of firms posting a vacancy

C. With any hiring difficulty



D. With a severe hiring difficulty (different scale)



Survey-weighted population estimates derived from the subsample with useable responses across all four occupational groups. Posting a vacancy defined as a no/moderate/severe difficulty response. Any difficulty includes reported moderate or severe difficulty. Occupational groups are: managers and professionals (MAP); technicians and associate professionals (TAP); tradespersons and related workers (TRW); and all other occupations (OTH).

Pre- and post-GFC, rates are relatively stable. In the next section, we investigate whether this stability is related to persistence at the firm-level and whether persistence patterns have changed over time.

3.2 Persistence at the firm level

Tables 1 and 2 show one-year and two-year transition matrices for reported difficulties, by occupational group. These tables include entry and exit from posting a vacancy since, eg, firms may choose to cease advertising a role if they cannot find a suitable worker. The final column shows the share of firms in each prior year $(t-1)$ state.[26]

One-year patterns (table 1) show clear persistence over time across all occupational groups, with the main diagonal element (same response in consecutive years) being the most common outcome in all but two cases.[27] For example, in the managerial occupational group (MAP), three quarters of firm that didn't post a vacancy in the year also didn't post a vacancy in the following year. Just over half (54 percent) of firms reporting moderate difficulty hiring continue to report moderate difficulty in the following year, while 43 percent of severe difficulties are persistent. Conditional on continuing to post a vacancy, these rates of persistence are 66 $(= 0.539/(1-0.186))$ and 52 percent, respectively.

By comparison, two-year transitions (table 2) show weaker persistence, on average, because hiring difficulties appear to ease over this longer timeframe. That is, transition rates below the diagonal rise more than transition rates above the diagonal, compared with the one-year table. This apparent difference may in part be because of the extreme nature of the macroeconomic shock in 2008-9. From a purely statistical perspective, this shock becomes relatively more important in the two-year transition table because, only one (out of six) one-year transitions spans 2008-9, but two (out of five) two-year transition span this pair of years.

Table 3 show one-year transitions split by time rather than occupational

[26] Unlike the aggregate statistics in section 3.1, these numbers are unweighted. Since large firms are more likely to report difficulty hiring and have lower survey weights (ie, are in fuller coverage strata), hiring difficulty rates are higher in unweighted statistics.

[27] The exceptions are: for TAP, where transitions from no difficulty to no vacancy have a higher incidence rate; and for OTH, where transitions from severe to moderate difficulty are more likely.

group.[28] At the onset of the GFC ($t = 2009$), persistence rates dropped markedly, consistent with the aggregate patterns shown in figure 3. In particular, on average, firms facing moderate (severe) difficulties in 2008, were 16 (seven) percentage points more likely to face no difficulty hiring in 2009 than in earlier years. From 2009 onwards, having no difficulty hiring is more persistent than pre-GFC, due largely to fewer firms making the transition from no difficulty to moderate difficulty. Severe hiring difficulties remain less persistent than pre-GFC, but the persistence of moderate hiring difficulties returns to pre-2009 levels. Despite these differences, the pattern post-GFC is a return to the main diagonal dominating, though only barely for firms initially reporting severe difficulty hiring.

Table 4 repeats this analysis, but using the binary hiring difficulties measure used in most subsequent regressions. That is, firm-occupation responses are combined into a single "vacancy posted"-"any difficulty" pair. Collapsing to a single, rather than occupational group-specific, outcome measure starkly emphasises the persistence of (any) hiring difficulties. Across all three time periods, having a lagged hiring difficulty is the most likely state (last column, shares ranging from 55-77 percent of firms), and the persistence of reported hiring difficulties is the strongest diagonal element in each period, even for the period spanning the onset of the GFC ($t = 2009$). Having said that, the persistence of "any difficulty" declines by 21 percentage points and does not recover to pre-GFC levels in later years.[29]

Table 5 extends this point by looking at those firms that post vacancies over three consecutive years (either 2005-2007 or 2009-2011). Eight potential patterns of reporting any hiring difficulty are possible, and these are represented in binary form in the leftmost column of the table, where a one denotes any difficulty. The largest (absolute) changes in firm shares occur for the groups

[28] Each firm-occupation group response is treated as a separate observation (ie, each firm contributes four observations in a year).

[29] We also examined whether firms changing state after the onset of the GFC were different from non-changers. Specifically, we took firms posting vacancies in both 2008 and 2009, and looked at whether the transition from having any difficulty to not having any difficulty was any less prevalent for firms with each of the worker and firm characteristics listed in tables 7-9. Overall, there was not a strong systematic relationship between better performance and weaker (or stronger) likelihood of changing state, with only the following groups being significantly associated with being less likely to make the transition (at 5% level): doing R&D; being foreign-owned; having a collective employment agreement; being larger; having a higher TAP or TRW employment share; having a lower OTH employment share; paying higher wages; having higher relative quality or lower relative employee satisfaction. Firms with other high performance characteristics (eg, exporting or being an innovator) showed no significant differences from their low performance group.

with no variation in reporting – firms that never report any difficulty account for 4 percent of the sample before the onset of the GFC and 15 percent after, while firms that always report some difficulty account for 73 percent of the sample before and 48 percent after. Combined, firms that never change state (over a three year period) account for at least 63 percent of the sample.

3.3 Hiring difficulties and firm characteristics

Tables 6-9 relate hiring difficulties pre- and post-GFC, conditional on posting a vacancy, to various firm characteristics. Each table follows the same pattern – the leftmost column describes a firm grouping (either industry or firm/worker characteristics); the second column reports the (survey-weighted) share of that grouping of firms in the population; the next four columns then show the level of reported hiring difficulties by occupational group over the 2005-2008 (pre-GFC) period; the following four columns shows by how much that level is different in the 2009-2011 (post-GFC) period; and the final two columns show the average firm wage premium and long tenure share for each group.

For ease of reference, each table includes equivalent statistics for the whole economy (in bold) and orders the groupings from most likely to report difficulties in the pre-GFC period to the least likely.[30] That is, firms in groups above the "whole economy" row are more likely than the average firm to report difficulty, and, by extension, more likely than the group without the characteristic to report a hiring difficulty.

For example, consider the contemporaneous relationship between reported hiring difficulties and being an exporter (table 7, eighth row). In the population of firms with six or more employees, exporters constitute almost 16 percent of firms. Conditional on posting a vacancy, between 61.3 and 71.6 percent of exporters report having hiring difficulties pre-crisis, depending on the occupational group of the vacancy. These rates are 4-5 percentage points higher than the economy-wide average (second from bottom row, in bold) in professional occupational groups ($= 0.629 - 0.591$ for MAP, and $0.694 - 0.647$ for TAP), and are similar to economy-wide averages for trades (TRW) and other occupations (OTH). Post-GFC, exporters experience a slightly greater percentage point decline in reported hiring difficulties than

[30] Since these statistics are conditional on posting a vacancy, we weight across the four occupational groups by the number of firms posting vacancies to construct the ranking. Hence, for a particular occupational group it is not necessarily the case that hiring difficulty rates are rank-ordered.

the population as a whole, though the percentage point difference is at most 2 percent (for TRW). Consistent with international studies (eg, Schank et al. 2007), exporters pay an average 5.5 percent wage premium to their workers (second-to-last column, mean significantly different from non-exporters at the one percent level). They also have a 4.5 percentage point higher long tenure share than the average firm.

