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## The impact of harmonising Australia's workplace health and safety laws on workers compensation

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**Working Paper: The impact of harmonising Australia's workplace health and safety laws on workers compensation**

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**Conflicts of interest:** We have no potential conflicts of interest to declare.

# The impact of harmonising Australia's workplace health and safety laws on workers compensation<sup>1</sup>

Anam Bilgrami, Henry Cutler and Kompal Sinha

## Abstract

We analyse the impact of harmonising workplace health and safety laws in Australia on workplace injury and disease by estimating effects on the probability of receiving workers compensation in the past year. The introduction of the reform in all but two Australian states created a unique, region-based natural experiment. We exploit this regional variation to perform difference-in-difference estimation on a panel data sample of workers from the Household, Income and Labour Dynamics in Australia survey, accounting for a diverse range of individual-level covariates associated with workers compensation claiming. We find harmonisation reduced the probability of receiving workers compensation in treated states by 0.9 percentage points ( $p=0.047$ ). This is likely to have resulted from increased enforcement activity by state governments and increased managerial focus on improving workplace health and safety. Subgroup analysis suggests the high-risk construction industry had a larger and more significant reduction of 2.9-3.6 percentage points ( $p=0.030$ ). We suggest the construction industry had a greater potential for achieving reductions in workplace injury and disease due to a higher level of underlying workplace risk and the introduction of construction specific legislative requirements imposed by harmonisation.

**Keywords:** workplace health and safety, Australia, workers compensation, causal analysis, workplace injury

**JEL Classifications:** D04, I18, J28; J38; L52

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<sup>1</sup> **Acknowledgements:** We are grateful to Professor Elisabetta Magnani, Dr Daehoon Nahm and participants at the Macquarie Business School Higher Degree Research Expo 2020 for their useful comments and suggestions on this research paper. This paper uses unit record data from the Household, Income and Labour Dynamics in Australia (HILDA) survey. The HILDA project was initiated and is funded by the Australian Government Department of Social Services and is managed by the Melbourne Institute of Applied Economic and Social Research (Melbourne Institute). The findings and views reported in this paper, however, are those of the authors and should not be attributed to either the Department of Social Services or the Melbourne Institute. This research is supported by an Australian Government Research Training Program (RTP) Scholarship received by Anam Bilgrami during her PhD study.

## 1.1 Introduction

Globally, 2.3 million deaths are linked to workplace injury and disease each year. According to the International Labour Organization, the economic costs of workplace injury and illness vary from 1.8% to 6% of gross domestic product (GDP) across countries (Takala et al., 2014).

In Australia, the economic cost of workplace injury and illness equates to 4.1% of GDP, which includes direct health care costs, workers compensation payouts and employer-paid premiums, and indirect costs from productivity losses, social welfare payments and informal care (Safe Work Australia, 2015). Individuals also incur a substantial burden from reduced quality of life and premature death. Approximately half a million (563,600) Australian workers in 2018 experienced a workplace injury or illness (ABS, 2018) and 107,335 of these injuries progressed to serious workers compensation claims, resulting in a time loss of one or more weeks off work (Safe Work Australia, 2020).

Transaction costs and information asymmetries exist in the workplace health and safety (WHS) context. Employees are not fully informed about job risk and compensating wage differentials may be inadequate. Employers do not bear all the negative externalities of worker ill health, and workers' efforts in injury prevention and illness or injury severity may not be transparent to employers (Kankaanpaa et al., 2008). Regulations, penalties and incentives exist to reduce the likelihood of workplace injury or illness by impacting the choices made by different groups (Chelius, 1976). This includes decisions by firms on equipment choice, implementation of training and risk management processes, and decisions by workers on preventative efforts and compliance with processes. Regulations may also have indirect effects through increased consumer prices or decreased wages, from increased compliance costs imposed on employers (Bailey et al., 2019).

Australia follows the Robens model for WHS regulation (Commonwealth of Australia, 2008), which operates on a single WHS Act outlining broad general duties for all parties, detailed Regulations and Codes of Practice to support the Act, an inspecting institution with power to impose administrative sanctions and bring prosecutions, and a framework of self-regulation and consultation (Boland, 2018). In July 2008, all Australian states and territories formally expressed their support for unifying WHS laws under a single model framework and approach, a process known as 'harmonisation', through their signing of the *Intergovernmental Agreement for Regulatory and Operational Reform in Occupational Health and Safety* (COAG, 2008).

The harmonised WHS laws were implemented across Australia in two waves. On 1 January 2012, the ‘first wave’ of the law was implemented in the Commonwealth, New South Wales (NSW), Australian Capital Territory (ACT), Northern Territory (NT) and Queensland. These jurisdictions were followed by South Australia (SA) and Tasmania on 1 January 2013 (‘second wave’ of harmonisation). Victoria and Western Australia (WA) did not implement the harmonised laws at this time.

The stated objectives of harmonisation were to enable uniform, equitable and effective safety standards for all workers in Australia, reduce compliance and regulatory burdens for multi-jurisdictional businesses, create efficiencies for government, and achieve significant and continual reductions in the incidence of death, injury and disease in the workplace (COAG, 2008).

Prior to the harmonisation process, there were variations between states and territories with regards to duties of care, consultation, risk control mechanisms, records keeping and reporting, compliance regimes, and penalties (Boland, 2018). There were also differences in regulatory requirements across states and territories, with large regulatory burdens faced by multi-jurisdictional businesses (Safe Work Australia, 2014).

In this paper, we explore the extent to which harmonisation reduced workplace injury and disease by analysing impacts on the probability of an individual receiving workers compensation in the past year. Our ultimate objective is to analyse the extent to which the laws impacted worker health status. The adoption of harmonisation in only six states and territories presents a unique natural experiment in Australia, through the creation of region-based treatment and control groups. Regional variations in policy implementation of this type are relatively rare in Australia (Cobb-Clark, 2013). We exploit this variation to estimate the impact of harmonisation using difference-in-difference (DID) estimation on individual-level panel data in the Household, Income, and Labour Dynamics in Australia (HILDA) survey.

While harmonisation was a high-level reform introduced to promote uniformity of WHS law across Australia, it included some distinct changes to specific regulations and definitions. This included expanded definitions of duty of care and the employer–employee relationship, removal of reverse ‘onus of proof’ in NSW and Queensland, the introduction of criminal penalties and increased financial penalties for WHS breaches, non-insurability of penalties, increased duties

for consultation, allowance for union rights of entry to a workplace, and the ability of the regulator to accept enforceable undertakings (Boland, 2018; Productivity Commission, 2012).

A post-implementation review of the content and operation of the harmonised laws found they were operating mostly as intended (Boland, 2018). National data also show an increase in enforcement activities after harmonisation, including enforceable undertakings and proactive and reactive workplace visits (Boland, 2018; Safe Work Australia, 2017; 2018). However, to the best of our knowledge, a comprehensive post-implementation evaluation of whether harmonisation has met its stated objectives has not been undertaken.

An ex-ante regulatory impact assessment commissioned by Safe Work Australia estimated prospective ongoing cost savings of \$25–33 per worker for multi-jurisdictional businesses and a 1.4% improvement in WHS health outcomes (Safe Work Australia, 2011). These estimates were based on a small, non-random sample of businesses ( $N=26$ ) prior to harmonisation and excluded small business response. While informative, ex-ante assessments are subject to uncertainty around the actual responses of businesses and workers to reforms due to changes in the external environment, including macroeconomic conditions and technological change (Productivity Commission, 2012).

Gunningham (2016) conducted a post-implementation survey of 37 senior managers of large businesses (those with more than 2,000 employees per state) and found reported improvements from harmonisation on engagement with WHS issues and in workplace health and safety outcomes. Two-fifths of respondents reported that increased obligations towards workers had prompted active engagement and resulted in procedural changes in contractor relationships, and most reported reduced regulatory burden on multi-jurisdictional businesses and reduced workplace injuries. Increased accountability and penalties were specific factors identified as driving greater commitment to WHS. This study was limited due to small sample size.

Potter et al. (2017) used national survey data to assess the impact of harmonisation on the Psychosocial Safety Climate (PSC-12), an indicator of employee-perceived psychological health and safety. Through pre-post linear regression on longitudinal data from the Australian Workplace Barometer Project (Safe Work Australia, 2012), Potter et al. (2017) found a worsened PSC in a jurisdiction which did not harmonise (WA), relative to harmonised states. This study was limited as it excluded Queensland and Victoria due to data unavailability and

used a narrow covariate set. The study also did not ascertain whether WA was an appropriate comparator to treated states based on pre-reform trends.

While minimising workplace injury and disease is a primary policy objective among Australian governments, it has received little research attention (Collie et al., 2016; Lane et al., 2019; Potter et al., 2017). Older studies from the United States (US) have analysed the impact of specific Occupational Safety and Health Administration (OSHA) standards and regulations on workplace injuries (Cooke and Gautschi, 1981; Curington et al., 1986; Gray and Scholz, 1991; Scholz and Gray, 1990; Viscusi, 1979; Weil, 1996), largely through the use of firm or industry-level data.

Viscusi (1979) estimated the impact of expected penalties on US firms' investment in safety and on injuries. Using industry-level data and time series estimation, Viscusi (1979) found no impact on either investment in safety or reduced injuries, attributing this to negligible financial penalties for offences. Curington et al. (1986) analysed the impact of OSHA on the frequency and severity of workplace injuries using time series estimation on administrative claims data. The study found no significant reduction in either the average frequency or severity of all injuries. The low impact of OSHA on the overall frequency of workplace injury in early studies (Curington et al., 1986; Viscusi, 1979) was attributed to older OSHA standards focusing on capital equipment rather than the complex interaction between labour and the workplace environment in contributing to accidents (Bartel and Thomas, 1985).

Other, more recent US studies have found a greater impact on workplace health and safety from OSHA enforcement measures (Gray and Scholz, 1991; Haviland et al., 2012; Scholz and Gray, 1990). Scholz and Gray (1990) analysed inspection data for manufacturing plants. They found a 10% increase in enforcement activities for large, frequently inspected firms with higher-than-average accident rates led to a 1% reduction in injuries. Receiving any penalty in an inspection led to a reduction in injuries and penalty size was less important than receiving a penalty. Gray and Scholz (1991) found that enforcement actions against mid-size firms were more effective in injury reduction than those against smaller or larger firms. Also, they noted penalty size was not important in reducing injuries. This may be due to changes in behaviour being driven by impacts on reputation rather than financial cost (Gray and Shadbegian, 2005).

Workplace health and safety is often pursued through workplace inspections. These inspections may be proactive (scheduled) or reactive (related to a particular issue or complaint) and may

consist of enforcement (including penalties) or consultation activities. Baggs et al. (2003) investigated the impacts of enforcement versus consultation activities on claims in Washington State. They found a significant decrease in claims associated with enforcement visits by inspectors but no impact from consultation-only visits. Haviland et al. (2012) analysed the impact of OSHA inspections with and without penalties on injuries in later years, using administrative data from Pennsylvania over 1998 to 2005 and longitudinal analysis. They found programmed inspections (proactive) to be more effective than complaint inspections (reactive) in reducing injuries. Furthermore, inspections with penalties reduced injuries by 19–24% on average per year in the two years following. These effects were not found for the smallest (<20 employees) or largest workplaces (>250 employees), nor for inspections without penalties. They noted that programmed inspections may have reduced more injuries because they were more comprehensive than complaint inspections, which focus on a particular issue.

Specific regulation types such as falls legislation applying to particular industries may lead to a greater impact on injury reduction. Lipscomb et al. (2003) found a significant reduction in workplace falls following the introduction of a vertical fall arrest standard in Washington State using linked data on union carpenters and claim data over ten years. This included policy effects before implementation, from anticipatory actions to the policy.

Research from Canada (Lanoie, 1992) and Spain (Arocena et al., 2008) affirms the importance of WHS enforcement and regulation design on injury reduction. Lanoie (1992) examined the impact of Canadian legislation with additional safety measures such as worker rights to refuse hazardous tasks and prevention programs inclusive of worker training and supervision, inspections, protective equipment, and disclosure requirements using industry-level data. Arocena et al. (2008) analysed innovative regulation measures such as quality management tools and worker empowerment using firm-level data. Both studies found a significant reduction in worker injuries from these regulations.

Some studies have analysed workers compensation claims rather than workplace injuries and focused on ‘incentive effects’ arising from changes in workers benefit scheme design (Boden and Ruser, 2003; Collie et al., 2016; Lane et al., 2019; Meyer et al., 1995). These studies explored whether larger workers compensation benefits increase worker moral hazard. Moral hazard may result from asymmetric information, with increased benefits leading to workers reducing their accident prevention efforts, making more legitimate and more fraudulent claims, or taking more time off work (Krueger, 1990; Lane et al., 2019).



Meyer et al. (1995) exploited a state-based natural experiment through DID to estimate the impact of a 50% increase in workers compensation benefits for high-earnings individuals in Kentucky and Michigan. They found an increase in workers compensation duration for individuals affected. Boden and Ruser (2003) also found the presence of incentive effects when analysing laws that introduced filing disincentives for workplace claims.

In Australia, states and territories set their own workers compensation benefits. Individual states and territories also have their own dispute resolution processes, including referrals or appeals to District or Supreme courts (Safe Work Australia, 2020). There is evidence of incentive effects in the Australian context, with average workers compensation duration differing across states and territories (Collie et al., 2016). Lane et al. (2019) analysed the effect of increased workers compensation benefits in Victoria on claiming behaviours using interrupted time series analysis and administrative claims data. They found a 12% increase in overall claiming volumes, with the effect varying by health condition.

Increases in enforcement activities from harmonisation, such as increases in workplace inspections, and the existence and non-insurability of penalties may have decreased workplace injuries, resulting in lower compensation claim probability (Scholz and Gray, 1990). A positive impact of proactive workplace visits, as opposed to reactive visits has been found (Haviland et al., 2012), and may have prompted reductions in injury and disease after harmonisation. Harmonisation impacts may differ across industries and firm sizes due to differing potential for injury reduction, and reputational impacts for larger versus smaller firms (Gray and Shadbegian, 2005). Any changes in benefit levels may be a confounding factor when estimating policy effects on worker compensation claims (Collie et al., 2016; Lane et al., 2019).

Our study is the first to analyse the impact of harmonisation on workers compensation in Australia and adds to the broader literature on the impacts of WHS regulation on workplace injuries and claims. Our objective was to examine the effects of harmonisation on workplace injuries and illness by looking at impacts on the probability of receiving workers compensation, rather than examining moral hazard or incentive effects.

