

# HOW WAGES ARE SET: EVIDENCE FROM A LARGE SURVEY OF FIRMS

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## **Abstract**

This paper studies the micro-foundations of wage dynamics in New Zealand, using the responses to a large behavioural survey. The majority of firms adjust wages annually, with smaller firms more likely to set wages less frequently. Firms have limited synchronicity in wage setting, with over half reporting that they do not have a fixed month for wage changes. There are limited links between wage adjustments and inflation and minimum wage legislation, although in both cases the link is stronger as firm size increases. We use ordered probit analysis to show that similar factors influence firms' wage and price rigidity.

# 1 Introduction

Wage-setting behaviour of firms is one of the determinants of inflation dynamics and thus is of high importance for monetary policy. Of particular interest to policy is the existence of nominal rigidities in wages; that is, firms are unable to alter wages immediately in response to macroeconomic shocks. Nominal rigidities in prices and wages affect monetary policy's ability to influence real activity (Murchison and Rennison, 2006). There are a number of competing theories of nominal rigidities with potentially different implications for modelling the economy and for the conduct of monetary policy.

While macroeconomic data provide a view of aggregate wage movements, it is difficult to say anything useful about the causes and extent of wage rigidity without microeconomic data. For instance, are firms' wage-setting decisions best approximated by fixed-duration Taylor contracts or random-duration Calvo contracts? The type of contract used has important implications for the degree of nominal rigidity in the economy. Similarly, the timing, synchronicity, and magnitude of wage changes are unable to be easily determined looking only at macro-level data.

This paper presents some micro-foundations of wage dynamics in New Zealand, based on data collected as part of the Business Operations Survey (BOS). Explicitly asking firms how they set wages presents a useful way to determine the influences on firms' wage-setting decisions. As such, survey data have been used by a number of authors to explain wage dynamics since the 1990s (see, for example, Blinder and Choi (1990) for the seminal survey-based wage study). More recently, a number of central banks have also engaged survey methods to explain wage dynamics, and to comment on the links between price and wage rigidity (Amirault et al., 2013; Druant et al., 2012).

The remainder of this paper is arranged as follows. Section 2 discusses the survey design and characteristics of respondent firms. Section 3 presents the main results of the survey, discussing the frequency, synchronicity and determinants of firm's wage setting. In particular, section 3 answer questions about how frequently firms change wages, how wage changes are distributed throughout the year, what factors determine downward nominal wage rigidity, the importance of minimum wage legislation on wage-setting, and what factors determine the entry wage. The results of a series of ordered multivariate probit analyses into what factors influence wage and price rigidity are presented. Section 4 concludes.

## 2 Survey design and characteristics of respondents

### 2.1 Survey design

The data used here originate from the 2010 *Business Operations Survey* carried out by Statistics New Zealand in August 2010.<sup>1</sup> The target population was businesses on Statistics

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<sup>1</sup> See [http://www.statistics.govt.nz/browse\\_for\\_stats/businesses/business\\_growth\\_and\\_innovation/business-op-survey-2010-tables.aspx](http://www.statistics.govt.nz/browse_for_stats/businesses/business_growth_and_innovation/business-op-survey-2010-tables.aspx) for a full description of the survey.

New Zealand's Business Frame with an annual GST turnover greater than NZD 30,000 and at least 6 employees. Firms operating in public administration and safety were excluded, as were local government enterprises, the central bank and non-profit institutions in the service of households. The final estimated population size of firms was 35,307 enterprises. The survey questions on price setting are provided in the appendix.<sup>2</sup>

The sample design was a two-level stratification, firstly by Australia and New Zealand Standard Industrial Classification 2006 (ANZSIC06) industrial sector, and then by firm size within each sector, as determined by number of employees. The four employment size groups were small (6-19 employees), medium 1 (20-29 employees), medium 2 (30-49 employees) and large (50+ employees). The breakdown for publication is slightly different from that used in the sample stratification, with the firm employment sizes used in this paper being: small (6-19 employees), medium (20-100 employees) and large (100+ employees).

The survey was sent to a random sample of firms within this sampling frame. Firms were asked to report on the most recently completed financial year prior to the sampling date. The survey had 5,369 replies, a response rate of 81.8 percent and comprising approximately one firm in seven of the targeted population of firms.

The results presented here have been weighted using weights provided by Statistics New Zealand to represent the population of firms. These weights are calculated within each industry and firm-size stratum such that multiplying each firm in the sample by its weight will deliver the number of firms in the total population in each stratum.<sup>3</sup>

It should be noted that these weights deliver aggregate and sectoral statistics that are firm-count weighted, so emphasise the behaviour of the more numerous smaller firms. Firms with more employees in general have a greater share of sector value added than those with fewer, so a sector aggregate based on output (perhaps of more interest to macroeconomic policy makers) could potentially differ from the results shown here. To account for this potential difference, the aggregate results for each question are also presented using employment weights, calculated by dividing the aggregate employment in each stratum derived from Statistics New Zealand's 2010 Business Demography Survey by the number of firms in that stratum.<sup>4</sup> Data for output by employment size and by industry are unfortunately not available.

