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Do standardised workplace health and safety laws and increased enforcement activities reduce the probability of receiving workers' compensation?

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Keywords: workplace health and safety, Australia, workers' compensation, causal analysis, workplace injury
JEL Classifications: D04, I18, J28; J38; L52

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Introduction: study objectives and related literature

Globally, 2.3 million deaths are linked to workplace injury and disease each year. The economic costs of workplace injury and disease 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, including 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. In 2018, over half a million (563,600) Australian workers experienced a workplace injury or illness, and one-fifth (107,335) of these injuries progressed to workers' compensation claims, resulting in one or more weeks off work (ABS, 2018; Safe Work Australia, 2020).

Workplace health and safety (WHS) is subject to transaction costs and information asymmetries since employees are not fully informed about job risk, and compensating wage differentials may be inadequate. Injury severity and workers' prevention efforts may not be visible to employers (Kankaanpaa et al., 2008), and employers do not bear the entire cost from a worker's ill health. Regulations, penalties, and incentives exist to reduce the likelihood of workplace injury or illness by impacting workplace behaviour (Chelius, 1976), including firm decisions on equipment choice, training, and risk management, and worker decisions on preventative efforts and process compliance.

Australia follows the Robens model for WHS law (Commonwealth of Australia, 2008). The Robens model 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 the power to impose administrative sanctions and bring prosecutions, and a framework for self-regulation and consultation (Boland, 2018). In July 2008, all Australian states and territories formally expressed their support for standardising WHS laws under a single model framework and approach by signing the *Intergovernmental Agreement for Regulatory and Operational Policy in Occupational Health and Safety* (COAG, 2008), a policy process known as 'harmonisation'.

Standardisation of WHS laws occurred across Australia in two waves. The Commonwealth, New South Wales (NSW), the Australian Capital Territory (ACT), the Northern Territory (NT) and Queensland implemented the policy on 1st January 2012 ('first wave'). South Australia (SA) and Tasmania implemented the policy on 1st January 2013 ('second wave'). Victoria and Western Australia (WA) did not standardise their WHS laws in either wave, despite signing the Intergovernmental Agreement.

The stated objectives of standardising WHS laws were to enable uniform, equitable and effective safety standards for all Australian workers, reduce compliance and regulatory burdens for multi-jurisdictional businesses, create government efficiencies, and achieve significant and continual reductions in the incidence of death, injury, and disease in the workplace (COAG, 2008). Before the policy, there were variations in WHS laws between states and territories on duties of care, consultation practice, 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 significant regulatory burdens faced by multi-jurisdictional businesses (Safe Work Australia, 2014).

This paper explores how standardising WHS laws and increasing enforcement activities impacted workers' probability of receiving workers' compensation in the past year. The extent of workers' compensation reflects workplace injury and disease prevalence. Past studies have used workers' compensation claims to determine the relative effectiveness of WHS policy on injury reduction (Lane et al., 2016). However, workers' compensation claims are not a perfect proxy for injury and disease prevalence as they cover a subset of all workplace injuries and do not include workplace fatalities.

Moreover, not every workplace injury progresses to an accepted claim. Some injuries are minor, may not cause undue pain or disability, or have an estimated treatment cost or lost time value less than an employer's excess. Thus, receipt of workers' compensation (i.e., accepted claims) is likely to indicate the incidence of serious workplace injuries (Lane et al., 2016). Past Australia-specific research has found that many injuries often go unreported and that claims data underreport the true incidence of workplace injury and disease (Drexel, 1992; National Occupational Health and Safety Commission, 2004; O'Neill et al., 2013; Zadow et al., 2017). Furthermore, psychological injuries are more likely to be underreported than physical injuries (Zadow et al., 2017).

Workers' compensation claims may also mask incentive effects or behavioural changes. These include worker moral hazard created when increased workers' compensation benefits lead to workers reducing their accident prevention efforts, making more legitimate or fraudulent claims, or taking more time off work (Boden and Ruser, 2003; Collie et al., 2016; Krueger, 1990; Lane et al., 2019; Meyer et al., 1995). These incentive effects have been identified in Australia. With all states and territories having their own set of workers' compensation benefit

levels and dispute resolution processes (Safe Work Australia, 2020), the average workers' compensation duration differs across Australian states and territories (Collie et al., 2016). Recent studies from the United States (US) have found negligible moral hazard effects (Huet-Vaughn and Benzarti, 2020), which could reflect changes from more careful employer and insurer screening of claims and more sophisticated employer WHS programs (Boden and Galizzi, 2016).

Another type of incentive effect is stricter regulation and penalties leading to workers being discouraged from making claims by employers or employees fearing negative work consequences from reporting injury (Boden and Galizzi, 2016; Fan et al., 2006; Moore et al., 2013). There are no empirical studies on the extent of this 'claim suppression' incentive effect existing in Australia, although it may exist in Canada, particularly within smaller workplaces and for immigrant workers (Prism Economics and Analysis, 2013).

While self-reported workplace injuries are a more expansive and direct measure of worker health than self-reported workers' compensation receipt, it may be more subject to recall bias and self-reporting error (Warner et al., 2005; Zadow et al., 2017). Any changes to workers' compensation claims may reflect reduced injury, increased claim suppression, or both. We acknowledge this as a limitation of our study but suggest claim suppression in Australia is likely to be insignificant compared to changes in workplace injury, given we have concurrent data that shows workplace injury has declined since WHS laws were standardised.

Standardising WHS laws occurred in six out of eight states and territories and presented a unique natural experiment through creating treatment and control groups based on jurisdiction. Variations in implementation by state and territory are relatively rare in Australian policy (Cobb-Clark, 2013). We exploit this variation to estimate the impact of standardising WHS laws using difference-in-difference (DID) estimation on individual-level panel data in the Household, Income, and Labour Dynamics in Australia (HILDA) survey.

Standardising WHS laws created several changes across states and territories. It expanded the duty of care definition[1] and the employer-employee relationship and removed the reverse' onus of proof' in NSW and Queensland[2]. It introduced additional criminal penalties and increased financial penalties for WHS breaches, increased consultative duties, allowed for greater union rights of entry into a workplace, and increased regulator ability to accept enforceable undertakings (Boland, 2018; Productivity Commission, 2012). A 2018 post-implementation review of standardising WHS laws found they were operating as intended (Boland, 2018). National data also show an increase in enforcement activities after the policy change, including enforceable undertakings and proactive and reactive workplace visits (Boland, 2018; Safe Work Australia, 2017; 2018).

Managers reported several workplace improvements after standardising WHS laws, including increased WHS engagement, procedural changes in contractor relationships, reduced injuries, and reduced regulatory burden for multi-jurisdictional business. These primarily resulted from increased penalties and increased accountability (Gunningham, 2016). Employee-perceived workplace psychological health and safety also improved in states and territories that

[1] 'Duty of care' refers to responsibility for the health and safety of other parties in the work environment (SafeWork NSW, 2021).

[2] 'Reverse onus of proof' means that burden lay on the 'defendant' in a WHS case to prove that they had done everything reasonably practicable to prevent a contravention. The removal of reverse onus of proof restored the presumption of innocence, and moved burden to the prosecution in a case, to prove the defendant had not done everything practicable to prevent injury (SafeWork NSW, 2015).

standardised their WHS laws (Potter et al., 2017). However, low sample size (Gunningham, 2016) and lack of comprehensive data (Potter et al., 2017) confounded these conclusions.

To the best of our knowledge, a comprehensive evaluation of whether standardising WHS laws met stated policy objectives has not been undertaken. While minimising workplace injury is a primary policy objective, it has received little research attention (Collie et al., 2016; Lane et al., 2019; Potter et al., 2017), which has inhibited accountability and rendered the impact of WHS regulations on workplace health and wellbeing uncertain.

Past studies from the US have used firm or industry-level injury and claim data to analyse the impact of 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).

While early US studies found limited impact from older standards (Viscusi, 1979; Curington et al., 1986; Bartel and Thomas, 1985), more recent studies have found greater impact (Gray and Scholz, 1991; Haviland et al., 2012; Scholz and Gray, 1990). Increases in enforcement activities and penalties have reduced injury rates (Scholz and Gray, 1990), and workplace inspections with penalties (enforcement visits) have reduced claims. Industry-specific legislation, such as stricter standards in falls arrest systems, have also decreased injury (Lipscomb et al., 2003). Furthermore, longitudinal analysis of administrative data finds programmed (proactive) inspections may be more effective than complaint (reactive) inspections in reducing injury (Haviland et al., 2012). Haviland et al. (2012) report inspections with penalties reduced injuries by 19–24% on average per year for mid-sized workplaces.

Research from Canada (Lanoie, 1992) and Spain (Arocena et al., 2008) confirms the importance of WHS enforcement and regulation design on injury reduction. These include worker rights to refuse hazardous tasks, prevention programs including worker training and supervision, inspections, disclosure requirements (Lanoie, 1992), and innovative measures such as quality management tools and worker empowerment (Arocena et al., 2008).

Our study is the first to analyse the impact of standardising WHS laws and increasing enforcement activities on the probability of receiving workers' compensation in Australia. It explores whether standardising WHS laws potentially reduced workplace injury and disease, adding to the broader literature on workplace regulation impacts on injuries and claims. Our study is also the first to use the HILDA survey to analyse workers' compensation claims over time. Similar to Galizzi (2012) and Dong et al. (2016), we employed rich longitudinal data to control for individual-level covariates associated with claims, including demographics, educational attainment, occupational characteristics, and current health status and behaviours. HILDA data also allowed us to evaluate the impact of standardising WHS laws on workers' compensation claims across multiple industries.

Our results suggest standardising WHS laws reduced the probability of a worker receiving workers' compensation in the past year by 0.9 percentage points ($p=0.047$). Subgroup analysis finds larger and more significant reductions of 2.9-3.6 percentage points in the construction industry ($p=0.030$). We discuss the potential reasons underlying policy effects in our conclusions (Section 6).

The remainder of this paper is organised as follows. Section 2 describes the policy context, including state and territory and industry-specific factors and presents national data trends on workplace injuries, claims and enforcement. Section 3 describes the data and variables used

and includes a descriptive analysis of the dependent variable and covariates. Section 4 describes the estimation approach. Section 5 includes the policy effect estimates and sensitivity checks to test the robustness of the estimates. Section 6 concludes with a discussion of key findings.

Policy context

Policy implementation timeline

The policy to standardise WHS laws in Australia ('harmonisation') was initiated through the Council of Australian Governments (COAG) National Policy Agenda to reduce regulatory burden and create a seamless national economy (Safe Work Australia, 2019). Before the policy, 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 substantial regulatory burdens faced by multi-jurisdictional businesses (Safe Work Australia, 2014).

