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# THE FUTURE OF WORK IN NEW ZEALAND:

## AN EMPIRICAL EXAMINATION

2021

# AUTHORS

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Access to the data used in this study was provided by Stats NZ under conditions designed to give effect to the security and confidentiality provisions of the Statistics Act 1975. The results presented in this study are the work of the author, not Stats NZ or individual data suppliers.

These results are not official statistics. They have been created for research purposes from the Integrated Data Infrastructure (IDI) and Longitudinal Business Database (LBD) which are carefully managed by Stats NZ. For more information about the IDI and LBD please visit https://www.stats.govt.nz/integrated-data/.

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# Abstract

*This report examines the adoption of future-of-work (FoW) practices, processes and technology in New Zealand workplaces. It uses the 2018 Business Operations Survey (BOS) linked to administrative data from Stats NZ's Integrated Data Infrastructure (IDI) and Longitudinal Business Database (LBD) to examine two main questions, each with a firm-level and an individual-level component. First, 'What proportion of firms are using FoW practices and what share of workers are employed by these firms?'. In addition, 'What firm characteristics are associated with being more likely to have FoW practices and what worker characteristics affect the odds of being employed by such firms?'. We investigate a variety of practices associated with the FoW, covering areas such as employee engagement and inclusion policies, flexible leave and work options, automation and digitalisation, and the use of collective agreements and non-standard work.*

*Across almost all the FoW practices investigated, we find that female workers are more likely to be employed by firms with these practices than male workers. It may be that firms with progressive practices, such as flexible work options, are more open to employing female workers or that female workers self-select into firms with these practices. Women are also more likely to work in firms which employ a greater share of workers on non-standard contracts, which is in line with previous work highlighting that women are more likely to experience insecure work. Māori, Pacific and Asian workers are also more likely to work in firms with FoW practices than European workers. The adoption of FoW practices varies considerably by industry, and these differences are largely in line with our expectations. Also, in line with our expectations, smaller firms are less likely to have FoW practices.*

*We speculate on potential drivers and implications of the observed relationships between FoW and firm and worker characteristics. We also discuss the possible role of Covid-19 and the associated policy responses on FoW practices, such as the adoption and normalisation of digitalisation and flexible work practices.*

# Executive summary

The 'Future of Work' (FoW) describes a variety of interacting disruptive forces, such as digitalisation and globalisation, that are changing the nature of the way we work, workforces and workplaces. Despite the ubiquity of discussion about the FoW, there appears to be little evidence on the adoption and distribution of FoW practices in New Zealand. This report is a first step in addressing this information gap. It uses the 2018 Business Operations Survey (BOS) linked to administrative data from Stats NZ's Integrated Data Infrastructure (IDI) and Longitudinal Business Database (LBD) to examine two main questions, each with a firm-level and an individual-level component. First, 'What proportion of firms are using FoW practices and what overall share of workers are employed by these firms?'. In addition, 'What firm characteristics are associated with being more likely to have FoW practices and what worker characteristics affect the odds of being employed by such firms?'. We investigate a variety of practices associated with the FoW, covering areas such as employee engagement and inclusion policies, flexible leave and work options, automation and digitalisation, and the use of collective agreements and non-standard work.

A consistent finding across almost all of the FoW practices examined is that female workers are more likely to work in firms which have these practices (even after controlling for a range of other explanatory factors such as industry of employment). This could reflect that more progressive firms are more likely to adopt FoW practices and are also more likely to hire, retain and promote women. In addition, such patterns may reflect that female workers have a stronger preference to work in firms with FoW practices such as additional parental leave, fair work policies, and flexible work options.

Turning to ethnicity, Māori, Pacific and Asian workers have greater odds of being employed by firms with FoW practices than European workers. As in the case of gender, these patterns may reflect ethnicity-based hiring or promotional biases and/or that non-European workers have a stronger preference to work in firms with FoW practices.

We also find that female workers and Māori and Pasifika workers are more likely to work in firms with a higher share of workers on collective agreements and with non-standard employment arrangements (covering temporary, casual and contract work). We speculated that this may reflect that these groups are more likely to be employed by firms with a higher share of lower-paid and more precarious roles, which is consistent with previous New Zealand research. Although data limitations make it difficult to assess, previous research has highlighted that the share of non-standard work in New Zealand does not appear to have increased based on available indicators. However, if it does increase in the future, women and Māori and Pasifika workers are likely to be affected disproportionately.

For almost every FoW outcome examined, workers with lower earnings are less likely to work in firms with FoW practices. This could be, in part, because we cannot control for occupation and education level due to data limitations and earnings may be proxying for these factors. Even within industries, the composition of workers within a firm in terms of occupation and education levels could vary considerably. Taking the administrative and support services industry as an example, a firm that primarily undertakes office administration services may have higher paid and more qualified workers on average than a cleaning services firm. The nature of the work being undertaken by the office administration firm is also likely to be amenable to many of the FoW practices such as working from home. In addition, it is likely that higher skilled workers have a greater ability to be selective about

where they are employed, and all else equal, may prefer firms with more progressive workplace practices. These factors suggest that the positive relationship between earnings and FoW practices may be less pronounced if occupation and qualification level were controlled for.

There are strong relationships between industry and FoW practices at both the individual and firm levels. For example, there is a large prevalence of FoW practices, including performance reviews, employee feedback programmes, fair work policies, flexible leave and work options, automation and the use of online platforms in industries such as financial & insurance services and information media & telecommunications. However, the patterns for collective agreements and non-standard work are different. The highest rates of firm coverage of collective agreements are in postal & warehousing, accommodation & food services and manufacturing. The agriculture, forestry & fishing, arts & recreation, education & training and administrative & support services industries have the greatest prevalence of firms with a high share of non-standard workers.

These industry results are largely as expected. For example, the nature of the work undertaken in industries such as financial & insurance services is more amenable to FoW practices such as flexible work options and automation (which includes, for example, automation of data collection and processing). It is also unsurprising that industries where work is seasonal and/or relatively low paid such as agriculture, forestry & fishing and accommodation & food services have a greater prevalence of non-standard work arrangements.

In general, we find that large firms (100 or more employees) are more likely to have FoW practices than small (less than 20 employees) and medium firms (20-99 employees). In the case of practices such as automation and digitalisation, the higher volumes involved with larger firms may make it more likely that the fixed costs of automation are worth bearing. In the case of workplace practices such as performance reviews, employee feedback programmes and flexible work and leave options, large firms may be more likely to establish these on a formal basis than smaller firms because they are more difficult to manage on an informal basis within large organisations. This highlights a limitation of the information available in BOS, which generally asks whether these policies or practices are offered on a formal basis.

This report provides initial results on the prevalence and distribution of FoW practices in New Zealand. Future work could use individual-level data on FoW practices from the Survey of Working Life (SoWL) supplement of the Household Labour Force Survey (HLFS). This would complement the current work by allowing analysis of individuals' exposure and access to FoW practices whereas this report only provides information on whether individuals work in firms with these practices. SoWL would also allow information such as occupation and highest qualification to be included. It also includes additional useful information, particularly on dimensions of job quality, such as perceived job security and work-related stress and access to options such as flexible work hours.

# Contents

# 1 Introduction

The term 'Future of Work (FoW)' describes a variety of interacting disruptive forces, such as digitalisation and globalisation, that are changing the nature of the way we work, workforces and workplaces. This report focuses mainly on workers and workplaces, examining the prevalence of workplace practices commonly associated with the FoW.

Despite the ubiquity of discussions about the FoW, there appears to be little evidence on the prevalence and distribution of key FoW practices in New Zealand workplaces. This report is an initial step to addressing this information gap. We seek to answer two main questions, each with a firm-level and an individual-level component. First, 'What proportion of firms are using FoW practices and what share of workers are employed by these firms?'. In addition, 'What characteristics are associated with firms being more likely to have FoW practices and what worker characteristics affect the odds of being employed by such firms?' We use information from Stats NZ's Business Operations Survey (BOS) 2018 Module C on the 'Changing nature of work', which asks firms about their adoption of various FoW practices. The BOS is part of New Zealand's Integrated Data Infrastructure (IDI) which allows us to link this dataset to various administrative data sources. We can thus analyse these FoW practices at the individual and firm levels and control for various worker and firm traits.

One of the key findings from this analysis is that women are more likely to work in firms that have adopted FoW practices, such as flexible leave and working arrangements. This finding is independent of industry-based gender imbalances and industry differences in the prevalence of FoW practices. However, occupational differences by gender may play a role as we are unable to control for this possibility due to data limitations. Firm size is also found to have a significant and sizeable effect on a firm's likelihood of adopting FoW practices, with smaller firms less likely to adopt these practices.

While descriptive, these findings provide a backdrop for understanding the adoption of technology and progressive practices in New Zealand businesses. It is a starting point for questions such as: Who is most likely to be affected by technological change?; What type of firms are likely to be trend setters and which run the risk of lagging behind?; and how might vulnerable workers be affected by these changes? However, a key limitation is that our analysis relies on an ad-hoc survey module. We, therefore, can provide only a snapshot of the associations between FoW practices and workplace and worker characteristics. We are unable to provide time-series information nor establish causal relationships.

This report proceeds as follows. Section 2 reviews literature on the FoW in relation to the New Zealand context, discussing five dimensions of the FoW: job quantity, job quality, social protections, wage and income inequality, and social dialogue and industrial relations. Section 3 provides a summary of the data and methodology used. Section 4 addresses our first research question by providing information on the prevalence of FoW practices. Section 5 presents results from logistic regressions to address our second research question on the relationship between FoW practices and firm and worker characteristics. Section 6 highlights general patterns that occur across the range of modelled FoW practices, discussing the possible drivers and implications of these general patterns. Finally, Section 7 concludes.

# 2 The Future of Work

The FoW encompasses a wide range of practices, trends and developments. While there is no commonly agreed definition of what FoW trends encompass, the International Labour Office (ILO) categorise FoW themes into five dimensions. These are: the number of jobs, the quality of jobs, social protection, wage and income inequality, and social dialogue and industrial relationships (Balliester and Elsheikhi, 2018). The following subsections describe each of these dimensions and how they relate to the New Zealand context.

This discussion is provided as background. As will be further explained in later sections, our analysis will focus on worker and workplace aspects of the FoW that are amenable to measurement via Stats NZ's BOS survey. However, this background information provides useful context. For example, while our analysis does not cover social protections, by examining which workers are more likely to be exposed to particular FoW practices, it may provide insights into who is benefiting from these practices, or who may be potentially vulnerable due to them.

## 2.1 Number of jobs

The number of jobs is separated into two themes. The first considers changes to the labour force (such as workforce ageing, rising female labour force participation and changes in migration) and how this is changing the number and composition of the workforce. That is, labour market supply considerations. This is potentially of relevance to the BOS analysis we undertake as the individual-level models include explanatory variables such as gender, age and whether the worker was born in NZ. A positive relationship between female workers and the likelihood of working at a firm with FoW practices could, for example, indicate that these practices may become more important as the gender composition of the workforce continues to shift. The second theme considers changes in employment and job availability driven by factors such as automation and job transformation. That is, labour market demand considerations. The BOS includes some relevant measures in this area, such as the extent of task automation within firms.

Ageing populations are a primary consideration of the first theme, and a common trend among OECD countries (Balliester and Elsheikhi, 2018). New Zealand's old-age dependency ratio (the number of people aged 65 and over per 100 people aged 15-64) was 22.4 in 2015 and following global trends, is projected to reach 39.7 by 2050 (United Nations, 2019). This likely means that a lower share of the population will be working going forward, although this may be partially offset by older people working for longer.

Increasing female workforce participation may help to offset factors which are reducing the share of the population who are working. Female workforce participation in New Zealand has increased steadily from 54.6% in 1986 to 65.8% in 2019, with a particularly large increase among women of childbearing age (Stats NZ, n.d.).

Another demographic trend is high net migration inflows. Before Covid-19 border restrictions, NZ had high levels of immigration and, as a result, one of the highest shares of foreign-born people in the population among OECD countries (OECD, 2020). In terms of emigration, there have also been concerns about the outflow of skilled workers, often referred to as the 'brain drain'. However, New

Zealand's focus on skilled immigration has led some to describe the situation as a 'brain exchange' rather than a 'brain drain' (for example, Glass and Choy, 2001).

The second theme affecting the number of jobs is the prevalence of employment and job availability. A key consideration is the effect that technological advancement will have on the destruction of jobs. Several studies argue that technological advancement, particularly in automation, will have a destructive impact on a number of existing jobs (Arntz et al., 2016; Frey and Osbourne, 2013). However, the degree to which jobs will be displaced is contested. Studies using an occupation-based approach such as Frey and Osbourne (2013), tend to estimate much higher automatability of jobs (47% across the United States) than studies using a task-specific approach, such as Arntz et al. (2016) which finds that 9% of tasks on average are automatable across OECD countries. Furthermore, even if tasks can be performed by machines, there may be legal, ethical or economic reasons that they are not. Following a similar approach to Frey and Osbourne (2013), Nedelkoska and Quintini (2018) find New Zealand workers to have the lowest risk of automation of all OECD countries, at 42% automatability, compared to an average of 47% across all OECD countries.

While net losses in the number of jobs cannot be ruled out entirely, often the impact of new technology is a transformation of jobs, or new jobs being created as consumer demand increases (Warhurst and Hunt, 2019). Other changes are leading to the creation of jobs in emerging fields (such as the green economy and personal services) although it is unclear whether this will be rapid enough to offset job destruction from technological advancement (Balliester and Elsheikhi, 2018). However, even if job destruction is offset by the creation of new jobs, these changes are likely to favour some types of workers more than others, raising potential concerns about inequality (discussed in Section 2.4).

## 2.2 Job quality

The OECD has developed a framework for measuring and assessing job quality (Cazes et al., 2015). This encompasses three broad dimensions: earnings quality, labour market security and the quality of the working environment.

The first dimension, earnings quality, captures the extent to which earnings contribute to workers' wellbeing and takes account of both the level and distribution of earnings. According to the OECD index in 2014, New Zealand was close to the OECD simple average and ranked 21st out of 36 OECD countries (OECD, 2016).[1] Earnings inequality is discussed further in Section 2.4.

In terms of labour market security, in 2016, New Zealand ranked 23rd out of 35 OECD countries with available data, with a similar score to the OECD simple average (OECD, 2016). This measure is made up of two components: unemployment risk and unemployment insurance. New Zealand performs relatively well on the unemployment risk component, which combines the probability of becoming unemployed with the length of unemployment spells. However, New Zealand performs relatively poorly on the unemployment insurance component, which takes account of the coverage of unemployment insurance/assistance and the replacement rate of unemployment payments. This reflects that New Zealand is an outlier among OECD countries in terms of its system of support for unemployed workers. The vast majority of OECD countries have income-smoothing mechanisms via

[1] The OECD index: OECD's combined index uses both average earnings and the earnings distribution of workers which are measured by a generalised means approach to aggregation. It is assumed that workers are averse to inequality. Data are for 2013 rather than 2014 for Chile and Sweden.

unemployment insurance systems where eligibility and the rate of support is tied to a person's previous earning levels and individual contributions. In contrast, New Zealand has a safety net system whereby means-tested payments are funded from general taxation. As a result, many displaced workers do not qualify for assistance (for example, because their partner works) and for many people, the payment level is well below the level of their previous earnings. Indeed, New Zealand households face unusually large falls in income compared with other OECD countries in the event of job loss (New Zealand Productivity Commission, 2019).

The last dimension of the OECD job quality framework is quality of the working environment. New Zealand scores relatively well on this dimension, ranking 5th out of the 33 OECD countries with available data in 2015. However, looking at the sub-components of this dimension, New Zealand's performance is variable. For example, out of these 33 countries, it has the lowest percentage of workers reporting inflexible working hours. Furthermore, it has the 9th highest shares of workers who work long hours (60 hours or more a week on average) (OECD, 2016).

The OECD's job quality framework focuses on outcome measures rather than regulatory settings. The OECD also provides some measures of labour regulations, such as the strictness of employment protection legislation, which incorporates factors such as the strictness of dismissal regulations (OECD, 2021). These data show that the strictness of New Zealand's employment protection legislation is relatively low compared with most other OECD countries. For regular employees, New Zealand is the OECD country with the 11th least stringent employment protection legislation. For temporary employees, it has the fourth least stringent employment protection legislation. That is, New Zealand's labour market is relatively flexible. While this flexiblity can afford advantages to both employers and employees and can contribute to a dynamic labour market, it also means that New Zealand employees have lower levels of protection than in most OECD countries.

The difference between the strictness of regulations between regular and temporary employees is also a consideration. In countries where regular employees have greater legal protections than temporary employees, this can lead to employers using temporary employment contracts rather than permanent ones in order to take advantage of the greater flexibility these allow for. In New Zealand, as in most OECD countries, the protections for temporary employees is lower than for regular employees, although the difference is not as large as seen in many other OECD countries.

Temporary employment is one type of non-standard work, which is a common concern in terms of job quality and the FoW. As well as temporary employment, non-standard employment consists of workers employed on a part-time basis, on contract for services and those under dependent self-employment.[2] While these forms of work bring advantages in terms of flexibility for both workers and employers, they raise concerns of job quality and other potential negative outcomes that may be associated with non-permanent employment such as lower wages, reduced wages, reduced social protection and work insecurity (Balliester and Elsheikhi, 2018). In response, policymakers in many countries are reviewing regulation in this space. However, a potential risk to more stringent regulation is diminishing the flexibility that is afforded by non-standard work (OECD, 2019).

The concerns about non-standard work extend to New Zealand policymakers. Relevant government investigations into this space include the Future of Work Tripartite Forum, the Productivity Commission's Inquiry into Technological Change and the Future of Work, and the Government's

[2] A worker under dependent self-employment is a worker who performs services for a single or a small number of businesses under a contract different to a contract of employment, and is therefore dependent on that firm for the majority of their work.

consultation on options for strengthening legal protections for contractors. While the available data are limited, it appears that the extent of non-standard work in NZ remains low and has not yet shown signs of expanding (New Zealand Productivity Commission, 2019). The Survey of Working Life (SoWL) 2018 indicates that permanent employment is still the dominant employment type in NZ (74.2%), 11.7% are self-employed without employees and 5.8% are employers (Stats NZ, 2019a).

Platform-mediated work, or 'gig' economy work, is a specific type of non-standard work that has raised concerns internationally with respect to worker protections. The main concerns being the precariousness of gig work, reduced bargaining ability and reduced legal protection. These concerns stem from the inability of platform workers to connect with colleagues and organise themselves in the absence of a fixed place of work (Sokas, 2017). In New Zealand, there are also regulatory restrictions to such workers organising themselves (see discussion in Section 2.5). Furthermore, ambiguity around legal protections and conflict resolution raise questions about how effectively worker protections will be enforced, if at all (Balliester and Elsheikhi, 2018).

While there is a lack of data on how many workers are undertaking gig work in New Zealand, the New Zealand Productivity Commission (2019) recently concluded from available information that the gig economy in NZ likely encompasses a small share of workers. They also indicated that much gig work appears to be done for short periods of time (for example, as an income-smoothing mechanism between jobs) and not as a primary source of income.

The effects of the Covid-19 pandemic (and resulting containment measures in New Zealand) on non-standard work prevalence and platform-mediated work have yet to be investigated, and in any case, data limitations would make this difficult to assess. It is possible that job disruption and redundancies may have accelerated a shift towards non-standard and platform-mediated work. If true, it is unclear whether this will be a temporary or a persistent shift. It could be that the uncertain business environment may increase the use of flexible worker contracts by businesses so they can more easily adjust to fluctuating operating capacity and uncertain demand. On the other side of the equation, the pandemic may have increased the demand for more secure employment as workers may have become more aware of the potentially precarious nature of non-standard employment arrangements. However, until more data are available to investigate these effects, these possibilities are purely speculative.