A unique feature of this study is the use of detailed, individual-level, nationally collected panel data covering all industries in Australia. In contrast, most studies that estimate the impact of workplace regulation on injuries rely on firm or industry-level data, or administrative workers compensation claims data. Our dataset allows us to include more detailed variables on worker

characteristics such as demographics, educational attainment, occupational characteristics, and health status and behaviours. It also allows us to evaluate harmonisation across multiple industries.

The staged implementation of harmonisation in some states and the exclusion of others creates a unique natural experiment in the Australian context, which we exploit to estimate the impact of harmonisation. We estimate the change in the probability of receiving workers compensation in the last year in states that harmonised (treatment group), relative to those states that did not harmonise (control group) using difference-in-difference estimation via pooled ordinary least squares, and random effects models.

We estimate harmonisation reduced the probability of an individual receiving workers compensation in the past year in treated states by 0.9 percentage points ( $p=0.047$ ). Findings from past literature (Haviland et al., 2012; Scholz and Gray, 1990), post-implementation managerial survey (Gunningham, 2016), and trends in national safety data (Safe Work Australia, 2017; 2018) suggest that this may have been due to increased enforcement activity and increased managerial focus on improving workplace health and safety after harmonisation.

Subgroup analysis suggests a larger and more significant reduction of 2.9-3.6 percentage points in the construction industry ( $p=0.030$ ). While we could not test why a larger impact was found for the construction industry, we hypothesise this may have been generated from a higher underlying risk in this industry and implementation of industry-specific regulations. These results suggest that harmonisation did reduce the incidence of workplace injury and disease, which was one of its stated objectives.

The remainder of this paper is organised as follows. Section 1.2 describes the policy context including jurisdiction and industry-specific factors and presents national data on trends in workplace injuries and claims. Section 1.3 describes the data and variables used and includes a descriptive analysis of the dependent variable and covariates. Section 1.4 describes the estimation approach. Section 1.5 includes the policy effect estimates and sensitivity checks to test the robustness of the estimates. Section 1.6 concludes with a discussion of key findings.

## 1.2 Policy context

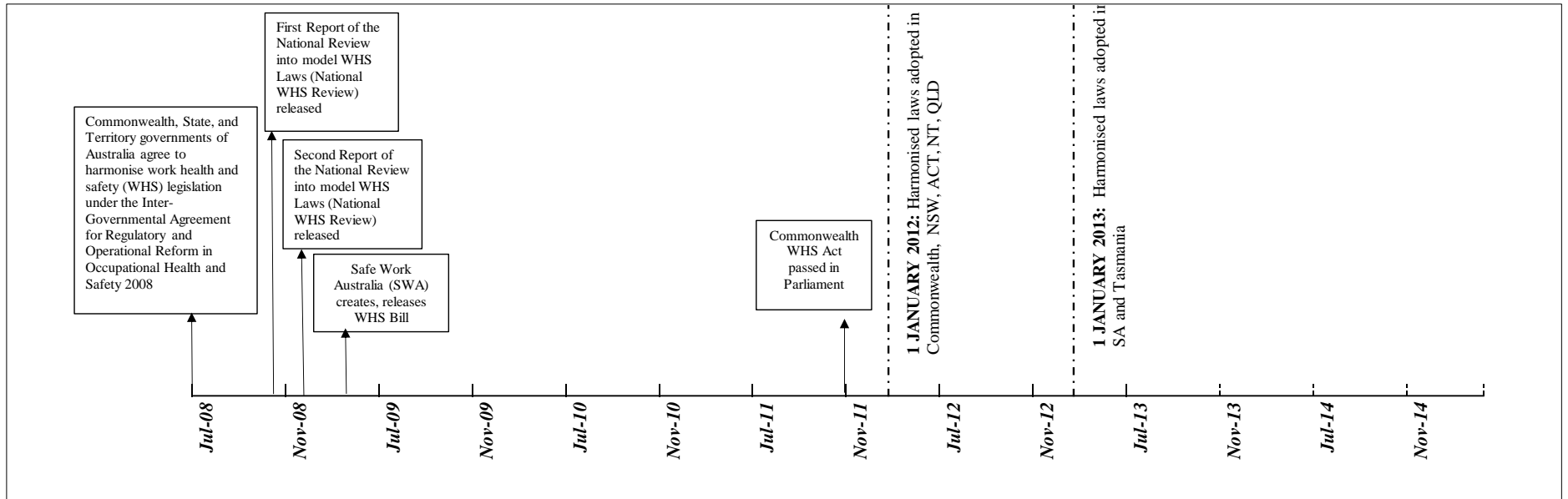
### 1.2.1 Harmonisation timeline

Harmonisation of WHS laws was initiated through the Council of Australian Governments' (COAG) National Reform Agenda to reduce regulatory burden and create a seamless national economy (Safe Work Australia, 2019). Prior to harmonisation, there were significant variations between states and territories on duties of care, consultation, risk control mechanisms, record keeping and reporting, compliance regimes and penalties (Boland, 2018). There were also differences in regulatory requirements across states and territories, with large regulatory burdens faced by multi-jurisdictional businesses (Safe Work Australia, 2014).

Harmonisation started with the establishment in July 2008 of the *Intergovernmental Agreement (IGA) for Regulatory and Operational Reform in Occupational Health and Safety*, between the Commonwealth and all Australian states and territories. Safe Work Australia was established in 2009 to drive national WHS policy development, and to monitor and maintain the harmonisation process (Safe Work Australia, 2011). States and territories committed to the adoption and implementation of a 'model' or harmonised WHS framework for legislation (COAG, 2008).

Safe Work Australia developed a single set of WHS laws (WHS Bill) in 2009, known as the 'model WHS laws'. These were legislated in November 2011 (**Figure 0.1**). The Commonwealth, states and territories were required to enact legislation that reflected the harmonised laws by the end of 2011 (Safe Work Australia, 2011). Implementation by individual states and territories was required for the harmonised laws to become legally binding (Safe Work Australia, 2019).

The model WHS laws were subsequently implemented by the Commonwealth, NSW, ACT, NT and Queensland on 1 January 2012, and by SA and Tasmania on 1 January 2013. WA recently committed to implementing the model WHS laws, with the passing of the WHS Bill through the WA Legislative Assembly in February 2020 (Parliament of Western Australia, 2020). This leaves Victoria as the only state, to date, that has not committed to implementing the harmonised laws, with the state government suggesting the model WHS laws would be a step backwards compared to their laws. As a result, the main WHS law in Victoria remains the Occupational Health and Safety Act 2004 (Work Safe Victoria, 2019).



**Figure 0.1: Timeline of WHS harmonisation process**

Source: Safe Work Australia (2011; 2019)

### **1.2.2 The objectives of harmonisation and major changes introduced**

The fundamental objective of harmonisation was to produce an optimal national approach to WHS regulation and operation to (COAG, 2008):

- enable the development of uniform, equitable and effective safety standards and protections for all Australian workers;
- address compliance and regulatory burdens for employers with operations in more than one jurisdiction;
- create efficiencies for governments in the provision of WHS regulatory and support services; and
- achieve significant and continual reductions in the incidence of death, injury and disease in the workplace.

The model WHS legislative framework comprises the model WHS Act, model WHS regulations and 24 model codes. It was to be applied to all organisations regardless of size or industry, and is outcomes-based, allowing organisations and states and territories to tailor their WHS approach to suit their circumstances (Boland, 2018).

The model WHS Act establishes duties requiring the elimination or minimisation of workplace risks, provides for worker consultation, representation and participation relating to WHS matters, enables compliance with and enforcement of the harmonised laws through the regulator and enables the creation of Regulations and Codes of Practice to support the WHS objectives (Boland, 2018). Regulations identify steps and processes applied to specific work activities and hazards to fulfill WHS duties, while codes provide practical information on how the WHS Regulations may be met (Boland, 2018).

A major change introduced by the harmonised WHS laws was a broadened definition of the traditional employer–employee relationship and of the ‘workplace’, to recognise the changing nature of work and employment arrangements (Gunningham, 2016). The model Act imposed duties on a person conducting a business or undertaking (PCBU) to ensure, as far as reasonably practicable, the health and safety of all workers engaged, influenced or directed by the PCBU to undertake work, and other persons put at risk from work (including volunteers).

Other significant changes include (Boland, 2018; Productivity Commission, 2012):

- removal of reverse ‘onus of proof’ in NSW and Queensland;

- introduction of criminal penalties for offences and an increase in financial penalties for WHS breaches, with the maximum penalty being almost double the highest penalty previously set;
- allowance for union rights of entry to a workplace to enquire into suspected contraventions; and
- ability of the regulator to accept written, legally binding, enforceable undertakings to take specified action to rectify breaches or improve performance.

Furthermore, penalties for WHS breaches were made non-insurable, with duty holders no longer able to obtain insurance for a penalty following a prosecution. This was designed to defer the transference of duty of care and ensure those who can influence WHS outcomes take a more proactive role (Boland, 2018).

**Appendix Table 0.11** summarises some of the specific changes to legislation introduced in harmonised states compared to the existing WHS law in the non-harmonised state, Victoria. This shows changes in broad definitions and duties for harmonised states, and specific changes applying to certain types of work such as high-risk construction. Particularly notable is the absence from Victorian legislation of the duty to consult and coordinate with other duty holders, and the right for workers to refuse to carry out or to cease work where there is reasonable concern around safety. The harmonised laws also contain a broader definition for ‘confined spaces’ than Victorian laws, and cover the risk of all falls, while Victorian law covers falls of 2 metres or higher. The harmonised regulations contain a specific obligation to manage the risks of excavation work, which is excluded in Victorian laws.

### **1.2.3 Factors affecting estimation of policy effect**

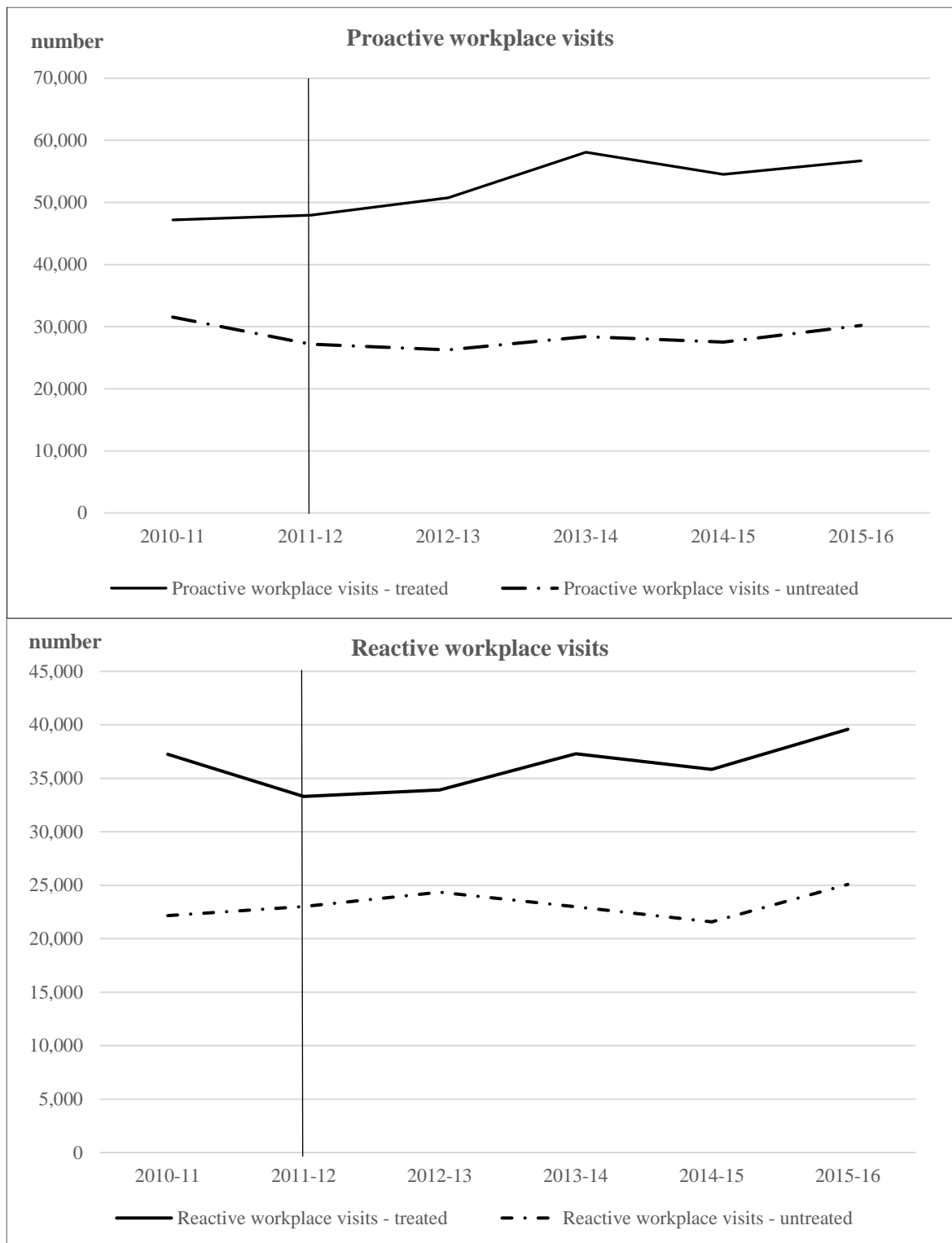
#### ***The implementation of harmonisation across states and territories, workplaces and industries***

While harmonisation introduced broadened legal definitions, and specified changes to certain duties, regulations and penalties, the ultimate impact on health and safety outcomes is dependent on its implementation across workplaces and industries in harmonised states and territories (Bluff and Gunningham, 2012). Since the model WHS laws are outcomes-based, they allow each jurisdiction some flexibility in implementation, particularly in aspects of administration and enforcement. The IGA allows states and territories to enact additional provisions that do not affect the operation of the harmonised laws (Bluff and Gunningham, 2012).

Another issue is the potential for differential implementation across organisations. Large businesses may better implement regulatory changes due to better understanding of compliance and reputation concerns, and businesses operating in ‘high-risk’ sectors are more receptive to implementing new regulations after they are introduced (Safe Work Australia, 2013; Gunningham, 2016). We conduct separate estimations for four high-risk industries to examine whether the impact of harmonisation on workers compensation claims differed for high-risk industries.