The policy was initiated with the establishment in July 2008 of the *Intergovernmental Agreement for Regulatory and Operational Policy 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 monitor and maintain policy implementation (Safe Work Australia, 2011). States and territories committed to adopting and implementing a 'model' or standardised 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 1**). The Commonwealth, states and territories were required to enact legislation that reflected the standardised laws by the end of 2011 (Safe Work Australia, 2011). Implementation by individual states and territories was needed for the laws to become legally binding (Safe Work Australia, 2019).

The Commonwealth, NSW, ACT, NT and Queensland subsequently implemented the standardised WHS laws on 1st January 2012 (first wave), and SA and Tasmania implemented the standardised WHS laws on 1st January 2013 (second wave). WA recently committed to implementing the standardised WHS laws, with the WHS Bill's passing through the WA Legislative Assembly in February 2020 (Parliament of Western Australia, 2020).

To date, Victoria is the only state that has not committed to implementing the standardised WHS laws, despite initially signing the Intergovernmental Agreement. The Victorian government has suggested the standardised WHS laws would be a 'step backwards', damaging small and medium-sized business, reducing productivity and causing job losses (Windholz, 2013). As a result, Victoria's primary WHS law remains the Occupational Health and Safety Act 2004 (Work Safe Victoria, 2019). However, the statement that the standardised WHS laws would be a 'step backwards' for Victoria can be disputed. The model laws contain several components stricter than the existing Victorian WHS law (discussed further in Section 2.2).

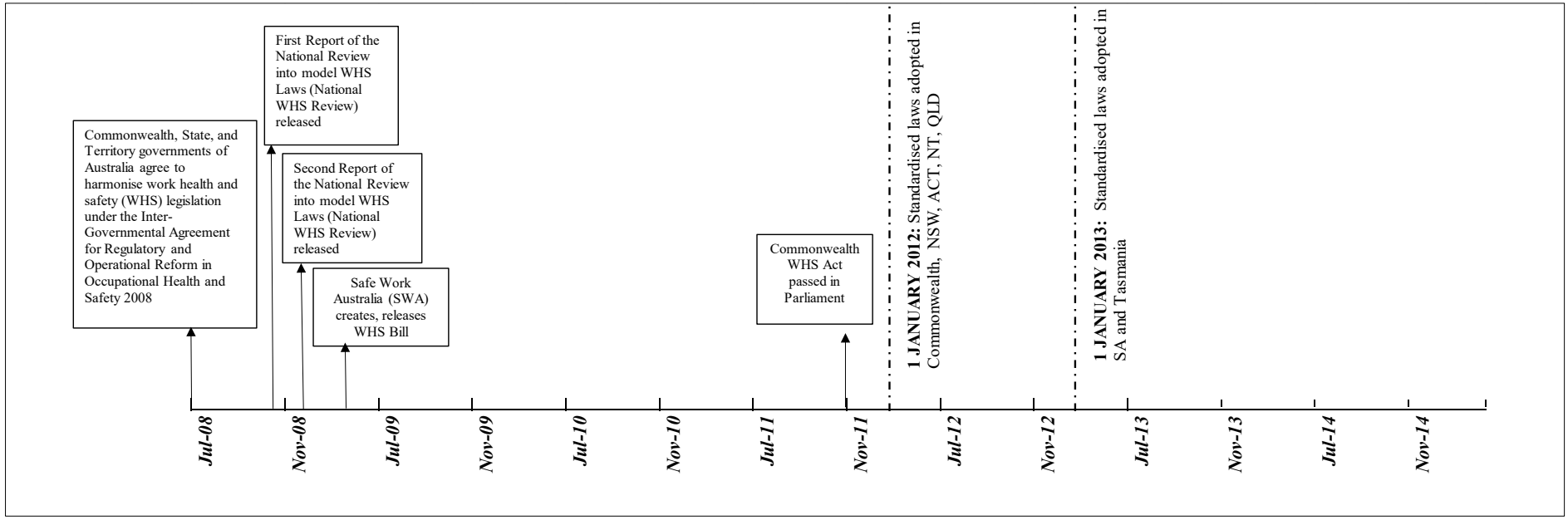

Figure 1: Timeline of policy implementation

Source: Safe Work Australia (2011; 2019)

The objectives of standardising WHS law and the major changes introduced

The fundamental objective of standardising WHS laws 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 across all organisations regardless of size or industry. The framework is outcomes-based, meaning it defines safety and compliance outcomes resulting from regulation, rather than being too prescriptive on approach. This framework allows organisations and states, and territories to tailor their WHS approach and risk-management processes to suit their specific circumstances and industry mix (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 standardised 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 fulfil WHS duties, while codes provide practical information on how the WHS Regulations may be met (Boland, 2018).

A significant change introduced by the standardised WHS laws was a broadened definition of the traditional employer-employee relationship and the 'workplace' to recognise the changing nature of work and employment (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 included (Boland, 2018; Productivity Commission, 2012):

- removal of reverse' onus of proof' in NSW and Queensland;
- introduction of criminal penalties for offences and increased financial penalties for WHS breaches (the maximum penalty was doubled);
- allowance for union rights of entry to a workplace to enquire into suspected contraventions; and
- the ability of the regulator to accept written, legally binding, enforceable undertakings to take specified action to rectify breaches or improve performance.

Appendix Table A1 summarises legislation changes in states and territories that adopted the standardised WHS laws compared to the existing WHS law in Victoria. This table shows changes in broad definitions and duties for states and territories that standardised their WHS laws, and specific law changes for 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 standardised WHS 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 standardised WHS laws contain a specific obligation to manage excavation work risks, excluded in Victorian laws. Some standardised WHS laws and regulations are more stringent and stricter than Victorian WHS laws, particularly for the construction industry.

Factors affecting estimation of the policy effect

The implementation of the policy across jurisdictions, workplaces and industries

While the policy to standardise WHS laws introduced broadened legal definitions and specified changes to duties, regulations and penalties, the ultimate impact on workers' compensation receipt and worker health depends on policy implementation across workplaces and industries (Bluff and Gunningham, 2012). Since the standardised WHS laws are outcomes-based, they allowed each state or territory some flexibility in implementation rather than being prescriptive, particularly in administration and enforcement, to suit each state or territory's specific industry mix. The Intergovernmental Agreement allows states and territories to enact additional provisions that do not affect the standardised WHS laws' operation (Bluff and Gunningham, 2012).

Table 1 shows differences in industry-specific legislation between states and territories before the policy, which illustrates that each state or territory had a different mix of legislation to cater to its specific industry mix. A pre-policy review (Australian Government, 2009) noted that the extent to which different industry-specific Acts addressed WHS varied markedly. Different obligations were often placed on employers, employees and suppliers across different states and territories, and there were differences in enforcement. There were economic inefficiencies for businesses operating in more than one state or territory, and incentives existed for business to locate in lower-regulation states or territories.

Table 1: Pre-policy differences in industry-specific legislation between states and territories

Provision	*NSW*	*VIC*	*QLD*	*WA*	*SA*	*TAS*	*NT*	*ACT*
General OHS Act	✔	✔	✔	✔	✔	✔	✔	✔
Mining	✔	✔	✔	✔	✔		✔	
Dangerous goods		✔	✔	✔	✔	✔	✔	✔
Electrical safety			✔	✔				
Explosives			✔		✔			
Maritime	✔	✔	✔	✔	✔	✔	✔	
Radiation	✔	✔	✔	✔	✔	✔	✔	
Petroleum and Gas	✔		✔					
Miscellaneous	✔	✔		✔				✔

Source: Adapted from Australian Government (2009)

Due to various interactions between the standardised WHS laws and prior WHS arrangements across states and territories, it is difficult to assess whether the policy uniformly increased or decreased the strictness of WHS law across states and territories or to measure the 'intensity' of treatment. Windholz (2013) notes several significant changes were made that increased consistency across states and territories through simplification of common aspects and definitions in prior WHS laws. Overall, states and territories that standardised their WHS laws implemented broader employer duties, enhanced consultation processes, and increased unions' power. However, the Model Act and Regulations were not inclusive of several state or territory-specific regulations (Windholz, 2013). These include Queensland's requirement that businesses

with over 30 employees appoint WHS Officers and the requirement for PCBUs to engage in proactive and systematic processes of identifying, assessing, controlling and monitoring workplace risks and hazards, which existed in Queensland, NT and ACT before the standardised WHS laws were introduced. Removal of reverse onus of proof in NSW and Queensland was also seen as a weakening of employee protections by unions (Windholz, 2013).

A review of state and territories' specific arrangements before the policy reveals variations in whether a state or territory's regulations were made stricter by the policy or not, depending on the subject matter (see **Appendix Table A2**). For example, there were variations in worker obligation to report injury, illness, accident or risk to employers, with these provisions being found in WA, NT and ACT, but not in the other states and territories. Provisions for worker rights to refuse unsafe work existed in WA, Tasmania, NT and ACT, and Victoria and SA (under the direction of health and safety representatives). No such provisions existed in NSW and Queensland. Victoria was the only state or territory to define 'worker health' explicitly and include psychological health within this definition in its laws. As discussed in Section 2.2, however, many changes introduced through the standardisation were stricter than existing Victorian law.

One conclusively stricter change introduced by the standardised WHS laws was increased penalties for WHS offences and the introduction of criminal penalties. The maximum penalty set by the model laws was almost double the highest penalty previously set (Boland, 2018). Before the policy, NSW had the largest fine for a corporation and WA had the largest fine for an individual.

A 2018 post-implementation review concluded that the standardised WHS laws were operating as intended (Boland, 2018). National data on enforceable undertakings, proactive and reactive workplace visits and improvement notices issued indicate that states and territories increased enforcement activity after standardised WHS laws were introduced. The number of enforceable undertakings had tripled from 10 in 2011-12 to 33 in 2016-17.

Figure 2 shows a steeper increase in proactive workplace visits in states and territories that standardised WHS laws. Similarly, reactive workplace visits (those related to an incident or complaint) rose faster in treated states and territories since they introduced standardised WHS laws. Simultaneously, there has been a general decline in the number of notices issued for WHS breaches (**Figure 3**). Differences in visits and notices issued suggest potential differences in safety outcomes within states and territories. The steeper increase in proactive visits in states and territories that standardised WHS laws 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 states and territories that standardised WHS laws may relate to the increase in proactive visits, with this form of inspection resulting in increased detection of potential safety issues, leading to follow-up, reactive visits.

Overall, national data indicate that standardising WHS laws likely increased enforcement activity. To test the robustness of standardising WHS laws on specific states and territories-(including pre-policy differences in law), we undertake a sensitivity analysis in Section 5.4, deleting one state or territory at a time.

