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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 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 of firms reporting that they do not have a fixed month for wage changes. There are some links from inflation and minimum wage legislation to wage adjustments; in both cases the link is stronger as firm size increases.

* The views expressed in this paper are those of the author(s) and do not necessarily reflect the views of the Reserve Bank of New Zealand. We thank participants at the 2015 Conference of the New Zealand Association of Economists, as well as an anonymous referee.

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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 business or organisation. The results in this paper have been confidentialised to protect individual businesses from identification.

Careful consideration has been given to the privacy, security, and confidentiality issues associated with using administrative and survey data in the IDI. Further detail can be found in the Privacy impact assessment for the Integrated Data Infrastructure available from www.stats.govt.nz. Any table or other material in this report may be reproduced and published without further licence, provided that it does not purport to be published under government authority and that acknowledgement is made of this source.

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Non-technical summary

In this paper, we present findings on how New Zealand businesses set wages. The results are drawn from a large survey of more than 5,300 businesses, the *Business Operations Survey*, conducted in 2010 by Statistic New Zealand.

We find that most New Zealand firms (74 percent) review and set wages annually, which is similar to the proportion in other countries. In general, businesses do not have a predefined month in which they review and set wages, but for those firms that do, April is the most common month. April is the most common month for businesses to begin their financial year, and so it is unsurprising that this is when most changes occur.

We find that there is a reasonably strong link between inflation and wages – 55 percent of employees have their wages set with some kind of link (formal or informal) to inflation. This number is reasonably high internationally, but is in line with previous macro-economic studies of wages and inflation in New Zealand. Past inflation outcomes are more important for determining wages than expectations of future inflation.

Most firms reported that there was no link between minimum wage legislation and wage setting. However, this varied considerably by firm size – very few small firms reported a link between minimum wage legislation and wage setting, while most larger firms (who are more likely to have minimum-wage workers) reported some link.

We use a statistical technique called probit analysis to identify which characteristics of a firm influence how frequently they change wages. The size of the firm was a significant determinant, with larger firms more likely to change annually or more frequently. Similarly, the skill-mix of a firm was a significant determinant, with higher-skill firms more likely to change annually or more frequently. The industry in which a firm operates was not a significant determinant of frequency, once we controlled for other factors.

1 Introduction

Wage-setting behaviour of firms is one of the key 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 – where wages do not immediately change 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 Taylor (1980) type fixed-duration contracts or Calvo (1983) type random-duration contracts? The type of contract used has important implications for the degree of nominal rigidity in the economy, but it is difficult (or impossible) to distinguish between the two using only macroeconomic data. 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 survey responses point to reasonable rigidity in wages. The majority of wages are set annually, with very few firms resetting wages more frequently than once per year. Wage rigidity is linked to firm size, the mix of skills within the firm's workers, the degree of wage indexation and, to a lesser extent, collective bargaining with unions. There is clear downward nominal rigidity to wages, with the strongest driver being firm's fear of the knowledge loss through employees leaving. Unions were an important factor for those firms that negotiate collective agreements, but such firms are relatively few in number.

2 Survey design

The data discussed in this paper originate from the 2010 *BOS* carried out by Statistics New Zealand in August 2010.[1] The target population of the *BOS* was enterprises on Statistics New Zealand's Business Frame with an annual GST turnover greater than NZD 30,000 and at least 6 employees. Enterprises in the *BOS* are defined as all economic units for which individual accounting records are available (thus, for example, a business operating in three locations would count as three enterprises on the Business Frame). The sample therefore covers companies, partnerships, incorporated clubs and societies, state owned enterprises and statutory bodies, government departments and agencies, and trusts. For the *BOS* sample, firms operating in public administration and safety were excluded (i.e. most of central government), as were local government enterprises, the central bank, and non-profit institutions in the service of households. The final estimated population was 35,307 enterprises.