The relationship between employee satisfaction, hiring difficulties, wages and long tenure (last row of table 8) is, perhaps, worth highlighting. Of the high self-assessed performance metrics, firms in this group have the lowest average levels of reported hiring difficulty (pre-GFC), an above average (one percentage point) long tenure share, and only slightly above average wage premium. Together, these factors are suggestive of non-wage conditions playing a role in hiring decisions.

There is substantial heterogeneity across firm groups and also across occupations (within groups), both in terms of initial levels of reported hiring difficulties, and in percentage point changes after the onset of the GFC. For example, in construction (table 6, row 4) – which accounts for 10 percent of firms in the population – 80 percent of firms that post trades-related vacancies report some difficulty hiring pre-crisis, with this number dropping to 55 percent post-crisis. At the same time, these firms found managerial and professional vacancies (MAP) relatively easy to fill before the GFC (difficulty hiring rate of 51 percent pre-crisis compared to the whole economy rate of 59 percent), and even more so after (31 percent compared with 47 percent for the whole economy). At the other end of the spectrum, property and business services firms have relatively more difficulty hiring managers (71 percent pre-crisis), and relatively less difficulty hiring trades-related workers (57 percent).

Despite this heterogeneity, there are common patterns across these groups. High performance firms (table 7-9) are more likely to report hiring difficulties than other firms. This evidence, together with the positive wage premia associated with these firm types, is more consistent with economy-wide skills shortages or thin markets, than an inability of firms to attract workers at the market rate. Ranking by firm premium is also evident in the industry table, with most below-average wage industries having low rates of reported hiring difficulties – the exception being accommodation, cafés and restaurants where 71 percent of firms report hiring difficulties in the unskilled (OTH) category, compared with the economy-wide average of 61 percent.

Paying a wage premium is positively associated with a higher long tenure share at the group level. At the firm level, the correlation between the

two variables is 0.154. In subsequent regressions we disentangle the relative contribution of each of these factors in explaining hiring outcomes.

Almost without exception, hiring becomes easier post-crisis regardless of the firm type considered.[31] Only accommodation, cafés and restaurants, and mining experiencing increases in difficulty hiring, both within the managerial (MAP) occupational group.[32]

Workforce composition (occupation and part-time share) is linked to overall reported hiring difficulties for at least two reasons. First, there are substantial differences in reported hiring difficulties by occupational groups, and workforce composition partly determines whether a vacancy is posted in a category. Over and above this, as can be seen in table 9, firms with a higher proportion of workers in a given occupational group are more likely to report hiring difficulties in that category, conditional on posting a vacancy. For example, firms with above average shares of technicians and associate professionals (TAP), have a hiring difficulty rate eight percentage points higher than the economy-wide average for TAP workers (table 9, row 2).

Finally, estimated average wage premia are consistent with reported workforce composition shares. Firms with higher proportions of skilled workers pay higher average wage premia while, conversely, firms with high proportions of low-skilled (OTH) workers have below average pay. Firms with more part-time workers appear to pay a lower wage.

3.4 Regression results

We now turn to a regression approach to estimate the relative influence of macroeconomic conditions (eg, industry demand), local labour market conditions, firm characteristics and persistence in reported hiring difficulties. In short-hand, regressions are of the form

$$\mathrm{D}_{it} = \lambda_{jt} + \beta_s \mathbf{s}_{ikt} + \beta_A \mathbf{A}_{jkt}\mathbf{s}_{ikt} + \beta_Z \mathbf{Z}_{it} + \beta_{D_1}\mathbf{D}_{it-1} + \beta_{D_2}\mathbf{D}_{it-2} + \epsilon_{it}, \quad (1)$$

where i, j, k, t index firm, industry, location and time respectively. The dependent variable, D_{it}, is a binary indicating any reported hiring difficulty,

[31] This is not trivially obvious in tables 7-9, since "non-characteristic" group statistics are not reported. If changes in hiring difficulties have a negligible effect on the share of the population with the characteristic (p), then the non-characteristic group change can be calculated as $(\Delta W - p\Delta H)/(1-p)$ where ΔW and ΔH are the whole economy and reported group percentage point change respectively. This derived change is always negative.

[32] Mining, at least, represents a very small proportion of the population (and sample).

either across all occupational groups or for a particular group. Lagged occupational group-specific values of the dependent variable are included on the right-hand side along with a set of industry-year dummies controlling for macro conditions (λ_{jt}); firm-level employment shares in each location ($\mathbf{s}_{ikt}$); local industry-specific labour market characteristics ($\mathbf{A}_{jkt}$); firm characteristics ($\mathbf{Z}_{it}$); and an error term (ϵ_{it}). Coefficients are estimated using probit regression, either for all firms or for only those firms posting a vacancy.

As we have seen, many firm characteristics are correlated with reported hiring difficulties. In this section, we simply use the firm wage premium and long tenure share as summary measures of good firm performance. This parsimonious approach escapes the problem of including highly-correlated measures of superior firm performance, where estimation of coefficients may be difficult. Further, if firm-level choices and outcomes are affected by hiring outcomes, this approach avoids reporting a large number of biased coefficients. In principle at least, in-so-far as these other metrics do not proxy for non-financial benefits to workers over and above that captured by the long tenure share (eg, higher job satisfaction), then the included variables are likely a sufficient measure of the firms' ability to meet the market price for a worker. In robustness tests, we assess the effect of adding additional direct measures of non-wage work practices.

Both the direct relationship between workforce characteristics and reported hiring difficulties, and the desire to remove compositional effects from the firm wage premium lead us to also include firm size, and occupational group and part-time employment shares in $\mathbf{Z}_{it}$. Summary statistics for these firm-level variables are reported in table 10.[33] This table also demonstrates the structure of the lagged hiring difficulties variables we include. Specifically, we allow for three types of firm-occupation groups, based on the observed persistence patterns discussed earlier: those with no hiring difficulty; those with hiring difficulties; and those who did not post a vacancy (the reference group).[34]

Since both LMA shares and aggregate industry-year dummies are included in regressions, the potential impact of local labour market characteristics – the excess turnover rate of employment, net employment growth, and total

[33]The table reports unweighted statistics, so the mean of the firm wage premium and long tenure share differ from the economy-wide averages reported in earlier tables.

[34]In unreported regressions, we also included third lags of these variables. These display similar patterns of significance as the second period lags, with smaller coefficients. We do not include these results in the paper, since this results in a substantial loss in the sample, affecting the precision of all estimated parameters, and reduces the pre-GFC period to a single year.

average employment in the LMA – is identified from temporal variation at the LMA-level not correlated with national macroeconomic effects.