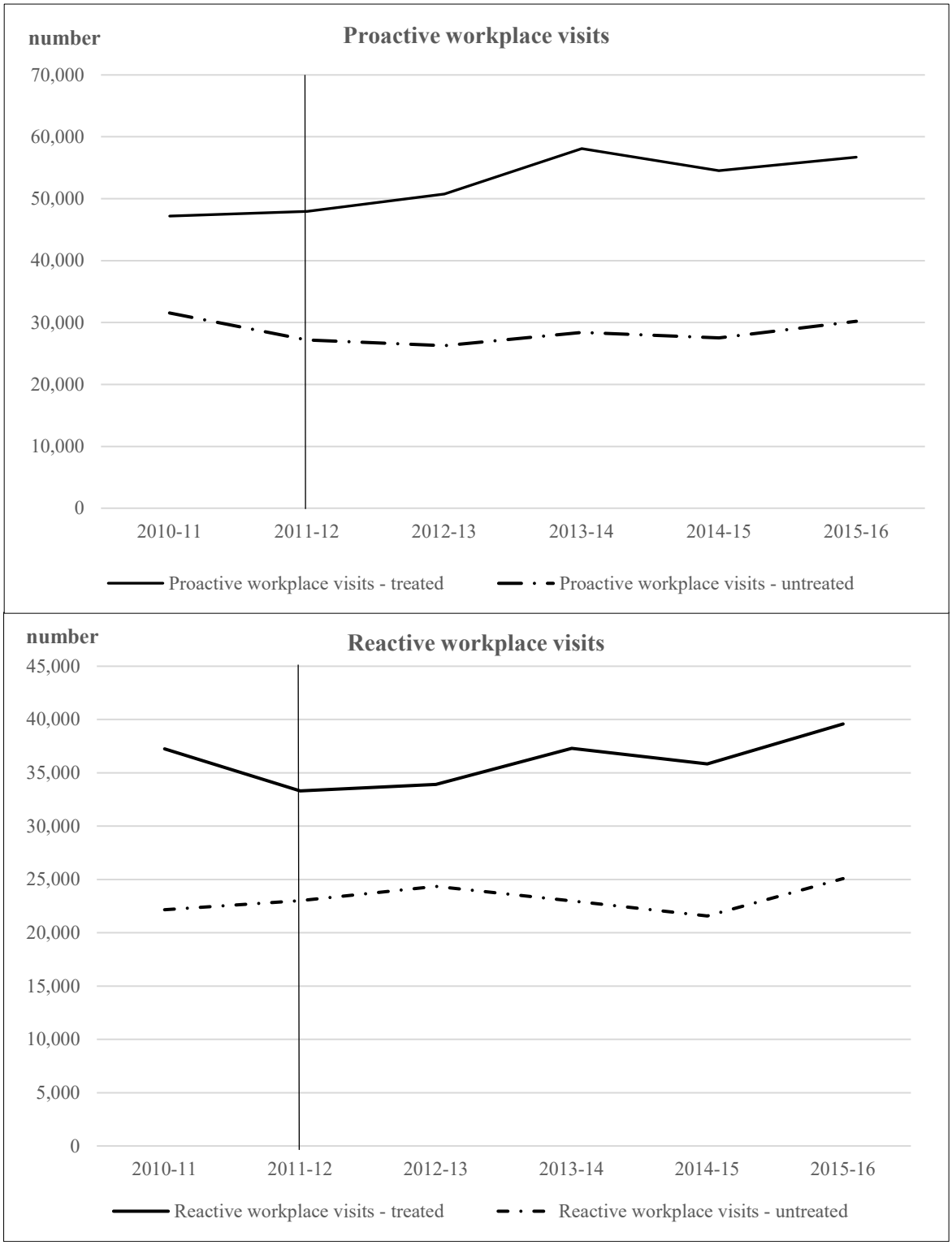

Figure 2: Proactive and reactive workplace visits – treated (NSW, ACT, NT, Queensland, Tasmania, SA) and untreated (Victoria, WA) states and territories

Source: Safe Work Australia (2017; 2018)

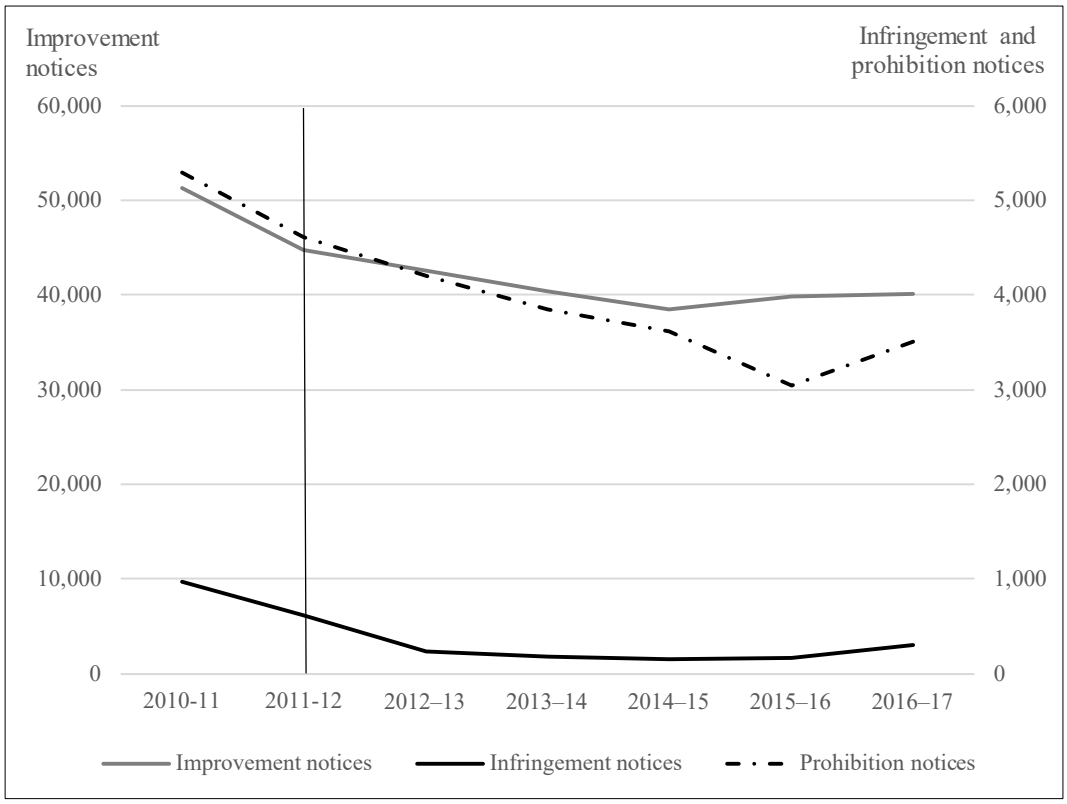

Figure 3: Number of notices issued in Australia*

Note: * It is problematic to compare data on notices across states and territories. Notices are issued differently in each state or territory (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)

Another issue in policy effect measurement is potentially different implementation across organisations and industries. Large businesses may better implement regulatory changes due to a better understanding of compliance and reputation concerns. Businesses operating in 'high-risk' sectors are more receptive to implementing new laws and regulations (Safe Work Australia, 2013; Gunningham, 2016). We conduct separate estimations for four high-risk industries to examine whether the policy's impact differed for high-risk industries.

Changes in workers' compensation benefits in NSW

Moral hazard may drive workers' compensation claims through incentive effects, with more generous 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 policy effect.

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 in NSW around the same time as WHS laws were standardised (Lane et al., 2016). This legislation 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, limiting 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 potentially confounded the policy effect estimation. The decreased generosity of income replacement payments and workers' compensation benefits in NSW would reduce the incentive to seek workers' compensation in NSW, and therefore may bias upward our estimated policy effect. To test this potential bias, we exclude NSW from the treatment group and re-estimate the policy effect in a sensitivity analysis (Section 5.3).

Trends in national data: injuries and fatalities before and after policy introduction

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 and territories in 2006 and 2010 but experienced a substantial reduction between 2010 and 2014 (**Figure 4**). NT, Queensland and Victoria also experienced a decline in workplace injuries between 2010 and 2014, while Tasmania and WA experienced increased injury rates.

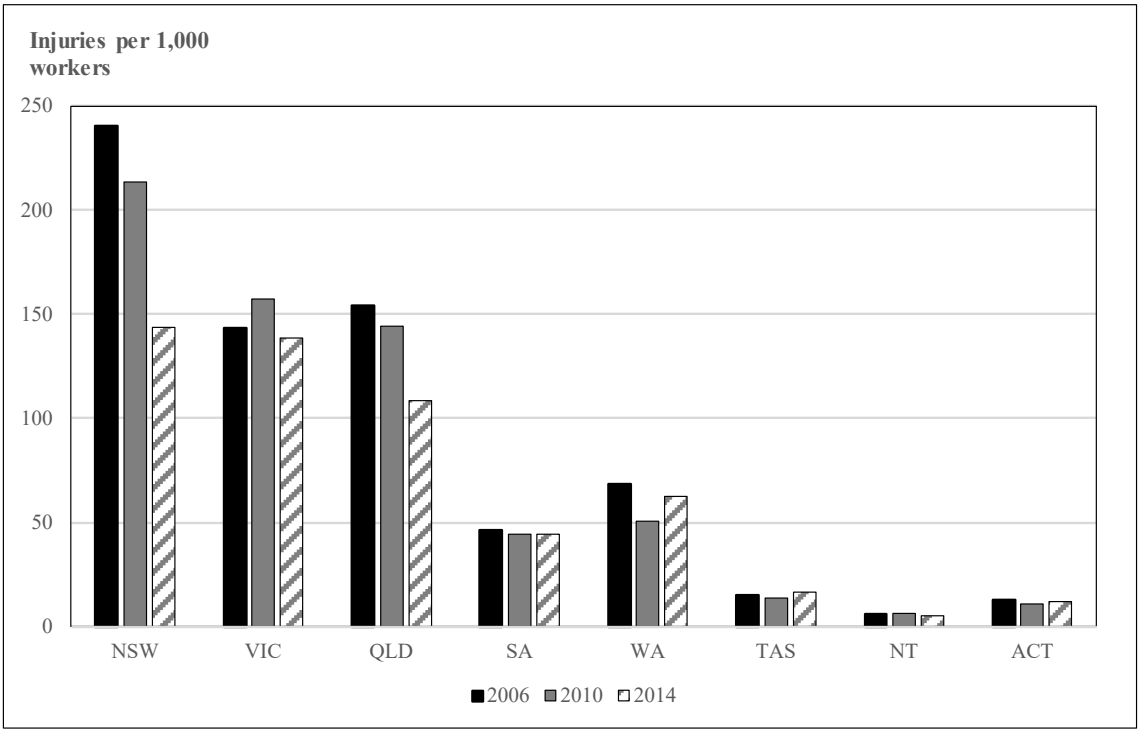

Figure 4: Workplace injuries per 1,000 workers by state or territory

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 5** to **Figure 7** disaggregate the trends in workplace injuries, serious claims incidence and worker fatality by states and territories that introduced standardised WHS laws and those that did not.