As will be discussed, BOS covers some relevant dimensions of job quality at the firm level. For example, it gathers information on the share of employees on temporary work contracts. However, many of the dimensions of job quality cannot be measured with the data we are using. For example, we cannot examine long working hours as we do not have information on hours worked. Moreover, the information that is available is at the firm level. This means that while BOS provides information on the share of employees on temporary work contracts within a firm, it does not provide information on whether an individual worker is on this type of contract. However, as will be discussed, analysis using alternative individual-level survey information on dimensions of job quality could be undertaken in the future to complement the current research.

## 2.3 Social protections

Social and worker protections such as labour market policies like minimum wage, superannuation schemes and healthcare are impacted by various FoW trends such as ageing populations, increasing non-standard employment and migratory labour inflows. In New Zealand, publicly funded healthcare

is provided extensively, with eligible people[3] able to receive free public hospital services, as well as subsidies on primary health care visits, prescription medicines and so forth (Ministry of Health, 2011). Likewise, New Zealand Superannuation is provided to those aged 65 and over who meet residency criteria (Ministry of Social Development, n.d.). Projected increases in the old-age dependency ratio mean that the provision of these services will represent an increasing burden on public finances (New Zealand Treasury, 2016).

In terms of social security provided by workers themselves, non-standard and platform-mediated work has been noted to limit workers' ability to invest in housing and pension schemes (Breene, 2016), which puts individuals relying on such work in a precarious position later in life. Furthermore, protections such as minimum wages and leave provisions are often dependent on formal employment and are therefore not available to these types of workers (Breene, 2016). This is less of a concern in New Zealand, as minimum wage and leave entitlements are in place for permanent, fixed-term and casual workers alike (Employment New Zealand, n.d.a; b). Additionally, in New Zealand contractors are similarly eligible for healthcare, income support, tax and worker compensation via the Accident Compensation Corporation (ACC) (New Zealand Productivity Commission, 2019). However, as mentioned, unlike almost all other OECD countries, New Zealand does not have an unemployment insurance scheme and households face comparatively large falls in income in the event of job loss (New Zealand Productivity Commission, 2019).

## 2.4 Wage and income inequality

Widening income gaps are a concern in many developed countries. This issue has already been touched on briefly under the earnings quality dimension of the OECD's job quality framework (Section 2.2). These gaps have been attributed to several factors including globalisation, financialisation, the proliferation of ICT, the hollowing-out of the jobs market, the rise of superstar firms, rent-seeking behaviour of high-income professionals, and short-termism in executive decision making (Balliester and Elsheikhi, 2018). There are also concerns that technological advances are placing more emphasis on the role of capital in the economy, displacing labour and increasing the income of capital owners (Piketty, 2015; ILO and OECD, 2015; Acemoglu and Restrepo, 2018).

In terms of technological advances, automation has raised particular concerns for earnings inequality. Research suggests that automation is leading to the growth in the share of employment in low-skilled jobs and high-skilled jobs which are less amenable to automation, but the contraction of middle-skilled jobs involving routine tasks that are more amenable to automation (for example, see Autor et al., 2006). This is described as job polarisation, or the "hollowing-out" of the job market (Balliester and Elsheikhi, 2018).

In New Zealand, there has been a marked increase in the share of workers employed in high-skilled occupations and decreases in the share of workers in low-skilled occupations since 1960. Meanwhile, the employment rate for occupations with medium levels of skill requirement rose initially, but have been falling since the early 1990s (Carey, 2017). This hollowing-out of the jobs market and job polarisation is expected to continue with further technological advancement, particularly digitalisation and the technical replacement of routine tasks (Acemoglu and Autor, 2011; Carey, 2017). This is accelerated by the erosion of labour market institutions such as unions, which several

[3] Including but not limited to New Zealand citizens, permanent residents and resident class visa holders.

studies cite as a major contributing factor for wage and income inequality (Summers, 2017; Jappelli and Pistaferri, 2010).

## 2.5 Social dialogue and industrial relations

Social dialogue and industrial relations aim to provide and support fair workplaces (ILO, 2013). Declining unionisation and increasing automation raise challenges for social dialogue and industrial relations, causing the effective organisation and regulation of work to become more difficult (The Economist, 2015). New Zealand has experienced diminishing rates of unionisation since the 1980s, with increasing globalisation, international trade and organisation of the manufacturing sector cited as main drivers of this trend (Blumenfeld et al., 2002). According to the ILO, New Zealand now has the 8th lowest collective bargaining coverage rate among 37 OECD countries (15.9% of employees in 2016). New Zealand's trade union density rate is somewhat higher in comparison at 17.9% of employees in 2016, making it the 21st lowest in the OECD. Moreover, in New Zealand, the only legislative provision for employee voice in the workplace outside of collective bargaining is mandated worker representation on health and safety matters.

The rise of non-standard work and platform-mediated or gig work may also be impacting the role of social dialogue and industrial relations. Some approaches that unions have taken to address and organise non-standard and gig workers include: contesting the misclassification of dependent workers as independent contractors, the formation of alliances to foster more effective lobbying, and regulatory reform allowing collective bargaining for such workers (Johnston and Land-Kazlauskas, 2018). Indeed, one of the issues raised by the New Zealand government's investigation into ways to better protect vulnerable contractors is that contractors cannot generally bargain collectively about their employment terms. Authorisation to bargain collectivelymust be granted by the Commerce Commission as this would amount to anti-competitive behaviour prohibited by the Commerce Act (MBIE, 2019). However, the impacts of non-standard and gig work on social dialogue and industrial relations may be less of a concern in New Zealand. This is due to the rates of employment in these forms of work being small and not yet showing signs of increasing (New Zealand Productivity Commission, 2019; Stats NZ, 2019a). On the other hand, shocks to the labour market caused by Covid-19 have heightened concerns about the greater precariousness of these forms of work and raise questions about the possible future prevalence of non-standard and gig work.

# 3 Data and methodology

While the previous section provides some context on FoW trends and their potential implications, we now turn to the specifics of our analysis. This section briefly summarises the data and methodology employed. A full description of the data, how we constructed our analysis dataset, descriptive statistics and methodology is presented in Appendix A.

## 3.1 BOS 2018 and the changing nature of work module

Our main data source is Stats NZ's BOS 2018. The BOS is an annual survey and its sample comprises private enterprises with six or more employees. It is separated into four modules. The first two are permanent modules that relate to business operations (asked every year) and innovation (asked in odd years) or ICT (asked in even years). The third and fourth modules are ad-hoc contestable modules. The 2018 survey contained an ad-hoc module on the 'Changing nature of work'. The questions within this module cover a range of topics such as: employment arrangements, including the share of workers in permanent, fixed-term, casual or service contract agreements; employment practices, including leave provisions, flexible work arrangements, employee engagement, and policies or practices addressing pay gaps, an ageing workforce, bullying and diversity; business practices such as digitalisation, platform mediated work and outsourcing; and automation across a range of tasks. The BOS also contains questions in other modules, including the proportion of workers covered by collective agreement contracts, the competitiveness of the business environment, and whether any recent mergers/acquisitions have taken place.

The BOS is part of Stats NZ's Longitudinal Business Database (LBD) and therefore can be linked to administrative data on firms. We can also link workers to the firms they are employed by and access information on worker characteristics from the Integrated Data Infrastructure (IDI). This allows us to observe a range of firm and individual worker characteristics alongside the FoW practices recorded in the BOS.

## 3.2 Defining FoW practices

Our first research question is: 'What proportion of firms are using FoW practices and what overall share of workers are employed by these firms?' The BOS 2018 'Module C: Changing nature of work' (and to a lesser extent, 'Module A: Business operations') asks firms whether they use a wide range of practices that relate to the FoW. These serve as useful outcomes of interest for our first research question. By looking at the prevalence of these practices among firms and the number of workers employed by these firms, we can see how many firms are implementing these practices and how many individuals work for these firms. In total, we measure the prevalence of 33 FoW practices addressed by the BOS 2018. The results will be presented in Section 4 below.

For our second research question: 'What firm characteristics are associated with firms being more likely to have FoW practices and what worker characteristics affect the odds of being employed by such firms?', we reduce the number of FoW practices examined. This is because we run two regressions (one at the individual level and one at the firm level) for each of these practices so need

to reduce the set of examined practices to a more manageable number (see Section 3.4 covering methodology below).

The reduced set of practices is based on several considerations: their relevance to the FoW literature; groupings of practices suggested by principal components analysis (which shows which practices tend to be implemented together); prevalence rates of the practices; and common themes among practices (such as employee engagement, leave, automation, etc.). In this way, we narrow the list of FoW practices down to the 12 variables: 10 binary outcome variables, and two categorical outcome variables. These variables and associated descriptive statistics are presented in Appendix A.

## 3.3 Explanatory variables

As mentioned, since we are interested in both individual and firm level relationships between FoW practices and characteristics, two models for each outcome are specified: one using individual-level observations and one using firm-level observations (summarised Section 3.4 below and detailed in Appendix A). One set of explanatory variables for individual-level models is used, and another set for the firm-level models.

The first set of explanatory variables is designed to investigate factors that are associated with differences in workers' likelihood to be employed by firms that implement FoW practices. This set of variables includes gender, age, ethnicity, born in New Zealand, industry of employment, whether the individual worked multiple jobs[4] for two or more consecutive months and gross earnings.

The second set of explanatory variables are firm-level measures. These include firm profit, firm size, firm age, foreign ownership rate, industry of operation, whether recent mergers/acquisitions have occurred, the level of competition faced by the firm, recent changes in market share, and whether the firm had difficulties recruiting staff. Further details of these variables and associated descriptive statistics are presented in Appendix A.

## 3.4 Methodology

The methodology for our first research question is very straightforward. It simply involves presenting the percentage of firms using each FoW practice, and the share of workers employed by these firms.

For our second research question, we use cross-sectional multivariate logistic regression models to examine how worker and firm characteristics are associated with FoW practices. For the 10 binary outcome variables, we use standard binary logistic models, and as discussed, run separate models for firms and individuals. For the two multi-category variables, we use ordered logistic models, also run separately for firms and individuals. Appendix A provides more details.

We report results as odds ratios. In terms of interpretation, in the case of binary outcome variables, if the odds ratio is greater than 1, the explanatory variable is interpreted to be associated with an increased likelihood of the indicator being present. For example, in the individual-level models, a

[4] While we identify workers that work multiple jobs, we only consider the FoW practices associated with their primary job.

coefficient for the female variable of 1.3 means that female workers are 1.3 times more likely than male workers to be employed by a firm with flexible work options.

In the case of the ordered logistic models, the interpretation of the odds ratios is similar. For an example, looking at the individual-level ordered logit for collective agreements, the coefficient for female variable is about 1.1, meaning that the odds for females working in firms with higher rates of collective agreement coverage among their employees (as opposed to lower rates of coverage) is 1.1 times the odds for males. A more detailed description of odds ratios is presented in Appendix A.

## 3.5 Limitations

While linking the BOS to administrative data provides a wealth of information on FoW practices, this approach has limitations. First, we examine only individual-level information that is available on a population-wide basis from administrative data sources. This means that some very relevant information cannot be included, such as occupation, hours worked or paid, highest qualification and number of years in NZ for migrants. The reason behind this is explained in more detail in Appendix A.

In addition, we only have information on whether a firm has a particular FoW practice and we cannot observe if a specific worker within that firm has access to or uses that practice. For example, while a firm may offer a work-from-home option, it may only be available to office staff and not frontline workers. Moreover, the responses are generally given in a yes/no format. We therefore do not have information on how these are implemented. For example, two firms may both have work-from-home policies, but one may have a workplace culture where this option is used freely and widely, while another firm may only allow its use in very specific circumstances.

In terms of sample coverage, as noted, the BOS only includes firms with six or more employees, therefore we cannot investigate FoW practices among smaller firms. Our analysis of workers is also restricted to those who are paid a wage/salary, and does not generally include self-employed workers.

Finally, the BOS ‘Changing nature of work module’ is an ad-hoc module that was only asked in the 2018 survey. Therefore, we are restricted to cross-sectional analysis and are unable to investigate trends over time. This also means we are unable to use time-series information to control for unobserved heterogeneity. Our results are, therefore, associations only, and we make no attempt to establish causal interferences.

# 4 Results: The prevalence of FoW practices (Research question 1)

Our first research question is: 'What proportion of firms are using FoW practices and what overall share of workers are employed by these firms?'. The share of firms using a range of different FoW practices and the share of workers employed by these firms are presented in Table 1.

## 4.1 Changing employment practices

Within BOS 2018's 'Changing nature of work module', the 'Changing employment practices' section asks about practices relating to various FoW dimensions. These encompass social dialogue and industrial relations (in the form of employee engagement practices), social protections (in the form of leave and childcare provision, and policies and practices to promote a fair workplace) and job quality (in the form of flexible work arrangements). Wage and income inequality is not explicitly addressed, although considered to a lesser extent by fair work policies and practices. Firms were asked whether or not practices were available on a formal basis for non-managerial employees.

### 4.1.1 Employee engagement

As presented in Table 1, all employee engagement practices are relatively common, being offered by the majority of firms in most cases (with the exception of employee feedback programmes, which are still offered by a considerable 40.9% of firms, employing 65.1% of all workers). Engagement in health and safety is near ubiquitous (85% of firms employing 92.9% of all workers). However, this is to be expected, and in fact, it is surprising it is not higher as the consultation of employees with regards to health and safety practices and processes is required under New Zealand law (Employment New Zealand, n.d.c).

### 4.1.2 Fair work policies and practices

Firms were asked whether they have practices and policies in place to address pay gaps (e.g. gender or ethnicity gaps); an ageing workforce; workplace bullying; and diverse and inclusive workplaces. The most common of these are policies and practices against bullying (52.7% firms, employing 76% of all employees). The least common are policies and practices addressing pay gaps, such as gender and ethnicity gaps (13.8% firms, employing 34.4% of all employees) and ageing workforces (14.3% firms, employing 28.6% of all employees).

### 4.1.3 Leave and childcare provisions

Firms were asked whether they offer a range of leave or childcare provisions. These include: being able to buy extra annual leave or take leave without pay; using personal sick, unpaid or compassionate care leave to care for other people wo are sick; childcare (allowances or facilities); and parental leave provisions in addition to statutory provisions.

Looking at the prevalence rates in Table 1, the options of using sick/unpaid/compassionate care leave to care for others, and buying extra annual leave or unpaid leave are common practices, implemented by 55.4% and 64.3% of firms respectively, which employ 66% and 77.2% of all workers work respectively. Childcare allowances or facilities and parental leave provisions (in addition to statutory

provisions) are less common, practised by 10.4% and 19.6% of firms respectively, employing 8.4% and 23.4% of all workers.

### 4.1.4 Flexible work arrangements

The two most common flexible work practices at the firm level are flexible start and finish times (56.8% of firms and 66.4% of workers), and firms offering the option of part-time work (53% of firms and 66.9% of workers). The least common flexible work practice is job sharing, which only 20.6% of firms offer, employing 28% of all workers. Work-from-home options are also less common, offered by only 22.8% of firms. However, these seem to be concentrated in large firms, as a substantial 40.2% of all workers are employed by firms offering work-from-home options. Since our data relates to 2018, we cannot examine whether Covid-19 has increased the prevalence of work-from-home options. However, this seems very likely given lockdowns meant many people were required to work from home, and this appears to have been a catalyst for the implementation of work-from-home options more generally. Additionally, in cases where firms already had such policies in place, but these were relatively unused, there may now be greater acceptance and use of them.

## 4.2 Automation in the workplace

BOS respondents were asked to indicate the extent of automation within the firm for various types of tasks. These tasks were: managing people; planning and decision making; interacting with customers, suppliers and/or others; collecting data; processing data; routine physical tasks; and physical tasks where the task may not be routine and predictable. Unlike most other questions within this section, automation was not asked in a yes/no format. Instead, firms indicated whether these types of tasks were not automated, partly automated, fully automated, that automation is not applicable to these types of tasks within their business, or that they are unaware of the level of automation of these tasks. For simplicity, we transform this outcome to capture whether any automation is present in these categories (with 'fully automated' or 'partially automated' responses equating to yes, and 'not automated' responses equating to no, while 'not applicable' or 'don't know' responses are excluded).[5]

Out of non-physical tasks such as interacting with customers/suppliers, collecting and processing data, managing people, and planning and decision making, the most common areas of automation are the collection and processing of data. Roughly 60% of firms (employing just under 80% of workers) fully or partially automate these types of tasks. The least common areas of non-physical task automation are management tasks and planning and decision-making tasks. Roughly 20% of firms (employing 30% of workers) report partial or full automation in these types of tasks. Automation of interactions with customers/suppliers falls roughly mid-way between these, with 38.3% firms, employing 55.1% of workers automating such tasks. Automation of physical tasks is somewhat less common. Automation of routine physical tasks is present in 23.7% of firms (employing 38.5% of workers) and non-routine physical tasks in only 14.3% of firms (employing 20% of workers).

[5] Excluded responses are not included in the final analysis of FoW outcomes of interest (described later in this report). This is reflected in smaller observation counts for the models used to investigate these practices.

## 4.3 Changing business practices

The 'Changing business practices' section of BOS 2018 asks firms whether they have used various business practices often associated with the FoW within the last two financial years. These include: selling products and/or services directly to customers through online platforms;[6] using an online business platform to aggregate information about goods and/or services for customers; incorporating 'customer co-design' and/or 'design thinking practices' into the business; using blockchain technology to facilitate peer-to-peer transactions; outsourcing work overseas; and utilising the gig or sharing economy to provide goods and services to customers. Each of these are asked in a yes/no format, requiring no further variable transformation. Some of these practices are related to the job quality dimension of the FoW as they affect the dynamics of work processes and relationships.

The practices within this section were some of the least common practices. The most prevalent practices among these were using online platforms to sell goods/services (22.8% of firms employing 33.0% of workers) and using online platforms to provide information on goods/services (14.3% of firms employing 26.4% of workers). The least common practice among firms was the use of blockchain technology, practised by as little as 0.7% of firms (employing 2.2% of employees). There were also low rates of using the gig/sharing economy, practised by 1.3% of firms employing 2% of all employees. This is in line with the finding by the New Zealand Productivity Commission (2019) that use of the gig economy is currently low. However, since gig-economy workers are often independent workers, the prevalence of this practice may be considerably different for smaller firms, which are not included in the BOS.

Many of these practices relate to digitalisation of the workplace, and the adoption of such practices may be catalysed by the need for contactless transactions and business interactions brought about by Covid-19. For example, anecdotally, it appears that many businesses had to rapidly adapt to Covid-19 lockdowns by offering online sales for delivery or contactless pick-up either for the first time or to an extent that they had not previously done so.

[6] Similarly, firms are asked whether they have introduced a 'click and collect' option for customers. However, as this relates closely to selling products directly to customers through an online platform, we exclude it from the analysis.