The sample design was a two-level stratification, firstly by Australia and New Zealand Standard Industrial Classification 2006 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, with firms' general managers being asked to complete the survey (with confirmation from support people for some questions). The survey had 5,369 responses, a response rate of 81.8 percent and comprising approximately one firm in seven of the targeted population of firms. The high response rate reflects the legal requirement for firms to respond to Statistics New Zealand's request for data. In addition to the firm demographic questions asked every year, the 2010 *BOS* contained questions on three main topics: wage- and price-setting behaviour, information and communications technology usage, and financing. The survey questions on wage setting are provided in the appendix.[2] Firms were asked to report on the most recently completed financial year prior to the sampling date. In many senses (par-

[1] See http://www.statistics.govt.nz/browse_for_stats/businesses/business_growth_and_innovation/businessopsurvey2010tables.aspx for a full description of the survey.

[2] 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.

ticularly the extremely high response rate and comprehensive industry coverage), the *BOS* represents best practice in economic surveying. However, some of the questions on wage-setting behaviour were somewhat imprecise. For example, the *BOS* explicitly asked respondents to consider wage changes '*for most... employees*'. Thus, the results intentionally aggregate away from the heterogeneity within a firms' wage-setting practices. It is possible that wage-setting behaviour will vary across employees within a firm (at the least between, for example, part-time and full-time employees); in the *BOS* it is impossible to differentiate these changes.

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.[3] 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.[4] Data for output by employment size and by industry are unfortunately not available.

[3] The mean weight of firms is 6.6 (employees), with around 80 percent of firms having a weight less than 10 (employees).

[4] Preschool 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[5] wage or salary changes (i.e. excluding non-financial benefits) for most employees. The available responses were 'more often than annually', 'annually', and 'less often than annually'. The majority of firms change wages annually (table 1). 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, and 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.

[5] It is assumed that 'implementation' of a wage change occurs when the wage changes, rather than when it is negotiated. This is relevant if, for example, a firm negotiates multi-year contracts with a union which include yearly changes. In this example, 'implementation' would occur annually, despite negotiation happening less frequently than annually.

Table 1
How frequently are wage and salary changes implemented?

Industry	Number of firms	Frequency of changes: More often than annually	Annually	Less often than annually
Agriculture	2103	4	65	31
Commercial fishing[(a)]	42	8	71	21
Forestry and logging	210	17	45	38
Agriculture, forestry, and fishing support services	762	17	48	35
Mining	99	3	78	19
Primary	**3216**	**8**	**60**	**32**
Food, beverage, and tobacco	921	3	62	35
Textile, clothing, footwear, and leather	357	6	58	36
Wood and paper product	528	3	60	37
Printing, publishing, and recorded media	306	1	54	45
Petroleum, coal, chemical, and associated product	414	5	70	25
Non-metallic mineral product	165	3	65	32
Metal product	912	11	70	19
Transport and industrial machinery and equipment	831	6	71	23
Other machinery and equipment	210	5	67	29
Other manufacturing	369	8	57	37
Electricity, gas, water, and waste services[(a)]	114	5	62	33
Industry	**5127**	**6**	**64**	**30**
Construction	**3468**	**8**	**55**	**36**
Machinery and equipment wholesaling	903	1	77	21
Other wholesale trade	1959	3	70	27
Retail trade	4215	6	50	44
Distribution	**7077**	**4**	**59**	**37**
Accommodation and food services	4194	12	59	29
Transport, postal, and warehousing	1362	5	50	45
Publishing	120	3	70	28
Motion picture	135	4	63	34
Telecommunications[(a)]	87	7	76	17
Finance	159	2	81	16
Insurance[(a)]	45	5	89	5
Auxiliary finance	303	5	85	10
Rental, hiring, and real estate services	804	9	63	28
Other professional scientific	2907	6	83	11
Computer systems design	558	8	70	22
Administrative and support services	1335	9	69	22
Arts and recreation services	486	6	60	34
Other services	978	5	53	43
Private services	**13473**	**8**	**66**	**26**
Education and training	717	8	69	22
Health care and social assistance	2226	5	78	18
Government services	**2943**	**6**	**76**	**19**
Total — firm count weight	35307	7	63	30
Total — employment weight	35307	6	74	20

Note:(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 ($0 \leq \mathrm{h} \leq 1$) 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. (2006) 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 (Barattieri 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.[6]

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 (table 2). 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.