A 2018 post-implementation review concluded that the model WHS laws were largely operating as intended (Boland, 2018). National data on enforceable undertakings, proactive and reactive workplace visits and improvement notices issued indicate states and territories increased enforcement activity after harmonisation began. Since the allowance of enforceable undertakings under harmonisation, the volume of these has tripled in Australia from 10 in 2011-12 to 33 in 2016-17.

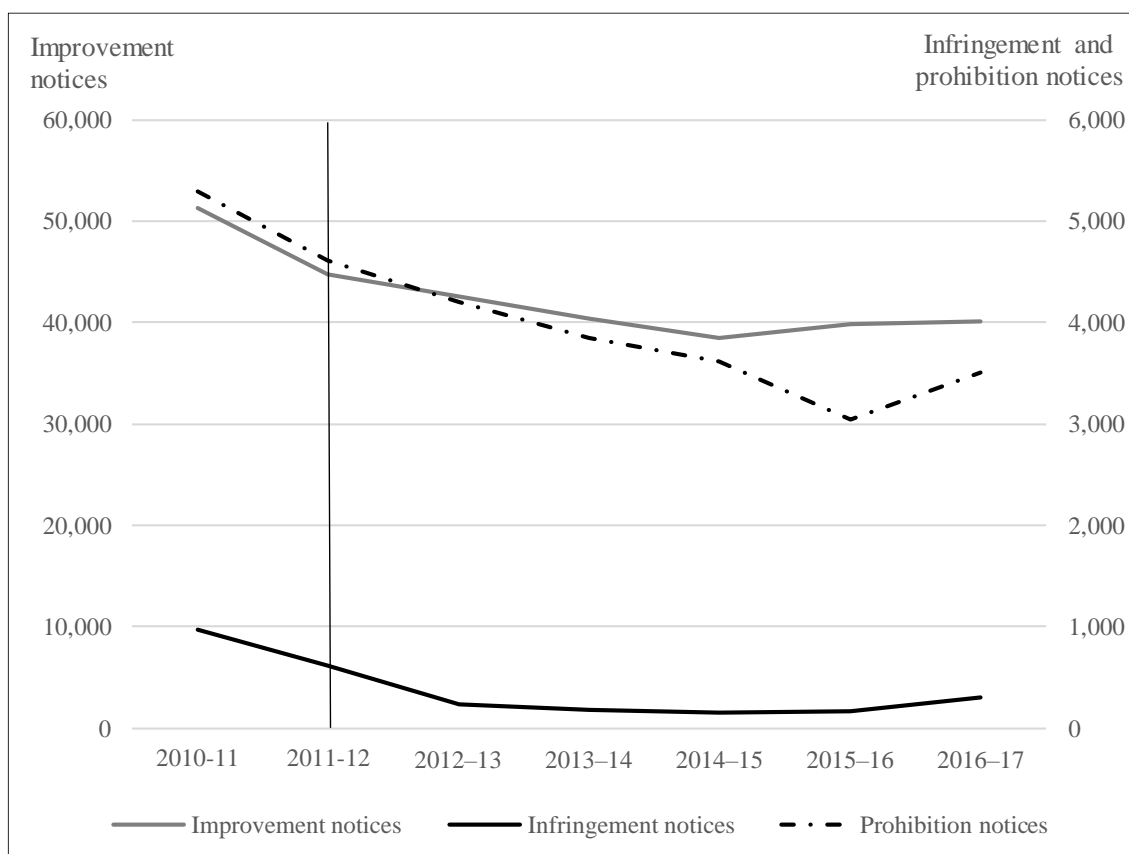
**Figure 0.2** shows a steeper increase in proactive workplace visits in harmonised states (treated states) compared to non-harmonised states (the untreated states, Victoria and WA). Similarly, reactive workplace visits (those related to an incident or complaint) have risen faster in treated states than non-treated states since harmonisation. At the same time, there was a general decline in the number of notices issued for WHS breaches (**Figure 0.3**). Differences in visits and notices issued suggest there may be differences in safety outcomes between treated and untreated states, as a result of harmonisation. The steeper increase in proactive visits in treated states in post-reform years suggests potentially improved monitoring and workplace practices, while the decline in notices over time may suggest improved workplace safety outcomes. The steeper increase in reactive workplace visits in treated states may be related to the increase in proactive visits, with this form of inspection resulting in increased detection of potential safety issues, and leading to follow-up, reactive visits.



**Figure 0.2: Proactive and reactive workplace visits – treated (NSW, ACT, NT, Queensland, Tasmania, SA) and untreated states (Victoria, WA)**

Source: Safe Work Australia (2017; 2018)





**Figure 0.3: Number of notices issued in Australia\***

Note: \* It is problematic to compare data on notices across states and territories, as notices are issued differently in each jurisdiction (e.g. in some instances, a single notice may be issued for multiple breaches, while in others, separate notices may be issued per breach).

Source: Safe Work Australia (2017; 2018) and Boland (2018)

### ***Changes in workers compensation benefits in NSW***

Moral hazard may drive workers compensation claim probability through incentive effects, with more generous workers compensation benefits leading to reduced worker effort in accident prevention, increased legitimate or fraudulent claims and increased time off work (Krueger, 1990; Lane et al., 2019). As a result, any concurrent changes in workers compensation schemes in states and territories may confound the ability to generate an unbiased estimate of the impact of harmonisation.

Each Australian state or territory provides (within limits) a period of near-full or full income replacement of pre-injury earnings for workers unable to earn due to a workplace injury (either 13 or 26 weeks, depending on state or territory). This is followed by payments that are gradually ‘stepped down’ by a percentage or to a set amount (Safe Work Australia, 2014). Benefit schemes

across states and territories remained relatively stable over the period 2011 to 2014 (our evaluation period), except in NSW.

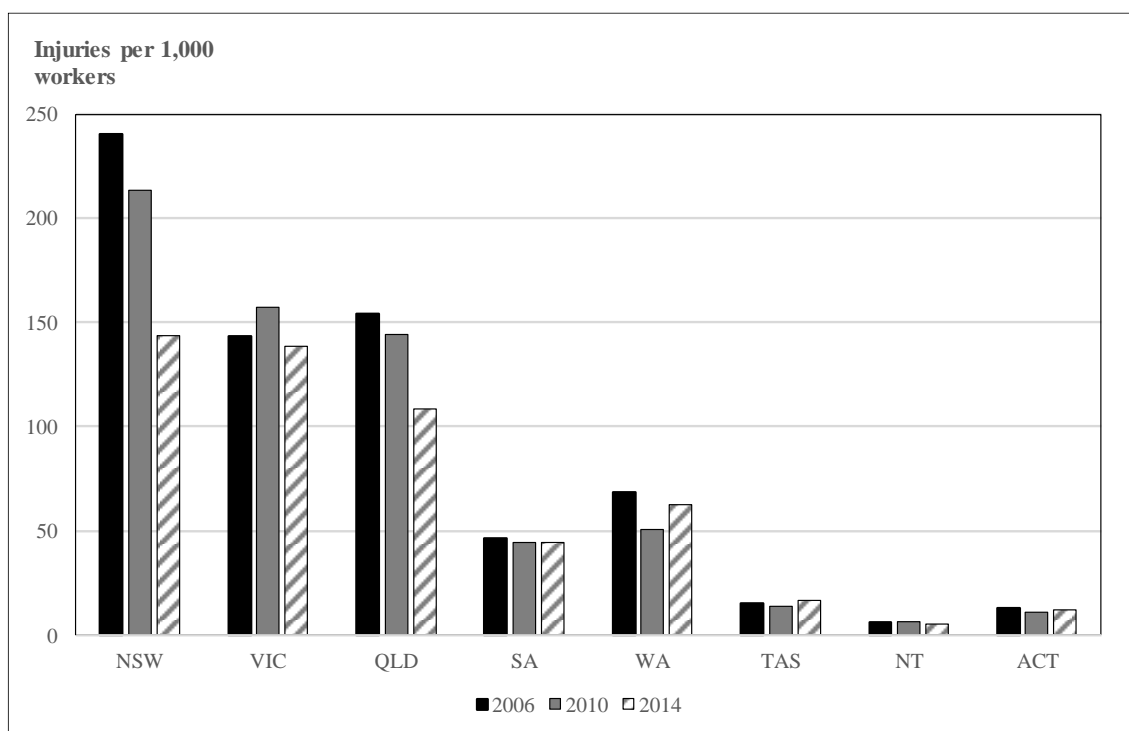
The NSW *Workers Compensation Legislation Amendment Act 2012* was introduced around the same time as harmonisation in NSW (Lane et al., 2016). This reduced the full income replacement term from 26 to 13 weeks and reduced the replacement percentage to 95% (Safe Work Australia, 2013; 2014). Step-down payments were also reduced and more strongly linked to worker capacity and the current hours of work, which limited access to compensation (Markey et al., 2013). The Act also terminated compensation for medical treatments earlier and required NSW workers to obtain pre-approval for medical treatments before receiving care (Markey et al., 2013).

These legislative changes were associated with reduced claim incidence in NSW between 2012 and 2013 (Lane et al., 2016) and may confound the estimated impact of harmonisation on workers compensation. The decreased generosity of income replacement payments and workers compensation benefits in NSW would reduce the incentive to seek workers compensation in this state, and therefore may bias upward our estimated policy effect from harmonisation. To test this potential bias we exclude NSW from the treatment group and re-estimate the impact of harmonisation in a sensitivity test (Section 1.5.3).

#### **1.2.4 Trends in national data: workplace injuries and fatalities before and after harmonisation**

The incidence of workplace injuries in Australia decreased from 63.6 to 42.6 per 1,000 workers between 2006 and 2014 (Lane et al., 2016). Around half the reduction translated to compensable workers compensation claims (from 31.0 per 1,000 workers in 2006 to 22.3 per 1,000 workers in 2014) (Lane et al., 2016).

NSW had the highest rate of workplace injuries of all states in 2006 and 2010, but also experienced a substantial reduction between 2010 and 2014 (**Figure 0.4**). NT, Queensland and Victoria also experienced decline in rates of workplace injuries between 2010 and 2014, while Tasmania and WA experienced increased injury rates.

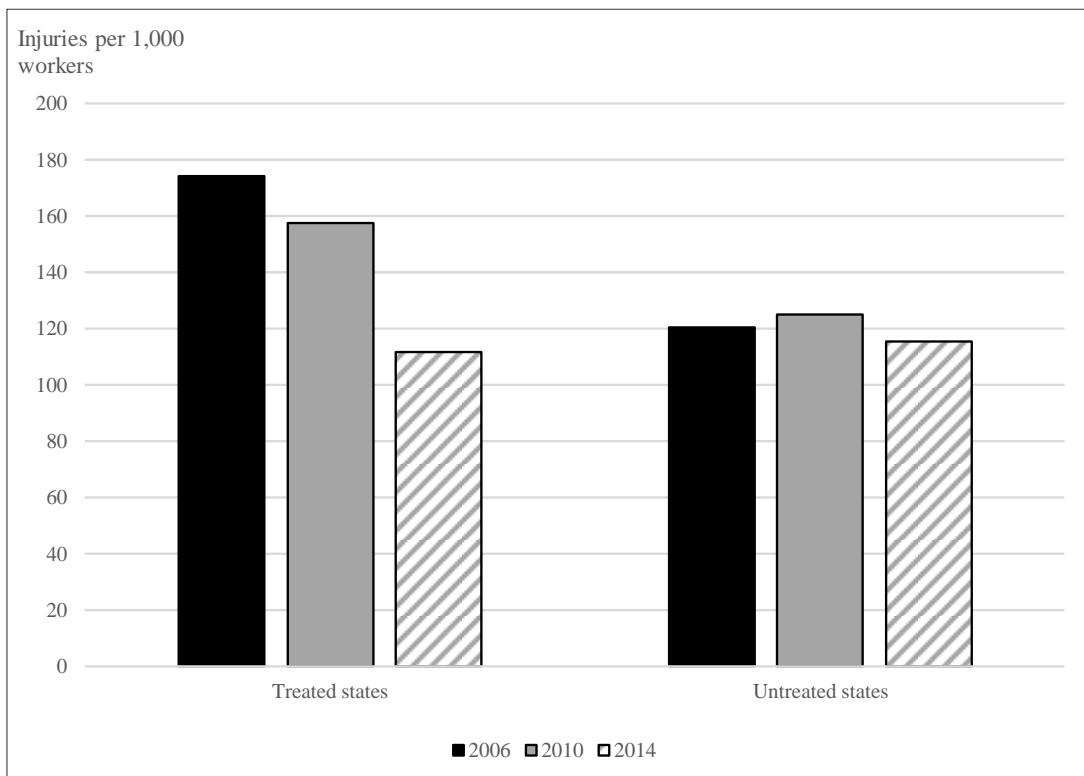


**Figure 0.4: Workplace injuries per 1,000 workers by state/territory**

Source: ABS (2006; 2010; 2014)

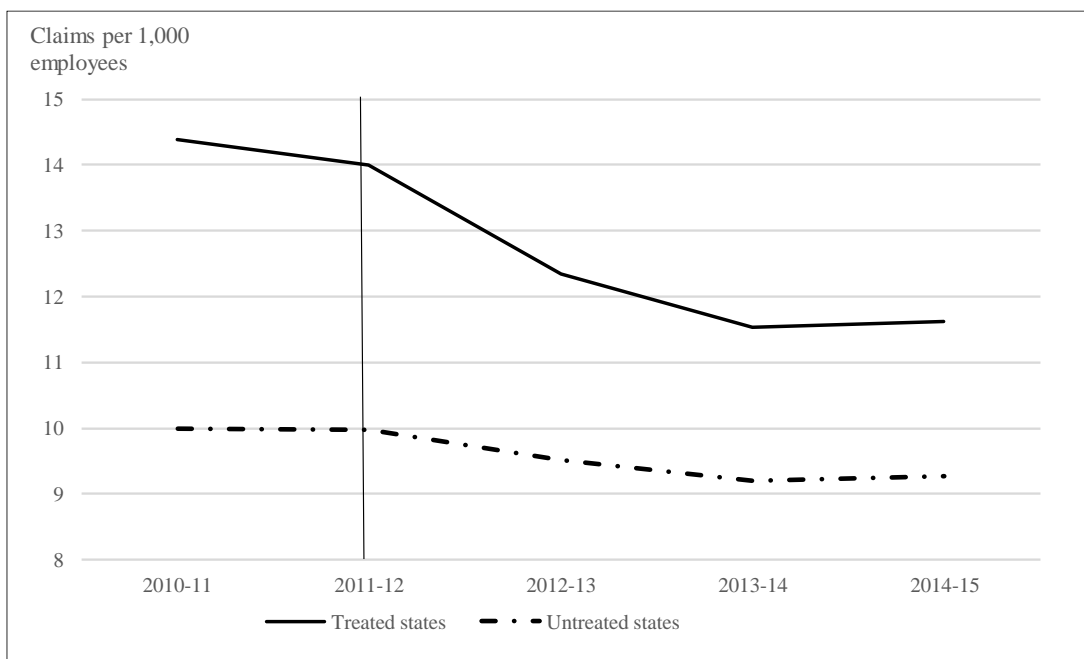
Safe Work Australia (2016; 2017) data show a decline in both the rate of fatalities and workers compensation claims for serious illness and injury in Australia, which coincides with the fall in workplace injuries reported. The rate for serious claims (i.e. resulting in one or more lost work weeks) fell steeply post-2011. **Figure 0.5**, **Figure 0.6** and **Figure 0.7** disaggregate the trends in workplace injuries, serious claims incidence and worker fatality by states which implemented harmonisation (treated states) and those that did not (untreated states).