Table 1: FoW practice prevalence

| FoW practice | Firms with practice in place (%) | Workers employed by practising firms (%) |
|---|---|---|
| **Employee engagement** | | |
| Employee engagement in regular decision making | 57.8% | 60.8% |
| Employee engagement in health and safety | 85.0% | 92.9% |
| Employee feedback programmes | 40.9% | 65.1% |
| Performance reviews | 71.8% | 84.4% |
| Training/mentoring programmes | 71.6% | 84.0% |
| **Fair work policies** | | |
| Policies/practices to address pay gaps | 13.8% | 34.4% |
| Policies/practices to address an ageing workforce | 14.3% | 28.6% |
| Policies/practices to address bullying | 52.7% | 76.0% |
| Policies/practices to address diverse and inclusive workplaces | 33.7% | 57.8% |
| **Leave and Childcare** | | |
| Buying extra annual leave or unpaid leave | 55.4% | 66.0% |
| Using sick/unpaid/compassionate care leave to care for others | 64.3% | 77.2% |
| Childcare allowances/facilities | 10.4% | 8.4% |
| Additional parental leave provisions | 19.6% | 23.4% |
| **Flexible work arrangements** | | |
| Option of part-time work | 53.0% | 66.9% |
| Job sharing | 20.6% | 28.0% |
| Option of shift work | 23.5% | 42.2% |
| Flexible start and finish times | 56.8% | 66.4% |
| Working from home options | 22.8% | 40.2% |
| **Automation** | | |
| Full or partial automation of management tasks | 20.7% | 30.6% |
| Full or partial automation of planning/decision making tasks | 20.4% | 30.0% |
| Full or partial automation of interaction with customers/suppliers/others | 38.3% | 55.1% |
| Full or partial automation of data collection tasks | 57.3% | 75.7% |
| Full or partial automation of data processing tasks | 62.5% | 79.8% |
| Full or partial automation of routine physical tasks | 23.7% | 38.5% |
| Full or partial automation of non-routine physical tasks | 14.3% | 20.0% |
| **Changing business practices** | | |
| Using online platforms to sell goods/services | 22.8% | 33.0% |
| Using online platforms to provide information on goods/services | 14.3% | 26.4% |
| Incorporating 'customer co-design'/'design thinking practices' into business | 4.4% | 14.2% |
| Using blockchain technology | 0.7% | 2.2% |
| Outsourcing work overseas | 5.1% | 10.6% |
| Using the gig/sharing economy | 1.3% | 2.0% |
| **Number of weighted observations** | 41,200 | 1,562,600 |

Note: Percentages are based on non-missing weighted responses.

## 4.4 Collective employment agreements

BOS also asks the extent to which the firm's employees are covered by a collective employment agreement. These are recorded in terms of the percentage of workers covered by such agreements, in categories of: none, >0-10%, 11-50%, 51-90% and 91-100%.

Table 2 shows that collective agreements are not overly common, and more than three-quarters of firms (accounting for 59.7% of workers) have no employees covered by them. Interestingly, of the firms which employ workers covered by collective agreements (approximately 24%) the majority of these (17.7% of all firms) see very high rates of workers covered by collective agreements (91-100%), with a roughly even distribution of firms in the lower categories. However, when we look at the number of workers in such firms, we find the distribution of collective agreements to be much flatter, with only slightly more workers in the 11-50% category (11.3% versus 9.4%-9.9% in other categories). This suggests that while firms which employ workers covered by collective agreements tend to be concentrated on high rates of collective agreement coverage, these firms are also relatively small compared with those that employ a more mixed group of workers in terms of collective agreement coverage.

Table 2: Collective agreement prevalence

| Percentage of workers covered by a collective employment agreement | Firms with collective agreement rate in specified category (%) | Workers employed by firms in specified category (%) |
|---|---|---|
| None | 75.6% | 59.7% |
| >0-10% | 1.7% | 9.9% |
| 11-50% | 2.4% | 11.3% |
| 51-90% | 2.5% | 9.7% |
| 91-100% | 17.7% | 9.4% |

Note: Percentages are based on weighted responses.

## 4.5 Non-standard work

The 'Employment arrangements' section of the 'Changing nature of work' module asked firms how many workers in the business were employed on the following contract types: permanent employment agreements, fixed-term employment agreements, casual employment agreements and a contract for services. We define non-standard contracts as fixed-term employment, casual employment agreements or a contract for services. For consistency with the categories of collective agreement rates, we define rates of non-standard contract use into the following categories: none; >0-10%; 11-50%; 51-90%, and 91-100%. Table 3 shows these different categories of non-standard contract coverage and the rate of firms and workers within each category.

A small percentage of firms use non-standard contracts extensively, with 5.1% of firms employing 91-100% of their employees on these types of contract. Slightly more (10.7%) employ 51-90% of their employees on non-standard contracts, with 7.8% of workers employed by such firms. A more common practice is for firms to employ 11-50% of their employees on non-standard contracts, with 39.6% of firms (employing 36.1% of employees) using this mix of non-standard to permanent contracts. A significant portion of businesses use little or no non-standard contracts, with 45.1% of firms employing either none or less than 11% of their employees on non-standard contracts (employing 51.6% of all workers).

Table 3: Non-standard work prevalence

| Rate of workers employed by a non-standard contract | % Firms with NSW rate in specified category | % Workers employed by firms in specified category |
|---|---|---|
| None | 21.6% | 12.5% |
| >0-10% | 23.5% | 39.1% |
| 11-50% | 39.6% | 36.1% |
| 51-90% | 10.7% | 7.8% |
| 91-100% | 5.1% | 4.4% |

Note: Percentages are based on weighted responses.

# 5 Results: FoW practices and firm and worker characteristics (Research question 2)

This section presents the results from the logistic regressions examining the relationship between FoW practices and the characteristics of firms and workers. The results are organised into four broad themes: employee engagement and inclusion; automation and digitalisation; flexible leave and work options; and collective agreements and non-standard work. As mentioned, for each outcome of interest there are two models: one at the individual level (controlling for individual-level characteristics) and one at the firm level (controlling for firm-level characteristics).

## 5.1 Employee engagement and inclusion

This subsection discusses measures of employee engagement and inclusion practices: performance reviews, employee feedback programmes and fair work policies. Specifically, BOS asked firms if they had performance review practices or employee feedback programmes (such as satisfaction surveys) in place on a formal basis for non-managerial employees. The fair work policy outcome variable is based on whether the firm had policies or practices in place to address an ageing workforce, pay gaps (e.g. gender or ethnicity pay gaps) and/or diverse and inclusive workplaces. While these practices do not encompass the wide range of practices that fall within the scope of employee engagement and inclusion, as discussed, they were selected on the basis of available information in BOS 2018 and to keep the number of outcomes variables manageable.

### 5.1.1 Individual level

Table 4 presents results from the individual-level logistic regressions for employee engagement and inclusion. Separate regression models were run for each of the three practices, with the same set of explanatory variables used for each regression.

The results show that, after controlling for other explanatory variables in the models, female workers are more likely than male workers to be employed by firms that have employee feedback programmes and fair work policies. Female workers are 1.16 times more likely to work in firms with employee feedback programmes and 1.17 times more likely to work in firms with fair work policies than male workers. It may be that female workers self-select into firms with fair work policies (which includes policies to address gender gaps), and/or that firms with a higher share of female workers have greater incentives to have these policies in place. However, there is no statistically significant difference between female and male workers in the case of performance reviews.

Older workers are less likely to work in firms with performance review practices, employee feedback programmes or fair work policies. Compared with workers aged 25-34, the odds ratio for workers aged 45-54, 55-64 and 65 and over are all around 0.9 for all three practices, indicating that these groups are about 10% less likely to work in firms with each of these practices than 25-34 year old workers.

Looking at ethnicity, Pacific and Asian workers are more likely to work in firms with performance reviews than European workers (odds ratios of 1.09 for both ethnicities), but there is no statistically significant difference between Māori and European workers. Māori, Pacific and Asian workers are

more likely to work in firms with employee engagement practices than European workers (odds ratios of 1.10, 1.29 and 1.15 respectively). Likewise, Māori, Pacific and Asian workers are more likely to work in firms with fair work policies than European workers (odds ratios of 1.06, 1.20 and 1.05 respectively). Those who were born in NZ are less likely to work in firms with any of these three policies or practices in place than those who were born overseas. As with gender, it may be that ethnically-diverse workplaces have more to gain from policies and practices that address ethnic pay gaps and create inclusive workplaces, and/or that ethnic minority and migrant workers find workplaces with diversity and inclusion practices (and presumedly in turn, a culture of diversity and inclusion) more attractive places to work.

Turning to income, the odds that workers are employed by firms with these engagement and inclusion practices increase as income increases. Workers earning less than $20,000 are approximately half as likely to work in firms with these practices as workers earning more than $60,000, and these odds increase monotonically with income. As discussed, we cannot include occupation and education in our models due to data limitations. It may be that income is partially proxying for these, with workers in higher-paid and higher-skilled occupations more likely to work in firms with engagement and inclusion practices. Workers holding multiple jobs are also less likely to work primarily for firms with engagement practices.

At the individual level, the odds of working for firms that have engagement practices changes considerably by industry of employment. For performance reviews, workers in firms in all industries have greater odds than workers in firms in the base category industry of agriculture, forestry & fishing of being employed by firms having performance reviews. The greatest odds are associated with workers in the following industries: financial & insurance services (at a considerable 34.64 times the odds of agriculture, forestry & fishing workers); education & training (6.56); healthcare & social assistance (6.63) and electricity, gas, water & waste services (5.75).

Similarly, workers in all industries (except other services) have higher odds of working for firms with employee feedback programmes compared with workers in agriculture, forestry & fishing. The odds are highest for information media & telecommunications (6.88 times the odds of agriculture, forestry & fishing workers) and healthcare & social assistance (8.48).

For fair work policies, workers in firms in all industries except other services have higher odds of working for firms with these programmes compared with workers in agriculture, forestry & fishing firms. Workers employed by firms in the electricity, gas, water & waste services industry have the highest odds ratio (almost 11 times more likely than those in the agriculture, forestry & fishing industry), followed by financial & insurance services (odds ratio of 5.52), and information media & telecommunications (5.11). The high rate among electricity, gas, water & waste workers may reflect that many firms in this industry are at least partly government owned,[7] and the requirement to pursue fairness and diversity for inclusive workplaces is set out in public service legislation.

[7] BOS includes private enterprises. This definition includes central government enterprises (NZISC96 code 1311) but excludes local government enterprises (NZISC96 code 1321).

Table 4: Employee engagement and inclusion logistic models (Individual level)

| | Performance reviews | Employee feedback programmes | Fair work policies |
|---|---|---|---|
| **Female** | 1.023 (0.019) | 1.161*** (0.014) | 1.169*** (0.014) |
| **Age (Base category: 25-34)** | | | |
| 15 – 24 | 1.060** (0.03) | 1.033* (0.02) | 1.051*** (0.019) |
| 35 – 44 | 0.97 (0.026) | 0.976 (0.018) | 0.979 (0.016) |
| 45 - 54 | 0.866*** (0.023) | 0.901*** (0.016) | 0.934*** (0.016) |
| 55 - 64 | 0.818*** (0.024) | 0.901*** (0.018) | 0.934*** (0.017) |
| 65+ | 0.848*** (0.034) | 0.945** (0.026) | 0.959 (0.024) |
| **NZ born** | 0.935*** (0.021) | 0.890*** (0.013) | 0.907*** (0.012) |
| **Prioritised ethnicity (Base category: European)** | | | |
| Māori | 1.021 (0.024) | 1.095*** (0.018) | 1.060*** (0.016) |
| Pacific | 1.093*** (0.029) | 1.292*** (0.025) | 1.195*** (0.021) |
| Asian | 1.090*** (0.034) | 1.147*** (0.023) | 1.049*** (0.019) |
| MELAA | 1.098 (0.07) | 1.008 (0.044) | 1.226*** (0.051) |
| Other | 1.007 (0.064) | 1.007 (0.042) | 1.063 (0.042) |
| **Earnings (Base category: More than $60,000)** | | | |
| Less than $20,000 | 0.477*** (0.013) | 0.527*** (0.01) | 0.581*** (0.01) |
| $20,000 - $40,000 | 0.563*** (0.015) | 0.585*** (0.011) | 0.634*** (0.011) |
| $40,000-$60,000 | 0.698*** (0.017) | 0.696*** (0.011) | 0.715*** (0.01) |
| **Multiple Jobs** | 0.805*** (0.027) | 0.874*** (0.021) | 0.873*** (0.019) |
| **Industry (Base category: Agriculture, forestry & fishing)** | | | |
| Mining | 1.618*** (0.078) | 1.278*** (0.049) | 1.834*** (0.071) |
| Manufacturing | 2.117*** (0.054) | 1.811*** (0.039) | 1.945*** (0.041) |
| Electricity, gas, water & waste services | 5.747*** (0.275) | 2.671*** (0.079) | 10.67*** (0.412) |
| Construction | 1.408*** (0.061) | 1.310*** (0.043) | 1.182*** (0.038) |
| Wholesale trade | 2.892*** (0.109) | 1.622*** (0.043) | 1.549*** (0.04) |
| Retail trade | 2.925*** (0.114) | 2.632*** (0.072) | 2.417*** (0.064) |
| Accommodation & food services | 2.400*** (0.114) | 1.871*** (0.064) | 1.674*** (0.056) |
| Transport, postal & warehousing | 1.407*** (0.04) | 3.093*** (0.079) | 2.205*** (0.053) |
| Information media & telecommunications | 3.713*** (0.127) | 6.877*** (0.209) | 5.110*** (0.14) |
| Financial & insurance services | 34.64*** (2.359) | 5.542*** (0.14) | 5.516*** (0.136) |
| Rental, hiring & real estate | 3.191*** (0.189) | 1.391*** (0.049) | 1.541*** (0.054) |
| Professional, scientific & technical | 4.338*** (0.19) | 2.031*** (0.058) | 2.472*** (0.071) |
| Administrative & support services | 2.354*** (0.06) | 2.723*** (0.06) | 1.882*** (0.041) |
| Education & training | 6.558*** (0.384) | 5.116*** (0.201) | 3.116*** (0.104) |
| Healthcare & social assistance | 6.632*** (0.249) | 8.482*** (0.294) | 2.767*** (0.071) |
| Arts & recreation | 3.760*** (0.178) | 5.130*** (0.196) | 3.179*** (0.103) |
| Other services | 1.116* (0.065) | 0.748*** (0.037) | 0.693*** (0.035) |
| **Constant** | 3.672*** (0.137) | 1.190*** (0.033) | 1.039 (0.027) |
| **Observations (unweighted)** | 758,100 | 753,700 | 759,400 |
| **Observations (weighted)** | 1,559,200 | 1,553,600 | 1,561,600 |
| **Pseudo $R^2$** | 0.054 | 0.054 | 0.037 |

Odds ratios relative to base category (1). Standard errors in parentheses. Significance level indicated by: *** p<0.01, ** p<0.05, * p<0.1

### 5.1.2 Firm level

Table 5 presents results from the firm-level logistic regressions for the three examined employee engagement and inclusion practices. The most profitable firms (profit of more than $10,000) are 2.38 times more likely than firms with a positive profit of $5,000 or less of having formal performance review practices in place (although there is no significant difference for feedback programmes). On the other end of the distribution, firms with a negative profit are 1.44 times more likely to have formal performance reviews than firms with positive profit of $5,000 or less, and 1.50 times as likely to have employee feedback programmes (albeit significant only at the 10% and 5% levels respectively). However, there are no statistically significant differences for fair work policies.

Smaller firms are much less likely to have formal engagement and inclusion practices. The likelihood that small firms (less than 20 employees) have performance reviews, employee feedback programmes or fair work policies are about a quarter to a third of the likelihood of large firms (100 or more employees). Medium firms (20-99 employees) are about half as likely as large firms to have each of these practices as large firms.

Firms with some degree of foreign ownership are more likely to have engagement and inclusion practices than firms which are wholly domestically owned, but the odds do not increase monotonically with foreign ownership share. Firms with a small share of foreign ownership (1-10%) have the highest odds of having performance review or employee feedback programmes compared with firms with no foreign ownership (4.22 times as likely for performance review programmes and 3.19 times as likely for employee feedback programmes). For fair work policies, firms that are 11-50% foreign owned have the highest odds of having these policies in place compared with wholly domestically owned firms. Those that are 90% or more foreign owned are 3.34 times as likely to have performance review practices, 2.33 times as likely to have employee feedback programmes and 2.79 times as likely to have fair work policies.

Industry results in the firm-level model are consistent with the individual-level model. For all three practices, firms in the healthcare & social assistance and education and training industries have among the highest odds of having these practices relative to the base category of firms in the agriculture, forestry & fishing industry. Firms in the healthcare & social assistance industry are 5.01 times as likely to have performance review practices in place, 4.23 times more likely to have employee feedback programmes and 2.92 times more likely to have fair work policies compared with firms in the agriculture, forestry & fishing industry. For performance reviews, the odds ratio is also high for the financial & insurance service industry (4.62).

The likelihood of having performance reviews or feedback programmes for firms which have had severe recruitment difficulties are 2.06 and 1.62 times the odds of firms that have not had recruitment difficulties respectively, and these differences are significant at the 1% level. This is in contrast with the effect seen across all other FoW practice outcome variables, in which the coefficient for severe and moderate recruitment difficulty are either insignificant or only significant at the 5% or 10% level. This relationship may reflect actions taken by firms to attract and retain staff as employee engagement has been shown to have a positive impact on employee retention and reduce turnover (Swe and Lu, 2019; Schaufeli and Bakker, 2004).

Across all ten of the firm-level models of binary FoW outcomes of interest, the model for fair work policies is the only one with a significant difference in odds with regard to whether firms have recently undergone a merger or acquisition. Such firms are 2.94 times as likely to have fair work policies than those that had not undergone a merger/acquisition. The explanation for this may tie in with the similar relationship between foreign ownership and fair work policies, as parent firms may

use formal policies to ensure their workers are treated consistently. Such policies would be necessary where firms are large and not easily managed by informal means, which would also explain the firm size effects seen earlier.