Figure 5 shows a steep decrease in the average, population-weighted workplace injury rate for states and territories that introduced standardised WHS laws between 2010 and 2014. The average rate for untreated states had a relatively small decrease. **Figure 6** and **Figure 7** also show coinciding declines in the population-weighted rates of serious claim and worker fatality after policy introduction for all states and territories, but with steeper declines for states and territories that standardised their laws.

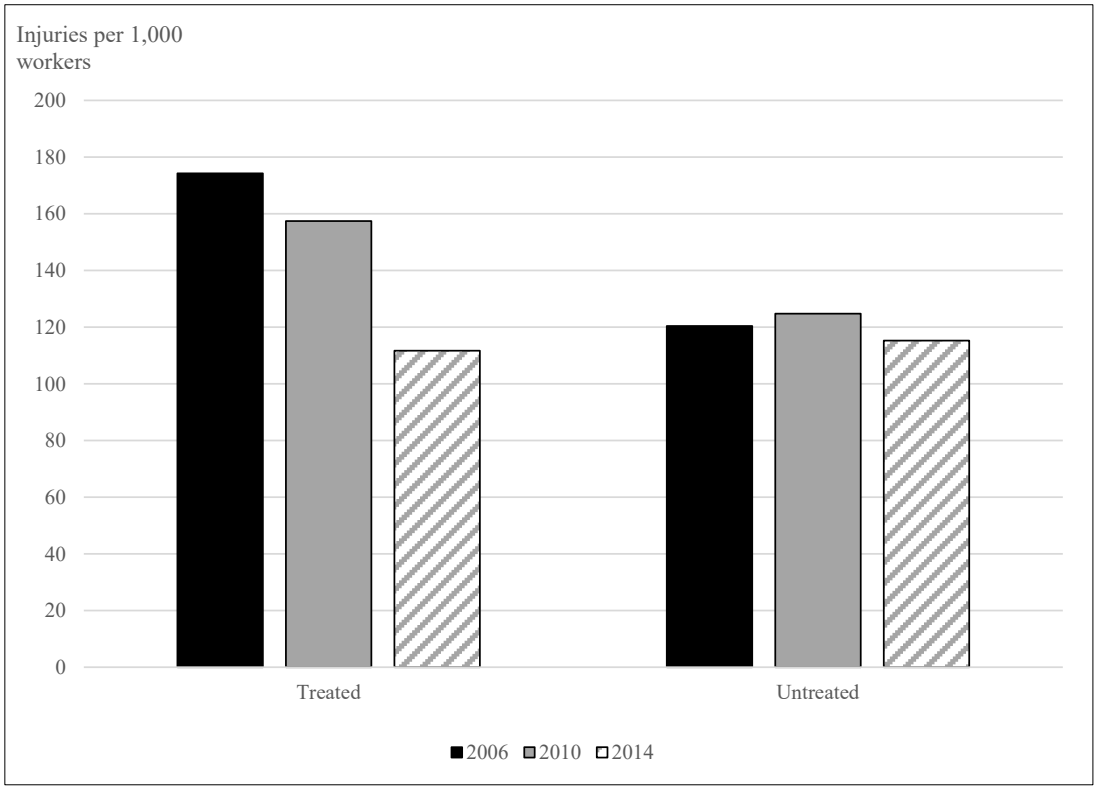

Figure 5: Workplace injuries per 1,000 workers by treated states and territories (NSW, ACT, NT, Queensland, Tasmania, SA) vs. untreated states (Victoria, WA) (weighted average – by population)

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

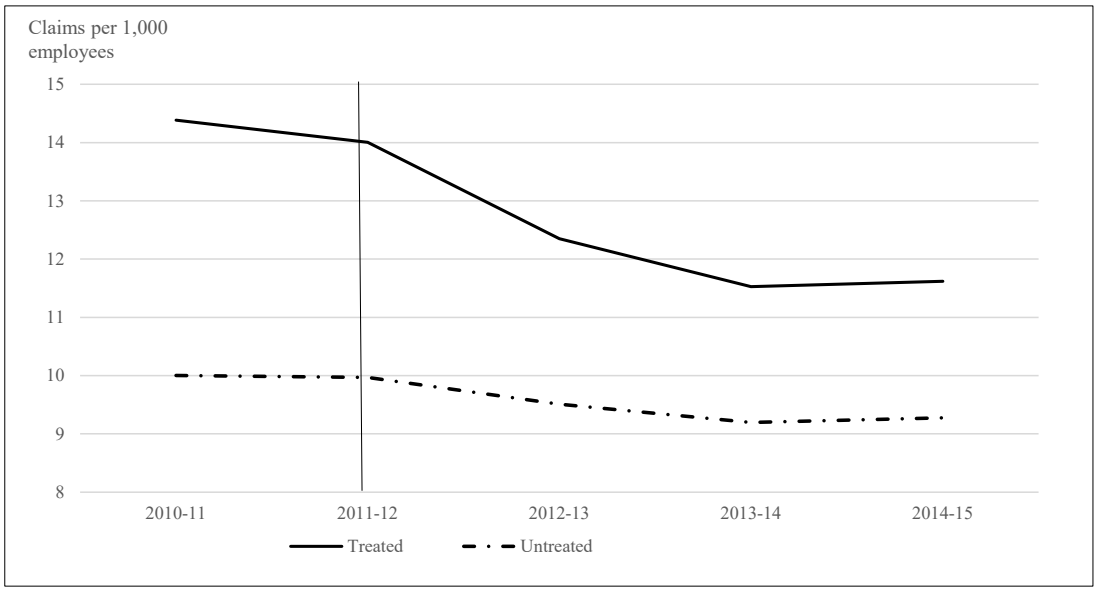

Figure 6: Incidence rates of serious injury and disease claims by treated states and territories (NSW, ACT, NT, Queensland, Tasmania, SA) vs. untreated states (Victoria, WA) (weighted average – by population)

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

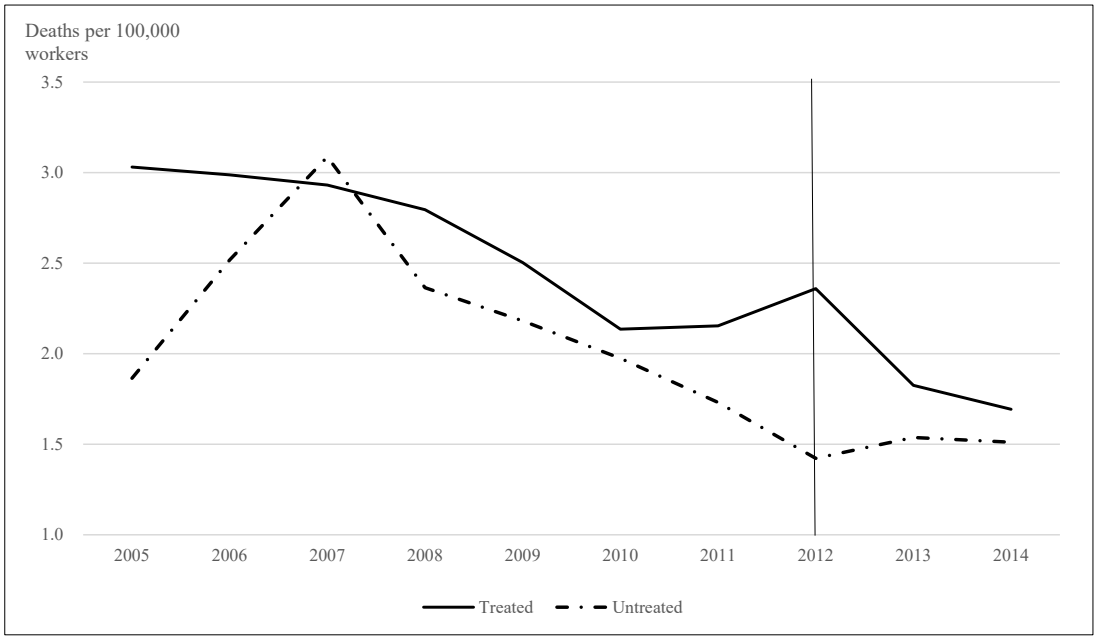

Figure 7: Worker fatality rate by treated states and territories (NSW, ACT, NT, Queensland, Tasmania, SA) and untreated states (Victoria, WA) (wtd. avg by pop)

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

Overall, national data indicate that standardising WHS laws may have reduced worker injuries and claims. The econometric estimations in Section 4 isolate whether this is a significant causal effect after controlling for other covariates which may be influencing trends.

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-policy in the baseline analyses is Wave 11 (2011), immediately before standardised WHS laws were introduced.[3] Wave 13 (2013) and Wave 14 (2014) were the post-policy waves, which are years after policy implementation. We also analysed longer-term effects of standardised WHS laws in a sensitivity analysis (Section 5.5) using pooled, post-policy years up to Wave 16 (2016).[4]

Treatment and control groups

Due to the policy's staggered implementation across states and territories, we conducted two separate estimations with different treatment and control groups. To analyse the initial (first wave) implementation of the policy on 1st January 2012, the treatment group (states and territories that standardised their WHS laws) included ACT, NSW, NT and Queensland. The control group included SA, Tasmania, Victoria and WA. Analysis of the full (second wave) implementation of the policy from 1st January 2013 considered ACT, NSW, NT, Queensland, SA and Tasmania as the treatment group, and Victoria and WA as the control group.

We used Wave 13, rather than Wave 12, as a post-policy wave to analyse initial policy implementation, and Wave 14 rather than Wave 13 to analyse full policy implementation. This was because we derived our dependent variable 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 policy introduction.

When analysing the first wave of policy implementation (1st January 2012), we could only conclusively deduce that an individual's claim in Wave 12 was in the post-policy period if their survey interview occurred in December 2012. Hence, it would not be accurate to use Wave 12 as a post-policy wave. Similarly, when analysing the second wave of policy implementation (from 1st January 2013), this issue pertained to using Wave 13 as a post-policy wave.

Since standardised WHS laws were legislated to be adopted by all states and territories (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 reduced the chance of confounding from changes in other policies. However, we included a sensitivity analysis in Section 5.5 by estimating a longer-term policy effect, which also avoids confounding from post-policy fluctuations in the dependent variable (further discussed in Section 3.2). Our sample sizes for the baseline estimations were 14,680 for the first wave analysis (7,858 in the treatment group and 6,822 in the control group), 14,821 for the second wave analysis (9,741 in the treatment group and 5,080 in the control group) and 29,868 for the longer-term analysis (19,459 in the treatment group and 10,409 in the control group).

[3] The sample was replenished in 2011 with 2,153 additional households.
[4] We thank an anonymous reviewer for suggesting this additional analysis.

Dependent variable: pre- and post-policy trends

The dependent variable analysed was a binary variable, constructed from a HILDA survey question which asked individuals whether they spent any time on workers' compensation during the last 12 months (where *1*=time spent on workers' compensation, *0* otherwise).