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<sup>2</sup> A full copy of the survey questionnaire is available at [http://www2.stats.govt.nz/domino/external/quest/sddquest.nsf/12df43879eb9b25e4c256809001ee0fe/6233ea80fe191165cc25777d007a8490/\\$FILE/BOS%202010\\_Sample.pdf](http://www2.stats.govt.nz/domino/external/quest/sddquest.nsf/12df43879eb9b25e4c256809001ee0fe/6233ea80fe191165cc25777d007a8490/$FILE/BOS%202010_Sample.pdf)

<sup>3</sup> The mean weight of firms is 6.6, with around 80 percent of firms having a weight less than 10.

<sup>4</sup> Pre-school and school education and hospitals were excluded on the assumption that the majority of employment within these industries would primarily be in the state sector.

### **3 Wage setting dynamics: frequency, synchronicity, and determinants**

#### **3.1 How frequently do firms change their wages?**

Firms in the BOS were asked how frequently they implement wage or salary changes for most employees. The available responses were '*more often than annually*', '*annually*', and '*less often than annually*'. Table 1 presents the results. The majority of firms change wages annually. This was the case whether responses were weighted by firm count or by employee count. Weighted by employee count, 74 percent of firms report that they adjusted wages annually. Only 6 percent of firms adjust wages more frequently than annually, and the remaining 20 percent adjust wages less frequently than annually. Using firm-count weights, 63 percent of firms report an annual frequency for wage changes.

A high prevalence of annual wage adjustment is consistent with international literature. Amirault *et al.* (2013) find that 96 percent of Canadian firms change their wages annually; Druant *et al.* (2012) find that in Europe around 60 percent of firms change their wages annually, and derive an average wage duration of 15 months; Le Bihan *et al.* (2012) find that the frequency of annual wage changes is 88 percent.

This pattern was reasonably similar across industries, although there are some small discrepancies. For instance, the forestry, agriculture, and accommodation & food services industries tend to have a higher-than-average proportion of wages being set more frequently than yearly, while many of the services industries tend to have a higher-than-average proportion of wages being adjusted annually.

These results were also dependent on firm size – larger firms have a higher likelihood of adjusting wages annually, while smaller firms have a higher likelihood of adjusting wages less frequently than annually. Le Bihan *et al.* (2012) also find that the frequency of wage changes is slightly higher for large firms in France. An explanation of this phenomenon is that larger firms are more likely to have dedicated human resource management departments than smaller firms. Thus, larger firms are more likely to have a formal wage-setting process which involves wages being reviewed and changed on a fixed annual schedule.

**Table 1: How frequently are wage and salary changes implemented?**

Ind. no.	Industry name	Number of firms	Frequency of changes		
			More often than annually	Annually	Less often than annually
1	Agriculture	2103	4	65	31
2	Commercial fishing <sup>(a)</sup>	42	8	71	21
3	Forestry & logging	210	17	45	38
4	Agriculture, forestry, & fishing support services	762	17	48	35
5	Mining	99	3	78	19
	<b>Primary</b>	<b>3216</b>	<b>8</b>	<b>60</b>	<b>32</b>
6	Food, beverage, & tobacco	921	3	62	35
7	Textile, clothing, footwear, & leather	357	6	58	36
8	Wood & paper product	528	3	60	37
9	Printing, publishing, & recorded media	306	1	54	45
10	Petroleum, coal, chemical, & associated product	414	5	70	25
11	Non-metallic mineral product	165	3	65	32
12	Metal product	912	11	70	19
13	Transport and industrial machinery & equipment	831	6	71	23
14	Other machinery & equipment	210	5	67	29
15	Other manufacturing	369	8	57	37
16	Electricity, gas, water, & waste services <sup>(a)</sup>	114	5	62	33
	<b>Industry</b>	<b>5127</b>	<b>6</b>	<b>64</b>	<b>30</b>
17	<b>Construction</b>	<b>3468</b>	<b>8</b>	<b>55</b>	<b>36</b>
18	Machinery & equipment wholesaling	903	1	77	21
19	Other wholesale trade	1959	3	70	27
20	Retail trade	4215	6	50	44
	<b>Distribution</b>	<b>7077</b>	<b>4</b>	<b>59</b>	<b>37</b>
21	Accommodation & food services	4194	12	59	29
22	Transport, postal, & warehousing	1362	5	50	45
23	Publishing	120	3	70	28
24	Motion picture	135	4	63	34
25	Telecommunications <sup>(a)</sup>	87	7	76	17
26	Finance	159	2	81	16
27	Insurance <sup>(a)</sup>	45	5	89	5
28	Auxiliary finance	303	5	85	10
29	Rental, hiring, & real estate services	804	9	63	28
30	Other professional scientific	2907	6	83	11
31	Computer systems design	558	8	70	22
32	Administrative & support services	1335	9	69	22
35	Arts & recreation services	486	6	60	34
36	Other services	978	5	53	43
	<b>Private services</b>	<b>13473</b>	<b>8</b>	<b>66</b>	<b>26</b>
33	Education & training	717	8	69	22
34	Health care & social assistance	2226	5	78	18
	<b>Government services</b>	<b>2943</b>	<b>6</b>	<b>76</b>	<b>19</b>
	<b>Overall – firm count</b>	<b>35307</b>	<b>7</b>	<b>63</b>	<b>30</b>
	<b>Overall – employment weight</b>	<b>35307</b>	<b>6</b>	<b>74</b>	<b>20</b>