Table 11 shows the ability of the business cycle (industry-year dummies) and firm location (firm-level LMA employment shares) to account for variation in reported hiring difficulties. Columns 1-3 report year dummy coefficients for full sample regressions, either including only those dummies, including industry-year dummies, or industry-year dummies with LMA employment shares.[35] Columns 4-6 repeat the same analysis for the subsample of firms posting at least one vacancy during the year. Industry-specific business cycle effects (columns 2 and 4) account for roughly 6 percent of variation in hiring difficulty outcomes, whilst the addition of LMA employment shares adds little in explanatory power and has virtually no influence on estimated main year effects (columns 3 and 6), suggesting that cyclical declines in reported hiring difficulties were universal across regions. Indeed, visual examination of estimated LMA share coefficients show no systematic geographic patterns.

Table 12 shows the result of controlling solely for firm characteristics (other than industry and location). Initially the firm wage premium and the long tenure share are included individually (columns 1-2 & 6-7) and then together (columns 3 & 8), before additional workforce characteristics are added (columns 4-5 & 9-10). Total firm employment is added before other covariates, to demonstrate that inclusion of this variable causes a large change in the estimated coefficient for the firm wage premium.

As intimated by the performance group summary statistics, a positive wage premium is associated with an increased likelihood of reporting hiring difficulties, while better worker retention (high long tenure share) is associated with lower reported hiring difficulties. These estimated coefficients are slightly larger when both measures are included, reflecting the mild positive correlation between the two. Focussing on columns 3 and 8, marginal effects are stronger where all firms are included in the regression, compared with models estimated solely on those firms posting vacancies, consistent with higher wage (tenure) firms being more (less) likely to have a vacancy.

Conditional on posting a vacancy, a 10 percent rise in the firm wage premium is associated with a 2.5 percent rise in the likelihood of reporting a hiring difficulty (column 8). This estimated coefficient halves when log firm employment is added to the regression, whilst the coefficient on the long tenure share remains largely the same (column 9). Larger firms are more likely to

[35]Note that 2007 is the reference year throughout the paper, since this is the first year included in analysis with lagged hiring difficulties.

report hiring difficulties also – consistent with the "better firms have more difficulty" hypothesis. With the addition of other firm controls (column 10), and unlike the long tenure share, the firm wage premium is no longer significantly related to hiring difficulties. In part this may be because the premium varies systematically with occupation shares (see table 9), and firms with more workers in high-skilled occupations are also more likely to report hiring difficulties.

In unreported regressions, we also tested whether the inclusion of 17 non-wage business practice indicators had any impact on estimated coefficients.[36] We expect these additional controls to reduce the size of the estimated coefficient of the long wage tenure variable if workers stay at firms because of non-wage practices. Conditional on posting a vacancy, however, including these measures has a limited effect on the estimated coefficients of the long tenure share (and the wage premium). Specifically, relative to the full model for firms posting vacancies (column 2 of table 14), inclusion of non-wage variables increases the long tenure share coefficient from -0.093 to -0.085 (still significant at the one percent level), and reduces the firm wage premium coefficient from 0.053 to 0.043 (still insignificant at the five percent level).

Table 13 shows the effect of, firstly, reintroducing business cycle and firm location controls to the model with firm-level characteristics (columns 1 and 3), and then also adding lagged hiring difficulty variables (columns 2 and 4). The inclusion of macro effects has little impact on estimated firm characteristic coefficients. Similarly, estimated year effects are not affected by the inclusion of firm characteristics, suggesting that changing firm composition is not a major driver of macroeconomic patterns.[37]

The introduction of lagged hiring outcome variables (columns 2 & 4), conversely, has a marked impact on estimated coefficients for both firm characteristics and year effects. This is perhaps not surprising, since both outcomes

[36] These practices are only available in 2006 (BOS questions C17 and C19) and cover both the availability of flexible work arrangements (eg, job sharing, working from home, flexible start and finish times) and other employment practices (eg, employee feedback, childcare, access to additional leave). Each practice is represented by a binary set to one if the practice is held. For the purpose of the robustness test, firms non-wage practices are assumed to hold constant over all time, perhaps a reasonable assumption given that Fabling and Grimes (2009) show that human resource management practices within New Zealand firms are persistent over a four year period (62 and 80 percent of firms maintain consistent individual practices). A further dummy was included and set to one for the 16 percent of firms not in the 2006 sample.

[37] Alternatively, the selection of largely slow-moving or time-invariant firm characteristics imposes this relationship.

and firm characteristics are highly persistent features of the firm. Conditioning on posting a vacancy, hiring difficulties in the previous year raise the marginal probability of reporting hiring difficulties in the current year by between 6 and 12 percent, depending on the occupational group. While still positive and significant, the relationship is weaker going back two years (controlling for one-year lags), with the probability of having hiring difficulties 4-5 percent higher. Firms that had no difficulties in previous years are less likely than firms posting no vacancy to have trouble filling vacancies, though estimated coefficients are only sometimes different from zero (focussing on column 4).

In table 14, local labour market employment variables are added to the model. These add little to the model over and above aggregate industry shocks and LMA share variables, with the single significant coefficient (on excess turnover, column 2) having the opposite sign to expectation. The absence of clear effects from the local labour market may be because the main effect on hiring difficulties comes from the national or international labour market; that the local labour market is important but that it largely moves over this period with national (industry-year) trends; or that the LMA-level variables derivable from LEED are not the correct measures to include. Alternatively, it could be that LMA effects are captured by the other covariates included in the model.

In unreported regressions, we estimated models including only macro effects, LMA shares and local labour market variables (ie, excluding firm characteristics). In the sample where all years are included, both net employment growth and average LMA employment have positive coefficients (significant at the 5 percent level). Reducing the sample to observations where lagged firm characteristics are available (but not included) causes the coefficient on net employment growth to become smaller (and insignificant). The coefficient on total LMA employment becomes insignificant with the subsequent inclusion of firm characteristics. That is, in the absence of firm controls, it appears that larger labour markets yield worse hiring outcomes for firms (counter to the expected role of labour market liquidity). Once we control for the fact that larger, higher paying, more skilled-labour-intensive firms are more likely to be located in cities, this apparent relationship disappears.[38]

Finally, since average hiring difficulties and persistence patterns differ across occupational groups, table 15 reports regressions where the independent vari-

[38]This finding is akin to that of Maré et al. (2013), who show that the positive relationship between local workforce characteristics and average firm innovation outcomes disappears in the presence of direct controls for firm practices.

able is a reported hiring difficulty in each of the four occupational classes. For brevity, this table only reports results conditional on reporting a vacancy in that occupational group. Consistent with the raw summary statistics reported earlier, firms with higher shares of employment in the respective occupational group are more likely to report hiring difficulties (bold employment share coefficients).[39]

Greater hiring difficulties for larger firms are apparent for all occupational groups, outside of the unskilled (OTH) category. While coefficients differ across occupations, signs of point estimates for the firm wage premium and tenure share variables remain unchanged (except for the "all other" occupational group). Significant relationships between hiring difficulties and wages are only apparent for the managers and professionals group. Finally, the lagged coefficients show the same pattern exhibited by the employment share variables – the main relationship between current and lagged hiring difficulties is within occupational group (again, these coefficients are in bold for ease of reference). Having said that, there is evidence over and above these main relationships, that past hiring difficulties in other occupations also predict broader hiring difficulties, with nine of the 24 other coefficients on lagged "any difficulty" variables being positive and significantly different from zero at the one percent level.