**Figure 0.5** shows a steep decrease in the average, population-weighted workplace injury rate for treated states between 2010 and 2014, while the average rate for untreated states had a relatively small decrease. **Figure 0.6** and **Figure 0.7** also show coinciding declines in the population-weighted rates of serious claim and worker fatality post-harmonisation for both treated and untreated states, but with steeper declines for treated states.



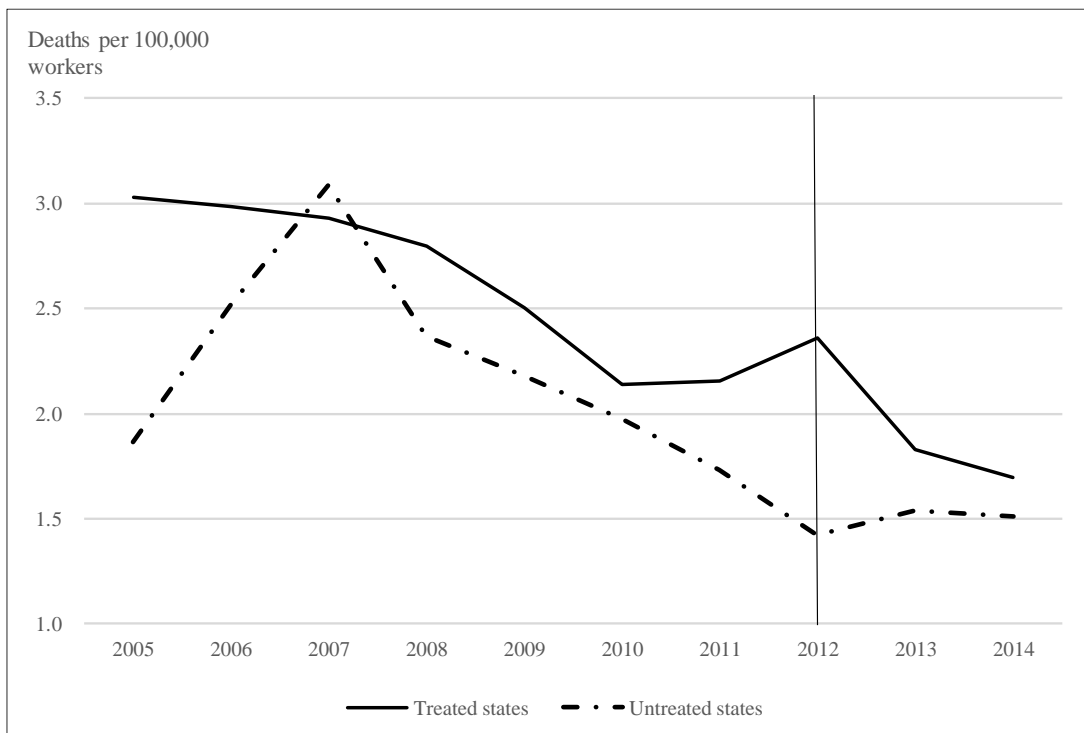
**Figure 0.5: Workplace injuries per 1,000 workers by treated (NSW, ACT, NT, Queensland, Tasmania, SA) and untreated states (Victoria, WA) (weighted average – by population)**

Source: ABS (2006; 2010; 2014; 2015)



**Figure 0.6: Incidence rates of serious injury and disease claims by treated (NSW, ACT, NT, Queensland, Tasmania, SA) and untreated states (Victoria, WA) (pop wt. average)**

Source: Safe Work Australia (2017) and ABS (2015)



**Figure 0.7: Worker fatality rate by treated (NSW, ACT, NT, Queensland, Tasmania, SA) and untreated states (Victoria, WA) (weighted average – by population)**

Source: Safe Work Australia (2016) and ABS (2015)

Overall, national data indicate that harmonisation may have reduced worker injuries and claims in treated states relative to untreated states. The econometric estimations in Section 1.4 isolate whether this was a significant causal effect, after controlling for other covariates which may be influencing trends.

### 1.3 Data, definitions and sample characteristics

We use data from the Household, Income, and Labour Dynamics in Australia (HILDA) survey, a household-based panel study conducted annually since 2001. Wave 1 contained information on 7,682 responding households and 19,914 persons, who were asked questions on family, household formation, income and work (Summerfield et al., 2017). The pre-reform wave used in our analysis is Wave 11 (2011), which is the wave immediately prior to reform introduction.<sup>2</sup> The post-reform waves used were Wave 13 (2013) and Wave 14 (2014), which are years after harmonisation was implemented.

<sup>2</sup> The sample was replenished in 2011 with 2,153 additional households.

### 1.3.1 Treatment and control groups

Due to the staggered implementation of the reform across states, we conduct two separate estimations with different treatment and control groups. To analyse the initial implementation of harmonisation on 1 January 2012, the treatment group comprises ACT, NSW, NT and Queensland, and the control group comprises SA, Tasmania, Victoria and WA. Analysis of the full implementation of harmonisation from 1 January 2013, considers ACT, NSW, NT, Queensland, SA and Tasmania as the treatment group, and Victoria and WA as the control group.

We use Wave 13, rather than Wave 12, as a post-reform wave to analyse initial reform implementation, and Wave 14 rather than Wave 13 to analyse full reform implementation. This is because our dependent variable was derived from a question in HILDA that asked individuals whether they spent time on workers compensation ‘in the past year’. The majority of HILDA survey interviews are conducted in August and September each year (Summerfield et al., 2017), meaning the likely coverage of this variable in Wave 12 extends to before harmonisation.

When analysing the first wave of harmonisation (1 January 2012), we can only conclusively deduce that an individual’s claim in Wave 12 was in the post-reform period (from 1 January 2012 onwards) if their interview date was in December 2012. Hence, it would not be accurate to use Wave 12 as a post-reform wave. Similarly, when analysing second wave harmonisation (from 1 January 2013), this issue would occur in using Wave 13 as a post-reform wave.

Since the harmonised Act and regulations were legislated to be adopted by states (Safe Work Australia, 2011), we would expect the policy effect to be immediate and in the short-run. Estimating the policy effect using waves close to implementation also reduces the chances of confounding from changes in other policies. However, we do include a sensitivity check in Section 1.5.5 by estimating a longer-term second wave policy effect, to check for confounding from post-reform fluctuations in the outcome variable for the control group (further discussed in Section 1.3.2). Our sample sizes for the baseline estimations are presented in **Table 0.1**.

**Table 0.1: Sample sizes (*individual* × *year*) for the treatment and control groups**

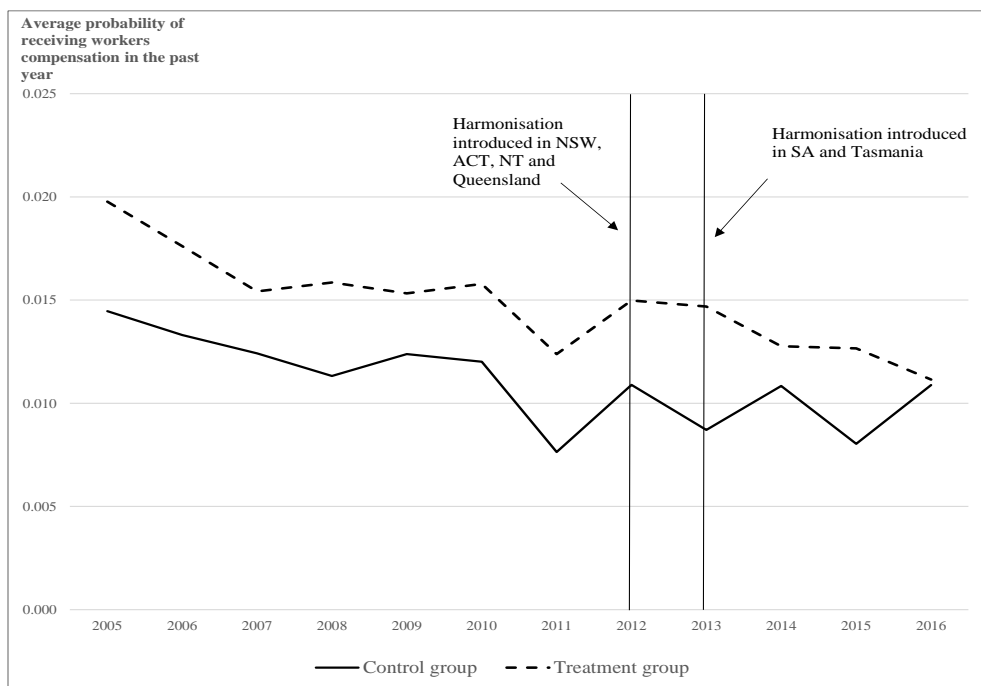
	Treatment group	Control group	Total
<b>First wave: 2011 and 2013</b>	7,858	6,822	14,680
<b>Second wave: 2011 and 2014</b>	9,741	5,080	14,821

### 1.3.2 Dependent variable: pre- and post-reform trends

The dependent variable is a binary variable, constructed from a HILDA survey question which asks individuals whether they spent any time on workers compensation during the last 12 months (where  $I$ =time spent on workers compensation,  $0$  otherwise).

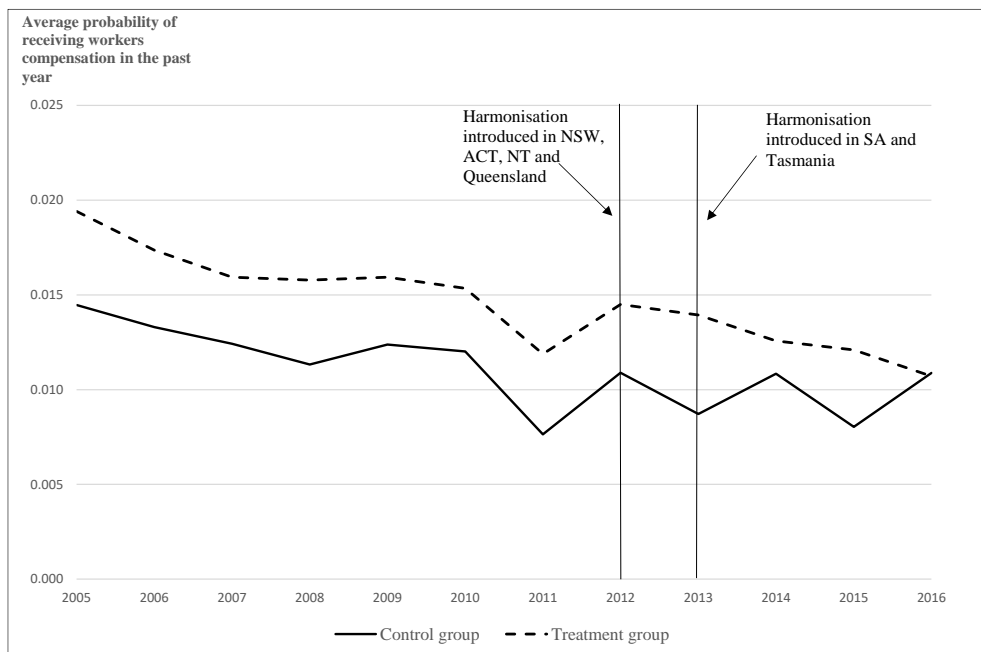
Our dependent variable is subject to limitations as an indicator of workplace injury and disease. Self-reported workers compensation claims cover a subset of all workplace injury and do not include workplace fatalities, and therefore present a partial picture of the full effect of harmonisation. Australian data show twice as many injuries as accepted workers compensation claims (Lane et al., 2016). Not every workplace injury progresses to an accepted claim, as some injuries are minor, may not cause undue pain or disability, or have an estimated treatment cost or lost time value that is less than an employer's excess. While self-reported workplace injuries would be a more expansive dependent variable than self-reported workers compensation, it may be more subject to recall bias or self-reporting error than workers compensation data (Warner et al., 2005). Such a variable is not available in HILDA. Receiving workers compensation indicates the incidence of more serious workplace injuries and accepted claims are generally used as a marker of the relative effectiveness of WHS policy (Lane et al., 2016).

Pre- and post-reform trends in the average value of the dependent variable are presented in **Figure 0.8** and **Figure 0.9** by year, for the first and second wave treatment and control groups. For the entire sample, the average probability of receiving workers compensation in the past year equated to 1.2% in 2014. This is comparable to the reported incidence rate of serious workers compensation claims in Australia in 2014 of 1.1% (10.5 per 1,000 workers) (Safe Work Australia, 2017), which suggests the HILDA sample is representative of the general population.



**Figure 0.8: Average annual value of the dependent variable (workers compensation in the past year) – first wave of harmonisation (treatment group = NSW, NT, ACT and QLD, and control group = SA, TAS, VIC and WA)**

Source: HILDA



**Figure 0.9: Average annual value of the dependent variable (workers compensation in the past year) – second wave of harmonisation (treatment group = NSW, NT, ACT, QLD, SA and TAS and control group = VIC and WA)**

Source: HILDA



On visual inspection, the pre-reform values of the workers compensation variable exhibit parallel trends between the treatment and control groups, particularly for the second wave of harmonisation. Hence, this analysis is naturally well-suited to policy effect estimation via difference-in-difference (DID) estimation. In its construction of a counterfactual, DID implicitly assumes that differences in pre-reform levels in the outcome variable would have been maintained between the treatment and control groups in the absence of policy introduction (Moffitt, 1991).<sup>3</sup> In Section 1.4.1, we statistically confirm the presence of pre-reform parallel trends between the treatment and control groups to check the validity of this assumption.