(a) the number of respondents for commercial fishing; electricity, gas, water and waste services; telecommunications and insurance is low, so results from these sectors should be treated with caution.

Annual price changes imply a wage-setting process of the form of Taylor (1980) in which wages are contracted to be fixed for a period of time. An alternative wage-contracting process is Calvo (1983) wage setting, in which a fixed proportion of firms ( $0 < h < 1$ ) is allowed to alter wages in any given period. Under Calvo wage setting, the duration of a wage is not constant – over a large number  $n$  of periods there is a positive (but small) probability that a firm will be able to change wages every period ( $h^n$ ), and similarly that a firm will not be able to change their wages in any period  $(1 - h)^n$ .

Calvo wage setting is the conventional assumption for wage-setting in most DSGE modelling frameworks (e.g. Erceg et al., 2000), as it is a convenient modelling assumption for wage stickiness. However, these (and other) empirical results show that most firms use Taylor-style wage setting in practice, with wages being set annually and kept for the entire year. Levin et al. (2005) argue that adoption of Taylor wage setting rather than Calvo wage setting in a DSGE modelling framework yields significantly lower wage and price dispersion (and associated welfare costs), and thus generates different optimal monetary policy.

### **3.2 How are wage changes distributed throughout the year?**

As well as the frequency of wage changes, the distribution of wage changes across the year can have monetary policy implications. If wage contracts are staggered throughout the year rather than all occurring at a given time, shocks to the economy are more persistent (Barratieri et al., 2010). Olivei and Tenreyro (2007) show that the response to a monetary policy shock differs depending on the quarter in which it was applied due to the timing of wage changes.<sup>5</sup>

In aggregate, 35 percent of firms (weighted by employee count) report that they did not have a fixed month in which salary or wage changes occurred. As with the proportion of firms who reported annual wage changes, this proportion was negatively related to firm size; smaller firms were more likely than large firms to have no fixed month in which wage changes were made. This is consistent with the hypothesis that larger firms would be more likely to have dedicated human resources departments than small firms, and thus more formal wage-setting characteristics.

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<sup>5</sup> Empirically, they find that shocks in Q1 and Q2 generate more significant responses than those in Q3 and Q4, as wages are stickier in Q1 and Q2 than in the second half of the year. The probability of wage change in a given quarter is based on anecdotal evidence and a survey of New England firms in the Federal Reserve System's 2003 Beige Book.

**Table 2: Month that most wage and salary changes are implemented**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	No part. month
<b>Size</b>													
Small	5	3	4	12	3	4	6	3	3	3	4	4	56
Medium	6	3	5	17	4	5	11	4	4	4	4	4	41
Large	8	4	9	19	3	6	20	7	7	11	4	4	21
<b>Sector</b>													
Primary	4	5	5	13	3	17	8	5	5	4	3	4	45
Industry	5	3	4	13	3	4	8	3	4	4	4	2	50
Construction	4	3	2	10	1	4	6	3	3	2	0	4	67
Distribution	4	2	5	14	4	4	8	3	1	2	4	4	54
Private services	6	2	5	16	4	2	6	2	4	4	5	4	49
Gov't services	7	6	4	5	1	4	18	5	3	5	2	2	47
Total – firm count	5	3	4	13	3	4	8	3	3	3	4	4	52
Total – emp. weight	7	3	6	16	3	5	15	5	5	7	4	4	35

The proportion of firms with no fixed month for wage changes is relatively even across industries. However, again the lower-skilled job categories (such as forestry, construction, retail trade, and accommodation & food services) are more likely than average to have no fixed month for wage changes.

The remaining 65 percent of firms report that they did have a dedicated month in which wage adjustments were most common. The most common months for wage changes to occur were April (16 percent of firms) and July (15 percent of firms). The April changes are likely linked to the New Zealand fiscal year (which begins on April 1st). April is often when new budgets are implemented, and wage adjustments would follow naturally from this process. The July changes are related to the 'half-year pay reviews' which are common in many firms. July seems like a natural time to carry out wage adjustments in New Zealand; it is during the quieter winter months, staff are less likely to be away on holidays etc. Of those firms that change wages in a particular month, the first month of the financial year does appear prevalent.