### Table 5: Employee engagement and inclusion logistic models (Firm level)

| | Performance reviews | Employee feedback programmes | Fair work policies |
|---|---|---|---|
| **Profit (Base category: >0-5K NZ$)** | | | |
| Negative | 1.436* (0.292) | 1.499** (0.253) | 0.806 (0.138) |
| Zero | 1.927 (0.779) | 2.129* (0.924) | 0.956 (0.413) |
| 5-10K NZ$ | 1.675* (0.479) | 1.001 (0.234) | 0.817 (0.19) |
| >10K NZ$ | 2.379*** (0.721) | 1.433 (0.369) | 0.967 (0.226) |
| NA or Missing | 0.65 (0.274) | 0.466* (0.206) | 1.022 (0.449) |
| **Size (Base category: Large)** | | | |
| Small | 0.274*** (0.046) | 0.276*** (0.036) | 0.322*** (0.041) |
| Medium | 0.514*** (0.083) | 0.419*** (0.05) | 0.498*** (0.057) |
| **Firm age (Base category: 10-19)** | | | |
| Less than 10 | 1.265 (0.185) | 1.183 (0.144) | 1.172 (0.14) |
| 20-29 | 0.925 (0.154) | 0.915 (0.13) | 0.936 (0.13) |
| 30-39 | 0.629** (0.125) | 0.734* (0.123) | 1.118 (0.194) |
| 40-49 | 0.68 (0.213) | 0.75 (0.206) | 1.232 (0.358) |
| 50+ | 0.504** (0.15) | 0.660* (0.166) | 0.835 (0.193) |
| **Foreign Ownership (Base category: zero)** | | | |
| 1-10% | 4.217*** (1.883) | 3.189*** (1.162) | 2.915*** (1.111) |
| 11-50% | 1.055 (0.486) | 1.014 (0.278) | 3.122*** (1.195) |
| 51-90% | 2.502*** (0.749) | 2.676*** (0.709) | 2.440*** (0.6) |
| 90+ | 3.341*** (0.877) | 2.330*** (0.44) | 2.789*** (0.521) |
| **Industry (Base category: Agriculture, forestry & fishing)** | | | |
| Mining | 1.412 (0.469) | 0.831 (0.252) | 2.002** (0.585) |
| Manufacturing | 1.255 (0.219) | 0.916 (0.154) | 1.332* (0.229) |
| Electricity, gas, water & waste services | 1.137 (0.29) | 1.323 (0.316) | 1.932*** (0.458) |
| Construction | 1.027 (0.253) | 1.06 (0.249) | 1.11 (0.267) |
| Wholesale trade | 2.058*** (0.5) | 1.243 (0.262) | 1.179 (0.254) |
| Retail trade | 0.938 (0.24) | 1.022 (0.245) | 1.242 (0.312) |
| Accommodation & food services | 1.207 (0.308) | 1.08 (0.259) | 1.076 (0.26) |
| Transport, postal & warehousing | 1.029 (0.277) | 0.93 (0.234) | 1.458 (0.372) |
| Information media & telecommunications | 1.647* (0.43) | 1.279 (0.276) | 2.078*** (0.479) |
| Financial & insurance services | 4.623*** (1.387) | 1.456* (0.325) | 1.620** (0.357) |
| Rental, hiring & real estate | 1.807* (0.553) | 1.225 (0.332) | 1.760** (0.471) |
| Professional, scientific & technical | 3.529*** (0.935) | 1.608** (0.342) | 1.908*** (0.411) |
| Administrative & support services | 1.269 (0.298) | 1.281 (0.271) | 1.01 (0.215) |
| Education & training | 4.202*** (1.394) | 3.230*** (0.776) | 4.078*** (1.031) |
| Healthcare & social assistance | 5.014*** (1.566) | 4.230*** (0.983) | 2.915*** (0.659) |
| Arts & recreation | 2.268*** (0.702) | 2.459*** (0.654) | 2.148*** (0.579) |
| Other services | 1.306 (0.343) | 1.084 (0.278) | 1.205 (0.317) |
| Merger/acquisition | 0.789 (0.309) | 0.979 (0.258) | 2.938*** (0.916) |
| **Competition (Base category: Many competitors, several dominant)** | | | |
| Captive Market | 0.827 (0.251) | 1.118 (0.28) | 0.871 (0.227) |

| | | | |
|---|---|---|---|
| ≤2 Competitors | 0.885 (0.144) | 0.964 (0.135) | 0.81 (0.105) |
| Many competitors, none dominant | 0.750* (0.12) | 0.823 (0.112) | 0.823 (0.113) |
| Unknown | 0.735 (0.173) | 0.564*** (0.124) | 0.440*** (0.103) |
| **Market share (Base category: No change)** | | | |
| Decreased | 0.75 (0.156) | 1.057 (0.194) | 1.06 (0.196) |
| Increased | 1.165 (0.178) | 1.089 (0.138) | 1.168 (0.143) |
| Unknown | 1.071 (0.156) | 0.898 (0.114) | 0.875 (0.113) |
| **Recruitment difficulty (Base category: None)** | | | |
| Moderate | 1.343* (0.228) | 1.101 (0.165) | 1.06 (0.159) |
| Severe | 2.062*** (0.365) | 1.623*** (0.25) | 1.306* (0.205) |
| N/A or Unknown | 1 (0.175) | 1 (0.189) | 0.566*** (0.114) |
| **Constant** | 3.634*** (1.007) | 1.307 (0.315) | 1.065 (0.252) |
| **Observations (unweighted)** | 6,400 | 6,400 | 6,400 |
| **Observations (weighted)** | 41,200 | 41,200 | 41,200 |
| **Pseudo $R^2$** | 0.100 | 0.073 | 0.08 |

Odds ratios relative to base category (1). Standard errors in parentheses. Significance level indicated by: *** p<0.01, ** p<0.05, * p<0.1

## 5.2 Flexible leave and work options

This subsection examines the relationship between flexible leave or work options and worker and firm characteristics. We use two leave outcome measures and one flexible work measure. The first is whether or not the firm has flexible leave arrangements. These involve firms having provisions on a formal basis for non-managerial employees to do any of the following: buy extra annual leave or take leave without pay; and/or use personal sick leave, unpaid leave or compassionate care leave to care for other people who are sick. The second leave variable is offering parental leave provisions in addition to the legal minimum requirements on a formal basis for non-managerial employees. The third practice is whether firms offer flexible work options on a formal basis for non-managerial employees, involving working-from-home options and/or flexible start/finish times.

### 5.2.3 Individual level

As shown in Table 6, female workers are more likely to work in firms that have flexible leave, additional parental leave provisions and flexible work options (odds ratios relative to male workers of 1.11, 1.03 and 1.17 respectively). This is as expected as the transition to parenthood is a source of substantial change in work patterns and disproportionately affects females (Paull, 2008; Schober, 2013). Female workers may, therefore, self-select into firms which have flexible work options and parental leave provisions. However, the magnitude of the difference between female and male workers is not particularly large. This may partly reflect the fact that we can only observe whether a worker's firm offers such provisions and not whether a particular worker actually has access to and uses the provision.

Older workers aged 45 and over are less likely to work in firms with flexible leave, additional parental leave provisions or flexible work options than workers aged 25-34. For example, the odds ratios for workers aged 45-54, 55-64 and 65 and over relative to those aged 25-34 are around 0.9 for all three of these FoW practices.

Compared with European workers, Māori, Pacific and Asian workers are more likely to be employed in firms with flexible leave arrangements (odds ratios of 1.11, 1.29 and 1.09 respectively). However, for

parental leave provisions, the only statistically significant differences compared with European workers are for Asian workers and those of other ethnicities. For flexible work options, the only statistically significant difference is for Māori workers, who are less likely to be employed by firms with these options than European workers (odds ratio of 0.90). Workers who were born in New Zealand are less likely to be employed by firms which offer flexible leave and/or work arrangements.

Those with lower earnings are less likely to work in firms that offer flexible leave, additional parental leave and/or flexible work options. As noted in the Section 3.5, we cannot observe occupation or education, and income is likely to be partially proxying for these. For example, higher income earners are likely to be more educated and in occupations which are more amenable to flexible leave and work provisions, such as professional services (e.g. lawyers, accountants) or managerial roles.

As with the other FoW outcome variables, industry of employment is an important explanatory factor in leave and flexible work provisions. The industries with the greatest odds ratios compared with the base category of agriculture, forestry & fishing are financial & insurance services (odds ratio of 11.43 for flexible leave provisions, 6.54 for additional parental leave and 3.8 for flexible work options) and information media & telecommunications (4.62 for flexible leave, 6.95 for parental leave and 2.13 for flexible work). As above, these are also industries where it is likely that a greater share of workers are employed in roles that are well suited to flexible leave and work options.

## Table 6: Flexible leave and work options logistic models (Individual level)

| | Flexible leave arrangements | Additional parental leave | Flexible work options |
|---|---|---|---|
| **Female** | 1.112*** (0.019) | 1.028** (0.013) | 1.295*** (0.016) |
| **Age (Base category: 25-34)** | | | |
| 15 - 24 | 1.041 (0.027) | 1.003 (0.022) | 0.986 (0.019) |
| 35 - 44 | 0.996 (0.024) | 0.942*** (0.016) | 1.019 (0.018) |
| 45 - 54 | 0.943** (0.023) | 0.892*** (0.016) | 0.942*** (0.017) |
| 55 - 64 | 0.900*** (0.023) | 0.893*** (0.017) | 0.896*** (0.017) |
| 65+ | 0.907*** (0.031) | 0.910*** (0.026) | 0.926*** (0.024) |
| **NZ born** | 0.954** (0.019) | 0.99 (0.014) | 0.961*** (0.014) |
| **Prioritised ethnicity (Base category: European)** | | | |
| Māori | 1.114*** (0.025) | 0.987 (0.017) | 0.901*** (0.014) |
| Pacific | 1.286*** (0.032) | 0.965 (0.021) | 1.013 (0.018) |
| Asian | 1.091*** (0.029) | 1.386*** (0.027) | 1.017 (0.02) |
| MELAA | 0.98 (0.06) | 0.971 (0.041) | 1.025 (0.045) |
| Other | 1.013 (0.058) | 0.903*** (0.034) | 1.029 (0.044) |
| **Earnings (Base category: More than $60,000)** | | | |
| Less than $20,000 | 0.568*** (0.014) | 0.679*** (0.013) | 0.638*** (0.012) |
| $20,000 - $40,000 | 0.622*** (0.015) | 0.643*** (0.012) | 0.650*** (0.012) |
| $40,000-$60,000 | 0.732*** (0.015) | 0.702*** (0.011) | 0.695*** (0.011) |
| **Multiple Jobs** | 0.854*** (0.027) | 0.942** (0.025) | 0.881*** (0.021) |
| **Industry (Base category: Agriculture, forestry & fishing)** | | | |
| Mining | 1.467*** (0.066) | 2.172*** (0.092) | 0.665*** (0.026) |
| Manufacturing | 2.526*** (0.063) | 1.599*** (0.044) | 1.157*** (0.026) |
| Electricity, gas, water & waste services | 3.894*** (0.155) | 3.228*** (0.105) | 5.325*** (0.206) |
| Construction | 2.201*** (0.098) | 0.663*** (0.033) | 0.930** (0.032) |
| Wholesale trade | 1.560*** (0.048) | 1.207*** (0.04) | 1.854*** (0.052) |
| Retail trade | 2.126*** (0.069) | 0.624*** (0.021) | 1.089*** (0.029) |
| Accommodation & food services | 1.983*** (0.085) | 1.287*** (0.056) | 1.873*** (0.071) |
| Transport, postal & warehousing | 2.967*** (0.09) | 0.396*** (0.014) | 2.317*** (0.061) |
| Information media & telecommunications | 4.619*** (0.163) | 6.952*** (0.209) | 2.125*** (0.057) |
| Financial & insurance services | 11.43*** (0.438) | 6.538*** (0.187) | 3.793*** (0.098) |
| Rental, hiring & real estate | 1.289*** (0.051) | 1.05 (0.046) | 0.874*** (0.03) |
| Professional, scientific & technical | 2.490*** (0.09) | 2.315*** (0.072) | 3.605*** (0.129) |
| Administrative & support services | 3.736*** (0.101) | 1.503*** (0.041) | 1.951*** (0.045) |
| Education & training | 3.591*** (0.157) | 0.635*** (0.032) | 2.185*** (0.081) |
| Healthcare & social assistance | 2.270*** (0.067) | 1.451*** (0.045) | 0.926*** (0.024) |
| Arts & recreation | 4.969*** (0.259) | 1.192*** (0.044) | 2.070*** (0.074) |
| Other services | 1.154*** (0.064) | 1.029 (0.069) | 0.689*** (0.035) |
| **Constant** | 2.784*** (0.094) | 0.295*** (0.009) | 1.926*** (0.054) |
| **Observations (unweighted)** | 759,400 | 759,400 | 758,900 |
| **Observations (weighted)** | 1,561,600 | 1,561,600 | 1,560,100 |
| **Pseudo $R^2$** | 0.035 | 0.082 | 0.045 |

Odds ratios relative to base category (1). Standard errors in parentheses. Significance level indicated by: *** p<0.01, ** p<0.05, * p<0.1

### 5.2.4 Firm level

Table 7 contains the firm-level logistic models of flexible leave and work options. Smaller firms have lower odds of having flexible leave and work arrangements. For flexible leave arrangements, small firms (with less than 20 employees) are roughly half as likely and medium firms (with 20-99 employees) are about two thirds as likely to offer these provisions compared with large firms (with 100 or more employees). Compared with large firms, small firms are 0.77 times as likely to have flexible work arrangements and medium firms are 0.88 times as likely (although the difference for medium firms is not statistically significant). This could be in part because smaller firms find it harder to cover periods of employee leave or flexible work times and are therefore less likely to offer these provisions. Or, it could be because the BOS question asks whether these provisions are offered on a formal basis. It may be that smaller firms offer these provisions but on an informal basis. There are no statistically significant relationships between firm size and additional leave provisions.

Firm age appears to be negatively associated with the odds of having flexible leave or additional parental leave provision practices. However, this is only significant at the 5% and 10% significance levels for the flexible leave arrangements model and in the category of firms less than ten years old in the parental leave category. There are no statistically significant differences for flexible work options.

Higher profits are generally positively associated with the odds of flexible leave arrangements. For example, the likelihood that firms with $5,000 profits or more have flexible leave arrangements is more than two times higher than the likelihood of firms with positive profits of less than $5,000. The likelihood that firms with profits of more than $10,000 offer additional parental leave is 1.80 times higher than the likelihood of firms with positive profits of less than $5,000.

Foreign ownership is associated with greater odds of providing additional parental leave for firms that are 11-50% and more than 90% foreign owned (2.49 and 2.42 times the odds of wholly domestically owned firms respectively). However, there is no statistically significant difference between domestically owned firms and those which are 50-90% foreign owned. In addition, firms which are 1-10% foreign owned are about twice as likely to have flexible work options than domestically owned firms, and firms which are 90% or more foreign owned are 1.59 times as likely.

The association between industry and leave provisions are similar to the individual-level results, although the magnitude of the odds ratios is generally smaller and there are fewer statistically significant differences. As in the individual-level model, financial & insurance services have the highest odds ratios for flexible leave arrangements and the second highest for flexible work options compared with the base category of agriculture, forestry & fishing (odds ratio of 2.30 and 2.56). However, unlike the individual-level model, there is no significant difference between financial & insurance service and agriculture, forestry & fishing firms in the probability of having additional parental leave provisions. The other industry that had large odds ratios in the individual-level models was information media & telecommunication. In the firm-level models, firms in this industry are more likely to have additional parental leave provisions than firms in the agriculture, forestry & fishing industry (1.75 times the odds of firms in the base, significant at the 5% level), but the difference is not significant in the flexible leave and work arrangements models.

Table 7: Flexible leave and work options logistic models (Firm level)

| | Flexible leave arrangements | Additional parental leave | Flexible work options |
|---|---|---|---|
| **Profit (Base category: >0-5K NZ$)** | | | |
| Negative | 1.329 (0.256) | 1 (0.196) | 1.375* (0.232) |
| Zero | 0.991 (0.471) | 0.661 (0.334) | 1.189 (0.424) |
| 5-10K NZ$ | 2.137*** (0.532) | 0.703* (0.149) | 1.452* (0.313) |
| >10K NZ$ | 2.154*** (0.519) | 1.796*** (0.374) | 1.750** (0.421) |
| NA or Missing | 1.129 (0.547) | 1.044 (0.541) | 0.878 (0.323) |
| **Size (Base category: Large)** | | | |
| Small | 0.493*** (0.074) | 1.212 (0.182) | 0.768** (0.097) |
| Medium | 0.670*** (0.091) | 0.9 (0.117) | 0.883 (0.101) |
| **Firm age (Base category: 10-19)** | | | |
| Less than 10 | 1.258* (0.172) | 1.494*** (0.213) | 1.183 (0.144) |
| 20-29 | 0.761* (0.119) | 1.063 (0.194) | 0.803 (0.111) |
| 30-39 | 0.897 (0.178) | 0.793 (0.187) | 0.779 (0.142) |
| 40-49 | 0.947 (0.311) | 0.786 (0.261) | 0.765 (0.23) |
| 50+ | 0.512** (0.156) | 1.3 (0.367) | 0.719 (0.175) |
| **Foreign Ownership (Base category: zero)** | | | |
| 1-10% | 0.962 (0.371) | 1.085 (0.404) | 2.006** (0.68) |
| 11-50% | 0.813 (0.314) | 2.486** (0.88) | 1.369 (0.469) |
| 51-90% | 1.345 (0.382) | 1.451 (0.334) | 1.404 (0.336) |
| 90+ | 1.31 (0.276) | 2.419*** (0.466) | 1.591*** (0.274) |
| **Industry (Base category: Agriculture, forestry & fishing)** | | | |
| Mining | 1.525 (0.526) | 0.998 (0.386) | 0.600* (0.174) |
| Manufacturing | 1.435** (0.245) | 0.916 (0.194) | 0.849 (0.137) |
| Electricity, gas, water & waste services | 1.424 (0.37) | 1.091 (0.308) | 0.897 (0.207) |
| Construction | 1.778** (0.45) | 1.205 (0.363) | 0.607** (0.142) |
| Wholesale trade | 1.248 (0.272) | 1.312 (0.349) | 1.535** (0.324) |
| Retail trade | 1.053 (0.264) | 0.671 (0.224) | 0.509*** (0.117) |
| Accommodation & food services | 0.919 (0.228) | 1.876** (0.496) | 1.084 (0.255) |
| Transport, postal & warehousing | 1.313 (0.353) | 0.828 (0.284) | 0.873 (0.211) |
| Information media & telecommunications | 1.324 (0.315) | 1.753** (0.465) | 1.341 (0.306) |
| Financial & insurance services | 2.301*** (0.571) | 1.304 (0.341) | 2.557*** (0.589) |
| Rental, hiring & real estate | 1.567 (0.432) | 1.433 (0.444) | 1.580* (0.414) |
| Professional, scientific & technical | 1.763** (0.407) | 1.592* (0.413) | 2.566*** (0.607) |
| Administrative & support services | 1.252 (0.276) | 1.027 (0.267) | 1.256 (0.261) |
| Education & training | 2.137*** (0.602) | 1.381 (0.419) | 1.206 (0.29) |
| Healthcare & social assistance | 2.337*** (0.587) | 1.646* (0.452) | 1.242 (0.275) |
| Arts & recreation | 1.642* (0.487) | 1.08 (0.362) | 0.765 (0.199) |
| Other services | 1.515 (0.392) | 1.367 (0.404) | 0.724 (0.171) |
| **Merger/acquisition** | 0.937 (0.326) | 1.572 (0.569) | 1.596 (0.462) |
| **Competition (Base category: Many competitors, several dominant)** | | | |
| Captive Market | 1.249 (0.369) | 1.392 (0.385) | 0.699 (0.161) |
| ≤2 Competitors | 0.844 (0.129) | 0.956 (0.168) | 0.780* (0.103) |
| Many competitors, none dominant | 0.833 (0.127) | 0.986 (0.165) | 0.887 (0.126) |

| | | | |
|---|---|---|---|
| Unknown | 0.557*** (0.124) | 0.699 (0.202) | 0.470*** (0.104) |
| **Market share (Base category: No change)** | | | |
| Decreased | 0.823 (0.165) | 0.773 (0.193) | 1.184 (0.223) |
| Increased | 0.865 (0.123) | 1.340* (0.204) | 1.342** (0.173) |
| Unknown | 0.814 (0.113) | 1.128 (0.176) | 1.043 (0.129) |
| **Recruitment difficulty (Base category: None)** | | | |
| Moderate | 0.976 (0.162) | 0.884 (0.166) | 0.863 (0.131) |
| Severe | 1.011 (0.172) | 1.319 (0.249) | 1.031 (0.163) |
| N/A or Unknown | 0.710* (0.145) | 1 (0.208) | 1 (0.168) |
| **Constant** | 4.189*** (1.163) | 0.137*** (0.0422) | 1.810** (0.435) |
| **Observations (unweighted)** | 6,400 | 6,400 | 6,400 |
| **Observations (weighted)** | 41,200 | 41,200 | 41,200 |
| **Pseudo $R^2$** | 0.040 | 0.053 | 0.062 |

Odds ratios relative to base category (1). Standard errors in parentheses. Significance level indicated by: *** p<0.01, ** p<0.05, * p<0.1

## 5.3 Automation and digitalisation

We now examine technology-related FoW practices, specifically, automation and digitisation practices. We examine, separately, the automation of: routine physical tasks; non-routine physical tasks and; non-physical tasks. Automation of non-physical tasks includes managing people, planning and decision making, interacting with customers, suppliers and/or others, collecting data and processing data. For digitalisation, we examine the use of online platforms, which measures whether firms sell products and/or services directly to customers through online platforms and/or use an online business platform to aggregate information about goods and/or services for customers.