Pre- and post-policy trends in the dependent variable's average value are presented in **Figure 8** and **Figure 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.

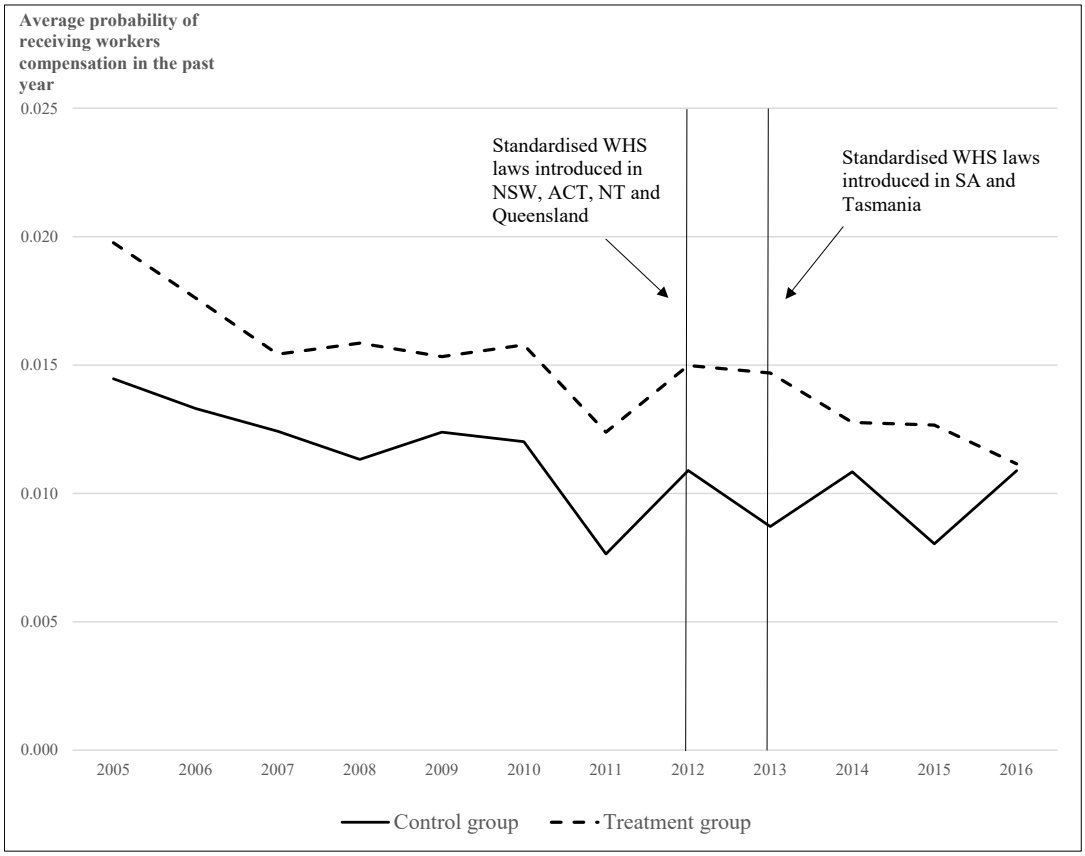

Figure 8: Average annual value of the dependent variable (workers' compensation in the past year) – initial (first wave) policy implementation (treatment group = NSW, NT, ACT and QLD, and control group = SA, TAS, VIC and WA)

Source: Authors' calculations based on the HILDA dataset.

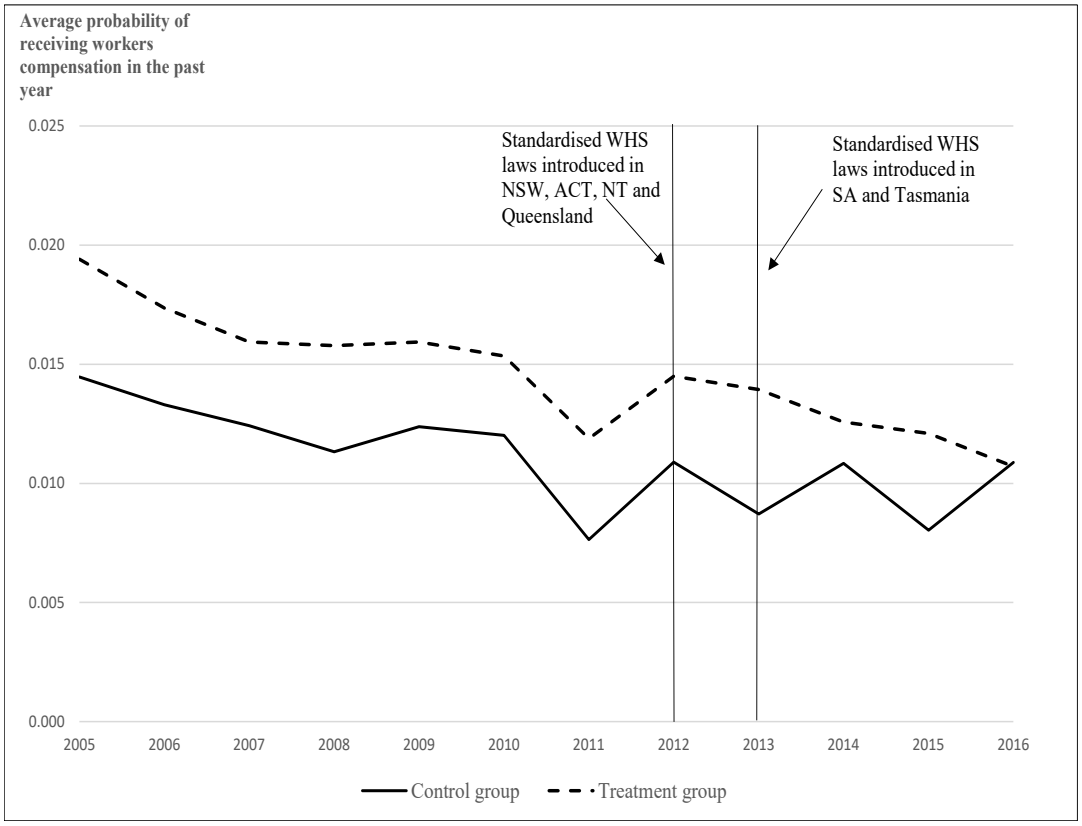

Figure 9: Average annual value of the dependent variable (workers' compensation in the past year) –full (second wave) policy implementation (treatment group = NSW, NT, ACT, QLD, SA and TAS and control group = VIC and WA)

Source: Authors' calculations based on the HILDA dataset.

On visual inspection, the workers' compensation variable's pre-policy values exhibit parallel trends between the treatment and control groups. 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-policy levels in the dependent variable would be maintained between the treatment and control groups in the absence of policy introduction (Moffitt, 1991).[5] In Section 2.4.1, we statistically confirm the presence of pre-policy parallel trends between the treatment and control groups to check this assumption's validity.

Figure 8 and **Figure 9** show a steady downward trend in workers' compensation probability for the treatment groups following the first and second policy implementation waves. In contrast, the trend for the control groups fluctuates in the post-policy period. Hence, the policy may have reduced the probability of receiving workers' compensation for treated states and territories relative to untreated states, which coincides with trends in injuries and claims in national data (Section 2.4).

[5] For those in the sample who report receiving workers' compensation 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-policy parallel trends for the treatment and control groups. Hence, in this paper, we do not analyse the impact of standardising WHS laws on the duration of workers' compensation.

A potential threat to estimating the policy effect is confounding from regression-to-the-mean effects in the dependent variable. Regression-to-the-mean effects may occur due to fluctuations in the dependent variable and measuring the dependent variable at a few points in time. A high rate in the dependent variable is more likely to be followed by 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.

Since the policy to standardise WHS laws was 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 standardised laws, many of these laws are more stringent and stricter than requirements in existing WHS law in Victoria, particularly for the construction industry. This suggests implementation of the standardised laws may hold potential gains in workplace health and safety for Victoria.

Furthermore, the fact that the dependent variable exhibits fluctuations in the control groups in post-policy years as opposed to a constant declining trend in the treatment groups 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 groups in pre-policy years.

A way to check for regression-to-the-mean effects from point-in-time fluctuations in the dependent variable is to use more years of data in policy effect calculation (Robson et al., 2001). We include a sensitivity analysis in Section 5.5 by pooling three years of data after policy introduction to calculate a longer-term effect. This analysis assists in checking for confounding from regression-to-the-mean effects.

The econometric estimations in Section 4 isolate whether the policy had a significant causal impact on individuals receiving workers' compensation in the past year in treated states and territories.

Covariates

We identified covariates 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 past 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 included age, gender (Islam et al., 2001), marital status, a dummy variable to indicate the presence of dependent children (Lanoie, 1992) and a dummy variable to indicate being from a culturally and linguistically diverse background (CALD). Covariates also included 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 included as covariates, 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 included dummy variables to indicate job type and industry to control for work-risk related factors associated with claiming. We also included a dummy variable to indicate agreement with the statement *'I have to work very intensely in my job'* to act as a proxy for work intensity.

Other covariates on health status and behaviours associated with workers' compensation claims were also included, such as self-assessed health (SAH) (Biddle and Roberts, 2003) and obesity (Ostbye et al., 2007). SAH at the time of the survey may help to control for differences in injury severity for those who received workers' compensation. 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). We created dummy variables to indicate missing values for work contract type, SAH, organisation size, hours/years worked, job type and industry, to maintain sample sizes across estimations.

In Australia, workers' compensation schemes provide income replacement based on pre-injury earnings (Safe Work Australia, 2014). We included both the logarithm of previous-year annual disposable individual income and equivalised household income as covariates to account for individual-level 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 included individual state and territory dummies to control for jurisdiction-specific characteristics and macroeconomic factors and account for state or territory-specific features of workers' compensation benefit schemes.

We provide average values of the covariates for the second wave treatment and control groups in **Table 2** for Wave 11 (2011) (pre-policy) and Wave 14 (2014) (post-policy). Covariate averages are similar between treatment and control groups. However, the control group is slightly healthier, has higher educational attainment levels, 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 were only small changes in most covariate averages between the pre- and post-policy periods for both groups, which shows the treatment and control groups' demographic and health characteristics remained relatively stable (insignificant t-statistics at the 5% level). Some significant changes occurred for educational attainment and full-time work status (increased attainment and increased full-time work from 2011 to 2014). These are apparent for both groups and, therefore, likely reflect general time trends. Industry and job type mix remained relatively stable across both treatment and control groups over time.