[6] 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
Size													
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
Sector													
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 weight	5	3	4	13	3	4	8	3	3	3	4	4	52
Employment 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 do 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. Moreover, July reflects the start of the Australian fiscal year, so firms with an Australian connection (e.g. operations in Australia, and Australian parent company) may be more likely to change wages in July than in other months.

Of those firms that change wages in a particular month, the first month of the

firms' financial year does appear prevalent (table 3). The presence of a minimum wage legislation change in both April 2009 and April 2010 (discussed in section 3.5) may also have contributed to the prevalence of April wage changes.

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, Barattieri et al. (2010) find no seasonality in the frequency of wage changes in the United States.

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

	Month wage / salary change implemented												No
End month of financial year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	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

Note: First month of financial year shaded in grey.

3.3 What factors contribute to downward nominal wage rigidity?

A well-documented phenomenon of wage dynamics is downward rigidity — workers are highly averse to 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, 1989).[7]

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 (table 4). 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'.

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.

[7] 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 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 as experienced employees would leave	Employees would resent managers
Size									
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
Sector									
Primary	5	43	18	33	39	32	52	52	37
Industry	14	38	21	32	42	38	60	60	35
Construction	8	35	21	35	50	46	68	65	38
Distribution	6	37	22	31	42	42	54	61	34
Private services	9	38	23	33	40	42	56	59	36
Gov't services	17	35	25	40	40	41	58	62	35
Collective bargain									
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 weight	9	38	22	33	42	41	57	60	35
Employment weight	22	43	24	39	44	45	62	62	33

3.4 How strongly are wages linked to inflation?

Firms were asked whether there were any links between their wage and salary adjustments and inflation. Around half — 43 percent by firm weight and 55 percent by employee weight – report that there is some form of link with inflation (table 5). 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 only a third of firms report a 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 causes wage growth, and Coibion et al. (2015) show that 41 percent of firms follow inflation when making business decisions. Both of these findings are consistent with our results.

Table 5
Link between wage and salary changes and inflation

	Contractually linked to inflation	Take account of past inflation	Take account of expected inflation	None of the above
Size				
Small	8	27	9	60
Medium	5	38	12	49
Large	8	47	22	35
Sector				
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
Collective agreements				
Yes	13	50	24	25
No / don't know	7	29	9	58
Total				
Firm count weight	7	30	10	57
Employment weight	7	40	16	45

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 inflation when setting wages, 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 (table 6). 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, only 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
Size				
Small	63	28	12	2
Medium	54	38	13	2
Large	43	46	17	4
Sector				
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 weight	60	31	13	2
Employment weight	51	39	14	3

There is little international survey 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 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 (table 7). 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.

These results are broadly consistent with the international literature. Galuščák et al. (2012) 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 Magnitude of wage changes

As well as the frequency of wage changes, an important factor when considering firms' wage-setting behaviour is the magnitude of those wage changes. The *BOS* dataset does not include questions on the magnitude of wage changes; however we are able to infer magnitudes based on data from the Labour Cost Index (LCI) survey. The LCI is a quarterly measure of unit labour costs, prepared by Statistics New Zealand. The LCI measures changes in wage inflation of paid employees in all occupations, and data are sourced from a survey of about 2,000 employers (covering about 6,000 workers). The LCI dataset includes a distribution of wage changes by magnitude. Table 8 summarises the annual average proportion of wages by magnitude for the calendar years 2009 and 2010.