### 5.3.1 Individual level

The results of the individual-level logistic models for automation and digitalisation are presented in Table 8. Female workers are more likely to be employed by firms which have partial or full non-physical, routine physical and non-routine physical automation than male workers, although the magnitude of the association is not large (odds of 1.06, 1.09 and 1.06 respectively). They are also more likely to work in firms with online platforms, and the magnitude of the difference with male workers is larger (odds ratio of 1.27). In general, older workers are less likely to work in firms with some degree of automation. Workers aged 25-34 are more likely than workers in any other age group to work in firms which use online platforms.

The likelihood of Māori, Pacific and Asian workers being employed by firms with some degree of automation are all higher than that of European workers, with odds ratios ranging from 1.06 to 1.36. Those who were born in NZ are less likely to be employed by firms with some degree of non-physical task automation or non-routine physical task automation, although the association is not particularly large (odds ratios of 0.94 and 0.96 respectively). There is no statistically significant relationship between being born in NZ and working in a firm which has partly or fully automated routine physical tasks. New Zealand-born workers have 0.94 and 0.96 times the odds of being employed by firms with non-physical and non-routine physical automation (respectively) of those born outside of New Zealand.

In contrast, Māori and Pacific workers are less likely to work in firms using online platforms than European workers. This may be in part due to the 'digital divide', which describes groups that lack

access to digital technologies or training for their use. In New Zealand, the digital divide has historically been defined by lower rates of internet access, internet use, and training in computing among Māori and Pacific Peoples (Gibson, 2002). More recent studies have concluded that the digital divide is still a present concern for Māori and Pacific Peoples, particularly in youths and those living in rural settings (Sylvester et al., 2017; Digital Inclusion Research Group, 2017; InternetNZ, 2018). New Zealand-born workers are less likely than foreign-born workers to work in firms which use online platforms.

The likelihood of working in an automating firm or a firm that uses online platforms increases as earnings increase. Compared with workers that earn more than $60,000, workers that earn less than $20,000 have odds ratios of 0.66, 0.77 and 0.88 of working in firms with non-physical, routine physical and non-routine physical task automation respectively. The gap between workers earning over $60,000 and those in lower earnings brackets decreases as income increases: for those earning $40,000-$60,000 the odds ratios are 0.84, 0.85 and 0.93 for non-physical, routine physical and non-routine physical task automation respectively. The results are similar for online platforms, although the magnitude of the differences is smaller. Compared with those earning more than $60,000, workers earning less than $20,000 and $20,000-$40,000 are about 15% less likely to work in firms that use online platforms, and those earning $40,000-$60,000 are about 4% less likely.

Workers holding multiple jobs are less likely to work in automating firms or firms that use online platforms, although the associations are not large. Compared with those who have only one job, the odds ratio for non-physical task automation is 0.90, and 0.95 for routine physical task automation. There is no statistically significant relationship between holding multiple jobs and non-routine physical task automation. Similarly, for online platforms, the odds ratio is 0.91.

Industry plays a large role in the likelihood of workers being employed by firms with automation or online platforms. The industries of employment with the greatest odds ratios compared with agriculture, forestry & fishing include: information media & telecommunications; financial & insurance services; manufacturing; retail trade; electricity, gas, water & waste services; and arts & recreation. Some of the differences by type of automation likely reflect the nature of the work undertaken. For example, compared with agriculture, forestry & fishing, the manufacturing industry's odds ratios are similar across all three types of automation (manufacturing workers are about 2.2 to 2.9 times more likely to work in a firm with partial or full automation). However, workers in the information media & telecommunications industry are much more likely to work in a firm with non-physical task automation (odds ratio of 7.64), somewhat more likely to work in a firm with routine physical tasks automation (1.6), and less likely to work in a firm with non-routine physical tasks automation (0.59).

Similarly, the likelihood that workers are employed by firms that use online platforms is higher than in the agriculture, forestry & fishing industry in all industries except mining. There are some particularly large differences. For example, the likelihood that a worker in the financial & insurance service industry is employed by a firm that uses online platforms is over 56 times that of a worker in the agriculture, forestry & fishing industry. The corresponding figure for workers in the information media & telecommunications industry is almost 50 times, and 32 times as great for the electricity, gas, water & waste industry.

## Table 8: Automation and digitalisation logistic models (Individual level)

| | Non-physical task automation | Routine physical task automation | Non-routine physical task automation | Online platforms |
|---|---|---|---|---|
| **Female** | 1.059*** (0.02) | 1.094*** (0.012) | 1.059*** (0.013) | 1.266*** (0.014) |
| **Age (Base category: 25-34)** | | | | |
| 15 - 24 | 1.046 (0.033) | 1.017 (0.018) | 0.932*** (0.02) | 0.964** (0.018) |
| 35 - 44 | 0.938** (0.026) | 0.957*** (0.015) | 0.948*** (0.017) | 0.932*** (0.015) |
| 45 - 54 | 0.908*** (0.025) | 0.976 (0.016) | 0.948*** (0.018) | 0.880*** (0.015) |
| 55 - 64 | 0.953 (0.028) | 0.966** (0.017) | 0.953** (0.018) | 0.835*** (0.015) |
| 65+ | 0.907** (0.038) | 1.03 (0.026) | 1.027 (0.029) | 0.846*** (0.022) |
| **NZ born** | 0.939*** (0.021) | 0.994 (0.013) | 0.963** (0.014) | 0.927*** (0.012) |
| **Prioritised ethnicity (Base category: European)** | | | | |
| Māori | 1.210*** (0.032) | 1.271*** (0.019) | 1.221*** (0.02) | 0.895*** (0.014) |
| Pacific | 1.364*** (0.047) | 1.302*** (0.022) | 1.056*** (0.02) | 0.943*** (0.016) |
| Asian | 1.188*** (0.037) | 1.243*** (0.022) | 1.260*** (0.025) | 0.973 (0.017) |
| MELAA | 1.487*** (0.103) | 1.082** (0.039) | 1.059 (0.042) | 1.123*** (0.044) |
| Other | 1.098 (0.072) | 1.041 (0.041) | 1.007 (0.046) | 0.893*** (0.036) |
| **Earnings (Base category: More than $60,000)** | | | | |
| Less than $20,000 | 0.656*** (0.018) | 0.773*** (0.013) | 0.875*** (0.017) | 0.842*** (0.015) |
| $20,000 - $40,000 | 0.748*** (0.021) | 0.756*** (0.012) | 0.885*** (0.017) | 0.848*** (0.014) |
| $40,000-$60,000 | 0.844*** (0.021) | 0.846*** (0.012) | 0.927*** (0.015) | 0.957*** (0.014) |
| **Multiple Jobs** | 0.898*** (0.034) | 0.951** (0.021) | 0.969 (0.026) | 0.912*** (0.022) |
| **Industry (Base category: Agriculture, forestry & fishing)** | | | | |
| Mining | 0.955 (0.049) | 0.827*** (0.037) | 0.842*** (0.049) | 0.873** (0.055) |
| Manufacturing | 2.249*** (0.069) | 2.888*** (0.066) | 2.175*** (0.067) | 5.760*** (0.159) |
| Electricity, gas, water & waste services | 5.816*** (0.302) | 1.606*** (0.05) | 2.931*** (0.11) | 32.48*** (1.17) |
| Construction | 0.962 (0.042) | 0.725*** (0.026) | 1.199*** (0.051) | 1.516*** (0.077) |
| Wholesale trade | 2.035*** (0.081) | 0.684*** (0.02) | 0.683*** (0.026) | 11.12*** (0.349) |
| Retail trade | 3.673*** (0.162) | 1.774*** (0.046) | 0.938* (0.033) | 16.60*** (0.527) |
| Accommodation & food services | 1.626*** (0.084) | 0.627*** (0.023) | 0.457*** (0.027) | 5.347*** (0.197) |
| Transport, postal & warehousing | 3.431*** (0.141) | 0.527*** (0.013) | 0.611*** (0.021) | 12.81*** (0.378) |
| Information media & telecommunications | 6.586*** (0.293) | 1.558*** (0.041) | 0.594*** (0.022) | 48.53*** (1.633) |
| Financial & insurance services | 7.641*** (0.31) | 4.176*** (0.107) | 2.842*** (0.094) | 56.09*** (1.753) |
| Rental, hiring & real estate | 1.701*** (0.09) | 0.563*** (0.022) | 0.799*** (0.043) | 8.034*** (0.309) |
| Professional, scientific & technical | 1.092** (0.039) | 0.829*** (0.024) | 1.096** (0.041) | 3.988*** (0.126) |
| Administrative & support services | 3.443*** (0.114) | 1.259*** (0.029) | 1.520*** (0.048) | 4.293*** (0.121) |
| Education & training | 2.418*** (0.124) | 0.294*** (0.013) | 0.372*** (0.025) | 2.443*** (0.093) |
| Healthcare & social assistance | 2.831*** (0.11) | 0.350*** (0.011) | 0.478*** (0.019) | 1.861*** (0.062) |
| Arts & recreation | 2.227*** (0.103) | 1.759*** (0.054) | 2.798*** (0.101) | 29.99*** (1.209) |
| Other services | 1.077 (0.07) | 0.398*** (0.026) | 0.446*** (0.035) | 3.062*** (0.182) |
| **Constant** | 3.238*** (0.128) | 0.570*** (0.016) | 0.235*** (0.008) | 0.125*** (0.004) |
| **Observations (unweighted)** | 721,300 | 644,200 | 611,900 | 759,400 |
| **Observations (weighted)** | 1,440,000 | 1,321,900 | 1,256,900 | 1,561,600 |
| **Pseudo $R^2$** | 0.046 | 0.082 | 0.052 | 0.143 |

Odds ratios relative to base category (1). Standard errors in parentheses. Significance level indicated by: *** p<0.01, ** p<0.05, * p<0.1

### 5.3.2 Firm level

Firm-level results of the models for automation and digitalisation (see Table 9) show that smaller firms are less likely to automate. Compared to large firms with 100 or more employees, firms with less than 20 employees are a quarter as likely to have partial or full automation of non-physical tasks, and medium firms with 20-99 employees are about half as likely. The gap between the likelihood of small firms having partial or full automation of routine physical tasks is comparatively small (odds ratio of 0.72) and only significant at the 5% level. There is no significant difference between medium and large firms in the likelihood of automating routine physical tasks, and no significant differences by firm size for non-routine physical task automation. The general pattern that larger firms are more likely to automate processes is as expected. Automation often involves high fixed costs, and larger firms are more likely to have a higher volume of certain tasks and therefore the payoffs from automation are likely to be higher than for small firms.

There are no statistically significant differences between large and small and medium firms in the use of online platforms. Although the same argument about automation involving large fixed costs could also be applied to the development of online platforms, this may reflect that lower cost off-the-shelf options are more readily available to smaller firms in this case than with automation.

Foreign ownership tends to be positively associated with the likelihood of automation and the use of online platforms, although the relationships are generally not statistically significant or only weakly significant. The likelihood that a firm which is 51-90% foreign owned has automated non-physical tasks is about 2.87 times that of a firm that is wholly domestically owned. The likelihood that a firm which is at least 90% foreign owned has automated routine physical tasks is 1.62 times that of a domestically owned firm, and 1.79 times for non-routine physical tasks. For online platforms, firms that are 11-50% foreign owned are 2.65 times as likely to use online platforms than domestically owned firms.

Turning to industry, there are less significant relationships than in the individual-level models, but there are still some notable differences. Information media & telecommunications, retail trade, and financial & insurance services have the highest odds of non-physical task automation, at 2.67, 2.01 and 1.96 times the odds of agriculture, forestry & fishing, respectively. There are also industry differences in routine physical task automation. The largest odds ratios compared with agriculture, forestry & fishing are in financial & insurance services (1.88) and manufacturing (1.46). The only significant (above the 10% level) industry difference for non-routine physical task automation is the other services industry. Firms in this category (consisting of repair and maintenance in the case of BOS[8]) are less likely to automate non-routine physical tasks as firms in agriculture, forestry & fishing (odds ratio of 0.40).

For online platforms, firms in all industries except mining are more likely to use online platforms than firms in the agriculture, forestry & fishing industry. Unsurprising given the nature of the industry, the highest odds ratios compared with agriculture, forestry & fishing are for the information media & telecommunications industry (11.96). The odds ratios are also high for wholesale and retail trade industries (odds ratios of 8.45 and 8.99 respectively), most likely reflecting the prevalence of online sales.

[8] The other ANZSIC06 2-digit industries within 'Other services' (S95-Personal and other services and S96-Private household employing staff) are out of the scope of BOS.

## Table 9: Automation and digitalisation logistic models (Firm level)

| | Non-physical task automation | Routine physical task automation | Non-routine physical task automation | Online platforms |
|---|---|---|---|---|
| **Profit (Base category: >0-5K NZ$)** | | | | |
| Negative | 0.994 (0.2) | 0.837 (0.164) | 0.855 (0.184) | 1.122 (0.2) |
| Zero | 0.688 (0.337) | 0.723 (0.339) | 0.628 (0.246) | 0.863 (0.402) |
| 5-10K NZ$ | 0.69 (0.238) | 1.173 (0.281) | 0.933 (0.21) | 0.668 (0.174) |
| >10K NZ$ | 1.14 (0.497) | 1.869*** (0.365) | 1.14 (0.233) | 1.740*** (0.34) |
| NA or Missing | 1.346 (0.674) | 1.172 (0.567) | 1.174 (0.477) | 1.02 (0.483) |
| **Size (Base category: Large)** | | | | |
| Small | 0.250*** (0.049) | 0.720** (0.105) | 0.912 (0.165) | 0.811 (0.108) |
| Medium | 0.500*** (0.09) | 0.871 (0.105) | 1.111 (0.159) | 0.943 (0.11) |
| **Firm age (Base category: 10-19)** | | | | |
| Less than 10 | 1.293* (0.185) | 0.934 (0.138) | 1.356* (0.228) | 1.163 (0.153) |
| 20-29 | 0.874 (0.145) | 0.854 (0.143) | 0.881 (0.182) | 1.246 (0.2) |
| 30-39 | 0.665* (0.141) | 0.958 (0.212) | 1.393 (0.379) | 0.776 (0.142) |
| 40-49 | 1.003 (0.401) | 1.182 (0.343) | 1.103 (0.374) | 0.958 (0.274) |
| 50+ | 0.73 (0.215) | 0.699 (0.182) | 0.640* (0.151) | 0.927 (0.226) |
| **Foreign Ownership (Base category: zero)** | | | | |
| 1-10% | 2.648* (1.32) | 1.151 (0.352) | 0.873 (0.333) | 1.738 (0.595) |
| 11-50% | 2.980* (1.704) | 1.095 (0.355) | 1.551 (0.637) | 2.651*** (0.75) |
| 51-90% | 2.872*** (1.042) | 1.276 (0.27) | 1.827* (0.587) | 1.643* (0.421) |
| 90+ | 1.178 (0.297) | 1.621** (0.308) | 1.791** (0.415) | 1.415* (0.268) |
| **Industry (Base category: Agriculture, forestry & fishing)** | | | | |
| Mining | 0.433*** (0.136) | 0.733 (0.267) | 0.535 (0.264) | 0.949 (0.447) |
| Manufacturing | 0.97 (0.188) | 1.464** (0.275) | 1.119 (0.256) | 4.147*** (0.964) |
| Electricity, gas, water & waste services | 1.44 (0.413) | 0.852 (0.249) | 0.864 (0.294) | 6.227*** (1.777) |
| Construction | 0.767 (0.203) | 0.711 (0.211) | 0.842 (0.285) | 2.787*** (0.882) |
| Wholesale trade | 1.498 (0.373) | 0.865 (0.213) | 0.547* (0.174) | 8.451*** (2.241) |
| Retail trade | 2.006** (0.594) | 1.368 (0.384) | 0.795 (0.296) | 8.987*** (2.623) |
| Accommodation & food services | 0.759 (0.213) | 0.725 (0.228) | 0.498* (0.199) | 5.033*** (1.449) |
| Transport, postal & warehousing | 1.029 (0.309) | 0.732 (0.21) | 0.621 (0.223) | 3.574*** (1.127) |
| Information media & telecommunications | 2.670*** (0.839) | 1.12 (0.299) | 0.698 (0.233) | 11.96*** (3.314) |
| Financial & insurance services | 1.963** (0.531) | 1.877** (0.462) | 1.252 (0.377) | 8.079*** (2.177) |
| Rental, hiring & real estate | 1.206 (0.363) | 0.687 (0.228) | 0.689 (0.27) | 6.746*** (2.053) |
| Professional, scientific & technical | 1.314 (0.334) | 1.062 (0.27) | 1.001 (0.302) | 2.917*** (0.802) |
| Administrative & support services | 1.406 (0.356) | 1.146 (0.285) | 1.337 (0.386) | 5.263*** (1.405) |
| Education & training | 1.504 (0.434) | 0.629 (0.203) | 0.743 (0.281) | 3.414*** (1.047) |
| Healthcare & social assistance | 1.689* (0.463) | 0.835 (0.241) | 0.79 (0.28) | 3.728*** (1.091) |
| Arts & recreation | 1.242 (0.367) | 0.603 (0.213) | 0.489* (0.205) | 11.82*** (3.644) |
| Other services | 1.284 (0.371) | 0.532* (0.177) | 0.397** (0.178) | 4.386*** (1.374) |
| **Merger/acquisition** | 0.996 (0.349) | 1.675* (0.525) | 1.357 (0.365) | 1.355 (0.352) |
| **Competition (Base category: Many competitors, several dominant)** | | | | |
| Captive Market | 0.839 (0.243) | 1.219 (0.34) | 1.958* (0.695) | 0.300*** (0.093) |
| ≤2 Competitors | 0.806 (0.127) | 0.785 (0.135) | 0.876 (0.178) | 0.777* (0.114) |

| | | | | |
|---|---|---|---|---|
| Many competitors, none dominant | 0.87 (0.141) | 0.82 (0.142) | 0.95 (0.198) | 0.786 (0.124) |
| Unknown | 0.578** (0.149) | 0.71 (0.19) | 0.711 (0.239) | 0.325*** (0.106) |
| **Market share (Base category: No change)** | | | | |
| Decreased | 0.886 (0.199) | 0.86 (0.205) | 0.839 (0.235) | 0.814 (0.172) |
| Increased | 0.897 (0.131) | 1.078 (0.165) | 1.068 (0.194) | 1.236 (0.165) |
| Unknown | 1.001 (0.147) | 1.032 (0.161) | 0.884 (0.172) | 0.928 (0.129) |
| **Recruitment difficulty (Base category: None)** | | | | |
| Moderate | 1.357* (0.224) | 0.861 (0.168) | 0.997 (0.248) | 0.984 (0.167) |
| Severe | 1.569** (0.277) | 1.319 (0.262) | 1.347 (0.335) | 0.925 (0.163) |
| N/A or Unknown | 1 (0.227) | 1 (0.212) | 1 (0.247) | 1 (0.185) |
| **Constant** | 5.290*** (1.671) | 0.471*** (0.138) | 0.192*** (0.075) | 0.115*** (0.035) |
| **Observations (unweighted)** | 5,800 | 5,400 | 5,100 | 6,400 |
| **Observations (weighted)** | 35,000 | 32,900 | 31,500 | 41,200 |
| **Pseudo $R^2$** | 0.059 | 0.037 | 0.036 | 0.084 |

Odds ratios relative to base category (1). Standard errors in parentheses. Significance level indicated by: *** p<0.01, ** p<0.05, * p<0.1

## 5.4 Collective agreements and non-standard work

As noted in Section 3, the models for collective agreements and non-standard work are both ordered logistic models. The ordered categorical variable for collective agreements measures the share of workers in the firm who are covered by a collective agreement. Similarly, the non-standard work variable measures the share of workers on a fixed-term or casual contract, or on a contract for services.