Table 2: Mean values for the full set of covariates – second wave control and treatment groups (pre- and post-policy)

Variable	*Control group*							*Treatment group*						
	Pre-policy (2011)			*Post-policy (2014)*			*t stat*	*Pre-policy (2011)*			*Post-policy (2014)*			*t stat*
	N	*Mean*	*std.dev*	*N*	*mean*	*std.dev*	*Difference 2011-2014*	*N*	*mean*	*std.dev*	*N*	*mean*	*std.dev*	*Difference 2011-2014*
Demographic characteristics:														
Age (years)	3,884	39.38	14.04	3,878	39.84	14.27	-1.44	7,350	39.33	14.08	7,098	39.53	14.23	-0.85
Proportion male	3,884	0.52	0.50	3,878	0.51	0.50	0.45	7,350	0.52	0.50	7,098	0.52	0.50	0.39
In married/defacto relationship	3,884	0.66	0.47	3,878	0.66	0.47	-0.45	7,350	0.67	0.47	7,098	0.67	0.47	-0.61
Presence of dependent children	3,884	0.71	1.04	3,878	0.68	1.02	1.25	7,350	0.71	1.05	7,098	0.72	1.07	-0.67
Culturally and Linguistically Diverse (CALD)	3,884	0.12	0.32	3,878	0.11	0.32	0.72	7,350	0.11	0.31	7,098	0.11	0.31	0.44
In remote/regional area	3,884	0.24	0.43	3,878	0.24	0.43	-0.01	7,350	0.35	0.48	7,098	0.34	0.48	0.23
Household size	3,884	3.00	1.34	3,878	2.93	1.34	**2.28**	7,350	2.94	1.34	7,098	2.95	1.36	-0.49
Health status/health behaviours:														
SAH poor	3,884	0.01	0.08	3,878	0.01	0.07	0.73	7,350	0.01	0.09	7,098	0.01	0.11	-1.81
SAH fair	3,884	0.07	0.25	3,878	0.07	0.26	-0.90	7,350	0.08	0.27	7,098	0.08	0.27	-0.96
SAH good	3,884	0.28	0.45	3,878	0.30	0.46	-1.59	7,350	0.32	0.47	7,098	0.32	0.47	0.37
SAH very good	3,884	0.37	0.48	3,878	0.37	0.48	-0.36	7,350	0.34	0.48	7,098	0.36	0.48	-1.89
SAH excellent	3,884	0.14	0.34	3,878	0.12	0.33	1.69	7,350	0.11	0.32	7,098	0.11	0.31	0.57
SAH missing	3,884	0.13	0.34	3,878	0.12	0.33	1.50	7,350	0.13	0.34	7,098	0.11	0.32	**3.01**
BMI obese	3,884	0.18	0.38	3,878	0.19	0.39	-1.06	7,350	0.18	0.39	7,098	0.19	0.39	-1.33
Have long-term health condition	3,884	0.15	0.35	3,878	0.14	0.35	0.23	7,350	0.17	0.38	7,098	0.18	0.38	-0.70
Drinks alcohol daily	3,884	0.04	0.21	3,878	0.04	0.19	1.66	7,350	0.05	0.22	7,098	0.05	0.21	1.38
Daily smoker	3,884	0.14	0.35	3,878	0.13	0.33	1.80	7,350	0.15	0.36	7,098	0.15	0.35	1.43
Highest educational attainment:														
Less than high school education	3,884	0.19	0.39	3,878	0.16	0.37	**3.51**	7,350	0.22	0.41	7,098	0.19	0.39	**4.02**
High school	3,884	0.18	0.39	3,878	0.17	0.38	1.64	7,350	0.17	0.38	7,098	0.16	0.37	1.02
Certificate or diploma	3,884	0.32	0.47	3,878	0.34	0.47	-1.74	7,350	0.34	0.47	7,098	0.35	0.48	-1.64
Tertiary education	3,884	0.31	0.46	3,878	0.33	0.47	**-2.45**	7,350	0.27	0.45	7,098	0.29	0.46	**-2.69**
Work characteristics:														
In full-time work	3,884	0.46	0.50	3,878	0.57	0.49	**-10.5**	7,350	0.47	0.50	7,098	0.59	0.49	**-14.21**
Union membership	3,884	0.23	0.42	3,878	0.23	0.42	0.18	7,350	0.23	0.42	7,098	0.23	0.42	0.88
Years worked with current employer	3,105	8.63	8.78	3,098	8.87	8.90	-1.06	5,908	8.62	8.72	5,743	8.70	8.68	-0.50

Variable	*Control group*							*Treatment group*						
	Pre-policy (2011)			*Post-policy (2014)*			*t stat*	*Pre-policy (2011)*			*Post-policy (2014)*			*t stat*
	N	*Mean*	*std.dev*	*N*	*mean*	*std.dev*	*Difference 2011-2014*	*N*	*mean*	*std.dev*	*N*	*mean*	*std.dev*	*Difference 2011-2014*
Missing years worked	3,884	0.20	0.400	3,878	0.20	0.40	-0.06	7,350	0.20	0.40	7,098	0.19	0.39	0.80
Weekly hours worked in all jobs	3,662	36.27	15.06	3,779	35.97	15.13	0.85	7,158	36.75	15.20	6,894	36.28	15.20	1.84
Varying weekly hours	3,884	0.06	0.23	3,878	0.03	0.16	**7.06**	7,350	0.02	0.16	7,098	0.03	0.16	-0.92
Missing weekly hours	3,884	0.001	0.02	3,878	0.001	0.02	-0.001	7,350	0.001	0.03	7,098	0.001	0.04	-0.31
Log of annual disposable income ($10,000s) in 2011	3,836	1.36	0.90	3,838	1.35	0.95	0.32	7,249	1.32	0.90	7,027	1.33	0.90	-0.39
Log of equivalised household disposable income ($10,000s) in 2011	3,874	1.64	0.52	3,869	1.63	0.54	0.21	7,325	1.58	0.54	7,091	1.58	0.53	-0.11
Government sector job	3,884	0.19	0.40	3,878	0.20	0.40	-0.58	7,350	0.22	0.42	7,098	0.21	0.41	1.88
Permanent job	3,884	0.58	0.49	3,878	0.58	0.49	0.15	7,350	0.57	0.49	7,098	0.57	0.49	-0.21
Contractor	3,884	0.08	0.27	3,878	0.09	0.28	-1.12	7,350	0.08	0.27	7,098	0.08	0.27	0.12
Casual role	3,884	0.17	0.38	3,878	0.18	0.39	-1.52	7,350	0.20	0.40	7,098	0.20	0.40	-1.01
Other job contract	3,884	0.002	0.04	3,878	0.002	0.04	0.28	7,350	0.002	0.05	7,098	0.002	0.05	-0.45
Missing job contract type	3,884	0.17	0.37	3,878	0.15	0.35	**2.22**	7,350	0.15	0.36	7,098	0.14	0.35	1.41
Organisation size <20 people	3,884	0.44	0.50	3,878	0.44	0.50	0.19	7,350	0.45	0.50	7,098	0.45	0.50	-0.22
Organisation size 20-100 people	3,884	0.26	0.44	3,878	0.26	0.44	0.01	7,350	0.28	0.45	7,098	0.27	0.44	0.88
Organisation size >100 people	3,884	0.29	0.46	3,878	0.30	0.46	-0.24	7,350	0.28	0.45	7,098	0.28	0.45	-0.77
Missing organisation size	3,884	0.004	0.06	3,878	0.004	0.06	0.18	7,350	0.003	0.05	7,098	0.002	0.04	1.37
Agreement with statement *'I have to work very intensely in my job'*	3,262	0.631	0.48	3,363	0.630	0.48	0.29	6,262	0.627	0.48	6,184	0.610	0.49	**2.17**
Job type:														
Managers	3,884	0.14	0.35	3,878	0.14	0.35	-0.29	7,350	0.13	0.33	7,098	0.14	0.34	-1.70
Professionals	3,884	0.25	0.43	3,878	0.26	0.44	-1.06	7,350	0.23	0.42	7,098	0.23	0.42	-0.10
Technicians	3,884	0.14	0.34	3,878	0.14	0.34	0.04	7,350	0.14	0.34	7,098	0.13	0.34	0.95
Community service workers	3,884	0.09	0.29	3,878	0.11	0.32	**-2.85**	7,350	0.11	0.31	7,098	0.12	0.33	**-2.11**
Sales	3,884	0.09	0.29	3,878	0.08	0.28	1.26	7,350	0.09	0.28	7,098	0.09	0.28	0.50
Clerical and admin	3,884	0.15	0.36	3,878	0.13	0.34	**2.19**	7,350	0.15	0.36	7,098	0.14	0.34	**2.32**
Machine operators/labourers	3,884	0.14	0.35	3,878	0.13	0.34	0.84	7,350	0.16	0.36	7,098	0.16	0.36	0.02
Missing job type	3,884	0.001	0.03	3,878	0.001	0.03	0.38	7,350	0.001	0.04	7,098	0.001	0.04	0.15
Industry:														
Construction	3,884	0.09	0.29	3,878	0.08	0.28	1.33	7,350	0.08	0.28	7,098	0.08	0.27	1.22

Variable	*Control group*							*Treatment group*						
	Pre-policy (2011)			*Post-policy (2014)*			*t stat*	*Pre-policy (2011)*			*Post-policy (2014)*			*t stat*
	N	*Mean*	*std.dev*	*N*	*mean*	*std.dev*	*Difference 2011-2014*	*N*	*mean*	*std.dev*	*N*	*mean*	*std.dev*	*Difference 2011-2014*
Mining	3,884	0.01	0.12	3,878	0.01	0.12	0.47	7,350	0.02	0.13	7,098	0.02	0.13	-0.72
Manufacturing	3,884	0.09	0.28	3,878	0.09	0.28	0.06	7,350	0.08	0.27	7,098	0.08	0.28	-0.35
Electricity, gas, water and waste services	3,884	0.01	0.09	3,878	0.01	0.08	0.96	7,350	0.01	0.08	7,098	0.01	0.08	0.85
Agriculture, forestry or fishing	3,884	0.03	0.17	3,878	0.03	0.18	-0.86	7,350	0.03	0.18	7,098	0.03	0.18	-0.34
Transport and storage	3,884	0.04	0.19	3,878	0.04	0.20	-0.89	7,350	0.04	0.20	7,098	0.04	0.20	-0.01
Other services	3,884	0.14	0.34	3,878	0.13	0.34	0.61	7,350	0.14	0.35	7,098	0.12	0.33	**3.10**
Education	3,884	0.09	0.29	3,878	0.09	0.29	0.10	7,350	0.09	0.29	7,098	0.09	0.29	-0.92
Government administration/defence	3,884	0.05	0.23	3,878	0.06	0.23	-0.46	7,350	0.07	0.25	7,098	0.06	0.24	1.76
Cultural and recreational activities	3,884	0.03	0.18	3,878	0.03	0.17	0.69	7,350	0.04	0.19	7,098	0.04	0.18	0.27
Communication and services	3,884	0.02	0.13	3,878	0.01	0.12	0.90	7,350	0.01	0.11	7,098	0.01	0.11	0.06
Finance and insurance	3,884	0.04	0.19	3,878	0.04	0.19	0.11	7,350	0.03	0.18	7,098	0.03	0.17	0.52
Restaurants and hotels	3,884	0.06	0.23	3,878	0.06	0.24	-0.69	7,350	0.06	0.24	7,098	0.07	0.25	-1.50
Retail trade	3,884	0.12	0.32	3,878	0.11	0.31	1.71	7,350	0.11	0.32	7,098	0.11	0.32	0.07
Wholesale trade	3,884	0.03	0.18	3,878	0.03	0.17	0.91	7,350	0.03	0.16	7,098	0.03	0.16	0.08
Health	3,884	0.12	0.32	3,878	0.13	0.34	-1.57	7,350	0.13	0.34	7,098	0.14	0.35	**-2.58**
Other or missing industry	3,884	0.03	0.18	3,878	0.05	0.21	**-3.12**	7,350	0.03	0.17	7,098	0.03	0.18	-1.73

Bold *t-statistics indicate significant changes over time at the 5% level of significance.*

Methodology: estimation approach

We analysed the effect of standardised WHS laws and increased enforcement activities on the probability of receiving workers' compensation in Australia. We estimated the change in the probability of receiving workers' compensation in the last year in states and territories that implemented the policy (treatment group) relative to those that did not (control group). Under a DID estimation framework, the post-policy dependent variable trend for states that did not implement the policy represents our counterfactual scenario for the treated states and territories. The staged implementation of the policy in some states and territories at the exclusion of others created a unique natural experiment, which we exploit to estimate the policy effect.