4 Conclusions

Understanding the extent to which hiring difficulties are persistent, and the characteristics of firms that face these difficulties, provides a useful lens for thinking about skills shortages and the functioning of the labour market. Since the onset of the Global Financial Crisis, aggregate reported hiring difficulties have declined substantially, suggesting a strong role for macroeconomic and/or local market conditions in determining firms' success in hiring. Motivated by this, we have examined the relative influence of the business cycle, local labour market conditions, persistence and firm characteristics in determining hiring outcomes.

Both descriptive transition matrices and econometric evidence point to strong persistence in firm-level reporting of hiring difficulties. These persistence

[39] Recalling that the "all other occupations" (OTH) employment share is the reference group, the fact that all reported employment share coefficients are negative in column 4 implies that firms with high OTH share have higher reported hiring difficulty of OTH workers than other firms.

patterns remain despite controls for wage and non-wage work conditions, industry-year fixed effects and local labour market influences. This evidence militates against a "transitory shocks" argument for explaining aggregate hiring difficulties. Subject to posting a vacancy, many of the same firms report hiring difficulties year-on-year.

Firms reporting hiring difficulties are also more likely to have characteristics associated with superior economic performance – being exporters, foreign-owned, larger, overseas direct investors, and R&D performers. This is somewhat counterintuitive, since these firms tend to pay higher wages (controlling for worker quality) and be better able to retain staff. Using the firm wage premium and long tenure worker share as summary measures of firm performance and the ability to provide attractive total remuneration packages to potential employees, probit regressions confirm that these firms are more likely to face hiring difficulties. This finding is further reinforced by positive coefficients on additional controls for firm size and the employment shares of skilled occupational groups.

Taken together, we interpret these results as strong evidence against the "sore losers" hypothesis – ie, the idea that reported hiring difficulties are driven by poor performing firms who cannot pay the market rate for skills. Instead, the results are more consistent with the suggestion of Haskel and Martin (2001) that technical progress may create persistent skills shortages, for a subset of jobs, over long periods of time.

The evidence for local labour market effects is weak, which may be a consequence of the conservative estimation approach. Alternatively, it may reflect the possibility that the potential labour market for New Zealand's larger firms is national or international, in which case the impact of the labour market on hiring outcomes is captured by industry-year fixed effects. If true, this interpretation might imply that less attention should be paid to "local" skill shortages, if such a focus diverts resources from understanding and alleviating skills shortage at the national level.

5 Future research directions

Understanding the labour catchment of new hires of firms may improve our understanding of the role of the local labour market, as well as differences in reported hiring difficulties. In particular, internationally-engaged (both inward and outward) firms are amongst those most likely to face hiring diffi-

culties – future research could usefully address the question of whether these firms have greater access to international labour markets.

Despite strong persistence, firms do transition out of having hiring difficulties. By allowing for time variation in the firm wage premium, we could begin to address the question of whether firms have an ability to affect outcomes using wage policies. Additionally, worker (rather than firm) fixed effects could be used to look at whether firms adjust their expectations over time in the face of persistent hiring difficulties – that is, do firms ultimately "settle" for lower quality (relative to incumbent) workers, and is it this that explains transitions out of reporting hiring difficulties?

The relationship between the firm wage premium, long tenure share, and non-pay conditions is intriguing and warrants further independent investigation. In particular the data could be used to investigate the hypothesis that there are competing high-wage/low-turnover, low-wage/high-turnover business models.

Finally, the question remains as to whether reported hiring difficulties impact on aggregate economic outcomes. The greater incidence of hiring difficulties for larger, high performing firms suggests that firm-level effects might be amplified in aggregate. However, identifying any impact on firm performance may be complicated by the fact that reported hiring difficulties, firm-level practices (such as exporting and R&D), and firm performance are all highly persistent.

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Tables

Table 1: One-year transitions in hiring difficulties

Prior year ($t-1$)		Current year (t): No vacancy	Difficulty: None	Difficulty: Moderate	Difficulty: Severe	Share of firms
Managers & professionals (MAP)						
No vacancy posted		0.754	0.127	0.090	0.030	0.463
Difficulty:	None	0.341	0.435	0.187	0.037	0.189
	Moderate	0.186	0.158	0.539	0.117	0.245
	Severe	0.171	0.087	0.310	0.432	0.103
Technicians & associate professionals (TAP)						
No vacancy posted		0.775	0.103	0.090	0.032	0.557
Difficulty:	None	0.401	0.391	0.166	0.042	0.142
	Moderate	0.265	0.136	0.496	0.103	0.209
	Severe	0.238	0.064	0.301	0.397	0.092
Tradespersons & related workers (TRW)						
No vacancy posted		0.784	0.110	0.080	0.026	0.528
Difficulty:	None	0.360	0.432	0.172	0.036	0.158
	Moderate	0.256	0.163	0.469	0.111	0.205
	Severe	0.177	0.082	0.294	0.448	0.108
All other occupations (OTH)						
No vacancy posted		0.603	0.229	0.143	0.025	0.240
Difficulty:	None	0.188	0.582	0.216	0.013	0.325
	Moderate	0.123	0.255	0.563	0.058	0.370
	Severe	0.124	0.124	0.420	0.332	0.066

Unweighted transitions for all years pooled.

Table 2: Two-year transitions in hiring difficulties

Prior year ($t-2$)		Current year (t): No vacancy	Difficulty: None	Difficulty: Moderate	Difficulty: Severe	Share of firms
Managers & professionals (MAP)						
No vacancy posted		0.719	0.140	0.103	0.038	0.454
Difficulty:	None	0.381	0.370	0.204	0.045	0.180
	Moderate	0.228	0.187	0.468	0.117	0.252
	Severe	0.233	0.125	0.348	0.294	0.115
Technicians & associate professionals (TAP)						
No vacancy posted		0.754	0.111	0.097	0.038	0.548
Difficulty:	None	0.428	0.335	0.198	0.039	0.131
	Moderate	0.301	0.160	0.433	0.105	0.216
	Severe	0.281	0.115	0.327	0.277	0.105
Tradespersons & related workers (TRW)						
No vacancy posted		0.755	0.125	0.088	0.031	0.515
Difficulty:	None	0.418	0.374	0.165	0.042	0.141
	Moderate	0.298	0.190	0.396	0.116	0.217
	Severe	0.230	0.129	0.313	0.329	0.127
All other occupations (OTH)						
No vacancy posted		0.571	0.246	0.156	0.027	0.224
Difficulty:	None	0.215	0.524	0.241	0.019	0.305
	Moderate	0.152	0.313	0.484	0.051	0.396
	Severe	0.136	0.196	0.441	0.228	0.075

Unweighted transitions for all years pooled.