In the case of ordered logistic regressions, the odds ratios are interpreted as the relative odds of being in a higher category of the outcome variable as opposed to being in a lower category. As this makes the interpretation of the magnitude of the odds ratio less intuitive, this section will focus on the significance and direction of the odds ratios, as well as the size of the odds ratios relative to other odds ratios. The same explanatory variables are used as for the logit models discussed previously. These models are presented in Table 10 (at the individual level) and Table 11 (at the firm level).

### 5.4.1 Individual level

Female workers have higher odds than male workers of being employed by firms with higher shares of workers on collective agreements. Recall that while our models control for industry, they do not control for occupation due to data limitations, which may have a bearing on these results. Also, while women are more likely to work in professions where collective agreements are more common, such as teaching and nursing, many (but not all) of these workers and their employers would be excluded from our analysis since the BOS sample covers private enterprises only. Although speculative, it may be that this result reflects that women are more likely to be employed by firms with a higher share of lower-paid roles, and within the private sector, lower-paid roles that are of a more precarious nature tend to be more likely to be covered by a collective agreement. However, this does not necessarily align with the finding that lower earnings are associated with lower odds of being employed by a firm with higher collective agreement coverage (discussed below). This would, however, be in line with our findings that women are more likely to be employed by firms with higher shares of non-standard workers. Indeed, previous research has highlighted that women are more likely to face insecure work conditions. For example, Pacheco et al. (2016) finds that 62% of temporary workers are female.

There are significant differences by age in the collective agreement model, with greater odds of working in firms with higher shares of workers covered by collective agreements for all workers outside of the 25-34 age range. However, there are fewer differences by age for non-standard work, where only workers aged 45-54 years are more likely to work in firms with higher shares of workers covered by collective agreements than those aged 25-34 years.

Maōri, Pacific and Asian workers have greater odds of being employed by firms with higher rates of collective agreements and non-standard work than their European counterparts. This may reflect similar factors as those behind the results for female versus male workers discussed above, such as a higher likelihood of working in jobs which are, by their nature, more precarious. Those who were born in New Zealand have higher odds of being employed by firms with higher rates of collective agreement coverage (although the difference is only significant at the 10% level). In contrast, New Zealand-born workers are less likely to work in firms where larger shares of workers have non-standard employment arrangements.

Lower earnings are associated with lower odds of being employed by a firm with higher collective agreement coverage. The sign is reversed in the case of non-standard work, with lower-income workers being more likely to work for firms with higher rates of non-standard work arrangements. This may reflect that insecure work is associated with lower earnings and more precarious employment types such as casual work. Data limitations mean that we cannot control for hours worked, so it may also be that workers in firms with high rates of non-standard employment tend to have lower earnings because they work fewer hours. Unsurprisingly, people who work multiple jobs have greater odds of working for firms with higher rates of workers with non-standard employment arrangements.

The industry of employment associated with the greatest odds of high collective agreement rates relative to the base case of agriculture, forestry & fishing is transport, postal & warehousing, with high odds also seen in accommodation & food services and manufacturing. Agriculture, forestry & fishing has higher odds of employment by firms with higher rates of non-standard workers than every other industry. This is unsurprising given the seasonal nature of agricultural, forestry & fishing work, resulting in cyclical business patterns and the need for temporary labour at different times of the year. However, relative to most other industries, arts & recreation, education & training, administrative & support services and rental, hiring & real estate services have high odds of higher rates of non-standard workers. Lower odds are present for firms within the mining, manufacturing, construction, wholesale and retail trade industries. These results are in line with previous findings that non-standard work is prevalent in service industries, and has led to concerns that rates of non-standard work will increase as the employment shares continue to shift towards services and away from sectors such as manufacturing (Drache et al., 2015; Buera and Kaboski, 2012).

Table 10: Collective agreements and non-standard work ordered logistic models (Individual level)

| | Collective Agreements | Non-standard Work |
|---|---|---|
| **Female** | 1.120*** (0.013) | 1.057*** (0.012) |
| **Age (Base category: 25-34)** | | |
| 15 - 24 | 1.075*** (0.023) | 0.973 (0.018) |
| 35 - 44 | 1.038** (0.018) | 1.02 (0.015) |
| 45 - 54 | 1.116*** (0.019) | 1.054*** (0.016) |
| 55 - 64 | 1.203*** (0.021) | 1.026 (0.017) |
| 65+ | 1.208*** (0.03) | 1.035 (0.023) |
| **NZ born** | 1.025* (0.014) | 0.966*** (0.012) |
| **Prioritised ethnicity (Base category: European)** | | |
| Māori | 1.272*** (0.021) | 1.127*** (0.016) |
| Pacific | 1.440*** (0.023) | 1.058*** (0.018) |
| Asian | 1.315*** (0.026) | 1.208*** (0.02) |
| MELAA | 1.052 (0.047) | 1.098** (0.042) |
| Other | 0.991 (0.037) | 0.985 (0.034) |
| **Earnings (Base category: More than 60K NZ$)** | | |
| 20K NZ$ | 0.878*** (0.016) | 1.570*** (0.026) |
| 20 - 40K NZ$ | 0.877*** (0.015) | 1.157*** (0.018) |
| 40 - 60K NZ$ | 0.887*** (0.012) | 0.984 (0.012) |
| **Multiple Jobs** | 1.001 (0.026) | 1.123*** (0.026) |
| **Industry (Base category: Agriculture, forestry & fishing)** | | |
| Mining | 1.385*** (0.057) | 0.134*** (0.004) |
| Manufacturing | 3.112*** (0.079) | 0.099*** (0.002) |
| Electricity, gas, water & waste services | 1.565*** (0.044) | 0.128*** (0.003) |
| Construction | 1.108** (0.049) | 0.113*** (0.004) |
| Wholesale trade | 0.898*** (0.028) | 0.119*** (0.003) |
| Retail trade | 1.054 (0.035) | 0.106*** (0.002) |
| Accommodation/food services | 3.309*** (0.138) | 0.182*** (0.007) |
| Transport/postal/warehousing | 5.126*** (0.14) | 0.273*** (0.005) |
| Information media/telecommunications | 1.763*** (0.046) | 0.266*** (0.007) |
| Financial/insurance services | 2.207*** (0.056) | 0.142*** (0.003) |
| Rental/hiring/real estate | 0.458*** (0.021) | 0.317*** (0.011) |
| Professional/scientific/technical | 0.216*** (0.008) | 0.135*** (0.003) |
| Admin/support services (incl. Public admin/safety) | 1.059** (0.027) | 0.387*** (0.009) |
| Education/teaching | 0.379*** (0.018) | 0.461*** (0.012) |
| Healthcare/social assistance | 2.999*** (0.083) | 0.242*** (0.005) |
| Arts/recreation | 2.270*** (0.069) | 0.757*** (0.019) |
| Other | 1.295*** (0.095) | 0.085*** (0.005) |
| **Cut 1 (0 / >0-10%)** | 1.073 (0.03) | -3.635 (0.025) |
| **Cut 2 (>0-10% / 11-50%)** | 1.579 (0.03) | -1.505 (0.024) |
| **Cut 3 (11-50% / 51-90%)** | 2.273 (0.031) | 0.631 (0.023) |
| **Cut 4 (51-90% / >90%)** | 3.142 (0.033) | 1.822 (0.025) |
| **Observations (unweighted)** | 713,200 | 759,400 |
| **Observations (weighted)** | 1,456,400 | 1,561,600 |
| **Pseudo $R^2$** | 0.061 | 0.049 |

Odds ratios relative to base category (1). Standard errors in parentheses. Significance level indicated by: *** p<0.01, ** p<0.05, * p<0.1

### 5.4.2 Firm level

As with most firm-level models of FoW outcomes, small and medium-sized firms have lower odds of having higher rates of collective agreement coverage than large firms. This relationship is also present to an extent in the model for non-standard work, however it is only significant at the 5% significance level for medium-sized firms, and it is not significant for small firms.

Turning to industries, there are few statistically significant differences in collective agreement coverage compared with the base category of agriculture, forestry & fishing. The exceptions are the accommodation & food services industry, which has greater odds of having a higher share of workers covered by collective agreements, and financial & insurance services and professional, scientific & technical services, which both have lower odds.

Similar to the individual-level results, almost all industries have lower prevalence in the use of non-standard employment arrangements than the base case of agriculture, forestry & fishing. The one exception is arts & recreation, where the difference is not statistically significant.

There are several associations which are not common across the two models. In the model for collective agreements there are lower odds for firms aged 30-39 years to have higher rates of coverage compared with the base case of 10-19 years, significant at the 5% level. However, this is not reflected in any other age categories and does not seem to be indicative of any general pattern across firm age and collective agreement coverage. Firms in the highest profit category (more than $10,000) have greater odds (compared with firms with $1-5,000 profit) of having higher rates of collective agreement coverage, which is again significant at the 5% level. In the non-standard work model, the odds of having higher rates of coverage are lower for firms that have more than 90% foreign ownership compared with the base case of 100% domestic ownership (significant at the 5% level).

Table 11: Collective agreements and non-standard work ordered logistic models (Firm level)

| | Collective Agreements | Non-standard Work |
|---|---|---|
| **Profit (Base category: >0-5K NZ$)** | | |
| Negative | 0.82 (0.169) | 0.877 (0.144) |
| Zero | 0.689 (0.313) | 1.638 (0.603) |
| 5-10K NZ$ | 0.834 (0.14) | 0.795 (0.132) |
| >10K NZ$ | 1.412** (0.221) | 1.089 (0.143) |
| NA or Missing | 1.144 (0.533) | 0.615 (0.23) |
| **Size (Base category: Large)** | | |
| Small | 0.680*** (0.09) | 1.13 (0.12) |
| Medium | 0.710*** (0.078) | 0.845** (0.069) |
| **Firm age (Base category: 10-19)** | | |
| Less than 10 | 1.167 (0.177) | 1.162 (0.129) |
| 20-29 | 0.758 (0.129) | 0.828 (0.097) |
| 30-39 | 0.606** (0.126) | 0.814 (0.142) |
| 40-49 | 1.53 (0.509) | 0.737 (0.158) |
| 50+ | 0.73 (0.166) | 0.899 (0.188) |
| **Foreign Ownership (Base category: zero)** | | |
| 1-10% | 0.799 (0.229) | 1.113 (0.259) |
| 11-50% | 0.761 (0.259) | 1.024 (0.205) |
| 51-90% | 1.127 (0.231) | 1.033 (0.194) |
| 90+ | 0.918 (0.169) | 0.683** (0.11) |
| **Industry (Base category: Agriculture, forestry & fishing)** | | |

| | | |
|---|---|---|
| Mining | 1.358 (0.417) | 0.213*** (0.047) |
| Manufacturing | 1.221 (0.231) | 0.206*** (0.029) |
| Electricity/Gas/water/Waste services | 1.357 (0.341) | 0.270*** (0.051) |
| Construction | 1.221 (0.34) | 0.164*** (0.035) |
| Wholesale trade | 0.919 (0.239) | 0.228*** (0.04) |
| Retail trade | 1.283 (0.368) | 0.219*** (0.045) |
| Accommodation/food services | 2.462*** (0.66) | 0.458*** (0.118) |
| Transport/postal/warehousing | 1.209 (0.324) | 0.308*** (0.065) |
| Information media/telecommunications | 0.739 (0.195) | 0.231*** (0.048) |
| Financial/insurance services | 0.429*** (0.12) | 0.165*** (0.029) |
| Rental/hiring/real estate | 0.438** (0.157) | 0.375*** (0.088) |
| Professional/scientific/technical | 0.221*** (0.07) | 0.153*** (0.029) |
| Admin/support services (incl. Public admin/safety) | 0.931 (0.235) | 0.431*** (0.101) |
| Education/teaching | 0.616 (0.199) | 0.528*** (0.11) |
| Healthcare/social assistance | 1.405 (0.335) | 0.380*** (0.07) |
| Arts/recreation | 1.481 (0.445) | 1.277 (0.314) |
| Other | 1.515 (0.43) | 0.138*** (0.029) |
| **Merger/acquisition** | 0.942 (0.266) | 1.16 (0.256) |
| **Competition (Base category: Many competitors, several dominant)** | | |
| Captive Market | 1.077 (0.352) | 0.711 (0.163) |
| ≤2 Competitors | 1.281 (0.196) | 1.078 (0.133) |
| Many competitors, none dominant | 0.878 (0.152) | 1.266* (0.155) |
| Unknown | 1.104 (0.355) | 0.975 (0.225) |
| **Market share (Base category: No change)** | | |
| Decreased | 0.808 (0.179) | 0.839 (0.149) |
| Increased | 0.84 (0.132) | 0.99 (0.111) |
| Unknown | 1.03 (0.156) | 1.092 (0.131) |
| **Recruitment difficulty (Base category: None)** | | |
| Moderate | 0.914 (0.173) | 1.075 (0.16) |
| Severe | 0.936 (0.186) | 1.038 (0.161) |
| N/A or Unknown | 0.764 (0.203) | 0.947 (0.192) |
| **Cut 1 (0 / >0-10%)** | 0.7 (0.279) | -2.577 (0.223) |
| **Cut 2 (>0-10% / 11-50%)** | 0.802 (0.279) | -1.409 (0.22) |
| **Cut 3 (11-50% / 51-90%)** | 0.955 (0.279) | 1 (0.222) |
| **Cut 4 (51-90% / >90%)** | 1.125 (0.28) | 2 (0.249) |
| **Observations (unweighted)** | 6,100 | 6,400 |
| **Observations (weighted)** | 38,900 | 41,200 |
| **Pseudo $R^2$** | 0.048 | 0.042 |

Odds ratios relative to base category (1). Standard errors in parentheses. Significance level indicated by: *** p<0.01, ** p<0.05, * p<0.1

# 6 Discussion

This section discusses general patterns across the various FoW models presented in Section 5. It speculates on the potential drivers and implications of these patterns. It also outlines possible directions for future work in this area.

## 6.1 Gender

A consistent finding across all but one of the FoW practices examined is that female workers are more likely to work in firms which have these practices. There are several possible reasons for this pattern. Firstly, it may reflect a greater preference for hiring female workers by more progressive firms (i.e. firms more likely to innovate and implement FoW practices), compared with less progressive firms which may be subject to more traditional male-dominated hiring biases. Similarly, this may reflect higher retention of female workers by progressive firms, due to the absence of such biases in the promotion and remuneration of their workers. In addition, such patterns may arise from worker preferences. Female workers may actively seek employment by firms that implement progressive FoW practices such as additional parental leave, fair work policies, and flexible work options.[9]

While it is positive that women seem to be accessing employment within firms that offer options that they value, such as flexible working arrangements, it should also be noted that this may come at the expense of higher earnings. Previous international and New Zealand research suggests that this act of sorting by gender into particular types of firms partly explains the gender-wage gap. For example, in New Zealand, Sin et al. (2017) finds that sorting by gender at either the industry or firm level explains some (less than one-fifth) of the gender-wage gap.

It should also be noted that the data we use only provides information on whether women work in firms that offer options such as flexible hours, and not whether women have access to and use these policies. In fact, the HLFS SoWL suggests that at the individual level, women are less likely to have flexible hours (54.0% of male employees report having flexible hours versus 48.8% of female employees) (Stats NZ, 2019a). However, the difference between the firm-level and individual-level statistics could also be because we are examining multivariate regressions, while the SoWL statistics are bivariate and therefore do not control for other factors such as industry of employment. As will be discussed in Section 6.8, it would be useful to complement our BOS firm-level analysis of FoW practices with SoWL individual-level analysis.

The one exception to the trend of female workers being more likely to work in firms with FoW practices is performance reviews. There is no statistically significant difference in the likelihood that female workers are employed by firms that have formal performance review practices in place compared with male workers. Fabling et al. (2012) use a measure of performance pay systems that combines information on share of employees in a firm that had formal performance reviews and the share on "pay for performance" schemes. They find that performance pay systems raise average wages within firms. However, the positive effect on wages is concentrated on high-income male workers, with little to no effect on the wages of female workers. Moreover, recent studies highlight

[9] As we have controlled for industry of employment in the individual model, we can exclude any potential correlation of female-dominated industries and industries that are more likely to have FoW practices as potential explanations.

that the subjective nature of performance reviews opens up the possibility of gender bias and, in practice, place women at a disadvantage (Begeny et al., 2020; Brewer et al., 2020). This previous research suggests that, unlike other FoW practices such as flexible leave options, performance review practices do not benefit female workers specifically and may even disadvantage them. Therefore, unlike other FoW practices, female workers may be less likely to self-select into firms with performance review practices.

We also find that female workers are more likely to work in firms with a higher share of workers on collective agreements and with non-standard employment arrangements (covering temporary, casual and contract work). We speculated that this may reflect that women are more likely to be employed by firms with a higher share of lower-paid and more precarious roles, which is consistent with previous New Zealand research. For example, the SoWL highlights that women are more likely to be temporary employees (in 2018, 10.7% of female employees were temporary, versus 8.0% of male employees) (Stats NZ, 2019a) and Plum et al. (2019) finds that women are more likely to live in a household experiencing in-work poverty. While the Covid-19 period is outside the scope of our analysis as we only examine data from 2018, early evidence highlights that women fared worse in terms of employment losses during the pandemic and the associated lockdowns and border restrictions. This appears to be due to women being more likely to work in industries which were hardest hit by Covid-19, such as hospitality and tourism-related industries as well as a greater prevalence of non-standard types of work among women (Cook and Grimshaw, 2020; Stats NZ, 2020). Going forward, while data limitations make it difficult to assess, available indicators do not suggest that the share of non-standard work in New Zealand is increasing (Productivity Commission, 2019). However, if it does increase in the future, female workers are likely to be affected disproportionately by this.

It should also be noted that some of the gender differences may reflect that while we control for industry of employment, we are unable to control for occupation. For example, a freight forwarding company and a road freight company would both fall within the transport, postal and warehousing industry. However, a freight forwarding company may have a high share of workers in occupations such as administration roles, which are traditionally female-dominated roles and also more amenable to FoW practices such as working from home. In contrast, a road freight company may have a higher share of workers in occupations such as truck drivers, which are traditionally male-dominated roles and are less amenable to practices like working from home. Therefore, if we were able to control for occupation, it is possible that the measured gender differences would be less pronounced.