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

Our model specification is:

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

where:

Y is the binary dependent variable indicating whether the i^{th} individual received workers' compensation in the last year;
TG is a binary variable indicating whether an individual was in the treatment group (treated states and territories – 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-policy period (where T=1 if the observation is in 2013 in estimation A, and 2014 in estimation B);
TG×T is an interaction term indicating if an individual was in the post-policy 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 the policy is identified by the coefficient δ. To identify δ, we estimated equation (1) using pooled ordinary least squares (OLS) and random effects estimation to exploit the panel nature of our dataset.

All econometric analyses were performed using the software *Stata 16.1,* using the *reg* and *xtreg (re)* commands. We used the Huber-White robust estimator of variance to estimate standard errors under the *robust* command. The random-effects estimations further adjusted 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 and territories which either implemented standardised WHS laws or did not (Bell et al., 2019). Hence, treatment was not based on an individual choice process and was unlikely to have been determined by pre-policy attributes (Wooldridge, 2002), as all states initially agreed to the policy through their signing of the Intergovernmental Agreement. The results of the Hausman test across our estimations also favoured random-effects estimation over fixed-effects.

We also estimated equation (1) separately for individual high-risk industries in Section 5.2 to identify whether there were stronger effects from the policy for specific industries.

We did not estimate policy effects by comparing individual treated and untreated states and territories. Individual, pairwise comparisons between states and territories would have been informative for analysing policy effect mechanisms due to state or territory-based differences in policy implementation, workers' compensation benefit schemes, and pre-existing industry mix. However, we were inhibited by reduced sample sizes and lack of visual and statistical support for pre-policy parallel trends in the dependent variable when narrowing estimations to the individual state or territory level. Instead, to test the robustness of the policy effect to state or territory-specific impacts, we undertook a sensitivity analysis by deleting one state or territory at a time from the estimations and examining the impact on results (Section 5.4).

Statistical check for parallel trends: using pre-policy years to test the assumption

The validity of DID estimation hinges on pre-policy parallel trends in the dependent variable between the treatment and control groups. We statistically tested whether the parallel trends assumption holds for the treatment and control groups after the inclusion of covariates by estimating policy effects using pre-policy years, following Autor (2003). Since these years were before actual policy implementation, insignificant policy effects would indicate that the parallel trends assumption holds. **Appendix Tables A3** and **A4** show insignificant policy effects for both the first and second wave treatment and control groups, across all pairs of pre-policy years. This suggests that the common trends assumption is reasonable and the DID estimation approach is valid.

Estimation results

Baseline results

Our baseline estimation results are presented in **Table 3** in Panels (A) and (B). These show an insignificant impact from the first wave of policy implementation (2013) on the probability of receiving workers' compensation for the treatment group.

For the second wave of policy implementation (2014), we find a significant 0.9 percentage point decline (p-value<0.05) in the probability of receiving workers' compensation in the last year in treated states and territories using pooled OLS and random-effects estimation. Overall, the policy reduced the probability of receiving workers' compensation after being implemented more widely across states and territories.

The delayed policy impact may have been due to workplaces' extended time implementing standardised WHS laws fully. Tasks required by businesses include reviewing legislation, changing reporting frameworks and procedures, informing workers, and training WHS representatives. Although businesses were expected to have the new arrangements in place once the standardised laws came into effect (Safe Work Australia, 2011), it is unknown how quickly businesses met their requirements in practice.

Table 3: Estimation results – overall policy effect

	(i) Pooled OLS	(ii) Random-effects
(A) The first wave of policy implementation (2011=pre-policy, 2013=post-policy)		
Overall policy effect	-0.002 (0.005)	-0.003 (0.004)
N	*14,680*	*14,680*
p-value	0.592	0.563
(B) The second wave of policy implementation (2011=pre-policy, 2014=post-policy)		
Overall policy effect	**-0.009 (0.004)**	**-0.009 (0.004)**
N	*14,821*	*14,821*
p-value	**0.044**	**0.047**

*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.***

Policy effects for high-risk industries

Past literature suggests that businesses operating in high-risk sectors are more receptive to implementing new WHS 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). These four industries employ around 24% of the Australian population (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-policy years (**Table 4**), we found insignificant policy effects for three of the four high-risk industries. We did find a significant policy effect for construction. For the first wave of policy implementation (2013), we found a 2.4 percentage point decline in the probability of receiving workers' compensation using pooled OLS (p-value=0.076) and a 2.9 percentage point decline using random-effects estimation (p-value=0.030). For the second wave of policy implementation (2014), we found 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-value=0.030). The models also estimated declines in the probability of receiving workers' compensation for transport, and agriculture, forestry and fishing, but these effects were not statistically significant. This may have been due to low sample sizes, with less than 6% of the total sample in each industry.

Table 4: Estimation results - policy effect by high-risk industry

(A) – The first wave of policy implementation		
	(i) Pooled OLS	**(ii) Random-effects**
Agriculture, forestry and fishing		
Policy effect	0.015 (0.024)	0.009 (0.021)
N	*523*	*523*
p-value	0.533	0.665
Transport		
Policy effect	-0.034 (0.027)	-0.034 (0.026)
N	*682*	*682*
p-value	0.205	0.184
Manufacturing		
Policy effect	0.007 (0.019)	0.010 (0.016)
N	*1,450*	*1,450*
p-value	0.699	0.530

Construction		
Policy effect	**-0.024 (0.0137)**	**-0.029 (0.013)**
N	*1,380*	*1,380*
p-value	**0.076**	**0.030**
(B) – The second wave of policy implementation		
	(i) Pooled OLS	**(ii) Random-effects**
Agriculture, forestry and fishing		
Policy effect	-0.012 (0.020)	-0.014 (0.016)
N	*542*	*542*
p-value	0.552	0.389
Transport		
Policy effect	-0.015 (0.030)	-0.015 (0.027)
N	*692*	*692*
p-value	0.621	0.582
Manufacturing		
Policy effect	0.018 (0.017)	0.014 (0.016)
N	*1,521*	*1,521*
p-value	0.286	0.357
Construction		
Policy effect	**-0.041 (0.017)**	**-0.036 (0.017)**
N	*1,369*	*1,369*
p-value	**0.015**	**0.030**

*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.***

Sensitivity analysis: policy effect after omitting NSW from estimations

As workers' compensation scheme benefits are set at the state and territory level, the policy did not change the generosity of workers' compensation payments. However, policy implementation coincided with the introduction of legislative change in NSW, which reduced benefit generosity. As this may bias our policy effect upward (Collie et al., 2016; Lane et al., 2019), we performed a sensitivity analysis by excluding NSW from our estimations.

As shown in **Table 5**, after excluding NSW, the policy effect became slightly larger for the first wave (2013) and made the random-effects estimates significant at the 10% level. The estimated policy effect was similar to our baseline results for the second wave (2014), but the effect size became 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. Similar sized policy effects in this sensitivity analysis suggest our baseline policy effect was not confounded by the concurrent legislative change to workers' compensation benefits in NSW.

Table 5: Sensitivity analysis – overall policy effect after omitting NSW from estimations

	(i) Pooled OLS	**(ii) Random-effects**
(A) The first wave of policy implementation (2011=pre-policy, 2013=post-policy)		
Overall policy effect	-0.010 (0.006)	**-0.010 (0.006)**
N	*10,337*	*10,337*
p-value	0.103	**0.094**
(B) The second wave of policy implementation (2011=pre-policy, 2014=post-policy)		
Overall policy effect	**-0.009 (0.005)**	-0.008 (0.005)
N	*10,445*	*10,445*
p-value	**0.083**	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.***

Sensitivity analysis: removing one state/territory at a time to examine state or territory-specific effects

A sensitivity analysis of the second wave policy effect to state or territory-specific factors was conducted by removing data for one state or territory at a time, in order of ascending population size and re-estimating the policy effect to examine the change. **Table 6** shows the estimated policy effect varies little across estimations (0.7-1.0 percentage point decline compared to the baseline of a 0.9 percentage point decline). The policy effect remained statistically significant at the 10% level across all estimations except for the estimation that included only NSW as the treatment group and Victoria as the control group. However, the sample size was substantially smaller for this estimation, and parallel trends were also less likely to hold. Overall, the estimated second wave policy effect was relatively robust to the impact of state or territory-specific factors.

Table 6: Sensitivity analysis – (B) Second wave policy effect (2011=pre-policy, 2014=post-policy), removing one state/territory at a time from estimations

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

Sensitivity analysis: pooling post-policy years to estimate the policy effect

As the dependent variable fluctuated in post-policy years for the control group, the policy effect estimate may have been impacted by the specific post-policy year chosen for the baseline estimation. We, therefore, estimated a long-term policy effect using three additional post-policy years after the second wave. This also helped determine whether regression-to-the-mean effects impacted baseline estimates.

Results are presented in **Table 7** 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 territories) and significance at the 5% level. These results suggest the baseline estimates are robust to post-policy fluctuations in the dependent variable and potential regression-to-the-mean effects.

Table 7: Sensitivity analysis – policy effect after pooling several post-policy years

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

*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.***

Discussion and conclusions

We estimated the impact of standardised WHS laws and increased enforcement activities in Australia on the probability of receiving workers' compensation in the past year. This is the first study that analyses the impact of standardised WHS law on workers' compensation in Australia, adding to the broader literature on the effect of regulation and enforcement on workplace injuries and claims.