Table 3: One-year transitions in hiring difficulties by t

Prior year ($t-1$)		Current year (t): No vacancy	Difficulty: None	Difficulty: Moderate	Difficulty: Severe	Share of firms
($t < 2009$)						
No vacancy posted		0.739	0.109	0.112	0.040	0.424
Difficulty:	None	0.298	0.427	0.234	0.041	0.168
	Moderate	0.176	0.143	0.562	0.119	0.286
	Severe	0.156	0.067	0.299	0.478	0.123
($t = 2009$)						
No vacancy posted		0.765	0.149	0.070	0.016	0.443
Difficulty:	None	0.353	0.498	0.130	0.018	0.175
	Moderate	0.242	0.299	0.409	0.051	0.280
	Severe	0.243	0.139	0.376	0.243	0.102
($t > 2009$)						
No vacancy posted		0.754	0.140	0.085	0.021	0.478
Difficulty:	None	0.271	0.530	0.177	0.022	0.264
	Moderate	0.193	0.199	0.537	0.071	0.210
	Severe	0.200	0.095	0.338	0.366	0.048

Unweighted transitions for each firm-occupational group observation.

Table 4: One-year transitions in hiring difficulties by t – pooled response

Prior year $(t-1)$		No vacancy	Current year (t) Difficulty None	Any	Share of firms
$(t < 2009)$					
No vacancy posted		0.486	0.237	0.278	0.074
Difficulty:	None	0.128	0.468	0.403	0.158
	Any	0.041	0.089	0.870	0.768
$(t = 2009)$					
No vacancy posted		0.509	0.313	0.179	0.090
Difficulty:	None	0.230	0.577	0.192	0.170
	Any	0.117	0.226	0.658	0.740
$(t > 2009)$					
No vacancy posted		0.490	0.268	0.242	0.151
Difficulty:	None	0.140	0.537	0.323	0.304
	Any	0.065	0.163	0.772	0.545

Unweighted transitions of aggregated response across occupational groups, reduced to two hiring difficulty categories (none, any) as used in subsequent regressions.

Table 5: Hiring difficulty patterns over three years before and after the GFC

Pattern	2005-2007	2009-2011
000	0.041	0.147
001	0.033	0.063
010	0.015	0.030
011	0.049	0.086
100	0.030	0.052
101	0.050	0.070
110	0.049	0.070
111	0.733	0.481
000+111	0.774	0.628

Unweighted hiring difficulties, conditional on posting at least one vacancy in each period, where zero represents no hiring difficulties and one represents any hiring difficulty.

Table 6: Hiring difficulty as a proportion of firms posting a vacancy – by industry

	Pop. share	Level (pre-GFC) MAP	TAP	TRW	OTH	Change (pre- to post-GFC) MAP	TAP	TRW	OTH	Mean Wage premium	Long tenure
Communication services	0.005	0.700	0.810	0.655	0.769	- 0.155	-0.398	-0.516	-0.438	-0.003	0.573**
Transport & storage	0.041	0.561	0.688	0.767	0.766	- 0.187	-0.282	-0.321	-0.289	0.032**	0.683**
Accom., cafés & restaurants	0.099	0.558	0.571	0.763	0.709	0.052	-0.055	-0.111	-0.195	-0.117**	0.429**
Construction	0.100	0.506	0.652	0.797	0.576	-0.195	-0.210	-0.250	-0.275	0.043**	0.664**
Property & business services	0.141	0.706	0.747	0.569	0.620	-0.174	-0.221	-0.193	-0.235	0.065**	0.647**
Manufacturing	0.160	0.570	0.667	0.773	0.598	-0.090	-0.129	-0.198	-0.243	0.027**	0.705**
Wholesale trade	0.093	0.614	0.676	0.707	0.632	-0.192	-0.164	-0.229	-0.180	0.062**	0.685**
Whole economy	**1.000**	**0.591**	**0.647**	**0.722**	**0.610**	**-0.124**	**-0.167**	**-0.214**	**-0.219**	**0.000**	**0.633**
Mining	0.003	0.609	0.675	0.712	0.500	0.038	-0.094	-0.222	-0.144	0.230**	0.698**
Finance & insurance	0.015	0.653	0.664	0.382	0.598	- 0.091	-0.197	-0.139	-0.182	0.145**	0.658**
Electricity, gas & water	0.001	0.545	0.727	0.625	0.500	-0.212	-0.182	-0.339	-0.214	0.214**	0.720**
Retail trade	0.159	0.596	0.583	0.725	0.523	-0.170	-0.190	-0.251	-0.215	-0.052**	0.605**
Education	0.017	0.625	0.620	0.637	0.516	-0.192	-0.162	-0.211	-0.219	-0.054**	0.574**
Health & community services	0.060	0.645	0.629	0.520	0.546	-0.111	-0.100	-0.150	-0.157	-0.047**	0.696**
Agriculture, forestry & fishing	0.088	0.356	0.433	0.622	0.622	-0.073	-0.079	-0.154	-0.218	-0.044**	0.604**
Cultural & recreational services	0.019	0.446	0.570	0.613	0.573	-0.139	-0.163	-0.305	-0.241	-0.078**	0.584**

Industry groups are defined at the one-digit level based on the 1996 Australia-New Zealand System of Industry Classification. Firms are assigned to a permanent industry based on employment shares over time.The pre-GFC and post-GFC periods are April 2004-March 2008 and April 2008-March 2011 respectively. Occupational groups are: managers and professionals (MAP); technicians and associate professionals (TAP); tradespersons and related workers (TRW); and all other occupations (OTH). Groups are ordered from highest to lowest proportion of firms reporting hiring difficulties (weighted across all four occupations by the number of firms posting a vacancy). The final two column shows the average wage premium and long tenure share, respectively, for firms in the group (**; * denotes a mean different from the remainder of the population, significant at the 1%; 5% level).

Table 7: Hiring difficulty as a proportion of firms posting a vacancy – by firm characteristics

	Pop.	Level (pre-GFC)				Change (pre- to post-GFC)				Mean Wage	Mean Long
	share	MAP	TAP	TRW	OTH	MAP	TAP	TRW	OTH	premium	tenure
Foreign-owned	0.071	0.722	0.763	0.720	0.672	-0.120	-0.120	-0.265	-0.208	0.143**	0.650**
Merger & acquisition	0.024	0.742	0.718	0.696	0.642	- 0.171	-0.130	-0.227	-0.256	0.069**	0.610
Major technical change	0.061	0.655	0.757	0.715	0.615	- 0.107	-0.253	-0.258	-0.244	0.042**	0.619
Research & development	0.076	0.645	0.694	0.751	0.606	-0.048	-0.085	-0.207	-0.212	0.054**	0.651*
Older	0.492	0.611	0.671	0.747	0.621	-0.140	-0.185	-0.233	-0.254	0.000	0.691**
Invested in expansion	0.237	0.622	0.692	0.741	0.611	- 0.098	-0.149	-0.200	-0.214	0.018**	0.639
Export market entry	0.042	0.667	0.705	0.726	0.575	- 0.107	-0.196	-0.195	-0.188	0.055**	0.667**
Exporter	0.158	0.629	0.694	0.716	0.613	-0.135	-0.182	-0.238	-0.236	0.055**	0.678**
Overseas direct invest	0.033	0.645	0.720	0.733	0.564	- 0.057	-0.092	-0.195	-0.101	0.105**	0.647
Innovator	0.369	0.617	0.665	0.735	0.617	-0.106	-0.126	-0.186	-0.214	0.012**	0.624**
Whole economy	**1.000**	**0.591**	**0.647**	**0.722**	**0.610**	**-0.124**	**-0.167**	**-0.214**	**-0.219**	**0.000**	**0.633**
Dominant competitor	0.221	0.573	0.655	0.728	0.590	- 0.134	-0.174	-0.239	-0.223	0.001	0.648**

The pre-GFC and post-GFC periods are April 2004-March 2008 and April 2008-March 2011 respectively. Occupational groups are: managers and professionals (MAP); technicians and associate professionals (TAP); tradespersons and related workers (TRW); and all other occupations (OTH). Groups are ordered from highest to lowest proportion of firms reporting hiring difficulties (weighted across all four occupations by the number of firms posting a vacancy). The final two column shows the average wage premium and long tenure share, respectively, for firms in the group (**; * denotes a mean different from the remainder of the population, significant at the 1%; 5% level).