## 6.2 Ethnicity and country of birth

A similar pattern to the one found for gender is also seen among Māori, Pacific, Asian, and to a lesser extent MELAA and workers of other ethnicities.[10] When controlling for the range of explanatory variables (most notably, industry) such workers generally have greater odds of being employed by firms with FoW practices than their European counterparts. These patterns may also reflect a possible combination of ethnicity-based hiring or promotional biases affecting the recruitment or retention of workers from these ethnic backgrounds (similar to the speculation above for female workers), or workers' preference to work for firms with these practices in place.

[10] 'Other' ethnicities refers to those who are not identified as European, Māori, Pacific, Asian or MELAA.

Overseas workers are also more likely to work in firms employing FoW practices than those who were born in New Zealand. Since we are unable to control for educational levels, this may be partly due to New Zealand migration policy's focus on skilled workers in areas where New Zealand has skills shortages (Hawthorne, 2014). Workers with such skills may have the ability to be more selective of workplaces, and the relationship may be indicative of a preference of workers towards more progressive firms.

From the firm perspective, in line with the speculation that more progressive firms are less prone to gender biases hiring and promotion of workers, such firms may be also less prone to similar ethnic biases, affecting hiring and retention of foreign born and non-European workers. As with the case of gender, these differences by ethnicity and birthplace may also partly reflect firm differences in occupational composition that we cannot control for.

As discussed, while our analysis does not cover the Covid-19 period, the negative effects of previous recessions have fallen disproportionately on Māori and Pacific Peoples (Cochrane and Pool, 2017) and early estimates suggests that this is also the case for Covid-19 (e.g. Te Puni Kōkiri, 2020). As in the case of female workers, our research finds that Māori and Pacific workers are more likely to work in firms with a high share of non-standard employment arrangements, and previous work has highlighted that they are more likely to be in low-paid and precarious work. For example, 10.6% of Māori and 14.3% of Pacific employees are temporary workers, compared with 8.5% of European workers (Stats NZ, 2019a). As mentioned previously, while there is currently no evidence that non-standard work is on the rise in New Zealand (Productivity Commission, 2019), the gender and ethnicity distribution of the use of non-standard work could raise equity issues.

## 6.3 Worker earnings

Workers' earnings are consistently significant across all models. For almost every FoW outcome modelled (the exceptions being collective agreements and non-standard work, mentioned previously), workers with lower earnings are less likely to work in firms with FoW practices.[11] This could be because progressive firms are also more profitable, allowing them to pay workers more. However, this seems unlikely as the positive relationship between firm profitability and FoW practices is not particularly strong. Another possible explanation is that firms with practices in place that promote the wellbeing of workers such as leave provision, flexible work options and fair work policies are more likely to provide generous pay. However, this does not explain the significance of worker earnings across all other modelled FoW outcomes.

An additional explanation could be that earnings are proxying for occupation and/or qualification level, which we cannot control for due to data limitations. Even within industries, the composition of workers within a firm in terms of occupation and qualification levels could vary considerably. Taking the administrative and support services industry as an example, a firm that primarily undertakes office administration services may tend to have higher paid and more qualified workers than a cleaning

[11] While one might suspect that this is due to workers being employed by a larger number of workplaces throughout the year (i.e. more heavily employed over the year 2018), thus increasing their earnings and likelihood of working for at least one firm that has the FoW outcome(s) in place. This is unlikely to be the case, as we selectively target the firm that each worker has been employed by for the most months in 2018. As such, secondary employment or short-term/sporadic employment with firms that have FoW outcomes does not result in the worker being linked with said outcome, unless this is the specific firm that they are associated with (i.e. the income they have spent the longest amount of time working for in 2018).

services firm. The nature of the work being undertaken by the office administration firm is also likely to be amenable to many of the FoW practices we discuss. In addition, it is likely that higher skilled workers have a greater ability to be selective about where they are employed, and all else equal, may prefer firms with more progressive workplace practices. These factors suggest that the positive relationship between earnings and FoW practices may be less pronounced if occupation and qualification level were controlled for.

## 6.4 Multiple jobs

Workers who have worked for more than one firm for two or more consecutive months have lower odds of working for firms with almost all modelled FoW practices. While the reason behind this association is unclear, reasons have been offered in the literature for workers holding multiple jobs. These include earnings or hours limitations with their primary job, or a preference to hold a more diverse 'job portfolio'. The latter may stem from workers that either find more enjoyment dividing their time between several jobs or retain one job as a form of insurance due to uncertainty in their primary job (Hirsch et al., 2016). It is important to note that although it is not always the case, those who hold multiple jobs are often vulnerable workers who need to supplement their primary income because it is low-paid or they are unable to secure enough hours.

One of the few exceptions to the finding that holding multiple jobs is associated with lower odds of working in a firm with FoW practices is non-standard work. Multiple job workers have higher odds of working for firms with higher rates of non-standard workers. This is as expected and is likely due to the nature of the contracts that would allow or necessitate them to work multiple jobs (i.e. casual employment agreements or a contract for services).

## 6.5 Industry

There are strong relationships between industry and FoW practices at both the individual and firm levels. For example, there is a large prevalence of FoW practices, including performance reviews, employee feedback programmes, fair work policies, flexible leave and work options, automation and the use of online platforms in industries such as financial & insurance services and information media & telecommunications. However, the patterns for collective agreements and non-standard work are different. The highest rates of firm coverage of collective agreements are in postal & warehousing, accommodation & food services and manufacturing. The greatest likelihoods of firms having higher rates of non-standard workers occur in agriculture, forestry & fishing, arts & recreation, education & training and administrative & support services.

The results are largely as expected. For example, the nature of the work undertaken in industries such as financial & insurance services is more amenable to FoW practices like flexible work options and automation (which includes, for example, automation of data collection and processing). It is also unsurprising that industries where work is seasonal and/or relatively low paid such as agriculture, forestry & fishing and accommodation & food services have a greater prevalence of non-standard work arrangements.

As discussed, we cannot control for occupation or highest qualification. Measured differences by industry may also be proxying for some of these differences since certain occupation types are much more prevalent within certain industries. For example, firms within industries with a large share of

office workers (such as financial & insurance services) may be more easily able to offer remote working options to staff than firms within industries that have a large share of manual workers whose role cannot be performed remotely (such as the construction industry). In addition, industries such as financial & insurance services are likely to have a greater share of highly educated workers. They may, therefore, offer FoW practices such as flexible work options as a way to attract and retain staff. However, we include whether firms report recruitment difficulties as an explanatory variable, and this is generally not statistically significant in our models (with the exception of a positive association between recruitment difficulties and having performance reviews and employee feedback programmes), which sheds some doubt on this potential explanation. This does not, however, completely rule out the possibility that staff with higher income and education demand these work practices and have greater outside opportunities, and this influences businesses to offer these options.

## 6.6 Firm size

In general, we find that large firms (100 or more employees) are more likely to have FoW practices than small (less than 20 employees) and medium firms (20-99 employees). It may be that large firms get a larger payoff from FoW practices. In the case of practices such as automation and digitalisation, the higher volumes involved with larger firms may make it more likely that the fixed costs of automation are worth bearing. In the case of workplace practices such as performance reviews, employee feedback programmes and flexible work and leave options, large firms may be more likely to establish these on a formal basis than smaller firms because these are more difficult to manage on an informal basis within large organisations. This highlights a limitation of the information available in the BOS, which generally asks whether these policies or practices are offered on a formal basis. It may also be that firms with these practices are more likely to be successful and grow to become large firms. However, as noted above, there do not seem to be strong relationships between profits and firm age and FoW practices, which may shed some doubt on this explanation.

## 6.7 Foreign ownership

Most of the examined models show some significant, positive relationships between foreign ownership and FoW practices. However, the size and statistical significance of these relationships vary depending on the FoW practice being investigated.

In most cases, foreign ownership is associated with increased odds of having FoW practices, although this is often only significant when comparing wholly domestically owned firms with those which are 90% or more foreign owned. However, there are no significant differences between foreign- and domestically owned firms in the case of flexible leave provisions and the share of workers on collective agreements. Furthermore, for non-standard work, firms with more than 90% foreign ownership have lower odds of having a high share of workers on non-standard employment contracts.

The lack of uniformity across the rates of foreign ownership may indicate that there are other factors affecting these patterns. For example, foreign-owned firms also tend to be larger, and firm size is included as a separate explanatory variable in our models. Therefore, the relationship between foreign ownership and FoW practices may not be particularly strong in some cases.

## 6.8 Future work

Our analysis represents an initial step to provide information on the prevalence and distribution of FoW practices in New Zealand workplaces. While useful insights have been gleaned, there are a number of limitations. This subsection highlights some of these limitations, with a focus on those which could be addressed with further analysis using existing data sources. It should also be noted, however, that relevant data in many FoW domains are scarce. For example, the need to improve data on non-standard and gig work has been highlighted (New Zealand Productivity Commission, 2019; Riggs et al., 2019).

As noted, one of the limitations of our analysis is that information on several potentially important factors, including occupation, hours worked and highest qualification, are not included. We also do not have information at the individual level on variables such as employment type. While we include measures on the share of workers on different employment arrangements (permanent, temporary, casual and contractors) at the firm level, it would be informative to know what type of employment contract the individual is on.

As discussed in Section 3 and Appendix A, we cannot combine information from multiple survey sources. Therefore, we focussed on firm-level survey data from the BOS 2018 'Changing nature of work' module. We combined this with individual-level administrative data from the IDI, which is available on a population-wide basis. An alternative approach would be to use individual-level survey data combined with firm-level administrative data, which would provide basic firm demographic information. In particular, the HLFS includes information on individuals' occupation, hours worked and qualification level. In addition, every four years, the HLFS SoWL supplement includes individual-level future-of-work variables such as employment contract type, perceived job security and autonomy and flexible work arrangements. For example, while our analysis could only measure whether the firm the individual works in offers flexible hours, SoWL can measure whether the individual has access to flexible hours. Therefore, analysis of individual-level FoW information available via the HLFS SoWL supplement would be a valuable complement to the analysis in this report using BOS firm-level future-of-work information.

An additional advantage of SoWL is that it is run every four years, which could provide the opportunity to analyse trends over time. In contrast, the BOS 2018 'Changing nature of work' module was ad-hoc and there are no current plans to repeat it. In particular, given that Covid-19 may be influencing FoW practices, such as remote working and non-standard work, it may be useful to compare the latest 2018 SoWL with the next scheduled 2022 SoWL.

In addition, SoWL would allow more of the FoW elements discussed in Section 2 to be examined. Due to the nature of the data, our current analysis focusses on workplace practices. However, there are several other FoW dimensions that are not analysed. In terms of the number of jobs, our analysis included some relevant supply-side demographic information such as age and gender. It also included some relevant demand-side information on factors such as automation. Since the data are available only at one point of time, however, we cannot examine whether there is a relationship between changes in these variables and changes in the prevalence and distribution of FoW practices. Repeated cross-sectional data via SoWL would go some way to addressing this lack of time-trend analysis.

In terms of job quality, BOS offers some relevant firm-level information that touches on this topic. For example, it includes some measures which may be related to labour market security, such as the share of workers on permanent versus temporary contracts. SoWL includes more directly relevant information on this issue. This includes information on employment type, providing individual-level

information on temporary work, for example. It also includes individual-level information on a number of other dimensions of job quality, such as people's perceptions of the security of their employment, their hours of work and how flexible these are, and the degree of workplace autonomy they have.

Other dimensions discussed in Section 2 are less amenable to measurement using SoWL and would likely require other data sources. This includes social protections, wage and income inequality, and social dialogue and industrial relations. For example, the Ministry of Business, Innovation & Employment's National Survey of Employers includes information on pay equity and firms' relationships with unions.

# 7 Conclusion

The term 'Future of Work (FoW)' describes a variety of interacting disruptive forces, such as digitalisation and globalisation, that are changing the nature of the way we work, workforces and workplaces. Despite the ubiquity of discussion about the FoW, there appears to be little evidence on the adoption and distribution of FoW practices in New Zealand. This report is a first step in addressing this information gap. It describes what proportion of firms are using FoW practices and what share of workers are employed by these firms. It also examines what types of firms are more likely to have FoW practices in place, and what type of workers are employed by these firms.

The prevalence of FoW practices varies considerably, even in the case of related practices. For example, while more than two-thirds of firms report having partly or fully automated some non-physical tasks, only a quarter report having at least partly automated routine physical tasks and 14% report automating non-routine physical tasks. While 72% of firms offer flexible leave arrangements (such as the ability to buy extra annual leave or take leave without pay) and 59% offer flexible work options (such as working-from-home options), only about a fifth offer parental leave in addition to statutory provisions. As expected, the share of workers employed by firms with FoW practices is higher than the share of firms, reflecting that large firms are more likely to have FoW practices in place.

Female workers are more likely to be employed by firms with FoW practices than male workers. Similarly, Māori, Pacific and Asian workers are more likely to be employed by firms with FoW practices than European workers. This could be because firms with progressive FoW practices, particularly inclusion and diversity policies, are more likely to employ non-European and female workers. In turn, non-European and female workers may find such firms more attractive places to work. For example, female workers may more actively seek out firms which have flexible work and leave options to accommodate caregiving responsibilities. Female and non-European workers are also more likely to work in firms with a higher share of non-standard employment, highlighting their potential vulnerability. This is a particularly relevant issue given the labour market impacts of Covid-19, with early evidence showing that its negative impacts fall disproportionately on female workers.

Workers with lower earnings and those who hold multiple jobs are generally less likely to be employed by firms with FoW practices than higher earnings, with the exception of non-standard work. There are several possible reasons for this relationship. One possibility is that while we control for industry of employment, we are unable to control for occupation and qualification level in our analysis. Even within an industry, higher income employees may be more likely to work in firms where the nature of the roles undertaken is more amenable to practices such as flexible work options. In addition, it is likely that higher skilled workers have more outside options and therefore a greater ability to be selective about where they work and, all else equal, may prefer firms with more progressive workplace practices. In turn, firms with skilled workforces are more likely to offer these options. As expected, lower income earners and those who hold multiple jobs are more likely to work in firms where non-standard employment arrangements are more common.

The prevalence of FoW practices varies significantly by industry, but these differences are largely in line with expectations. For example, there is a large prevalence of FoW practices in industries such as financial & insurance services and information media & telecommunications. This may be at least partly due to the nature of the work undertaken in these industries, which tends to be more

amenable to FoW practices such as flexible work arrangements, particularly as we cannot control for occupation or highest qualification in our models.

Larger firms are more likely to have FoW practices. This may be because larger firms get a greater payoff from FoW practices, particularly in the case of practices like automation and digitalisation. However, the relationship may be heightened by the nature of the available information as BOS asks firms whether they have put some practices in place on a formal basis. It may be that some smaller firms do offer these practices, but on an informal basis.

This report provides initial results on the prevalence and distribution of FoW practices in New Zealand. Future work could use individual-level data on FoW practices from the SoWL supplement of the HLFS. This includes information on factors such as perceived job security and work-related stress and access to options such as flexible work hours.

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# Appendix A: Detailed data and methodology

This Appendix details the explanatory variables, data limitations and methodology that were summarised in Section3. We first describe our main data source, the BOS 2018, then discuss how we link this to several administrative datasets from Stats NZ's Longitudinal Business Database (LBD) and Integrated Data Infrastructure (IDI). We also provide details and descriptive statistics of the outcome and explanatory variables.

## BOS 2018 and the changing nature of work module

Our main data source is Stats NZ's BOS 2018. The BOS is an annual survey and its sample comprises private enterprises[12] that operate in New Zealand, are economically significant (have an annual GST turnover of at least $NZ30,000), have been operating at least one year and have six or more employees. To ensure that the BOS sample is representative of this population of firms, Stats NZ provide post-hock survey weights for each observation. These reflect the number of firms in the population represented by that observation, based on the sample versus population distributions of industry and firm size (Stats NZ, 2018).

This annual survey is separated into four modules. The first two are permanent modules that relate to business operations (asked every year) and innovation (asked in odd years) or ICT (asked in even years). The third and fourth modules are ad-hoc contestable modules. The 2018 survey contains a module pertaining to the 'Changing nature of work'. The questions within this module cover a range of topics such as: employment arrangements, including the number of workers in permanent, fixed-term, casual or service contract agreements; employment practices, including leave provisions, flexible work arrangements, employee engagement, and policies or practices addressing pay gaps, an ageing workforce, bullying and diversity; business practices such as digitalisation, platform mediated work and outsourcing; and automation across a range of types of tasks. The BOS also contains modules that ask other relevant questions, including the proportion of workers covered by collective agreement contracts, the competitiveness of the business environment, and whether any recent mergers/acquisitions have taken place.

## IDI and LBD datasets

The BOS is part of Stats NZ's Longitudinal Business Database (LBD) and is therefore linked to administrative datasets on firms. We can also link workers to firms via the Linked Employer-Employee Database (LEED), and access information on worker characteristics from the Integrated Data

[12] This excludes firms falling under the NZISC96 codes: 3-General government; 4-Private non-profit organisations serving households; 5-Households; 6-Rest of world; 21-Central bank; 1321-Local government enterprises; 2212, 2213, 2222, 2223, 2292, 2293, 2312, 2313, 2412, 2413 – Central and local government financial intermediaries. It also excludes firms with ANZSIC06 industry codes of: O-Public administration and safety; R89-Heritage activities; R90-Creative and performing arts activities; S95-Personal and other services; S96-Private household employing staff and undifferentiated goods and service producing activities of households for own use.

Infrastructure (IDI). This allows us to observe individual worker characteristics alongside the FoW practices recorded in the BOS.

Firm-level characteristics such as profit, firm size in rolling mean employment, age, foreign ownership rate and industry classification are drawn from the LBD's Longitudinal Business Frame (LBF). Individual worker characteristics such as age, gender and ethnicity are drawn from the personal details table of the IDI. We also use Department of International Affairs (DIA) birth records, so we are able to determine whether an individual was born in New Zealand.[13] We calculate individuals' gross salary/wage earnings and determine multiple job status using data from Inland Revenue Department's (IRD) Employer Monthly Schedule (EMS) tax records (detailed below).

Note that because BOS is our main data source, we are restricted to using linked administrative data that is available on a population-wide level. That is, we cannot link it to other survey information as there would be little overlap between the survey samples. As such, we cannot include some relevant explanatory variables, such as occupation and highest qualification, are these are not available from administrative data on a population basis. This is discussed in more detail in the 'Data limitations' subsection below.

## Building the sample for analysis

We have two populations of interest: one covering firms and one covering individual workers in those firms. Our firm population of interest covers firms in the BOS survey, as described above.

Our individual worker population of interest is workers employed by a BOS respondent firm. As described above, workers are linked to firms via LEED information. However, a complication is that workers may have worked for more than one firm during 2018, making it difficult to assign that worker to a single firm. Therefore, we associated an individual with the firm based on monthly tax data on wage/salary payments. Specifically, we associate an individual with the firm that the individual received wages/salary from for the most months during 2018. If an individual received wage/salary payments from two or more firms for exactly the same number of months during 2018, then the firm associated with the highest total wage/salary payments in 2018 is selected.

As an aside, during this stage a multiple-jobs indicator variable for whether a worker received wages/salary from more than one firm for two or more consecutive months is created.[14] Once the employer and 'multiple job' workers are identified, these monthly PAYE amounts are aggregated into annual income for the 2018 calendar year. Workers whose main employer is a BOS respondent firm are retained, thus forming the sample for analysis: all workers whose main firm of employment in 2018 participated in the BOS 2018.