The prevalence of pay adjustments in winter is a documented in other international surveys of wage dynamics (Amirault *et al.*, 2013; Druant *et al.*, 2012). Le Bihan *et al.* (2012) find that the frequency of wage changes spikes in the first quarter and the third quarter in French data; the first quarter change is consistent with a winter impact, while the third quarter change is because the nationally-set minimum wage is reviewed/changed each year in July. However, Barratieri *et al.* (2010) find no seasonality in the frequency of wage changes – the probability of a firm changing its wages in a given calendar month is broadly constant between 15 percent and 20 percent across the year.



**Table 3: Month of wage and salary change by end-month of financial year**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	No part. month
January	1	38	3	10	0	1	13	15	0	5	3	0	31
February	7	1	21	25	4	4	11	1	0	6	9	5	28
March	3	3	6	19	4	5	9	4	3	5	3	3	46
April	1	0	0	2	7	9	21	1	4	8	16	6	47
May	2	4	5	3	8	29	11	9	5	10	1	5	22
June	4	1	3	6	2	6	43	8	11	13	3	3	16
July	1	0	8	5	0	2	10	23	14	22	0	1	27
August	2	2	4	9	4	0	4	17	26	18	1	1	24
September	15	3	1	4	2	2	2	6	6	26	12	12	27
October	10	8	0	8	6	9	8	1	6	6	16	6	26
November	18	6	8	13	15	0	8	2	2	2	0	6	26
December	25	4	12	24	3	3	10	2	4	3	2	7	22
Total – firm count	5	3	4	13	3	4	8	3	3	3	4	4	52
Total – emp. weight	7	3	6	16	3	5	15	5	5	7	4	4	35

### 3.3 What factors contribute to downward nominal wage rigidity?

A well-documented phenomenon of wage dynamics is downwards rigidities to wages – workers will not accept cuts in nominal wages, and so firms may find it optimal not to reduce wages. A number of explanations of downward nominal wage rigidity exist. For example: Shapiro and Stiglitz (1984) argue that nominal wage cuts will increase shirking; lower wages reduce gratuity and loyalty to a firm which may reduce productivity (Akerlof, 1982; Akerlof and Yellen, 1990); wage cuts may increase worker turnover and increase high hiring costs (Stiglitz, 1974); adverse selection theory suggests that the most productive workers will quit if wages are cut (Weiss, 1980); insider-outsider theory suggests that firms will not fire staff to hire new staff at a lower wage rate because insiders will shun the newly-hired entrants (Lindbeck and Snower, 1988).<sup>6</sup>

Firms in the BOS were asked to rate the relative importance of nine sources of nominal wage rigidities (as one of ‘not important’, ‘moderately important’, or ‘very important’). Of the nine, the most important factor preventing wage or salary reduction is the fear that knowledge would be lost if employees left. 60 percent of firms say that this was a ‘very important’ factor preventing wage reductions, while only 9 percent say it was ‘not important’. This was similarly distributed across industries and firm size. This factor is consistent with Weiss’s (1980) adverse selection model – the best workers will quit first when wages are cut, so the firm will lose a large amount of knowledge. A second important factor was firms preferring to reduce the number of poor performers during recessions, which 58 percent of firms reported as ‘very important’.

<sup>6</sup> For a more detailed summary of nominal wage rigidity theory in relation to surveyed wage data see Babecký et al. (2010).

**Table 4: Factors preventing wage decreases (percent of firms citing factor as ‘very important’)**

	Agreements with unions	Legislated minimum wages	Expected to smooth wages over changing economic conditions	Reputation for reducing wages makes it difficult to hire	Employees would reduce their effort	Hiring and training costs would increase because employees leave	The best employees would leave - prefer to reduce the no. of poor performers	Hard-to- replace knowledge is lost because experienced employees would leave	Employees would resent their managers
<b>Size</b>									
Small	7	36	21	31	40	38	55	58	36
Medium	13	40	23	39	45	47	62	63	35
Large	33	49	26	43	44	47	66	65	31
<b>Sector</b>									
Primary Industry	5	43	18	33	39	32	52	52	37
Construction	14	38	21	32	42	38	60	60	35
Distribution	8	35	21	35	50	46	68	65	38
Private services	6	37	22	31	42	42	54	61	34
Gov’t services	9	38	23	33	40	42	56	59	36
Gov’t services	17	35	25	40	40	41	58	62	35
<b>Collective bargain</b>									
Yes	65	47	31	43	45	45	64	67	37
No / don’t know	6	37	21	33	41	40	57	59	35
Total – firm count	9	38	22	33	42	41	57	60	35
Total – emp. weight	22	43	24	39	44	45	62	62	33

Economy-wide, the least important factor preventing firms from reducing wages is agreements with unions. Only 9 percent of firms report that union agreements were a ‘very important’ factor preventing downwards wage movements, while 58 percent say they were ‘not important’. This reflects the relatively small share of firms that bargain collective agreements. For those firms with such agreements, two thirds report unions as being very important for preventing downward adjustments.