While parallel trends are less easily discerned from the national data (presented in **Figure 0.4** to **Figure 0.6**), it should be remembered that these are based on different measures (workplace injuries, and serious claims resulting in one or more weeks off work) to the dependent variable in our analysis (any time spent on workers compensation). Furthermore, there is substantial spacing between time points in available national data on workplace injuries (**Figure 0.4** and **Figure 0.5**), as compared to HILDA data. For our analysis, the parallel trends assumption is only directly relevant to the variable of interest, time spent on workers compensation in the past year, for the validity of the identification strategy.

**Figure 0.8** and **Figure 0.9** show a steady downward trend in workers compensation probability for the treatment groups following the first and second waves of harmonisation, while the trend for the control groups fluctuates in the post-reform period. Hence, harmonisation may have reduced the probability of receiving workers compensation for treated states and territories, relative to untreated states and territories, which coincides with trends in injuries and claims in national datasets (Section 1.2.4).

A potential threat to the estimation of the policy effect is confounding from the regression to the mean effects in the dependent variable. This may occur due to fluctuations in the outcome variable and measuring the outcome at a few points in time, since a high rate in the dependent variable is more likely to be followed a low rate in another year (Robson et al., 2001). It may also occur due to selection into the treatment group based on potential gains.

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<sup>3</sup> For those in the sample who report receiving workers compensation claim in the past year, there is another survey question in HILDA on the duration of workers compensation leave taken. We conducted preliminary analysis of this variable, and it did not support pre-reform parallel trends for the treatment and control groups. Hence, in this paper, we do not analyse the impact of harmonisation on the duration of workers compensation.

Since the model WHS laws were a national policy, initially agreed to by all states and territories, we posit that it is unlikely there was selection into the treatment or control groups based on potential gains. While Victoria remains the only state that has not committed to implementing the harmonised laws, many of the harmonised laws are clearly more stringent and stricter than requirements in WHS law in Victoria, particularly for the construction industry (as detailed in the comparison in Table 2.9). This suggests implementation of the harmonised laws may hold potential gains in workplace health and safety for Victoria.

Furthermore, the fact that the outcome variable exhibits fluctuations in the control group in post-reform years as opposed to a constant declining trend in the treatment group (as in Figure 2.8-2.9) would suggest that the control group states are not at a stable, low level of claims which cannot be further reduced (i.e. they have not yet reached a natural minimum rate). This compares to parallel trends in workplace claims between the treatment and control group in pre-reform years.

A potential way to check for regression to the mean effects from point-in-time fluctuations in the outcome variable is to use more years of data in the policy effect calculation (Robson et al., 2001). We include a sensitivity check in Section 2.5.5, by pooling three years of data after the reform was introduced to calculate the second wave policy effect.

The econometric estimations in Section 1.4 isolate whether harmonisation had a significant causal impact on individuals receiving workers compensation in the past year in treated states and territories after the implementation of harmonisation.

### **1.3.3 Covariates**

Covariates were identified based on a review of past literature on the effects of regulation on workplace injuries and claims (Arocena et al., 2008; Bartel and Thomas, 1985; Biddle and Roberts, 2003; Boden and Ruser, 2003; Curington, 1986; Hansen, 2016; Lanoie, 1992; Meyer et al., 1995). Most studies are at the industry level (Boden and Ruser, 2003; Curington, 1986; Lanoie, 1992) or firm level (Arocena et al., 2008; Bartel and Thomas, 1985). Some studies use administrative data on workers compensation claims (Arocena et al., 2008; Biddle and Roberts, 2003; Hansen, 2016; Meyer et al., 1995). Individual-level studies (Askenazy, 2006; Krueger, 1990) are relatively scarce.

We adapted variables from firm level and industry level studies and included additional variables from studies analysing individual-level determinants of workers compensation claims

and incidents (Askenazy, 2006; Donado, 2015; Islam et al., 2001; Krueger, 1990; Ostbye et al., 2007). Covariates include age, gender (Islam et al., 2001), marital status, a dummy variable to indicate presence of dependent children (Lanoie, 1992) and a dummy variable to indicate being from a culturally and linguistically diverse background (CALD). Covariates also include highest educational attainment, employment type and industry, organisation size, number of years worked with current employer and whether an individual works full-time.

Union membership and employment contract type were also included as a covariate, as they are strongly associated with the probability of claiming. In particular, workers on temporary or unstable contracts are less likely to claim, and those with union membership are significantly more likely to claim (Askenazy, 2006; Donado, 2015). We include dummy variables to indicate job type and industry, to control for work-risk related factors associated with claiming. We also include a dummy variable to indicate agreement with the statement *'I have to work very intensely in my job'*, to act as a proxy for intensity of work performed by individuals in their jobs.

Other covariates on health status and behaviours associated with workers compensation claiming were also included, such as self-assessed health (SAH) (Biddle and Roberts, 2003) and obesity (Ostbye et al., 2007). We included daily smoking and alcohol consumption to proxy for risk-aversion or propensity to engage in risky behaviours (Dave and Saffer, 2008; Magar et al., 2008). Dummy variables were created for missing values for work contract type, SAH, organisation size, hours/years worked, job type and industry, to maintain sample sizes across estimations.

Since workers compensation schemes in Australia provide income replacement based on pre-injury earnings (Safe Work Australia, 2014), we include both the logarithm of previous-year annual disposable individual income and equivalised household income as covariates to account for incentive effects behind claiming (Bronchetti and McInerney, 2012). Past literature has found workers compensation receipt increases with previous year earnings, at a declining rate (Bronchetti and McInerney, 2012). Lastly, we include individual state and territory dummies, to control for region-specific characteristics and macroeconomic factors, and to account for state-specific features of workers compensation benefit schemes.

Average values of the covariates for the second wave treatment and control groups are provided in **Table 0.2** for Wave 11 (2011) (pre-reform) and Wave 14 (2014) (post-reform). Covariate averages are similar between treatment and control groups, although the control group is slightly

healthier, has higher levels of educational attainment and a lower proportion of people in regional and remote areas. The similarity between covariate averages reduces the chance of selectivity bias in observable and unobservable characteristics between groups. There are only small changes in covariate averages between the pre- and post-reform periods for both groups, which shows the composition of the treatment and control groups remained relatively stable.

**Table 0.2: Mean values for full set of covariates – second wave control and treatment groups (pre- and post-reform)**

<i>Variable</i>	<i>Control group</i>						<i>Treatment group</i>					
	<i>Pre-reform (2011)</i>			<i>Post-reform (2014)</i>			<i>Pre-reform (2011)</i>			<i>Post-reform (2014)</i>		
	<i>N</i>	<i>mean</i>	<i>std.dev</i>	<i>N</i>	<i>mean</i>	<i>std.dev</i>	<i>N</i>	<i>mean</i>	<i>std.dev</i>	<i>N</i>	<i>mean</i>	<i>std.dev</i>
<b><i>Demographic characteristics:</i></b>												
Age (years)	3,884	39.38	14.04	3,878	39.84	14.27	7,350	39.33	14.08	7,098	39.53	14.23
Proportion male	3,884	0.52	0.50	3,878	0.51	0.50	7,350	0.52	0.50	7,098	0.52	0.50
In married/defacto relationship	3,884	0.66	0.47	3,878	0.66	0.47	7,350	0.67	0.47	7,098	0.67	0.47
Presence of dependent children	3,884	0.71	1.04	3,878	0.68	1.02	7,350	0.71	1.05	7,098	0.72	1.07
Culturally and Linguistically Diverse (CALD)	3,884	0.12	0.32	3,878	0.11	0.32	7,350	0.11	0.31	7,098	0.11	0.31
In remote/regional area	3,884	0.24	0.43	3,878	0.24	0.43	7,350	0.35	0.48	7,098	0.34	0.48
Household size	3,884	3.00	1.34	3,878	2.93	1.34	7,350	2.94	1.34	7,098	2.95	1.36
<b><i>Health status/health behaviours:</i></b>												
SAH poor	3,884	0.01	0.08	3,878	0.01	0.07	7,350	0.01	0.09	7,098	0.01	0.11
SAH fair	3,884	0.07	0.25	3,878	0.07	0.26	7,350	0.08	0.27	7,098	0.08	0.27
SAH good	3,884	0.28	0.45	3,878	0.30	0.46	7,350	0.32	0.47	7,098	0.32	0.47
SAH very good	3,884	0.37	0.48	3,878	0.37	0.48	7,350	0.34	0.48	7,098	0.36	0.48
SAH excellent	3,884	0.14	0.34	3,878	0.12	0.33	7,350	0.11	0.32	7,098	0.11	0.31
SAH missing	3,884	0.13	0.34	3,878	0.12	0.33	7,350	0.13	0.34	7,098	0.11	0.32
BMI obese	3,884	0.18	0.38	3,878	0.19	0.39	7,350	0.18	0.39	7,098	0.19	0.39
Have long-term health condition	3,884	0.15	0.35	3,878	0.14	0.35	7,350	0.17	0.38	7,098	0.18	0.38
Drinks alcohol daily	3,884	0.04	0.21	3,878	0.04	0.19	7,350	0.05	0.22	7,098	0.05	0.21
Daily smoker	3,884	0.14	0.35	3,878	0.13	0.33	7,350	0.15	0.36	7,098	0.15	0.35
<b><i>Highest educational attainment:</i></b>												
Less than high school education	3,884	0.19	0.39	3,878	0.16	0.37	7,350	0.22	0.41	7,098	0.19	0.39
High school	3,884	0.18	0.39	3,878	0.17	0.38	7,350	0.17	0.38	7,098	0.16	0.37
Certificate or diploma	3,884	0.32	0.47	3,878	0.34	0.47	7,350	0.34	0.47	7,098	0.35	0.48
Tertiary education	3,884	0.31	0.46	3,878	0.33	0.47	7,350	0.27	0.45	7,098	0.29	0.46
<b><i>Work characteristics:</i></b>												
In full-time work	3,884	0.46	0.50	3,878	0.57	0.49	7,350	0.47	0.50	7,098	0.59	0.49
Union membership	3,884	0.23	0.42	3,878	0.23	0.42	7,350	0.23	0.42	7,098	0.23	0.42
Years worked with current employer	3,105	8.63	8.78	3,098	8.87	8.90	5,908	8.62	8.72	5,743	8.70	8.68
Missing years worked	3,884	0.201	0.400	3,878	0.20	0.40	7,350	0.20	0.40	7,098	0.19	0.39

Variable	Control group						Treatment group					
	Pre-reform (2011)			Post-reform (2014)			Pre-reform (2011)			Post-reform (2014)		
	N	mean	std.dev	N	mean	std.dev	N	mean	std.dev	N	mean	std.dev
Weekly hours worked in all jobs	3,662	36.27	15.06	3,779	35.97	15.13	7,158	36.75	15.20	6,894	36.28	15.20
Varying weekly hours	3,884	0.06	0.23	3,878	0.03	0.16	7,350	0.02	0.16	7,098	0.03	0.16
Missing weekly hours	3,884	0.001	0.02	3,878	0.001	0.02	7,350	0.001	0.03	7,098	0.001	0.04
Log of annual disposable income (\$10,000s) in 2011	3,836	1.36	0.90	3,838	1.35	0.95	7,249	1.32	0.90	7,027	1.33	0.90
Log of equiv household disp.income (\$10,000s) – 2011	3,874	1.64	0.52	3,869	1.63	0.54	7,325	1.58	0.54	7,091	1.58	0.53
Government sector job	3,884	0.19	0.40	3,878	0.20	0.40	7,350	0.22	0.42	7,098	0.21	0.41
Permanent job	3,884	0.58	0.49	3,878	0.58	0.49	7,350	0.57	0.49	7,098	0.57	0.49
Contractor	3,884	0.08	0.27	3,878	0.09	0.28	7,350	0.08	0.27	7,098	0.08	0.27
Casual role	3,884	0.17	0.38	3,878	0.18	0.39	7,350	0.20	0.40	7,098	0.20	0.40
Other job contract	3,884	0.002	0.04	3,878	0.002	0.04	7,350	0.002	0.05	7,098	0.002	0.05
Missing job contract type	3,884	0.17	0.37	3,878	0.15	0.35	7,350	0.15	0.36	7,098	0.14	0.35
Organisation size <20 people	3,884	0.44	0.50	3,878	0.44	0.50	7,350	0.45	0.50	7,098	0.45	0.50
Organisation size 20-100 people	3,884	0.26	0.44	3,878	0.26	0.44	7,350	0.28	0.45	7,098	0.27	0.44
Organisation size >100 people	3,884	0.29	0.46	3,878	0.30	0.46	7,350	0.28	0.45	7,098	0.28	0.45
Missing organisation size	3,884	0.004	0.06	3,878	0.004	0.06	7,350	0.003	0.05	7,098	0.002	0.04
Agreement with statement 'I have to work very intensely in my job'	3,262	0.631	0.48	3,363	0.630	0.48	6,262	0.627	0.48	6,184	0.610	0.49
<b>Job type:</b>												
Managers	3,884	0.14	0.35	3,878	0.14	0.35	7,350	0.13	0.33	7,098	0.14	0.34
Professionals	3,884	0.25	0.43	3,878	0.26	0.44	7,350	0.23	0.42	7,098	0.23	0.42
Technicians	3,884	0.14	0.34	3,878	0.14	0.34	7,350	0.14	0.34	7,098	0.13	0.34
Community service workers	3,884	0.09	0.29	3,878	0.11	0.32	7,350	0.11	0.31	7,098	0.12	0.33
Sales	3,884	0.09	0.29	3,878	0.08	0.28	7,350	0.09	0.28	7,098	0.09	0.28
Clerical and admin	3,884	0.15	0.36	3,878	0.13	0.34	7,350	0.15	0.36	7,098	0.14	0.34
Machine operators/labourers	3,884	0.14	0.35	3,878	0.13	0.34	7,350	0.16	0.36	7,098	0.16	0.36
Missing job type	3,884	0.001	0.03	3,878	0.001	0.03	7,350	0.001	0.04	7,098	0.001	0.04
<b>Industry:</b>												
Construction	3,884	0.09	0.29	3,878	0.08	0.28	7,350	0.08	0.28	7,098	0.08	0.27
Mining	3,884	0.01	0.12	3,878	0.01	0.12	7,350	0.02	0.13	7,098	0.02	0.13
Manufacturing	3,884	0.09	0.28	3,878	0.09	0.28	7,350	0.08	0.27	7,098	0.08	0.28