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
Size						
Small	17	2	51	19	10	7
Medium	17	5	55	17	10	3
Large	13	17	43	19	11	2
Sector						
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
Collective agreements						
Yes	8	39	42	12	8	2
No / don't know	17	2	52	19	10	6
Total						
Firm count weight	16	3	51	19	10	6
Employment weight	14	11	49	18	10	4

Table 8
Proportion of wages of employees by magnitude of change (annual average)

Year	Decrease	No change	0% to 2%	2% to 3%	3% to 5%	5%+
2009	0.5	48.0	4.5	6.8	24.8	15.5
2010	0.3	51.8	10.5	13.8	15.3	8.3

In its section on wage changes, the *BOS* didn't specify a given year for which wage-setting behaviour should be considered. However, most of the questions in other sections of the *BOS* made reference to the 'last financial year'. Thus, firms were likely to have been considering wage changes in either 2009 (the last financial year) or 2010 (the current financial year at the time of completing the *BOS*) when answering the questions. In both 2009 and 2010, most wage changes were relatively small, as the New Zealand economy was in the immediate aftermath of the global financial crisis. The aggregate LCI increased by 1.6 percent over 2009, and 1.9 percent over 2010 (for comparison, over 2008 the LCI increased by 3.2 percent). This weakness in the labour market is apparent in the distribution data — around half of all wages saw no change in 2009 and 2010. With this in mind, it is possible that the frequency of wage changes expressed in the *BOS* understates the usual frequency. If wage increases were less common in 2009 and 2010 than they currently are, then it is possible that the frequency of wage changes reported in the *BOS* understates the current level as the New Zealand labour market has tightened.

The LCI data also provide a useful cross-check for the analysis of downwards nominal wage rigidity based on the *BOS* data. Since 2000, despite the New Zealand economy experiencing two recessions, the proportion of wages decreasing in a given quarter has been greater than zero in only three quarters (2009Q3 to 2010Q1). Thus, the LCI distributions data is supportive of strong downwards nominal wage rigidity in New Zealand, which was also apparent in the *BOS* data.

3.8 Determinants of 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[8].

We test for evidence that these factors influence wage rigidity using our survey data. We estimate a probit 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, that takes the value of 0 when the wage or salary changes are implemented annually or more frequently and 1 when the the changes are implemented less frequently than annually. The reference firm is a small firm operating in the industrial sector. We also include a number of firm-level characteristics as coviariates 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

[8] See Babecký et al. (2010) for a survey of determinants of wage rigidity and Messina et al. (2010) for a cross-country summary.

The final set of covariates measures 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 0 otherwise. 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, and 0 if there is no link to inflation.

Table 9 summarises the results from three probit estimations, showing the average marginal effects of these covariates on the probability that the firm changes wages less frequently than annually. The coefficients from the underlying regressions are reported in the appendix.

Table 9
Average marginal effects from probit models on likelihood of changing wages less frequently than annually

	(1)	(2)	(3)
Industry	*reference*	*reference*	*reference*
Primary	0.034	0.021	−0.009
Construction	0.035	0.032	0.020
Distribution	0.005	0.022	0.002
Private services	−0.043**	−0.009	−0.023
Govt services	−0.068**	−0.028	−0.034
Small	*reference*	*reference*	*reference*
Medium	−0.099**	−0.121**	−0.084**
Large	−0.197**	−0.218**	−0.162**
Competition	−0.013	−0.012	−0.011
Export share	−0.001**	−0.000	−0.000
High skilled		−0.002**	−0.002**
Technician		−0.002**	−0.001**
Collective			−0.029**
Wage indexation			−0.205**
Observations	5369	5369	5369
Pearson Chi^2	653 (0.71)	3293 (0.84)	4005 (0.66)

Note: * Significant at 5 percent level, ** significant at 1 percent level. Average marginal effects show the percentage increase in the probability of choosing to differentiate prices of a one unit increase in the explanatory variable. Underlying estimation coefficients given in table 10 in the appendix.

Column (1) shows the average marginal effects from a probit model using firm

product market characteristics – sector, size and competition. There is a clear differentiation by size, with medium firms 10 percent less likely than small firms to change wages less frequently than annually, and large firms 20 percent less likely. There is some differentiation by sector, with service sector firms less likely to change wages infrequently. Competition appears to have no effect on the frequency of wage changes, whereas higher competition increases the frequency of price changes (see Parker, 2014). There is some effect from competition in foreign markets, with a 10 percentage point increase in the share of output exported reducing the probability of changing wages less frequently than annually by 1 percent.