Empirically, Le Bihan *et al.* (2012) found that in any given quarter there was a 6 percent chance of a decrease in wages, which was almost one sixth of the chance of a wage rise. This suggests some degree of (but not complete) downwards nominal rigidity.<sup>7</sup>

### 3.4 How strongly are wages linked to inflation?

Firms were asked on whether there were any link between their wage and salary adjustments and inflation. The majority – 57 percent – report that there is no link. International trends on these links are somewhat divided – in Canada 57 percent of firms consider inflation in setting wages (Amirault *et al.*, 2013), while in Europe around two thirds of firms report no link between wages and inflation (Druant *et al.*, 2012) although the European data do suggest that wages and prices feed into each other at a macro level. In the New Zealand context, Dunstan *et al.* (2009) use macroeconomic data to find evidence that tradable inflation Granger cause wages, and Coibion *et al.* (2015) show that 41 percent of firms follow inflation when making business decisions, consistent with our results.

**Table 5: Link between wage and salary changes and inflation**

	Contractually linked to inflation	Take account of past inflation outcomes	Take account of expected future inflation	None of the above
<b>Size</b>				
Small	8	27	9	60
Medium	5	38	12	49
Large	8	47	22	35
<b>Sector</b>				
Primary	8	20	6	68
Industry	6	38	10	51
Construction	11	19	9	66
Distribution	4	29	8	62
Private services	9	31	11	53
Gov’t services	7	40	14	45
<b>Collective agreements</b>				
Yes	13	50	24	25
No / don’t know	7	29	9	58
Total – firm count	7	30	10	57
Total – emp. weight	7	40	16	45

<sup>7</sup> That French wages are not more downwardly rigid is surprising given that base pay is legally required to be written into the employment contract, so a downwards revision to pay involves negotiating and drafting a new employment contract.

Again, the distribution of firms who account for inflation in their wage-setting practices changes across firm size. Larger firms are much more likely to take account of inflation (both past and future) than smaller firms. There is a search cost associated with finding inflation (either finding past inflation or forecasting future inflation), and thus it is possible that larger firms are more willing to incorporate inflation into wage dynamics as this search cost can be spread over more wage adjustments. There is little difference in the proportion of small and large firms that have contractual links to inflation. However, those firms that bargain collective agreements are much more likely to have links to inflation, explicit or implicit.

Across all firm sizes, past inflation values were more important than future inflation values. This is consistent with the international literature. In Canada, past inflation is rated as important by seven times as many firms as future inflation (Amirault *et al.*, 2013). Past inflation is deemed to be the 'safer' option; adopting a wage-setting policy based on future inflation can lead to overcommitting to wage rises if inflation turns out lower than expected, or alienating staff through weak pay growth if inflation turns out higher than expected. The dominance of past inflation outturns is echoed in New Zealand firms' price-setting behaviour, where very few firms are purely forward looking (Parker, 2014).

While a firm may not explicitly take into account the inflation, they may base their wage increases on the evolution of their costs or on wages of their competitors. Thus, the general movement of prices in the economy may influence wage setting, without firms being aware of this influence.

### **3.5 Are wages influenced by minimum wage legislation?**

The New Zealand adult minimum wage increased from \$12.00 to \$12.50 on April 1st 2009, and then again to \$12.75 on April 1st 2010. One of the questions of the BOS asked firms if any of their employees had received wage increases because of these increases in the minimum wage. Economy-wide, 60 percent of firms report that none of their workers' wages had been increased due to the minimum wage change. 31 percent of firms report that the increase in the minimum wage had meant that they increased wages for their staff who were paid the minimum wage, while 13 percent say reported that the minimum wage increase had meant that they increase wages for their staff who were paid a set amount above the minimum wage.

The impact of the minimum wage varies significantly across industries and firm size. At one extreme, in the accommodation and food services industry, 25 percent of firms reported that the change in minimum wage laws had no effect on their wages, while 63 percent said that it meant they had to increase the wages of their staff who were paid the minimum wage. At the other end of the spectrum, in the computer systems design industry, 93 percent of firms said the change in minimum wage laws had no impact on their wages at all. This likely reflects the differences in average pay in these industries. In terms of firm size, larger firms tended to be more likely to be impacted by the minimum wage laws than smaller firms.