<i>Variable</i>	<i>Control group</i>						<i>Treatment group</i>					
	<i>Pre-reform (2011)</i>			<i>Post-reform (2014)</i>			<i>Pre-reform (2011)</i>			<i>Post-reform (2014)</i>		
	<i>N</i>	<i>mean</i>	<i>std.dev</i>	<i>N</i>	<i>mean</i>	<i>std.dev</i>	<i>N</i>	<i>mean</i>	<i>std.dev</i>	<i>N</i>	<i>mean</i>	<i>std.dev</i>
Electricity, gas, water and waste services	3,884	0.01	0.09	3,878	0.01	0.08	7,350	0.01	0.08	7,098	0.01	0.08
Agriculture, forestry or fishing	3,884	0.03	0.17	3,878	0.03	0.18	7,350	0.03	0.18	7,098	0.03	0.18
Transport and storage	3,884	0.04	0.19	3,878	0.04	0.20	7,350	0.04	0.20	7,098	0.04	0.20
Other services	3,884	0.14	0.34	3,878	0.13	0.34	7,350	0.14	0.35	7,098	0.12	0.33
Education	3,884	0.09	0.29	3,878	0.09	0.29	7,350	0.09	0.29	7,098	0.09	0.29
Government administration/defence	3,884	0.05	0.23	3,878	0.06	0.23	7,350	0.07	0.25	7,098	0.06	0.24
Cultural and recreational activities	3,884	0.03	0.18	3,878	0.03	0.17	7,350	0.04	0.19	7,098	0.04	0.18
Communication and services	3,884	0.02	0.13	3,878	0.01	0.12	7,350	0.01	0.11	7,098	0.01	0.11
Finance and insurance	3,884	0.04	0.19	3,878	0.04	0.19	7,350	0.03	0.18	7,098	0.03	0.17
Restaurants and hotels	3,884	0.06	0.23	3,878	0.06	0.24	7,350	0.06	0.24	7,098	0.07	0.25
Retail trade	3,884	0.12	0.32	3,878	0.11	0.31	7,350	0.11	0.32	7,098	0.11	0.32
Wholesale trade	3,884	0.03	0.18	3,878	0.03	0.17	7,350	0.03	0.16	7,098	0.03	0.16
Health	3,884	0.12	0.32	3,878	0.13	0.34	7,350	0.13	0.34	7,098	0.14	0.35
Other or missing industry	3,884	0.03	0.18	3,878	0.05	0.21	7,350	0.03	0.17	7,098	0.03	0.18

#### 1.4 Methodology: estimation approach

We examine the effect of harmonising WHS regulation in Australia on the probability of receiving workers compensation. We estimate the change in the probability of receiving workers compensation in the last year in states that harmonised (treatment group), relative to those states that did not harmonise (control group). Under a DID estimation framework, the post-reform outcome trend for states that did not harmonise represents our counterfactual scenario for the treated states. The staged implementation of harmonisation in some states and the exclusion of others creates a unique natural experiment, which we exploit to estimate the impact of harmonisation.

Due to the staggered implementation of the reform across states, we conduct two separate estimations with different treatment and control groups to isolate the impact of the first wave (estimation A) and second wave of harmonisation (estimation B).

Our model specification is:

$$Y_{it} = \alpha + \beta TG_i + \gamma T_t + \delta TG_i \times T_t + \phi X_{it} + \eta_i + u_{it} \quad \dots (1)$$

where:

*Y* is the binary dependent variable indicating whether the *i*<sup>th</sup> individual was on workers compensation claim in the last year;

*TG* is a binary variable indicating whether an individual is in the treatment group (treated states – in estimation A: ACT, NSW, NT and Queensland; and in estimation B: ACT, NSW, NT, Queensland, SA and Tasmania);

*T* is a dummy variable indicating observations in the post-reform period (where *T*=1 if observation is in 2013 in estimation A, and 2014 in estimation B);

*TG*×*T* is an interaction term indicating if an individual is in the post-reform treatment group;

*X* is a vector of control variables; and

*η* is the time-constant unobservable individual effect and *u* is an idiosyncratic error term for individual *i* in time *t*.

The average treatment effect on the treated (ATT) due to harmonisation is identified by the coefficient  $\delta$ . To identify  $\delta$ , we estimate equation (1) using pooled ordinary least squares (OLS), and random effects models to exploit the panel nature of our dataset.



To estimate standard errors, we used the Huber-White robust estimator of variance. The random-effects estimations further adjust the robust standard errors for clustering by individual ID.

For panel data modelling, we chose random-effects over fixed-effects estimation. Random-effects estimation is better suited to our policy context where individuals were in states which either implemented harmonisation or did not (Bell et al., 2019). Hence, treatment is not based on an individual choice process and unlikely to be determined by pre-program attributes (Wooldridge, 2002). The results of the Hausman test across our estimations also favoured the random-effects model over fixed-effects.

We also estimate equation (1) separately for individual high-risk industries in Section 1.5.2, to identify if there were policy effects from harmonisation for specific industries.

In this study, we did not undertake policy effect estimation by comparing individual treated and untreated states and territories. Individual state, pairwise comparisons would have been informative for analysing policy effect mechanisms, due to state-based differences in the implementation of harmonisation measures, workers compensation benefit schemes, and pre-existing industry mix. However, when narrowing estimations to the individual state or territory level, we were inhibited by reduced sample sizes, and lack of visual and statistical support for pre-reform parallel trends in the outcome measure. Instead, to test the robustness of the size and significance of the second-wave policy effect to state-specific impacts, we undertook a sensitivity check by deleting one state at a time from the estimations and examining the impact on results (Section 1.5.4).

#### **1.4.1 Statistical check for parallel trends: using pre-reform years to test assumption**

The validity of DID estimation hinges on the presence of pre-reform parallel trends in the dependent variable, between the treatment and control groups. We statistically tested whether the parallel trends assumption holds for the first wave and second wave treatment and control groups after the inclusion of covariates in the model, by estimating policy effects using pre-reform years, following Aitor (2003). Since these years are before actual harmonisation implementation, insignificant policy effects would indicate that the parallel trends assumption holds. **Table 0.3** and **Table 0.4** show insignificant policy effects across both the first wave and second wave treatment and control groups, and across all pairs of pre-reform years. This

suggests that the common trends assumption is reasonable and the DID estimation approach is valid in this context.

**Table 0.3: Statistical check – using pre-reform years to estimate policy effect – first wave treatment and control groups**

	(i) Pooled OLS	(ii) Random-effects
<b>Check: 2010=pre-reform, 2011=post-reform</b>		
Overall policy effect	0.003 (0.005)	0.004 (0.004)
<i>N</i>	13,188	13,188
p-value	0.486	0.385
<b>Check: 2009=pre-reform, 2010=post-reform</b>		
Overall policy effect	0.003 (0.006)	0.003 (0.005)
<i>N</i>	11,439	11,439
p-value	0.646	0.543
<b>Check: 2008=pre-reform, 2009=post-reform</b>		
Overall policy effect	0.0002 (0.006)	-0.0004 (0.005)
<i>N</i>	10,910	10,910
p-value	0.977	0.942
<b>Check: 2007=pre-reform, 2008=post-reform</b>		
Overall policy effect	0.006 (0.006)	0.007 (0.005)
<i>N</i>	10,540	10,540
p-value	0.357	0.214
<b>Check: 2006=pre-reform, 2007=post-reform</b>		
Overall policy effect	-0.004 (0.006)	-0.004 (0.005)
<i>N</i>	10,655	10,655
p-value	0.517	0.435
<b>Check: 2005=pre-reform, 2006=post-reform</b>		
Overall policy effect	-0.001 (0.007)	-0.002 (0.006)
<i>N</i>	10,633	10,633
p-value	0.845	0.719

*Robust standard errors in parentheses. All specifications include a full set of controls. Significant results (under at least a 10% level of significance) are in bold.*

**Table 0.4: Statistical check – using pre-reform years to estimate policy effect – second wave treatment and control groups**

	(i) Pooled OLS	(ii) Random-effects
<b>Check: 2010=pre-reform, 2011=post-reform</b>		
Overall policy effect	0.001 (0.005)	0.002 (0.004)
<i>N</i>	13,188	13,188
p-value	0.789	0.693
<b>Check: 2009=pre-reform, 2010=post-reform</b>		
Overall policy effect	0.002 (0.006)	0.003 (0.005)
<i>N</i>	11,439	11,439
p-value	0.732	0.539
<b>Check: 2008=pre-reform, 2009=post-reform</b>		
Overall policy effect	-0.0003 (0.006)	-0.001 (0.005)
<i>N</i>	10,910	10,910
p-value	0.962	0.924
<b>Check: 2007=pre-reform, 2008=post-reform</b>		
Overall policy effect	0.003 (0.006)	0.005 (0.006)
<i>N</i>	10,540	10,540
p-value	0.580	0.402

	(i) Pooled OLS	(ii) Random-effects
<b>Check: 2006=pre-reform, 2007=post-reform</b>		
Overall policy effect	-0.002 (0.006)	-0.002 (0.005)
<i>N</i>	10,655	10,655
p-value	0.722	0.707
<b>Check: 2005=pre-reform, 2006=post-reform</b>		
Overall policy effect	-0.001 (0.007)	-0.001 (0.006)
<i>N</i>	10,633	10,633
p-value	0.831	0.811

*Robust standard errors in parentheses. All specifications include a full set of controls. Significant results (under at least a 10% level of significance) are in **bold**.*

## 1.5 Estimation results

### 1.5.1 Baseline results

Our baseline estimation results are presented in **Table 2.5** in Panels (A) and (B), with overall workers compensation probability rates presented in Panel (C) for comparative purposes. These show an insignificant impact from the first wave of harmonisation (2013) on workers compensation probability for the treatment group.

For the second wave harmonisation (2014), we find a significant 0.9 percentage point decline ( $p < 0.05$ ) in the probability of receiving workers compensation in the last year in treated states using pooled OLS and random-effects estimation. Overall, these results suggest harmonisation reduced the probability of receiving workers compensation, and hence workplace injury and disease, after it was implemented more widely across states and territories. The delayed policy impact may have been due to time taken by workplaces to fully implement the harmonised laws, including time taken to review legislation, change reporting frameworks and procedures, undertake and implement training. Although the harmonised Act and regulations were legislated to be adopted by states (Safe Work Australia, 2011), there has been no evaluation of how quickly business implemented these requirements in practice.

**Table 0.5: Estimation results – overall policy effect**

	(i) Pooled OLS	(ii) Random-effects	
<b>(A) First wave of harmonisation (2011=pre-reform, 2013=post-reform)</b>			
Overall policy effect	-0.002 (0.005)	-0.003 (0.004)	
<i>N</i>	14,680	14,680	
p-value	0.592	0.563	
<b>(B) Second wave of harmonisation (2011=pre-reform, 2014=post-reform)</b>			
Overall policy effect	<b>-0.009 (0.004)</b>	<b>-0.009 (0.004)</b>	
<i>N</i>	14,821	14,821	
p-value	<b>0.044</b>	<b>0.047</b>	
<b>(C) Probability of receiving workers compensation in the last year</b>			
	<b>2011</b>	<b>2013</b>	<b>2014</b>
Treatment group – first wave	1.2%	1.5%	1.3%
Control group – first wave	0.8%	0.9%	1.1%
Treatment group – second wave	1.2%	1.4%	1.3%
Control group – second wave	0.8%	0.9%	1.1%

*Robust standard errors in parentheses. All specifications include a full set of controls. Significant results (under at least a 10% level of significance) are in **bold**.*

### 1.5.2 Policy effects for high-risk industries

Past literature suggests that businesses operating in high-risk sectors are more receptive to implementing new workplace health and safety regulations (Gunningham, 2016; Safe Work Australia, 2013). We conducted separate estimations for four high-risk industries – agriculture, forestry and fishing; transport; manufacturing; and construction – to examine policy effect heterogeneity. These four industries have the highest incidence rate for serious workers compensation claims in Australia (Safe Work Australia, 2018). Around 24% of the Australian population is currently employed across these four industries (3.0% in agriculture, forestry and fishing; 4.7% in transport; 7.1% in manufacturing and 9.7% in construction) (ABS, 2020).

For both post-reform years (**Table 0.6**), we found insignificant policy effects for three of the four high-risk industries, except construction. For the first wave of harmonisation (2013), the estimates for construction translate to a 2.4 percentage point decline in the probability of receiving workers compensation using pooled OLS ( $p=0.076$ ) and a 2.9 percentage point decline using random-effects estimation ( $p=0.030$ ). For the second wave of harmonisation (2014), effect sizes for construction translated to a 4.1 percentage point decline in the probability of receiving workers compensation using pooled OLS ( $p=0.015$ ) and 3.6 percentage point decline using random-effects ( $p=0.030$ ). Large, reduced probabilities were also estimated for transport, and agriculture, forestry and fishing, but these were not statistically significant. This may have been due to low sample sizes for these industries, with less than 6% of the total sample in each of

these industries. This may have reduced our capacity to robustly estimate industry-specific policy effects from harmonisation.

These results suggest harmonisation had a significant impact on probability of workers compensation specifically for construction. Specific changes in legislation applying to construction, such as changes in definitions for falls and confined spaces (**Appendix Table 0.11**), may have translated to improved worker health and reduced workers compensation probability.

**Table 0.6: Estimation results (A) – first wave: policy effect by high-risk industry**

	(i) Pooled OLS	(ii) Random-effects
<b>Agriculture, forestry and fishing</b>		
Policy effect	0.015 (0.024)	0.009 (0.021)
<i>N</i>	523	523
p-value	0.533	0.665
<b>Transport</b>		
Policy effect	-0.034 (0.027)	-0.034 (0.026)
<i>N</i>	682	682
p-value	0.205	0.184
<b>Manufacturing</b>		
Policy effect	0.007 (0.019)	0.010 (0.016)
<i>N</i>	1,450	1,450
p-value	0.699	0.530
<b>Construction</b>		
Policy effect	<b>-0.024 (0.0137)</b>	<b>-0.029 (0.013)</b>
<i>N</i>	1,380	1,380
p-value	<b>0.076</b>	<b>0.030</b>

*Robust standard errors in parentheses. All specifications include a full set of controls. Significant results (under at least a 10% level of significance) are in bold.*

**Table 0.7: Estimation results (B) – second wave: policy effect by high-risk industry**

	(i) Pooled OLS	(ii) Random-effects
<b>Agriculture, forestry and fishing</b>		
Policy effect	-0.012 (0.020)	-0.014 (0.016)
<i>N</i>	542	542
p-value	0.552	0.389
<b>Transport</b>		
Policy effect	-0.015 (0.030)	-0.015 (0.027)
<i>N</i>	692	692
p-value	0.621	0.582
<b>Manufacturing</b>		
Policy effect	0.018 (0.017)	0.014 (0.016)
<i>N</i>	1,521	1,521
p-value	0.286	0.357
<b>Construction</b>		
Policy effect	<b>-0.041 (0.017)</b>	<b>-0.036 (0.017)</b>
<i>N</i>	1,369	1,369
p-value	<b>0.015</b>	<b>0.030</b>

*Robust standard errors in parentheses. All specifications include a full set of controls. Significant results (under at least a 10% level of significance) are in **bold**.*

### 1.5.3 Sensitivity check: policy effect after omitting NSW from estimations

While harmonisation did not change benefit generosity (as benefit schemes are set at the jurisdictional level), its implementation did coincide with the introduction of a legislative change in NSW which reduced benefit generosity in this state. Findings of incentive effects in past Australian studies suggest that this may confound the estimation of our policy effect (Collie et al., 2016; Lane et al., 2019), by biasing it upward. As a result, we perform a sensitivity check by excluding NSW from our estimations.