Table 8: Hiring difficulty as a proportion of firms posting a vacancy – by self-reported firm performance

	Pop. share	Level (pre-GFC) MAP	TAP	TRW	OTH	Change (pre- to post-GFC) MAP	TAP	TRW	OTH	Mean Wage premium	Long tenure
Lower time to supply	0.086	0.627	0.655	0.773	0.622	- 0.158	-0.146	-0.232	-0.248	0.026**	0.652*
Higher profitability	0.170	0.657	0.669	0.734	0.612	- 0.220	-0.169	-0.234	-0.229	0.023**	0.646*
Lower cost	0.138	0.613	0.641	0.717	0.623	-0.157	-0.149	-0.218	-0.273	0.002	0.647*
Higher flexibility	0.509	0.584	0.654	0.726	0.615	-0.123	-0.169	-0.215	-0.223	0.010*	0.638*
Higher quality	0.543	0.582	0.652	0.735	0.609	-0.125	-0.170	-0.213	-0.220	0.004**	0.631
Whole economy	**1.000**	**0.591**	**0.647**	**0.722**	**0.610**	**-0.124**	**-0.167**	**-0.214**	**-0.219**	**0.000**	**0.633**
Higher customer satisfaction	0.535	0.567	0.652	0.727	0.611	-0.110	-0.161	-0.217	-0.225	0.001	0.635
Higher productivity	0.237	0.609	0.654	0.717	0.594	- 0.152	-0.156	-0.182	-0.196	0.022**	0.637
Higher employee satisfaction	0.416	0.549	0.635	0.699	0.582	-0.124	-0.176	-0.230	-0.210	0.004**	0.643**

The pre-GFC and post-GFC periods are April 2004-March 2008 and April 2008-March 2011 respectively. Occupational groups are: managers and professionals (MAP); technicians and associate professionals (TAP); tradespersons and related workers (TRW); and all other occupations (OTH). Groups are ordered from highest to lowest proportion of firms reporting hiring difficulties (weighted across all four occupations by the number of firms posting a vacancy). The final two column shows the average wage premium and long tenure share, respectively, for firms in the group (**; * denotes a mean different from the remainder of the population, significant at the 1%; 5% level).

Table 9: Hiring difficulty as a proportion of firms posting a vacancy – by workforce characteristics

	Pop. share	Level (pre-GFC) MAP	TAP	TRW	OTH	Change (pre- to post-GFC) MAP	TAP	TRW	OTH	Mean Wage premium	Long tenure
Higher employment	0.496	0.668	0.710	0.759	0.655	-0.139	-0.181	-0.249	-0.258	0.023**	0.636
Higher TAP share	0.357	0.668	0.728	0.731	0.612	-0.120	-0.149	-0.208	-0.244	0.041**	0.668**
Higher TRW share	0.450	0.580	0.684	0.785	0.593	-0.127	-0.173	-0.222	-0.222	0.005**	0.652**
Higher wage payer	0.500	0.638	0.701	0.745	0.610	-0.140	-0.176	-0.227	-0.233	0.110**	0.667**
Whole economy	**1.000**	**0.591**	**0.647**	**0.722**	**0.610**	**-0.124**	**-0.167**	**-0.214**	**-0.219**	**0.000**	**0.633**
Higher long tenure share	0.498	0.594	0.669	0.720	0.587	-0.134	-0.169	-0.229	-0.222	0.019**	0.785**
Collective agreement	0.232	0.581	0.619	0.724	0.608	- 0.057	-0.115	-0.209	-0.194	-0.008**	0.643*
Higher MAP share	0.494	0.621	0.646	0.686	0.599	-0.133	-0.154	-0.190	-0.243	0.011**	0.643**
Higher OTH share	0.487	0.566	0.577	0.679	0.649	-0.106	-0.151	-0.189	-0.207	-0.031**	0.602**
Higher part-time share	0.500	0.565	0.591	0.691	0.595	- 0.085	-0.146	-0.206	-0.197	-0.058**	0.601**

The pre-GFC and post-GFC periods are April 2004-March 2008 and April 2008-March 2011 respectively. Occupational groups are: managers and professionals (MAP); technicians and associate professionals (TAP); tradespersons and related workers (TRW); and all other occupations (OTH). Groups are ordered from highest to lowest proportion of firms reporting hiring difficulties (weighted across all four occupations by the number of firms posting a vacancy). The final two column shows the average wage premium and long tenure share, respectively, for firms in the group (**; * denotes a mean different from the remainder of the population, significant at the 1%; 5% level).

Table 10: Summary statistics – regression variables

	Mean	St. Dev.
Employment share: MAP	0.194	0.203
TAP	0.090	0.168
TRW	0.150	0.256
$\ln(L)$	3.412	1.277
Firm wage premium	0.044	0.143
Long tenure share	0.649	0.174
Part-time share	0.221	0.276
LMA: Excess turnover rate	0.456	0.091
Net employment growth	0.001	0.051
ln(average total employment)	8.225	1.674
No difficulties $(t-1)$: MAP	0.187	
TAP	0.144	
TRW	0.161	
OTH	0.340	
No difficulties $(t-2)$: MAP	0.181	
TAP	0.132	
TRW	0.140	
OTH	0.308	
Any difficulties $(t-1)$: MAP	0.348	
TAP	0.297	
TRW	0.302	
OTH	0.417	
Any difficulties $(t-2)$: MAP	0.369	
TAP	0.321	
TRW	0.341	
OTH	0.470	

Summary statistics are unweighted for either the full sample (contemporaneous variables) or the full sample with two lagged observations (lagged variables). Occupational groups are: managers and professionals (MAP); technicians and associate professionals (TAP); tradespersons and related workers (TRW); and all other occupations (OTH).