**Table 6: Have wages increased because of increases in the minimum wage?**

	No	Yes, for employees at minimum wage	Yes, for employees paid a set amount above minimum wage	Don't know
<b>Size</b>				
Small	63	28	12	2
Medium	54	38	13	2
Large	43	46	17	4
<b>Sector</b>				
Primary	50	34	17	6
Industry	63	29	10	3
Construction	76	18	9	2
Distribution	53	38	12	2
Private services	59	33	14	1
Gov't services	73	18	11	1
Total – firm count	60	31	13	2
Total – emp. weight	51	39	14	3

There is little international literature on the impact of minimum wage changes on wage setting, due to the vastly different treatment of minimum-wages in legislation across countries. Amirault *et al.* (2013) note that minimum wage changes are one of the reasons why Canadian firms will change wages *ad hoc* between their typical annual reviews, but the authors do not quantify its importance. Le Bihan *et al.* (2012) report that minimum wage changes are important for wage setting in France, but note that the French government mandates that the minimum wage (SMIC) be reviewed at least annually, and thus it is likely that firms will automatically build this review into their annual wage decisions.

### 3.6 Which factors influence the entry wage?

The most important factor determining the entry wage rate for New Zealand firms is the wage or salary rate of similar employees within the firm. Economy-wide, 51 percent of firms report that this is the most important factor determining entry wages. Wage and salary rates of workers outside of the firm are the second most important factor determining entry wages, while collective pay agreements are the least important (with only 3 percent of firms reporting it as important, although this number rises to 39 percent when only those firms that bargain collective agreements are included). These results are fairly constant across firms of different size, but there is a reasonable degree of divergence across industries.

**Table 7: Most important factor in determining entry wage**

	Minimum wage rates	Collective pay agreement	Wages, salaries of similar employees within this business	Wages, salaries of similar employees outside this business	Availability of similar workers in the labour market	Other
<b>Size</b>						
Small	17	2	51	19	10	7
Medium	17	5	55	17	10	3
Large	13	17	43	19	11	2
<b>Sector</b>						
Primary	18	3	44	24	9	10
Industry	14	5	58	12	10	5
Construction	9	2	58	13	16	5
Distribution	19	1	52	20	9	6
Private services	20	2	47	21	9	5
Gov't services	8	12	57	19	9	6
<b>Collective agreements</b>						
Yes	8	39	42	12	8	2
No / don't know	17	2	52	19	10	6
Total – firm count	16	3	51	19	10	6
Total – emp. weight	14	11	49	18	10	4

These results are broadly consistent with the international literature. Galuščák *et al.* (2010) report results on the same survey data as Druant *et al.* (2012), and show that across Europe 78.3 percent of firms say that internal factors (mainly wages within the firm) are the most important determinants of hiring pay, while 21.7 say that external factors (wages outside the firm and labour supply) are most important. Amirault *et al.* (2013) show that the most important factor in the wage-setting decision is the market wage rate, but they do not differentiate between the market wage rate offered within the firm and the market wage rate offered by competitors. Furthermore, their survey was based on wage setting for existing employees, rather than on wage setting for marginal hires.

### **3.7 Determinants of price and wage rigidities**

A number of studies have identified possible determinants of wage rigidity, by looking either at theoretical models of wage-setting behaviour or by analysing macroeconomic data. For example, firm size, industry, level of product market competition, degree of collective bargaining (union membership), skill share, tenure, and worker age and gender mix have all been identified as shaping the level of rigidity of a firm's wages (for a survey of determinants of wage rigidity see Babecký *et al.*, 2010, and for a cross-country summary see Messina *et al.*, 2010).

We test for evidence that these factors influence wage rigidity from our survey data. This is done by estimating a model for the frequency of wage setting that accounts for sectoral and firm-level characteristics. We create a categorical variable for the frequency of wage changes, where 1 = 'the wage or salary changes are implemented more frequently than annually', 2 = 'the changes are implemented annually', and 3 = 'the changes are implemented less often than annually'.

We estimate an ordered probit model, controlling for firm size and the sector that a firm operates in. The reference firm is a small manufacturer. We also include a number of firm-level characteristics as covariates as set out below:

#### *Intensity of product market competition*

Understanding the degree of competition a firm faces in its output markets is not straightforward using qualitative survey data. We construct two measures of competition. The first measure takes into account the number of competitors a firm faces. This is a dummy variable that takes the value of 1 if the firm reports it has 'many competitors, several dominant' or 'many competitors, none dominant' and a value of 0 otherwise. Other international studies have also used the importance of competitors' behaviour to pricing-behaviour as a dummy variable for competition. The second measure captures the exposure of the firm to external competitive pressures and uses the reported share of the firm's output that is exported, in line with Bertola *et al.* (2012).

#### *Composition of workforce*

The frequency of wage adjustments may differ depending on the type of staff employed. To capture potential differences, two variables on workforce composition are included. The first is the share of employees made up of high skilled workers. These are managers, who lead

organisations, departments or divisions and determine policy for the organisation or department, and professionals, who perform analytical, conceptual or creative tasks with skills equivalent to a bachelor degree or higher (e.g. accountant, engineer, computer programmer). The second variable, technicians, is the share of employment made up of technicians and associate professionals. These employees perform complex technical or administrative tasks often in support of managers or professionals. Such staff include technical officers, building inspectors, legal executives.