As shown in **Table 0.8**, after excluding NSW, policy effects become slightly larger for the 2013 estimation, with the random-effects estimated effect becoming significant at the 10% level. For the 2014 estimation (second wave), estimated policy effects are similar to our baseline results, but the effect size becomes insignificant at the 10% level in the random-effects specification. Statistical insignificance for some specifications is most likely due to the reduced sample size, as NSW comprises around 30% of the total estimation sample. The presence of similar sized policy effects suggests our estimated baseline policy effect is not confounded by inclusion of NSW and its legislative change.

**Table 0.8: Sensitivity check – overall policy effect after omitting NSW from estimations**

	(i) Pooled OLS	(ii) Random-effects
<b>(A) First wave of harmonisation (2011=pre-reform, 2013=post-reform)</b>		
Overall policy effect	-0.010 (0.006)	<b>-0.010 (0.006)</b>
<i>N</i>	10,337	10,337
p-value	0.103	<b>0.094</b>
<b>(B) Second wave of harmonisation (2011=pre-reform, 2014=post-reform)</b>		
Overall policy effect	<b>-0.009 (0.005)</b>	-0.008 (0.005)
<i>N</i>	10,445	10,445
p-value	<b>0.083</b>	0.113

*Robust standard errors in parentheses. All specifications include a full set of controls. Significant results (under at least a 10% level of significance) are in **bold**.*

### 1.5.4 Sensitivity check: removing one state at a time to examine state-specific effects

To analyse the sensitivity of the second-wave policy effect to state-specific factors, we deleted one state at a time from the estimations and examined the impact on the size and significance of the policy effect. **Table 0.9** shows the size of the estimated policy effect does not vary much across estimations after deleting each state at a time (0.7-1.0 percentage point decline compared to the baseline of a 0.9 percentage point decline). The policy effect remains

statistically significant at the 10% level across all estimations except for the last estimation which includes only NSW as the treatment group and Victoria as the control group. However, we note that for the last estimation, the sample size is substantially smaller and parallel trends are also less likely to hold (as it is a pairwise comparison of individual states). Overall, we conclude that the estimated second-wave policy effect is relatively robust to the impact of state-specific factors.

**Table 0.9: Sensitivity check – (B) Second wave of harmonisation (2011=pre-reform, 2014=post-reform), removing one state at a time from estimations**

	(i) Pooled OLS	(ii) Random-effects
<i>Results after removing ACT</i> (TG = NSW, NT, QLD, SA, TAS and CG = VIC and WA)		
Overall policy effect	<b>-0.008 (0.004)</b>	<b>-0.008 (0.004)</b>
<i>N</i>	14,455	14,455
p-value	<b>0.064</b>	<b>0.066</b>
<i>Results after removing ACT, NT</i> (TG = NSW, QLD, SA, TAS and CG = VIC and WA)		
Overall policy effect	<b>-0.008 (0.004)</b>	<b>-0.008 (0.004)</b>
<i>N</i>	14,305	14,305
p-value	<b>0.064</b>	<b>0.065</b>
<i>Results after removing ACT, NT, TAS</i> (TG = NSW, QLD, SA and CG = VIC and WA)		
Overall policy effect	<b>-0.009 (0.004)</b>	<b>-0.008 (0.004)</b>
<i>N</i>	13,870	13,870
p-value	<b>0.054</b>	<b>0.056</b>
<i>Results after removing ACT, NT, TAS, SA</i> (TG = NSW, QLD and CG = VIC and WA)		
Overall policy effect	<b>-0.010 (0.005)</b>	<b>-0.010 (0.005)</b>
<i>N</i>	12,484	12,484
p-value	<b>0.033</b>	<b>0.031</b>
<i>Results after removing ACT, NT, TAS, SA, WA</i> (TG = NSW, QLD and CG = VIC)		
Overall policy effect	<b>-0.008 (0.005)</b>	<b>-0.008 (0.005)</b>
<i>N</i>	11,143	11,143
p-value	<b>0.090</b>	<b>0.080</b>
<i>Results after removing ACT, NT, TAS, SA, WA, QLD</i> (TG = NSW, CG = VIC)		
Overall policy effect	-0.007 (0.006)	-0.007 (0.005)
<i>N</i>	8,115	8,115
p-value	0.195	0.167

*Robust standard errors in parentheses. All specifications include a full set of controls. Significant results (under at least a 10% level of significance) are in bold.*

### 1.5.5 Sensitivity check: pooling post-reform years to estimate the policy effect

The dependent variable exhibits some fluctuations in post-reform years for the control group states (**Figure 0.9**), which may affect policy effect estimation when measuring the policy effect using one post-reform point in time. To check for the robustness of the policy effect to these

fluctuations and also to examine concerns around regression to the mean effects from fluctuations in the outcome variable, we performed a sensitivity check by estimating a longer-term policy effect using three post-reform waves in the estimations after the second wave of harmonisation. Results are presented in **Table 0.10** and show a relatively similar policy effect to the baseline estimates (a 0.7 percentage point reduction in the probability of being on workers compensation in treated states) and significance at the 5% level. We conclude that the policy effect is robust to post-reform fluctuations in the outcome variable for the control group, and potential regression to the mean effects from this phenomenon.

**Table 0.10: Sensitivity check – (B) Second wave of harmonisation, overall policy effect after pooling post-reform years**

	(i) Pooled OLS	(ii) Random-effects
Overall policy effect	<b>-0.007 (0.003)</b>	<b>-0.007 (0.003)</b>
N	29,868	29,868
p-value	<b>0.031</b>	<b>0.033</b>

*Robust standard errors in parentheses. All specifications include a full set of controls. Significant results (under at least a 10% level of significance) are in **bold**.*

## 1.6 Conclusions

In this study, we estimated the impact of WHS harmonisation in Australia on workplace injury and disease by examining an individual-level indicator, the probability of receiving workers compensation in the past year. This is the first study, to the best of our knowledge, that analyses the impact of harmonisation on workers compensation in Australia and adds to the broader literature on WHS regulation on workplace injuries and claims. Our ultimate objective was to analyse the extent to which the laws impacted worker health status.

The results from pooled OLS and random-effects models suggest harmonisation reduced the probability of receiving workers compensation in treated states by 0.9 percentage points ( $p=0.047$ ), after the second wave of harmonisation. We find stronger and more significant policy effects in the high-risk construction industry. This may be due to the higher underlying risk for construction and the higher potential for improved workplace health and safety outcomes, and the implementation and applicability of legislation specific to construction. The use of the DID estimation approach is valid in our context, as parallel trends in the pre-reform outcome measure between treatment and control groups is supported by visual and statistical analysis. In addition, the size of our estimated policy effect was not affected by excluding the state of NSW from the estimation, which had a concurrent policy change reducing workers compensation benefit



generosity in 2012. The estimated policy effect was also robust to the impact of state-specific factors (as checked for in Section 1.5.4).

We conclude that WHS harmonisation improved workplace injury and disease outcomes in treated states and territories, which was one of its stated policy objectives. Our estimates align with trends in workplace injuries and claims after harmonisation from other national datasets for treated and untreated states and territories. Our study also supports findings from past literature on the ability of WHS regulation and enforcement measures to reduce workplace injuries (Arocena et al., 2008; Baggs et al., 2003; Lanoie, 1992; Lipscomb et al., 2003).

Our estimated second wave policy effect of a 0.9 percentage point reduction in receiving workers compensation in the past year (95% C.I: -0.02 to -1.7 percentage points) translates to a 34% decrease in the probability of receiving workers compensation in the treated group, relative to its estimated counterfactual (95% C.I: 0.76% to 64% decreased probability). This estimated effect size is larger than that found in a past US study on the impact of inspections with penalties (Haviland et al., 2012) of a 19–24% reduction in injuries on average per year. However, our policy effects are not directly comparable to past studies in this area, which looked at the effect of individual enforcement activities. The Australian and US policy context is also substantially different, which limits the comparability of results.

An *ex-ante* assessment estimated harmonisation would have a substantial one-off implementation cost of \$875 million in 2012 and \$50 million in ongoing costs per year (equating to \$1.1 billion and \$63 million per year, respectively, in 2020) (Productivity Commission, 2012).<sup>4</sup> This includes business compliance and government administration costs. A post-implementation quantification of the benefits and costs would be timely, as the harmonised laws have been operating for approximately eight years. This study would assist in partial quantification of the benefits of harmonisation, resulting from avoided workers compensation claims and improved workplace injury and disease outcomes. Applying our estimate of a 34% decrease in the probability of receiving workers compensation to the annual incidence of serious workers compensation claims in Australia (107,335 in 2017-18) would translate to roughly 36,494 fewer claims per year (95% C.I: 816 to 68,694 fewer claims). This equates to approximately \$441 million in direct cost savings per year from avoided serious claims (ABS,

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<sup>4</sup> Inflated to current year (ABS, 2020).

2020; Safe Work Australia, 2020)<sup>5</sup> and would offset around half of the initial implementation cost, and more than the annual ongoing costs of the reform. Based on these estimates, the harmonisation reform would be cost-effective after three years of implementation if the claim-reduction benefits found in 2014 were sustained into the future.

This study is subject to limitations. The data used do not allow us to disaggregate by specific injury types and severity as captured in studies using administrative data. Since workers compensation claims capture only a subset of total workplace injuries (as many injuries do not progress to successful claims), we are also estimating a partial effect on workplace injuries.<sup>6</sup> Furthermore, because harmonisation was a high-level reform, it is difficult to attribute our policy effects to specific measures or regulations encompassed by harmonisation. Hence, this analysis would be complemented by future detailed research at the firm-level or industry-level, exploring the effect of specific harmonisation regulatory measures on injuries, claims and fatalities.

## 1.7 References

Arocena P., Núñez I. and Villanueva M. (2008), ‘The impact of prevention measures and organisational factors on occupational injuries’, *Safety Science*, 46(9): 1369-1384.

Askenazy P. (2006), *Some Determinants of Reporting Workplace Accidents in France: The Role of Labour Contract*, Centre Pour La Recherche Economique Et Ses Applications (CEPREMAP), Paper 606.

Australian Bureau of Statistics (ABS) (2020), *6291.0.55.003 - Labour Force, Australia, Detailed, Quarterly, May 2020*, Canberra.

Australian Bureau of Statistics (ABS) (2020), *6401.0 – Consumer Price Index, Australia, June 2020*, Canberra.

Australian Bureau of Statistics (ABS) (2018), *6324.0 – Workplace Injuries, Australia, Jul 2017 to Jun 2018*, Canberra.

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<sup>5</sup> The median compensation cost of \$12,100 per serious claim in 2017-18 (Safe Work Australia, 2020) inflated to 2020 (ABS, 2020) and multiplied by avoided annual serious workers compensation claims.

<sup>6</sup> Lane et al. (2016) note that there are twice as many estimated workplace injuries as there are accepted workers compensation claims.

- Australian Bureau of Statistics (ABS) (2015), *3101.0 – Australian Demographic Statistics*, Canberra.
- Australian Bureau of Statistics (ABS) (2014), *6324.0 – Workplace Injuries, Australia, Jul 2013 to Jun 2014*, Canberra.
- Australian Bureau of Statistics (ABS) (2010), *6324.0 – Workplace Injuries, Australia, 2009-10*, Canberra.
- Australian Bureau of Statistics (ABS) (2006), *6324.0 – Workplace Injuries, Australia, 2005-06*, Canberra.
- Australian Industry Group (2011), *Comparison of Provisions – Model WHS Laws and Victorian OHS Laws*.
- Autor, D.H. (2003), 'Outsourcing at will: The contribution of unjust dismissal doctrine to the growth of employment outsourcing', *Journal of Labor Economics*, 21(1): 1-42.
- Baggs J., Silverstein B. and Foley M. (2003), 'Workplace health and safety regulations: Impact of enforcement and consultation on workers' compensation claims rates in Washington State', *American Journal of Industrial Medicine*, 43(5): 483-494.
- Bailey J.B., Thomas D.W. and Anderson J.R. (2019), 'Regressive effects of regulation on wages', *Public Choice*, 180(1-2): 91-103.
- Bartel A.P. and Thomas L.G. (1985), 'Direct and indirect effects of regulation: A new look at OSHA's impact', *The Journal of Law and Economics*, 28(1): 1-25.
- Bell A., Fairbrother M., Jones K. (2019), 'Fixed and random effects models: making an informed choice', *Quality & Quantity*, 53(2): 1051-74.
- Biddle J. and Roberts K. (2003), 'Claiming behaviour in workers' compensation', *Journal of Risk and Insurance*, 70(4): 759-80.
- Bluff E. and Gunningham N. (2012), 'Harmonising work health and safety regulatory regimes', Australian National University.