Table 11: Hiring difficulties, macro and location (probit estimates)

Dependent variable: Any	All firms			Firms posting vacancy		
hiring difficulty	(1)	(2)	(3)	(4)	(5)	(6)
$\delta(t = 2005)$	-0.018*	-0.014	-0.013	-0.026**	-0.022**	-0.022**
	[0.008]	[0.008]	[0.008]	[0.008]	[0.008]	[0.008]
$\delta(t = 2006)$	-0.000	0.004	0.004	-0.011	-0.009	-0.009
	[0.009]	[0.008]	[0.008]	[0.008]	[0.008]	[0.008]
$\delta(t = 2008)$	-0.030**	-0.031**	-0.031**	-0.025**	-0.025**	-0.026**
	[0.009]	[0.008]	[0.008]	[0.008]	[0.008]	[0.008]
$\delta(t = 2009)$	-0.218**	-0.219**	-0.219**	-0.186**	-0.187**	-0.188**
	[0.009]	[0.009]	[0.009]	[0.009]	[0.009]	[0.009]
$\delta(t = 2010)$	-0.211**	-0.214**	-0.215**	-0.184**	-0.185**	-0.186**
	[0.009]	[0.009]	[0.009]	[0.009]	[0.009]	[0.009]
$\delta(t = 2011)$	-0.184**	-0.188**	-0.189**	-0.164**	-0.166**	-0.167**
	[0.009]	[0.009]	[0.009]	[0.009]	[0.009]	[0.009]
N(firms)	36,783	36,783	36,783	32,478	32,478	32,478
Pseudo-R^2	0.032	0.064	0.070	0.030	0.060	0.065
Industry-year dummies	NO	YES	YES	NO	YES	YES
LMA employment shares	NO	NO	YES	NO	NO	YES

Reported coefficients are marginal effects from probit estimation with the binary indicator of any reported difficulty hiring as the dependent variable. Robust standard errors in square brackets (**;* denotes significance at the 1%; 5% level, respectively). Industry-year dummies use two-digit ANZSIC'96 industries. LMA shares are firm-level employment shares in each LMA.

Table 12: Hiring difficulties and firm characteristics (probit estimates)

Dependent variable: Any			All firms				Firms posting vacancy			
hiring difficulty	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Employment share: MAP					0.040**					0.090**
					[0.014]					[0.014]
TAP					0.109**					0.138**
					[0.016]					[0.016]
TRW					0.132**					0.141**
					[0.011]					[0.011]
ln(L)				0.124**	0.129**				0.072**	0.081**
				[0.002]	[0.002]				[0.002]	[0.002]
Firm wage premium	0.276**		0.318**	0.110**	0.063**	0.236**		0.251**	0.127**	0.026
	[0.018]		[0.019]	[0.019]	[0.022]	[0.018]		[0.018]	[0.018]	[0.022]
Long tenure share		-0.187**	-0.227**	-0.216**	-0.241**		-0.041**	-0.077**	-0.089**	-0.119**
		[0.015]	[0.015]	[0.015]	[0.015]		[0.015]	[0.015]	[0.014]	[0.015]
Part-time share					-0.004					-0.027**
					[0.011]					[0.010]
N(firms)	36,783	36,783	36,783	36,783	36,783	32,478	32,478	32,478	32,478	32,478
Pseudo-R^2	0.005	0.004	0.011	0.083	0.087	0.005	0.001	0.007	0.041	0.049

Reported coefficients are marginal effects from probit estimation with the binary indicator of any reported difficulty hiring as the dependent variable. Robust standard errors in square brackets (**;* denotes significance at the 1%; 5% level, respectively). Occupational groups are: managers and professionals (MAP); technicians and associate professionals (TAP); tradespersons and related workers (TRW); and all other occupations (OTH). All regressions include missing wage premium and long tenure share dummies.

Table 13: Hiring difficulties, firm characteristics, macro and location (probit estimates)

Dependent variable: Any hiring difficulty	All firms		Firms posting vacancy	
	(1)	(2)	(3)	(4)
$\delta(t = 2008)$	-0.034**	-0.044**	-0.026*	-0.038*
	[0.008]	[0.016]	[0.011]	[0.015]
$\delta(t = 2009)$	-0.226**	-0.262**	-0.225**	-0.242**
	[0.008]	[0.016]	[0.012]	[0.017]
$\delta(t = 2010)$	-0.220**	-0.160**	-0.223**	-0.136**
	[0.009]	[0.016]	[0.012]	[0.016]
$\delta(t = 2011)$	-0.193**	-0.108**	-0.202**	-0.092**
	[0.009]	[0.015]	[0.012]	[0.015]
Employment share: MAP	0.030*	0.029	0.088**	0.099**
	[0.015]	[0.030]	[0.015]	[0.027]
TAP	0.111**	0.035	0.145**	0.064*
	[0.017]	[0.031]	[0.017]	[0.029]
TRW	0.139**	0.130**	0.138**	0.117**
	[0.012]	[0.023]	[0.012]	[0.021]
$\ln(L)$	0.133**	0.074**	0.083**	0.043**
	[0.003]	[0.005]	[0.002]	[0.005]
Firm wage premium	0.097**	0.125**	0.041	0.050
	[0.025]	[0.046]	[0.024]	[0.042]
Long tenure share	-0.215**	-0.139**	-0.110**	-0.094**
	[0.017]	[0.034]	[0.016]	[0.031]
Part-time share	-0.033**	0.008	-0.039**	-0.010
	[0.012]	[0.023]	[0.011]	[0.020]
		$t-1$ $t-2$		$t-1$ $t-2$
No difficulties: MAP		-0.011 -0.002		-0.036** -0.017
		[0.015] [0.016]		[0.014] [0.014]
TAP		-0.024 0.001		-0.024 -0.002
		[0.017] [0.018]		[0.015] [0.015]
TRW		-0.028 -0.030		-0.035* -0.019
		[0.016] [0.017]		[0.014] [0.015]
OTH		0.032* 0.002		-0.019 -0.033*
		[0.013] [0.014]		[0.013] [0.013]
Any difficulties: MAP		0.150** 0.066**		0.103** 0.041**
		[0.013] [0.014]		[0.012] [0.012]
TAP		0.074** 0.050**		0.057** 0.042**
		[0.014] [0.013]		[0.012] [0.012]
TRW		0.140** 0.051**		0.107** 0.050**
		[0.013] [0.013]		[0.011] [0.012]
OTH		0.188** 0.082**		0.117** 0.042**
		[0.013] [0.014]		[0.013] [0.013]
N(firms)	36,783	13,125	32,478	11,313
Pseudo-R^2	0.149	0.279	0.112	0.246

Reported coefficients are marginal effects from probit estimation with the binary indicator of any reported difficulty hiring as the dependent variable. Robust standard errors in square brackets (**;* denotes significance at the 1%; 5% level, respectively). Occupational groups are: managers and professionals (MAP); technicians and associate professionals (TAP); tradespersons and related workers (TRW); and all other occupations (OTH). All regressions include industry-year dummies, missing wage premium and long tenure share dummies, and LMA employment shares. Regressions (1) and (3) include industry-year dummies for 2005 & 2006, main year effects not reported for brevity.