#### *Labour market institutions*

The final set of covariates measure differences in labour market institutions. The first of these is a dummy variable that takes the value of 1 if some of the firm's employees are covered by a collective bargaining agreement and zero otherwise. The next variable considers whether the extent of collective bargaining matters. It takes a value of 1 if the share of employees covered by collective bargaining exceeds 50 percent. The final covariate measures the role of wage indexation. This is a dummy variable that takes the value of 1 if inflation is taken into account, either informally or contractually, in the wage bargaining process.

Table 8 summarises the results from the two models, showing the average marginal effects of these covariates on the most rigid category: those firms that change wages less frequently than annually. The coefficients from the underlying regressions are reported in the appendix.

**Table 8: Average marginal effects from ordered probit models on frequency of wage and price changes**

	Wages change less often than annually	Prices did not change last financial year
Manufacturing	<i>reference</i>	<i>reference</i>
Primary	-0.040*	-0.126**
Construction	-0.011	-0.039
Distribution	0.001	-0.154**
Private services	-0.031*	-0.009
Gov't services	-0.033	-0.067**
Small	<i>reference</i>	<i>reference</i>
Medium	-0.057**	-0.042**
Large	-0.093**	-0.085**
Competition	-0.008	-0.012
Export share	0.000	-0.001**
High skilled	-0.001**	0.001**
Technician	-0.001**	0.000
Collective	-0.024	-0.019
Collective share	0.008	0.001
Wage indexation	-0.133**	0.016*

As suggested by the high-level analysis of the results discussed above, and also consistent with other empirical literature, the main determinants of wage rigidity are firm size, skill-share, and the degree of wage indexation, with some influence from industry. Medium and large firms were less likely to change wages less often than annually than small firms, consistent with the pattern identified above. Similarly, the presence of high-skilled and



technical staff increased the likelihood that firms change wages annually or more frequently. Both of these findings are consistent with the idea that larger firms and firms with a higher-skill workforce are more likely to have dedicated human-resources staff, and thus be more likely to engage in defined-frequency (e.g. annual) wage setting.

The industry results were also consistent with the above high-level findings. Primary industry firms and private services firms (e.g. retail or food services) exhibited less wage rigidity. The itinerant and low-skill nature of these industries means that wages are more likely to have idiosyncratic adjustments.

Neither of the collective bargaining variables included in the model are significant. This is consistent with the above results on downward nominal rigidity, where almost 60 percent of firms reported that union activity was not an important factor preventing them from lowering wages. Overall, unions appear to play little role in creating wage rigidity in New Zealand.

Comparisons can also be made between the determinants of wage rigidity and of price rigidity.<sup>8</sup> Table 8 also shows the results of a second ordered probit analysis, on the frequency of price changes. Here the frequency of price change is a categorical variable where 1 = 'the price changed more than 6 times in the last financial year', 2 = 'The price changed between 2 and 6 times', 3 = 'The price changed once', and 4 = 'the price did not change in the last financial year'. The same control variables (firm size and industry) and the same firm-level covariates were used as for the wage-frequency model.

The determinants of price rigidity are similar to the determinants of wage rigidity. Namely, price rigidity is also heavily influenced by size, and work-place skill mix. Industry was a more significant determinant of price rigidity than for wage rigidity, with firms in the primary, distribution, and government services industries less likely to have rigid prices. This may reflect the different expectations of price changes in an industry; customers may be more willing to accept price changes in some industries than in others.

Competition is a more important driver of price changes than of wage changes. The export-share measure of competition was a significant determinant of price rigidity, although our competition dummy variable was not.

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<sup>8</sup> See Parker (2014) for a more detailed analysis of price-setting behaviour in New Zealand.

## 4 Conclusions

This paper presents evidence on the nature of wage rigidity in New Zealand, based on extensive survey evidence. The main findings are as follows.

Wages in New Zealand display reasonable rigidity. The majority of wages are set annually, with only a small proportion of wages adjusted more frequently than annually. Probit analysis was used to show that wage rigidity is determined by firm size, labour-force skill mix, degree of wage indexation, and, to some extent, industry. The determinants of wage rigidity are similar to the determinants of price rigidity, although the level of competition only affects the frequency of price changes.

Wages display limited synchronicity in adjustment, with few firms reporting a fixed month in which wages are changed. Of those firms who did report a fixed month, April was the most popular month, reflecting the timing of New Zealand's fiscal year.

There are reasonably strong links between inflation and wage growth. This is consistent with macroeconomic evidence on New Zealand price and wages. The link between inflation and wages become stronger as firm size increases.