The probit was re-estimated with the inclusion of the variables pertaining to the composition of the workforce (column 2). Having a higher proportion of employees classed as high-skilled and technicians increases the likelihood of more regular wage changes. Once the composition of the workforce is included, the sector the firm operates in no longer has any explanatory power for frequency of wage changes.

A final probit was estimated including the labour market institutions variables (column 3). Firms that undertake collective bargaining are 3 percent less likely to change prices infrequently. Presumably the formal bargaining process forces these firms into an annual process. Where wage changes have some link to inflation, be it formal or informal, firms are markedly less likely to reset prices less frequently than annually. With inflation typically reported in annual percent changes, providing index-linked adjustments is more complex for less frequent changes. The previous findings that larger firms and those employing more highly skilled labour are more likely to change wages more frequently are robust to the inclusion of the labour market institutions data.

4 Conclusion

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, collective bargaining with unions.

Wages display limited synchronicity in adjustment, with only a minority of 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.

Wage setting in New Zealand exhibits strong downward nominal rigidity. 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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Appendices

A Probit estimation coefficients

Table 10
Coefficients from probit estimation

	(1)	(2)	(3)
Primary	0.111	0.0731	−0.0344
	(0.0707)	(0.0712)	(0.0735)
Construction	0.112	0.110	0.0743
	(0.0971)	(0.0975)	(0.100)
Distribution	0.0162	0.0764	0.00815
	(0.0672)	(0.0679)	(0.0713)
Private services	−0.154**	−0.0326	−0.0879
	(0.0510)	(0.0528)	(0.0552)
Gov't services	−0.250**	−0.104	−0.133
	(0.0782)	(0.0802)	(0.0829)
Medium	−0.317**	−0.391**	−0.299**
	(0.0423)	(0.0435)	(0.0453)
Large	−0.745**	−0.835**	−0.656**
	(0.0621)	(0.0638)	(0.0678)
Competition	−0.0469	−0.0443	−0.0419
	(0.0438)	(0.0442)	(0.0458)
Export share	−0.00276**	−0.00160	−0.00102
	(0.000948)	(0.000967)	(0.00100)
High skilled		−0.00844**	−0.00828**
		(0.00111)	(0.00115)
Technician		−0.00597**	−0.00517**
		(0.00123)	(0.00128)
Collective			−0.114*
			(0.0478)
Wage indexation			−0.792**
			(0.0421)
Constant	−0.406**	−0.229**	0.115
	(0.0545)	(0.0583)	(0.0642)
Observations	5369	5369	5369
Log likelihood	-2711	-2667	-2476
Pseudo R^2	0.04	0.06	0.12
Pearson Chi^2	653 (0.71)	3293 (0.84)	4005 (0.66)

*, ** significant at 5 percent and 1 percent level respectively.
White (1980) robust standard errors in parentheses.

B Survey questionnaire

Section C: Price and Wage Setting

1 Section C should be completed by the General Manager

Definition

2 The following section asks about factors that are important when this business reviews and sets prices. To answer these questions, apply the following definition.

Main product: The product (good or service) or product group from which this business gets its largest share of revenue.

If this business does not have a main product (eg in the case of large-format retail stores), provide answers that are most representative of this business's price-setting process.

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?**

- o more often than annually
- o annually
- o less often than annually

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

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

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	o	o	o	o
employees expect the employer to smooth wages over changing economic conditions	o	o	o	o
a reputation for reducing wages makes it difficult to hire employees	o	o	o	o
employees would reduce their effort	o	o	o	o
hiring and training costs would increase because employees leave	o	o	o	o
the best employees would leave - this business instead prefers to reduce the number of poor performers	o	o	o	o
hard-to-replace knowledge (eg client relationships) is lost because experienced employees would leave	o	o	o	o
employees would resent their managers	o	o	o	o

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

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

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

- o yes
- o no, but it is expected to be a factor in future negotiations
- o 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

- o no
- o yes, for employees paid at the minimum wage
- o yes, for employees paid a set amount above the minimum wage
- o 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?**

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

40 **Does this business negotiate collective agreements with unions?**

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

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