- Boden L.I. and Ruser J.W. (2003), 'Workers' compensation "reforms," choice of medical care provider, and reported workplace injuries', *Review of Economics and Statistics*, 85(4): 923-9.
- Boland M. (2018), *2018 Review of the model WHS laws*, Discussion paper.
- Bronchetti E.T. and McInerney M. (2012), 'Revisiting Incentive Effects in Workers' Compensation: Do Higher Benefits Really Induce More Claims?', *ILR Review*, 65(2): 286-315.
- Chelius J.R. (1976), 'Liability for industrial accidents: a comparison of negligence and strict liability systems', *The Journal of Legal Studies*, 5(2): 293-309.
- Cobb-Clark D.A. (2013), *The Case for Making Public Policy Evaluations Public*, Melbourne Institute of Applied Economic and Social Research, The University of Melbourne.
- Collie A., Lane T.J., Hassani-Mahmooei B., Thompson J. and McLeod C. (2016), 'Does time off work after injury vary by jurisdiction? A comparative study of eight Australian workers' compensation systems', *BMJ Open*, May 1;6(5):e010910.
- Commonwealth of Australia (2008), *Comparison of Occupational Health and Safety Arrangements in Australia and New Zealand*, Workplace Relation Ministers' Council.
- Cooke W.N. and Gautschi F.H. (1981), 'OSHA, plant safety programs, and injury reduction', *Industrial Relations: A Journal of Economy and Society*, 20(3): 245-57.
- Council of Australian Governments (COAG) (2008), *Inter-Governmental Agreement for Regulatory and Operational Reform in Occupational Health and Safety*.
- Curington W.P. (1986), 'Safety regulation and workplace injuries', *Southern Economic Journal*, 1: 51-72.
- Dave D. and Saffer H. (2008), 'Alcohol demand and risk preference', *Journal of Economic Psychology*, 29(6): 810-31.
- Donado A. (2015), 'Why do unionized workers have more nonfatal occupational injuries?'. *ILR Review*, 68(1): 153-83.

- Gray W.B. and Scholz J.T. (1991), 'Analysing the equity and efficiency of OSHA enforcement', *Law & Policy*, 13(3): 185-214.
- Gray W.B. and Shadbegian R.J. (2005), 'When and why do plants comply? Paper mills in the 1980s', *Law & Policy*, 27(2): 238-61.
- Gunningham N. (2016), 'Impacts of work health and safety harmonisation on very large businesses', *RegNet Research Paper*, (2016/118).
- Hansen B. (2016), 'California's 2004 workers' compensation reform: costs, claims, and contingent workers', *ILR Review*, 69(1): 173-98.
- Haviland A.M., Burns R.M., Gray W.B., Ruder T., Mendeloff J. (2012), 'A new estimate of the impact of OSHA inspections on manufacturing injury rates, 1998–2005', *American Journal of Industrial Medicine*, 55(11): 964-75.
- Islam S.S., Velilla A.M., Doyle E.J. and Ducatman A.M. (2001), 'Gender differences in work-related injury/illness: analysis of workers compensation claims', *American Journal of Industrial Medicine*, 39(1): 84-91.
- Kankaanpaa E., Tulder M.V., Aaltonen M. and Greef M.D. (2008), 'Economics for occupational safety and health', *Scandinavian Journal of Work, Environment & Health*, 34(5): 9.
- Krueger A.B. (1990), 'Incentive effects of workers' compensation insurance', *Journal of Public Economics*, 41(1): 73-99.
- Lane T., Gray S.E., Sheehan L. and Collie A. (2019), 'Increased benefit generosity and the impact on workers' compensation claiming behaviour: An interrupted time series study in Victoria', *Journal of Occupational and Environmental Medicine*, 61(3): e82-90.
- Lane T., Collie A. and Hassani-Mahmooei B. (2016), *Workplace Injury and Illness in Australia, 2004 to 2014: What is the incidence of workplace conditions and their impact on time lost from work by state and territory, age, gender and injury type?*, Melbourne: Monash University, ISCR; 2016 Jun. 54 p. Report No. 118-0616-R02.

- Lanoie P. (1992), 'The impact of occupational safety and health regulation on the risk of workplace accidents: Quebec, 1983-87', *Journal of Human Resources*, Oct 1: 643-60.
- Lipscomb H.J., Li L. and Dement J. (2003), 'Work-related falls among union carpenters in Washington State before and after the Vertical Fall Arrest Standard', *American Journal of Industrial Medicine*, 44(2): 157-65.
- Magar E.C., Phillips L.H. and Hosie J.A. (2008), 'Self-regulation and risk-taking', *Personality and Individual Differences*, 45(2): 153-9.
- Markey R., Holley S., O'Neill S. and Thornthwaite L. (2013), *The Impact on Injured Workers of Changes to NSW Workers' Compensation: June 2012 Legislative Amendments*, report no. 1 for Unions NSW.
- Meyer B.D., Viscusi W.K. and Durbin D.L. (1995), 'Workers' compensation and injury duration: evidence from a natural experiment', *The American Economic Review*, 1: 322-40.
- Moffitt R. (1991), 'Program evaluation with nonexperimental data', *Evaluation Review*, 15(3): 291-314.
- Østbye T., Dement J.M. and Krause K.M. (2007), 'Obesity and workers' compensation: results from the Duke Health and Safety Surveillance System', *Archives of Internal Medicine*, 167(8): 766-73.
- Parliament of Western Australia (2020), *Work Health and Safety Bill 2019*, available at: <https://www.parliament.wa.gov.au/parliament/bills.nsf/BillProgressPopup?openForm&ParentUNID=8F320741B83643A8482584BF000CF89B> [accessed 25 February 2020].
- Potter R.E., Dollard M.F., Owen M.S., O'Keeffe V., Bailey T. and Leka S. (2017), 'Assessing a national work health and safety policy intervention using the psychosocial safety climate framework', *Safety Science*, 100: 91-102.
- Productivity Commission (2012), *Impacts of COAG Reforms: Business Regulation and VET*, Productivity Commission research report, Volume 2.

Robson L., Shannon H., Goldenhar L. and Hale A. (2001), *Guide to Evaluating the Effectiveness of Strategies for Preventing Work Injuries: How to Show Whether a Safety Intervention Really Works*, US Department of Health and Human Services, Public Health Service Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health.

Safe Work Australia (2020), *Australian Workers Compensation Statistics 2017-18*.

Safe Work Australia (2019), *Model WHS Laws*, available at: <https://www.safeworkaustralia.gov.au/law-and-regulation/model-whs-laws#harmonising-whs-laws>, [accessed 20 November 2019].

Safe Work Australia (2018), *Comparative Performance Monitoring Report: Part 2 – Work Health and Safety Compliance and Enforcement Activities*, 20<sup>th</sup> Edition.

Safe Work Australia (2017), *Australian workers' compensation statistics 2014-15*

Safe Work Australia (2017), *Comparative Performance Monitoring Report: Part 2 – Work Health and Safety Compliance and Enforcement Activities*, 19<sup>th</sup> Edition.

Safe Work Australia (2016), *Workplace Traumatic Injury Fatalities, Australia, 2016*.

Safe Work Australia (2015), *The Cost of Workplace Injury and Illness for Australian Employers, Workers and the Community 2012-13*.

Safe Work Australia (2014), *Key Workers Compensation Information, Australia 2014*.

Safe Work Australia (2013), *Key Workers Compensation Information, Australia 2013*.

Safe Work Australia (2013), *The Effectiveness of Work Health and Safety Interventions by Regulators: A Literature Review*, Canberra: Safe Work Australia.

Safe Work Australia (2012), *The Australian Workplace Barometer: Report on Psychosocial Safety Climate and Worker Health in Australia*, December 2012.

Safe Work Australia (2011), *Decision Regulation Impact Statement for National Harmonisation of Work Health and Safety Regulations and Codes of Practice*, 7 November 2011. Scholz J.T.

and Gray W.B. (1990), 'OSHA enforcement and workplace injuries: A behavioral approach to risk assessment', *Journal of Risk and Uncertainty*, 3(3): 283-305.

Summerfield M., Bevitt A., Freidin S., Hahn M., La N., Macalalad N., O'Shea M., Watson N., Wilkins R. and Wooden M. (2017), *HILDA User Manual – Release 16*, Melbourne Institute of Applied Economic and Social Research, University of Melbourne.

Takala J., Hämäläinen P., Saarela K.L., Yun L.Y., Manickam K., Jin T.W., Heng P., Tjong C., Kheng L.G., Lim S. and Lin G.S. (2014), 'Global estimates of the burden of injury and illness at work in 2012', *Journal of Occupational and Environmental Hygiene*, 11(5): 326-37.

Viscusi W.K. (1979), 'The impact of occupational safety and health regulation', *The Bell Journal of Economics*, Apr 1:117-40.

Warner M., Schenker N., Heinen MA., Fingerhut L.A. (2005), 'The effects of recall on reporting injury and poisoning episodes in the National Health Interview Survey', *Injury Prevention*, 11(5): 282-7.

Weil D. (1996), 'If OSHA is so bad, why is compliance so good?', *The RAND Journal of Economics*, Oct 1: 618-40.

Wooldridge J. (2002), *Econometric Analysis of Cross Section and Panel Data*, Cambridge, MA: MIT Press.

Work Safe Victoria (2019), *Occupational Health and Safety Act and Regulations*, available at: <https://www.worksafe.vic.gov.au/occupational-health-and-safety-act-and-regulations> [accessed 29 November 2019].

Work Safe Victoria (2017), *A Guide to Falls Prevention*, Edition 2, June 2017.



## 1.8 Paper 1 Appendix

**Table 0.11: Major legislative changes in harmonised states versus law in Victoria (comparator state) (Appendix Table)**

Major changes in harmonised states – WHS Act (2011)	Law in comparator state, Victoria – OHS Act (2004)
<p><b>Redefinition of traditional employer–employee relationship and broadened definition of the workplace.</b>            Sections 7 and 19            * Defining worker as an employee, contractor or subcontractor, employee of a contractor or subcontractor, an employee of a labour hire company who has been assigned to work in the person’s business or undertaking, outworker, apprentice or trainee, student gaining work experience, volunteer or person of a prescribed class            * Extending primary duty of care beyond the employer–employee relationship by defining duty-holder as a ‘person conducting a business or undertaking’ (PCBU)</p>	<p>Sections 21 and 23            * Definition still in terms of employer–employee relationship            * Employer defined as person, company partnership, unincorporated association, franchising operation, or not-for-profit organisation with one or more employees            * Reference to an employee does include reference to an independent contractor engaged by an employer and any employees of the independent contractor; and (b) the duties of an employer extend to an independent contractor engaged by the employer, and any employees of the independent contractor, in relation to matters over which the employer has control or would have had control if not for any agreement purporting to limit or remove that control.</p>
<p>Section 20            * Defines duty of persons conducting a businesses or undertaking involving management or control of workplaces – that the workplace, the means of entering and exiting the workplace, and anything arising from the workplace, are so far as is reasonably practicable, without risk to the health and safety of any person.</p>	<p>Section 26  <b>Narrower definition:</b> Duties of persons who manage or control workplaces – ensure so far as reasonably practicable, that the workplace and the means of entering and leaving it are safe and without risks to health. Note: these provisions are limited to the matters over which the person has management or control.</p>
<p>Sections 22–26            * Defines duties of persons conducting businesses or undertakings that: • design plant or structures (section 22) • manufacture plant, substances or structures (section 23) • import plant, substances or structures (section 24) • supply plant, substances or structures (section 25) • install, construct or commission plant or structures (section 26)</p>	<p>Sections 27–31            A person who: • designs plant (section 27) • designs buildings or structures (section 28) • manufactures plant or substances (section 29) • supplies plant or substances (section 30) • installs, erects or commissions plant (section 31)   <b>The harmonised laws require designers to consider the safety of those who construct structures, while the Victorian laws focus only on end-users of the structure.</b></p>
<p>Sections 13–16            Principles that apply to duties: • Duties not transferrable • A person can have more than one duty • More than one person can concurrently have the same duty; each duty holder must comply with that duty to the standard required by this Act even if another duty holder has the same duty.</p>	<p>No equivalent provisions.</p>
<p><b>Increased financial penalties for WHS breaches, with the maximum penalty almost double the highest penalty previously set.</b>            Section 31 – penalties for reckless conduct            Individual: \$300,000 / 5 years jail</p>	<p>Section 32 – penalties for reckless conduct            Individual: 1800 penalty units / 5 years jail (\$219,852 at 1 July 2011)</p>

<b>Major changes in harmonised states – WHS Act (2011)</b>	<b>Law in comparator state, Victoria – OHS Act (2004)</b>
Officer: \$600,000 / 5 years jail Body corporate: \$3,000,000	Body corporate: 9000 penalty units (\$1,099,260 at 1 July 2011)
Section 32 and Section 33 offences – breach of safety duty Individual: \$150,000 Officer: \$300,000 Body corporate: \$1,500,000	Section 21 – breach of safety duty Individual: 1800 penalty units (\$219,852 at 1 July 2011) Body corporate: 9000 penalty units (\$1,099,260 at 1 July 2011)
Sections 84–89 A worker may cease/refuse to carry out work if the worker has a reasonable concern that to carry out the work would expose the worker to a serious risk to the worker’s health or safety, emanating from an immediate or imminent exposure to a hazard. A worker must notify the PCBU they have ceased work and remain available for alternative work; continuity of engagement is specified; an inspector may be called to assist.	No similar provisions in Victoria.
Section 46 Duty to consult, cooperate and coordinate with other duty holders who have a duty in relation to the same matter.	No similar prescribed duty.
Sections 80–82 and Regulations 22–23 Issue Resolution Establish requirement to have an agreed procedure to deal with WHS issues or to apply the default procedure outlined in the regulations. Regulations provide both a default procedure and minimum requirements for an agreed procedure. Agreed procedure must include all of the requirements in the default procedure.	Sections 73–75 and Regulations 2.2.1–2.2.4 Issue Resolution Establish a requirement to have an agreed procedure to deal with WHS issues or to apply the default procedure outlined in the regulations and regulations provide a default procedure. However, silent on whether the agreed procedure must include the requirements of the default procedure.
<b>Specific topics</b>	
<b>Confined spaces (Model WHS Laws – Part 4.3 and Code of Practice, Victorian OHS Laws Part 3.4 and Compliance Code)</b> Broader definition in model WHS laws than Victorian laws – which may have led to increased identification of such spaces in the workplace.	
<b>Falls (Model WHS Laws – Part 4.4 and Code of Practice, Victorian OHS Laws – Part 3.3 and Code of Practice)</b> WHS laws – cover the risk of all falls Victoria – 2 metres or above	
<b>Excavation work</b> The model WHS regulations have a specific obligation to manage the risks of excavation work, while Victorian laws are silent on this issue. Victoria has no specific requirements to notify excavation work, with no equivalent provision in the WHS regulations.	
<b>Construction projects and principal contractors</b> Both WHS and Victorian laws specify the need to appoint a principal contractor on construction work worth \$250,000 or more. WHS laws establish specific obligations in relation to providing amenities and controlling risks, but Victorian laws are silent on this.	

Source: Australian Industry Group (2011)