New Zealand firms exhibit strong downwards nominal rigidity with respect to wages. The strongest drivers of nominal downward rigidity were the fear of knowledge loss through employees leaving, and a preference to lay off poor performers. Unions were an important factor determining wage rigidity for those firms that had collective agreements, but such firms are in the minority.

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## Appendix

### Coefficients from ordered probit regression

	Frequency of price change	Frequency of wage change
Manufacturing	<i>reference</i>	<i>reference</i>
Primary	-0.498** (0.0578)	-0.144* (0.0642)
Construction	-0.132 (0.0764)	-0.0371 (0.0872)
Distribution	-0.661** (0.0529)	0.00227 (0.0598)
Private services	-0.0287 (0.0402)	-0.110* (0.0464)
Gov't services	-0.236** (0.0590)	-0.116 (0.0674)
Small	<i>reference</i>	<i>reference</i>
Medium	-0.150** (0.0342)	-0.196** (0.0389)
Large	-0.323** (0.0455)	-0.334** (0.0523)
competition	-0.0463 (0.0336)	-0.0289 (0.0382)
Export share	-0.00360** (0.000702)	0.0000198 (0.000794)
High skilled	0.00422** (0.000746)	-0.00467** (0.000856)
Technician	0.000524 (0.000858)	-0.00292** (0.000987)
Collective	-0.0715 (0.0469)	-0.0837 (0.0545)
Collective share	0.00412 (0.0558)	0.0302 (0.0644)
Wage indexation	0.0609* (0.0303)	-0.473** (0.0350)
Cut 1	-0.928** (0.0503)	-2.245** (0.0627)
Cut 2	-0.313** (0.0493)	0.186** (0.0552)
Cut 3	0.612** (0.0498)	
Log likelihood	-7147	-3770
Pseudo R <sup>2</sup>	0.03	0.04
Chi <sup>2</sup>	415	347
Pr (Chi <sup>2</sup> )	0.000	0.000

## Survey questionnaire

### Section C: Price and Wage Setting

1 Section C should be completed by the General Manager

#### Wage and salary bargaining

32 For the following questions, when considering wage and salary changes, please include changes to non-financial conditions (eg leave provisions).

33 How often does this business implement wage or salary changes for most of its employees?

- more often than annually
- annually
- Less often than annually

34 Mark all that apply. In which month(s) are most wage or salary changes implemented?

- January
- February
- March
- April
- May
- June
- July
- August
- September
- October
- November
- December
- No particular month(s)

35 In certain economic conditions, businesses might choose to reduce the wages or salaries of employees by changing pay rates or removing other employment benefits.

Mark one oval for each item listed. How important would the following considerations be in preventing this business from reducing wages or salaries, if required:

	not important	moderately important	very important	don't know
agreements with unions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
legislated minimum wages	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
employees expect the employer to smooth wages over changing economic conditions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
a reputation for reducing wages makes it difficult to hire employees	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
employees would reduce their effort	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
hiring and training costs would increase because employees leave	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
the best employees would leave - this business instead prefers to reduce the number of poor performers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
hard-to-replace knowledge (eg client relationships) is lost because experienced employees would leave	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
employees would resent their managers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**36 Mark all that apply. For this business, how are wage and salary changes linked to inflation?**

- wages and salaries are contractually linked to inflation
- wage and salary changes take account of past inflation outcomes
- wage and salary changes take account of expected future inflation
- none of the above

**37 Has the announced GST increase been a factor in this business's wage and salary negotiations?**

- yes
- no, but it is expected to be a factor in future negotiations
- no, and it is not expected to be a factor in future negotiations

**38 Mark all that apply. During the last 2 financial years, have any of this business's employees had wage increases because of an increase in the adult minimum wage?**

*Note:*

- the adult minimum wage changed from \$12.00 to \$12.50 on the 1st of April 2009
- the adult minimum wage changed from \$12.50 to \$12.75 on the 1st of April 2010

- No
- yes, for employees paid at the minimum wage
- yes, for employees paid a set amount above the minimum wage
- don't know

**39 Mark one oval. What is the most important factor in determining the entry wage of this business's newly hired employees?**

- minimum wage rates
- collective pay agreement
- wages or salaries of similar employees within this business
- wages or salaries of similar employees outside this business
- availability of similar workers in the labour market
- other

**40 Mark one oval. For this business's most recent debt request, was any finance received?**

- yes → go to **41**
- no —————→ go to the start of **Section D** on page 25
- don't know ————→ go to the start of **Section D** on page 25

**41 How many unions does this business negotiate collective agreements with?**

**42 Mark one oval for each item listed. How has union representation of employees affected the following in this business:**

	decreased	unaffected	increased	don't know
quality of work environment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
communication of employees' views	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
costs of conducting bargaining	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
productivity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
profitability	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
total labour costs (including wages and salaries)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
level of flexibility/ability to make changes to employment conditions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>