[13] Ideally, we would like to determine foreign citizenship, and number of years spent in New Zealand to inform the relationship between migrancy and FoW trends. However, although Customs border movement information is available in the IDI, it is difficult to determine this information on a population-wide basis. Therefore, our information on migration status is restricted to whether or not the individual was born in New Zealand.

[14] The reason behind limiting this to two or more consecutive months is to prevent individuals who change jobs during a month (and therefore have wages/salary from two employers in a single month) from being classified as holding multiple jobs.

# FoW outcomes of interest

Given the numerous FoW practices that are present in the BOS 2018 and the similarities present among many of them, instead of modelling each of these practices individually, we examine a selection of variables. The selection of these practices is based on several considerations: their relevance to the FoW literature; groupings of practices suggested by principal components analysis[15]; prevalence rates of the practices; and common themes among practices (such as employee engagement, leave, automation, etc.). In some cases, individual FoW practices were retained as the sole element of an outcome of interest. These practices were: routine physical task automation, non-routine physical task automation, performance reviews, feedback programmes, parental leave, non-standard work and collective agreements. In other cases, indicators are created by the exclusion of highly prevalent practices from themed groups (e.g. employee engagement in health and safety, which are required by law) or selection of a smaller number of practices prominent in the literature (e.g. flexible work options, of which working from home and flexible start/finish times are taken as the two key practices for this indicator). In this way, we narrow the list of FoW practices down to the 12 variables: 10 binary outcome variables, and two categorical outcome variables, detailed in Table A.1.

Table A.1: FoW outcome variables

| Variable and description | % firms with FoW outcome | # firms with FoW outcome (weighted) | % workers employed by such firms | # workers employed by such firms (weighted) |
|---|---|---|---|---|
| **Performance reviews**: Has performance reviews on a formal basis for non-managerial employees. | 71.8% | 29,600 | 84.4% | 1,316,500 |
| **Employee feedback programmes**: Has employee feedback programmes (e.g. satisfaction surveys) on a formal basis for non-managerial employees. | 40.8% | 16,800 | 65.1% | 1,010,700 |
| **Fair work policies**: Has policies/practices in place to address: An ageing workforce; pay gaps (between gender and/or ethnic groups); a diverse and inclusive workplace. | 37.4% | 15,400 | 60.6% | 947,000 |
| **Flexible leave arrangements**: Allows the buying of extra annual leave or taking leave without pay and/or using personal sick leave, unpaid leave or compassionate care leave to care for other people who are sick on a formal basis for non-managerial employees. | 72.1% | 29,700 | 82.6% | 1,289,900 |
| **Additional parental leave**: Offers parental leave provisions in addition to statutory provisions on a formal basis for non-managerial employees. | 19.7% | 8,100 | 23.4% | 365,500 |

[15] Groups of practices are identified via principal components analysis (PCA). This shows which practices tend to be implemented together and provides the basis of which practices we can combine with others. A similar process is used by Fabling and Grimes (2009) to determine suites of complementary personnel practices. Generally, these groupings conformed to the themes present in the BOS 2018. The components themselves do not lend themselves easily to simple interpretation, therefore PCA is only used to support the appropriate grouping and selection of FoW practices.

| | | | | |
|---|---|---|---|---|
| **Flexible work options**: Offers working-from-home options and/or flexible start/finish times on a formal basis for non-managerial employees. | 59.2% | 24,400 | 68.8% | 1,073,300 |
| **Non-physical task automation**: Fully or partly automated any of the following non-physical tasks/business processes: Managing people; Planning and decision making; Interacting with customers, suppliers and/or others; Collecting data; Processing data. | 68.9% | 24,100 | 84.8% | 1,221,700 |
| **Routine physical task automation**: Fully or partly automated task/business process: Routine physical tasks. | 24.0% | 7,900 | 38.5% | 508,500 |
| **Non-routine physical task automation:** Fully or partly automated task/business process: Physical tasks where the task may not be routine and predictable. | 14.3% | 4,500 | 20.0% | 252,000 |
| **Online platforms**: Sold products and/or services directly to customers through online platforms and/or used an online business platform to aggregate information about goods and/or services for customers in the last two financial years. | 27.9% | 11,500 | 41.2% | 643,700 |
| **Collective agreements:** The share of workers covered by a collective agreement. Variable defined by categories: Zero; 1-10%; 11-50%; 51-91%; and 91-100%. | (Zero) 75.6% | 29,400 | 59.7% | 869,800 |
| | (1-10%) 1.7% | 660 | 9.9% | 144,100 |
| | (11-50%) 2.4% | 950 | 11.3% | 163,900 |
| | (51-91%) 2.5% | 960 | 9.7% | 141,600 |
| | (91-100%) 17.7% | 6,900 | 9.4% | 137,200 |
| **Non-standard work:** The share of workers under a fixed term or casual contract, or on contract for services. Variable defined by categories: Zero; 1-10%; 11-50%; 51-91%; and 91-100%. | (Zero) 21.6% | 8,900 | 12.5% | 195,300 |
| | (1-10%) 23.5% | 9,700 | 39.1% | 610,700 |
| | (11-50%) 39.6% | 16,300 | 36.1% | 564,200 |
| | (51-91%) 10.7% | 4,400 | 7.8% | 122,100 |
| | (91-100%) 5.1% | 2,100 | 4.4% | 69,200 |

Note: Percentages are calculated from weighted observations.

# Individual-level explanatory variables

As we are interested in both individual and firm-level relationships between FoW practices and characteristics, two models for each outcome are specified: one using individual-level observations and one using firm-level observations. One set of explanatory variables for individual-level models is used, and another set for the firm-level models.

The first set of explanatory variables is designed to investigate factors that are associated with differences in workers' likelihood to be employed by firms that implement FoW practices. These are drawn from administrative data within the IDI. Namely, the personal details, DIA (births) and IRD EMS tables. Several of these are coded as categorical variables, such as age and earnings to allow for the possibility of non-linear relationships. As will be detailed in 'Data limitations' below, we are unable to include some relevant explanatory variables such as occupation and highest qualification. The individual-level explanatory variables are detailed in Table A.2.

## Table A.2: Individual-level explanatory variables

| Explanatory variable and description | Category | Sample mean (%) | Observations (weighted) |
|---|---|---|---|
| **Female:** Binary variable = to 1 if Female; 0 otherwise. Data source: IDI/personal_details. | - | 45.2% | 706,300 |
| **Age:** Age (in years) at the end of the sample period for the BOS 2018 (June 2018). Data source: IDI/personal_details. | 15-24 | 21.0% | 327,600 |
| | 25-34 | 25.0% | 390,700 |
| | 35-44 | 18.3% | 285,800 |
| | 45-54 | 17.8% | 278,100 |
| | 55-64 | 13.3% | 207,500 |
| | 65+ | 4.6% | 72,100 |
| **Ethnicity**: Ethnicity is prioritised if more than one ethnicity is assigned to the individual. Order of prioritisation is Māori>Pacific>Asian>MELAA> Other>European (base). Data source: IDI/personal_details. | Māori | 15.8% | 246,100 |
| | Pacific | 8.1% | 125,800 |
| | Asian | 16.9% | 263,800 |
| | MELAA | 1.8% | 27,700 |
| | Other | 1.9% | 29,000 |
| | European | 55.7% | 869,200 |
| **NZ Birth**: Binary variable = 1 if NZ birth records are present in the IDI/DIA; 0 otherwise. Data source: IDI/DIA. | - | 62.9% | 983,000 |
| **Industry**: ANZSIC06 industry code of the firm associated with the individual. Data source: LBF. | Agriculture, forestry & fishing | 5.3% | 82,400 |
| | Mining | 0.3% | 5,000 |
| | Manufacturing | 15.1% | 235,900 |
| | Electricity, gas, water & waste services | 0.8% | 12,600 |
| | Construction | 8.1% | 127,200 |
| | Wholesale trade | 6.5% | 101,400 |
| | Retail trade | 13.0% | 202,900 |
| | Accommodation & food services | 9.7% | 152,200 |
| | Transport, postal & warehousing | 7.0% | 108,600 |
| | Information media & telecommunications | 1.9% | 29,800 |
| | Financial & insurance services | 4.0% | 62,000 |
| | Rental, hiring & real estate services | 1.6% | 24,800 |
| | Professional, scientific & technical services | 8.1% | 127,200 |
| | Administrative & support services | 7.9% | 123,100 |
| | Education & training | 1.9% | 29,500 |
| | Healthcare & social assistance | 6.4% | 100,300 |
| | Arts & recreation | 1.3% | 19,900 |
| | Other services | 1.1% | 17,200 |
| **Multiple jobs**: Binary variable = 1 if income from wages and salary is recorded from more than one employer for two or more consecutive months during 2018; 0 otherwise. Data source: IDI/IRD_EMS. | - | 7.0% | 109,500 |
| **Earnings**: Gross earnings for the 2018 calendar year calculated as the sum of monthly gross income from wages and salary from January to December 2018. Data source: IDI/IRD_EMS. | <=NZ$20,000 | 25.7% | 401,100 |
| | NZ$20,001-40,000 | 19.7% | 307,500 |
| | NZ$40,001-60,000 | 23.5% | 366,500 |
| | > NZ$60,000 | 31.2% | 486,600 |

Note: Sample means are calculated from weighted observations and indicate the percentage of individuals within the given category.

# Firm-level explanatory variables

Firm-level explanatory variables that may influence the likelihood of a firm having particular FoW practices in place are drawn from BOS and LBF administrative data. The firm-level explanatory variables are detailed in Table A.3.

### Table A.3: Firm-level explanatory variables

| Explanatory variable, description and data source | Category | Sample mean (%) | Observations (weighted) |
|---|---|---|---|
| **Profit**: Firm profit in 2018. Data source: LBF. | Negative | 12.6% | 5,200 |
| | Zero (or missing) | 31.6% | 13,000 |
| | NZ$1-5,000 | 53.6% | 22,100 |
| | NZ$5,001-10,000 | 1.1% | 440 |
| | > NZ$10,000 | 1.1% | 470 |
| **Size**: Firm rolling mean employment in 2018. Data source: LBF. | <20 (small) | 71.6% | 29,500 |
| | 20-99 (medium) | 24.0% | 9,900 |
| | 100+ (large) | 4.6% | 1,900 |
| **Firm age**: Firm age (in years from birth to March 2018). Data source: LBF. | <10 | 37.9% | 15,600 |
| | 10-19 | 35.4% | 14,600 |
| | 20-29 | 14.6% | 6,000 |
| | 30-39 | 7.8% | 3,200 |
| | 40-49 | 2.4% | 970 |
| | 50+ | 2.4% | 980 |
| **Foreign ownership rate**: Foreign ownership rate in 2018. Data source: LBF. | Zero | 92.0% | 37,900 |
| | >0-10% | 0.8% | 350 |
| | 11-50% | 1.4% | 590 |
| | 51-90% | 1.5% | 600 |
| | >90% | 4.1% | 1,700 |
| **Industry**: ANZSIC06 industry code of the firm. Data source: LBF. | Agriculture, forestry & fishing | 8.7% | 3,600 |
| | Mining | 0.2% | 95 |
| | Manufacturing | 12.1% | 5,000 |
| | Electricity, gas, water & waste services | 0.4% | 160 |
| | Construction | 12.9% | 5,300 |
| | Wholesale trade | 7.5% | 3,100 |
| | Retail trade | 10.7% | 4,400 |
| | Accommodation & food services | 14.1% | 5,800 |
| | Transport, postal & warehousing | 3.6% | 1,500 |
| | Information media & telecommunications | 0.9% | 360 |
| | Financial & insurance services | 1.3% | 520 |
| | Rental, hiring & real estate services | 2.2% | 920 |

| | | | |
|---|---|---|---|
| | Professional, scientific & technical services | 10.0% | 4,100 |
| | Administrative & support services | 3.9% | 1,600 |
| | Education & training | 2.2% | 890 |
| | Healthcare & social assistance | 5.3% | 2,200 |
| | Arts & recreation | 1.1% | 450 |
| | Other services | 2.9% | 1,200 |
| **Merger / Acquisition**: Binary variable = 1 if the BOS respondent firm merged with or acquired a shareholding in any other New Zealand or overseas business; 0 otherwise. Data source: BOS. | - | 2.3% | 950 |
| **Competition**: Level of competition present in the market that the business operates in. Data source: BOS. | Captive market | 4.4% | 1,800 |
| | < 3 competitors | 16.5% | 6,800 |
| | Many competitors, several dominant | 56.1% | 23,100 |
| | Many competitors, none dominant | 16.7% | 6,900 |
| | Unknown | 6.6% | 2,700 |
| **Market share change**: Change in firm market share over the previous financial year (as at 30/06/2018). Data source: BOS. | Increased | 22.8% | 9,400 |
| | Decreased | 10.4% | 4,300 |
| | Stayed the same | 36.7% | 15,100 |
| | Unknown | 30.1% | 12,400 |
| **Recruitment difficulties**: The highest level of difficulty faced in recruiting any of the following: Managers and professionals; technicians and associate professionals; tradespersons and related workers (including apprentices); all other occupations. Data source: BOS. | Severe difficulty | 34.7% | 14,300 |
| | Moderate difficulty | 37.1% | 15,300 |
| | No difficulty | 16.0% | 6,600 |
| | N/A or Unknown[16] | 12.1% | 5,000 |

Note: Sample means are calculated from weighted observations and indicate the percentage of firms within the given category.

# Data limitations

While linking the BOS to administrative data provides a wealth of information on FoW practices, this approach has limitations. First, we examine only individual-level information that is available on a population-wide basis from administrative data sources. This means that some very relevant information cannot be included, such as occupation, hours worked or paid, highest qualification and number of years in NZ for migrants. We do not draw individual-level information from survey data because the key firm-level future-of-work variables are drawn from survey data (specifically, the BOS 2018) and it is not possible to undertake robust analysis using multiple survey sources. This is because there would be very little overlap between the survey samples and the resulting sample would also likely be unrepresentative of the underlying population. Given that we can only use one survey and this project is primarily concerned with future-of-work trends, we have therefore chosen to use the

[16] While N/A or Unknown responses are both assigned to the same category for recruitment difficulties, most of these responses are 'N/A' responses.

BOS 2018 survey and restrict attention in the IDI to population-wide administrative information on individuals in terms of explanatory variables.

It is worth noting that the Census includes some of the mentioned information that is not available through administrative sources. However, even though the Census' covers the whole population of those present in NZ on census night, we do not use the Census here. The Census 2013 is now outdated and does not include important groups, such as migrants who arrived in NZ after March 2013. The Census 2018 is also problematic as it has a non-response rate that is relatively high and non-random. This means that certain groups are underrepresented in Census 2018, such as Māori and individuals who live in higher deprivation areas. Furthermore, several variables of interest, such as occupation, have been deemed of poor quality in Census 2018 by the external data quality panel (see Stats NZ, 2019b).

The Household Labour Force Survey (HLFS) includes useful information, such as occupation, hours worked and highest qualification. In addition, every four years, HLFS includes a Survey of Working Life (SoWL) supplement which contains individual-level variables that are very relevant to the FoW. These include the type of employment contract the individual is on, whether the individual has access to future-of-work practices such as flexible hours of work, the individual's perceived level of job security, and so forth. This would alleviate another issue with the BOS analysis that we only know if individuals work in a firm that offers a particular FoW practice, and not whether a particular worker is exposed to the FoW practice in question. For example, a transport and logistics company may have a work-from-home policy that is available to office workers only, but not to people in roles such as drivers. In contrast, SoWL is a measure of whether the individual has access to these options. Unfortunately, we cannot use HLFS in conjunction with BOS as there would be little overlap between these two survey samples (as discussed above). However, future work could complement our BOS analysis with analysis of the SoWL (discussed further in Subsection 6.8).

Related to the issue that we cannot observe if a particular worker has access to FoW practices within a firm, for several of the FoW practices the BOS asks whether firms offer these on a formal basis to non-managerial staff. Moreover, the responses are generally given in a yes/no format. We therefore do not have information on how these are implemented. For example, two firms may both have work-from-home policies, but one may have a workplace culture where this option is used freely and widely, while another firm may only allow its use in very specific circumstances.

In terms of sample coverage, as noted, the BOS only includes firms with six or more employees and we therefore cannot investigate FoW practices among smaller firms. Our analysis of workers is also restricted to those who are paid a wage/salary. This means that it will not include self-employed workers in general, unless they pay themselves a wage/salary.

Finally, the BOS 'Changing nature of work module' is an ad-hoc module that was only asked in the 2018 survey. Therefore, we are restricted to cross-sectional analysis and are unable to investigate trends over time. This also means we are unable to use time-series information to control for unobserved heterogeneity. Our results are, therefore, associations only, and we make no attempt to establish causal interferences.

## Methodology: Research question 2

We use cross-sectional multivariate logistic regression models to examine how worker and firm characteristics are associated with FoW practices. For the 10 binary outcome variables, we use

standard binary logistic models, and as discussed, run separate models for firms and individuals. For the two multi-category variables, we use ordered logistic models, also run separately for firms and individuals.

Equations of the following type are estimated for individuals using logistic regressions:

$$P(Y_i) = \alpha_0 + \beta_1 I_i + \varepsilon_i$$

where $Y_{if}$ is whether individual *i* was working in a firm that had the given FoW practice being examined. The set of explanatory variables uses the aforementioned vector of individual characteristics ($I_i$ ) (see Table A.2).

Similar equations are estimated using logistic regressions for the firm-level analysis, but in the place of individual-level explanatory variables, firm-level explanatory variables (see Table A.3) are used:

We report results as odds ratios. This is the odds of success (i.e. the FoW outcome, $Y$, being equal to 1) in the presence of an explanatory variable ($X_i = 1$) over the odds of success in the absence of the explanatory variable ($X_i = 0$):

$$\frac{\Pr(Y = 1|X_i = 1)\ /\Pr(Y = 0|X_i = 1)}{\Pr(Y = 1|X_i = 0)\ /\Pr(Y = 0|X_i = 0)}$$

If the odds ratio is greater than (less than) than 1, the explanatory variable is interpreted to be associated with an increase (decrease) in the likelihood of the indicator being present. For example, in our individual-level 'Flexible work options' model, the coefficient for *female* is 1.295. This means the odds of females working for a firm with flexible work options are about 1.3 times the odds of males working for firms with flexible work options.

While logistic models are suitable for modelling the binary outcomes that make up the majority of our FoW outcomes of interest, they are unsuitable for use with categorical outcome variables such as non-standard work or collective agreements. Instead, we use ordered logistic models. Rather than estimating the odds of an outcome being equal to 1 over 0, this model estimates the likelihood of an outcome taking a higher value (i.e. falling into a higher category) over taking a lower value (for instance, any as opposed to none; 11-50%, 51-90% or >90% as opposed to zero or >0-10% etc.).

The interpretation of the odds ratio is similar. For an example, looking at the individual-level ordered logit for collective agreements, the coefficient for *female* is 1.12 this means that the odds for females working in firms with higher rates of collective agreement coverage among their employees (as opposed to lower rates of coverage) is 1.12 times the odds for males.

As an aside, compared with the individual-level models of FoW outcome variables, there are generally less significant differences in the explanatory variables and the magnitude of the differences tends to be smaller in the firm-level models. This is likely due to a combination of a smaller number of observations than the individual-level models and the larger range of our firm-level explanatory variables used.

Our data are cross-sectional. We therefore make no attempt at causal inferences, and instead examine associations between the FoW outcomes variables and the set of explanatory variables on worker and firm characteristics.

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