Table 14: Hiring difficulties and LMA characteristics (probit estimates)

Dependent variable: Any hiring difficulty	All firms (1)		Firms posting vacancy (2)	
$\delta(t = 2008)$	-0.046**		-0.042*	
	[0.016]		[0.016]	
$\delta(t = 2009)$	-0.258**		-0.240**	
	[0.017]		[0.018]	
$\delta(t = 2010)$	-0.145**		-0.116**	
	[0.020]		[0.020]	
$\delta(t = 2011)$	-0.092**		-0.072**	
	[0.018]		[0.018]	
Employment share: MAP	0.029		0.098**	
	[0.030]		[0.027]	
TAP	0.035		0.064*	
	[0.031]		[0.029]	
TRW	0.130**		0.117**	
	[0.023]		[0.021]	
$\ln(L)$	0.074**		0.043**	
	[0.005]		[0.005]	
Firm wage premium	0.125**		0.053	
	[0.046]		[0.042]	
Long tenure share	-0.137**		-0.093**	
	[0.034]		[0.031]	
Part-time share	0.007		-0.010	
	[0.023]		[0.020]	
	$t-1$	$t-2$	$t-1$	$t-2$
No difficulties: MAP	-0.011	-0.002	-0.036**	-0.017
	[0.015]	[0.016]	[0.014]	[0.014]
TAP	-0.024	0.002	-0.024	-0.001
	[0.017]	[0.018]	[0.015]	[0.015]
TRW	-0.028	-0.030	-0.036*	-0.018
	[0.016]	[0.017]	[0.014]	[0.015]
OTH	0.032*	0.002	-0.019	-0.033*
	[0.013]	[0.014]	[0.013]	[0.013]
Any difficulties: MAP	0.150**	0.067**	0.103**	0.042**
	[0.013]	[0.014]	[0.012]	[0.012]
TAP	0.074**	0.051**	0.058**	0.042**
	[0.014]	[0.013]	[0.012]	[0.012]
TRW	0.140**	0.052**	0.106**	0.050**
	[0.013]	[0.014]	[0.011]	[0.012]
OTH	0.188**	0.082**	0.117**	0.042**
	[0.013]	[0.014]	[0.013]	[0.013]
LMA excess turnover	0.245		0.310*	
	[0.153]		[0.135]	
LMA net employment growth	-0.017		0.001	
	[0.134]		[0.117]	
log average LMA employment	0.000		-0.010	
	[0.020]		[0.018]	
N(firms)	13,125		11,313	
Pseudo-R^2	0.279		0.247	

All regressions include industry-year dummies, missing wage premium and long tenure share dummies, and LMA employment shares. See table 13 for other notes.

Table 15: Hiring difficulties by occupation for firms posting vacancies (probit)

Dependent variable: Any hiring difficulty in occupational group	MAP (1)		TAP (2)	
$\delta(t = 2008)$	-0.021		-0.049*	
	[0.022]		[0.022]	
$\delta(t = 2009)$	-0.163**		-0.241**	
	[0.024]		[0.024]	
$\delta(t = 2010)$	-0.065*		-0.157**	
	[0.030]		[0.030]	
$\delta(t = 2011)$	0.014		-0.107**	
	[0.027]		[0.028]	
Employment share: MAP	**0.230****		0.004	
	[0.041]		[0.044]	
TAP	-0.040		**0.201****	
	[0.044]		**[0.043]**	
TRW	0.072*		0.093*	
	[0.036]		[0.037]	
$\ln(L)$	0.064**		0.037**	
	[0.007]		[0.007]	
Firm wage premium	0.183**		0.092	
	[0.070]		[0.073]	
Long tenure share	-0.130*		-0.134*	
	[0.052]		[0.055]	
Part-time share	0.006		-0.118**	
	[0.036]		[0.038]	
	$t-1$	$t-2$	$t-1$	$t-2$
No difficulties: MAP	**-0.164****	**-0.067****	-0.088**	-0.039
	[0.023]	**[0.022]**	[0.025]	[0.024]
TAP	-0.034	-0.040	**-0.138****	**-0.040**
	[0.023]	[0.024]	**[0.025]**	**[0.025]**
TRW	-0.044	0.021	-0.042	-0.009
	[0.023]	[0.023]	[0.024]	[0.025]
OTH	0.036	-0.019	0.035	-0.019
	[0.022]	[0.023]	[0.023]	[0.024]
Any difficulties: MAP	**0.186****	**0.084****	0.061**	0.037
	[0.019]	**[0.019]**	[0.021]	[0.021]
TAP	0.056**	0.057**	**0.158****	**0.085****
	[0.018]	[0.018]	**[0.019]**	**[0.018]**
TRW	0.015	0.029	0.069**	0.067**
	[0.020]	[0.019]	[0.020]	[0.020]
OTH	0.068**	0.027	0.065**	0.031
	[0.022]	[0.022]	[0.023]	[0.023]
LMA excess turnover	0.385		-0.448	
	[0.248]		[0.259]	
LMA net employment growth	-0.050		-0.127	
	[0.203]		[0.212]	
log average LMA employment	0.014		-0.001	
	[0.030]		[0.033]	
N(firms)	6,822		5,688	
Pseudo-R^2	0.277		0.281	

Table continues on next page.

Dependent variable: Any hiring difficulty in occupational group	TRW (3)		OTH (4)	
$\delta(t = 2008)$	-0.062*		-0.059**	
	[0.024]		[0.019]	
$\delta(t = 2009)$	-0.260**		-0.296**	
	[0.026]		[0.020]	
$\delta(t = 2010)$	-0.167**		-0.190**	
	[0.031]		[0.024]	
$\delta(t = 2011)$	-0.085**		-0.128**	
	[0.027]		[0.023]	
Employment share: MAP	-0.139*		-0.140**	
	[0.057]		[0.040]	
TAP	-0.121*		-0.253**	
	[0.057]		[0.045]	
TRW	**0.131****		-0.143**	
	[0.031]		[0.033]	
$\ln(L)$	0.019*		0.007	
	[0.008]		[0.006]	
Firm wage premium	0.015		-0.001	
	[0.078]		[0.063]	
Long tenure share	-0.067		-0.128**	
	[0.056]		[0.045]	
Part-time share	-0.042		-0.003	
	[0.039]		[0.030]	
	$t-1$	$t-2$	$t-1$	$t-2$
No difficulties: MAP	-0.054*	-0.034	-0.022	-0.005
	[0.025]	[0.025]	[0.020]	[0.020]
TAP	-0.062*	-0.068*	-0.052*	-0.007
	[0.027]	[0.028]	[0.023]	[0.023]
TRW	**-0.102****	**-0.053***	-0.025	-0.046*
	[0.024]	**[0.025]**	[0.021]	[0.022]
OTH	0.054*	-0.046	**-0.143****	**-0.085****
	[0.023]	[0.024]	**[0.020]**	**[0.020]**
Any difficulties: MAP	-0.009	0.014	0.025	0.025
	[0.022]	[0.022]	[0.017]	[0.017]
TAP	0.002	0.015	0.003	0.021
	[0.021]	[0.020]	[0.017]	[0.017]
TRW	**0.235****	**0.132****	0.063**	0.020
	[0.019]	**[0.019]**	[0.017]	[0.017]
OTH	0.147**	0.017	**0.236****	**0.089****
	[0.023]	[0.023]	**[0.019]**	**[0.019]**
LMA excess turnover	0.290		0.205	
	[0.236]		[0.195]	
LMA net employment growth	0.052		-0.063	
	[0.243]		[0.180]	
log average LMA employment	-0.010		0.003	
	[0.031]		[0.025]	
N(firms)	5,916		9,678	
Pseudo-R^2	0.283		0.243	

All regressions include industry-year dummies, a missing wage premium dummy, and LMA employment shares. Occupational groups are: managers and professionals (MAP); technicians and associate professionals (TAP); tradespersons and related workers (TRW); and all other occupations (OTH). See table 13 for other notes.

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