The results from pooled OLS and random-effects estimations suggest that the policy to standardise WHS laws reduced the probability of receiving workers' compensation in treated states and territories by 0.9 percentage points (p-value=0.047) after the wider (second wave) implementation phase. We find stronger and more significant policy effects in the high-risk construction industry of 2.9-3.6 percentage points (p-value=0.030).

National data indicate that enforcement activity (inspections and enforceable undertakings) increased after the policy was introduced, particularly for treated states and territories. The policy also introduced criminal penalties for WHS offences and increased financial penalties for breaches, with the maximum penalty being almost double the highest penalty previously set in Australia. Several aspects of the standardised regulation introduced were also stricter and more comprehensive than in Victoria, which did not standardise its WHS law.

National data also show a steeper decline in workplace injury rates between 2010 and 2014 for treated states and territories than untreated states. Besides increased enforcement activity and stricter regulatory aspects, the policy may have also fostered greater awareness of WHS issues, creating cultural change by increasing managerial focus on WHS (Gunningham, 2016).

Overall, the policy to standardise WHS laws may have improved workplace health and safety and reduced injury in treated states and territories, leading to a corresponding reduction in the

probability of receiving workers' compensation. The larger decline in the probability of receiving workers' compensation in the construction industry may have resulted from more potential to reduce injury given higher workplace risk and change to laws specifically aimed at the construction industry.

However, the decline in the probability of receiving workers' compensation may also be due to claim suppression effects, from stricter regulation and penalties causing employers to discourage workers from making claims (Boden and Galizzi, 2016; Fan et al., 2006; Moore et al., 2013). As our dependent variable measures only successful workers' compensation claims, we cannot disentangle the effects of improved workplace safety and injury reduction from potential claim suppression. While there is a lack of empirical research on claim suppression effects in Australia, we did control for having a CALD background and the workplace size, which are associated with claim suppression in Canada (Prism Economics and Analysis, 2013).

The use of the DID estimation approach was valid in our context. Visual and statistical analyses supported parallel trends in the dependent variable's pre-reform values between treatment and control groups. The size of the 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 and territory-specific factors.

The policy may have reduced workplace injury and disease in treated states and territories, a stated policy objective. If injury reduction explains our policy effect, this would support findings from past literature on the ability of regulation and increased enforcement to reduce workplace injury (Arocena et al., 2008; Baggs et al., 2003; Lanoie, 1992; Lipscomb et al., 2003). Although research on the injury-reduction effects of the Australian policy to standardise WHS laws is lacking, past research suggests this policy has achieved its other stated objectives (COAG, 2008) (Gunningham, 2016; Windholz, 2013). This includes increased consistency by simplifying common aspects and definitions in existing WHS law across states and territories (Windholz, 2013) and reduced regulatory burden for larger, multi-jurisdictional organisations (Gunningham, 2016).

Our study's estimated second wave policy effect translates to a 34% decrease in the probability of receiving workers' compensation.[6] This effect size is larger than the 19–24% average reduction in injuries per year from increased inspections with penalties found within a US study (Haviland et al., 2012). However, our policy effects are not directly comparable to this study as we do not evaluate the impact on injuries. The Australian and US workplace environment and policy context are also substantially different.

Nonetheless, our findings hold insights for other countries on how standardised (and broader) WHS laws and enforcement may hold potential benefits in claim reduction (and potentially injury reduction). For example, while OSHA administers WHS law at the federal level in the US, 27 states still operate state plans to cater to local needs, some with stricter standards (US Department of Labor, 2021). Our results suggest that the Australian policy, while still catering

[6] The 34% reduction was calculated by comparing the actual probability of workers' compensation in the second wave treatment group in 2014 (1.3%) relative to an estimated counterfactual (1.7%). The counterfactual was calculated by projecting the pre-policy rate in the treatment group from 2011 to 2014, using the control group's trend.

to local industry-mix needs, demonstrates the benefits of standardising laws and introducing higher penalties across states and territories.

However, our study does not specifically assess whether standardising WHS laws was cost effective. An ex-ante assessment of the policy to standardise WHS laws in Australia estimated a 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).[7] This included business compliance and government administration costs. An ex-post assessment of net benefits would be worthwhile as the standardised laws have operated for approximately eight years.

Our study provides some indication of the benefits of this policy resulting from reduced workers' compensation claims. Applying 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) translates to 36,494 fewer claims per year. This equates to approximately $441 million in reduced workers' compensation costs per year[8], which would offset nearly half of the estimated implementation cost and more than the policy's annual ongoing costs. Based on these estimates, the policy would likely be cost-effective after three years of implementation.

The standardised WHS laws reflected a deliberate effort to extend worker protection beyond the traditional employment relationship. Workers were defined more broadly in the standardised laws as any person carrying out work in any capacity, engaged by a PCBU, or whose work is influenced by a PCBU (Stewart and Stanford, 2017). This definition has become increasingly important for ensuring health and safety across diverse work contexts, given emerging trends towards workers employed within the 'gig economy'.

While standardised WHS laws were introduced when the gig economy was still small, this definition is broad enough to capture changing working conditions, thereby ensuring WHS responsibilities are not compromised (Stewart and Stanford, 2017). Little is known about the gig economy in Australia. There are few official estimates of its size as the gig economy is not well defined. Most studies indicate it represents a small proportion of all employment (0.5 to 1.5%) (Deloitte Access Economics, 2017; Biddle and Cavanough, 2019; Minifie, 2016). Given increasing trends in gig work to supplement traditional employment income (Biddle and Cavanough, 2019), it has been suggested that WHS coverage for gig workers should be clarified in Australian WHS law (Stewart and Stanford, 2017). There have also been calls to standardise existing workers' compensation schemes between states and territories and ensure all schemes encompass workers in the gig economy (Biddle and Cavanough, 2019).

Our study was subject to some limitations. Data did not allow us to disaggregate our results by injury types and severity. Since workers' compensation claims capture only a subset of total workplace injuries, we could only estimate a partial policy effect.[9] We could not distinguish between injury reduction impacts or claim suppression effects of the policy. We could also not attribute policy effects to specific legislative changes encompassed within the broader policy.

[7] Inflated to current year (ABS, 2020).
[8] 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.
[9] Lane et al. (2016) note that there are twice as many estimated workplace injuries as there are accepted workers' compensation claims.

Overall, our study would be best complemented by research at the firm-level or industry-level with administrative data to alleviate these limitations. Further research is also needed on the policy impacts within different work structures, such as gig work.

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Appendix Section A1
Table A1: Major legislative changes in states that standardised WHS laws versus law in Victoria (comparator state)

Major changes in standardised states – WHS Act (2011)	Law in comparator state, Victoria – OHS Act (2004)
Redefinition of traditional employer–employee relationship and broadened definition of the workplace. Sections 7 and 19 * Defining worker as an employee, contractor or subcontractor, employee of a contractor or sub-contractor, 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)	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.
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.	Section 26 **Narrower definition:** 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.
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)	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) **The standardised laws require designers to consider the safety of those who construct structures, while the Victorian laws focus only on end-users of the structure.**
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.	No equivalent provisions.
Increased financial penalties for WHS breaches, with the maximum penalty almost double the highest penalty previously set. Section 31 – penalties for reckless conduct Individual: $300,000 / 5 years jail	Section 32 – penalties for reckless conduct Individual: 1800 penalty units / 5 years jail ($219,852 at 1 July 2011)

Major changes in standardised states – WHS Act (2011)	Law in comparator state, Victoria – OHS Act (2004)
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.
Specific topics	
Confined spaces (Model WHS Laws – Part 4.3 and Code of Practice, Victorian OHS Laws Part 3.4 and Compliance Code) Broader definition in model WHS laws than Victorian laws – which may have led to increased identification of such spaces in the workplace.	
Falls (Model WHS Laws – Part 4.4 and Code of Practice, Victorian OHS Laws – Part 3.3 and Code of Practice) WHS laws – cover the risk of all falls Victoria – 2 metres or above	
Excavation work 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.	
Construction projects and principal contractors 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)

Appendix Section A2
Table A2: Pre-policy differences in WHS law in State Acts, selected WHS areas

WHS area	Pre-policy differences
Extent of Act's application to industries and hazards	The principal Acts did not have uniform scope or coverage, despite all being based on the 'Robens model'. General duties were placed on 'employers', the self-employed, variously described 'upstream' duty holders and employees. There were some differences in whether duties were placed on persons in control of workplaces, and the extent to which duties applied outside a workplace. The widest existing approach placed duties on persons conducting a business or undertaking (QLD and ACT) rather than specifically on 'employers', and on workers rather than employees (ACT and NT).
Due diligence	The term 'due diligence' was not defined in any of WHS laws across states.
Worker consultation	All Acts required employers to consult with their employees, workers, health and safety representatives and/or committees about certain aspects of health and safety at work. In NSW and TAS, the duty was confined to employees, while in VIC, NT and ACT, it had a broader scope by referring to workers and specifically including contractors and their employees (VIC and NT). In SA, WA and TAS, there were provisions within the general duty of care to consult on WHS, for example, with respect to the development of policies or similar. All provisions, other than in the NT, had penalties attached. The Qld Act included a provision that outlines broadly the purpose of consultation and states that it occurs both at industry and workplace levels.
Worker obligation to report injury, illness, accident or risk	Provisions existed in WA, NT, ACT Acts.
Worker right to cease unsafe work	Provisions existed under WA, TAS, NT and ACT. The WA Act was the only Act that specifically provided that workers must be paid for the time during which they ceased work on this basis. VIC and SA Acts provided that a Health and Safety Representative may direct workers to cease unsafe work. The NSW and Qld Acts were the only Acts that did not include any provisions for cessation of unsafe work.
Right of entry to workplace	All WHS Acts had right of entry provisions allowing authorised persons to enter workplaces for the purposes of investigating a suspected breach. However, the WHS Acts in Qld and NT also allowed right of entry for the purpose of discussing WHS matters with workers. Similarly, the WA Act allowed right of entry for holding discussions and investigating suspected breaches.
Definition of worker 'health'	The term 'health' was not defined in any WHS legislation, other than in the VIC Act, which provided that "health" included psychological health.

Source: Australian Government (2009)

Appendix Section A3

Table A3: Statistical check – using pre-policy years to estimate policy effect – first wave treatment and control groups

	(i) Pooled OLS	(ii) Random-effects
Check: 2010=pre-policy, 2011=post-policy		
Overall policy effect	0.003 (0.005)	0.004 (0.004)
N	*13,188*	*13,188*
p-value	0.486	0.385
Check: 2009=pre-policy, 2010=post-policy		
Overall policy effect	0.003 (0.006)	0.003 (0.005)
N	*11,439*	*11,439*
p-value	0.646	0.543
Check: 2008=pre-policy, 2009=post-policy		
Overall policy effect	0.0002 (0.006)	-0.0004 (0.005)
N	*10,910*	*10,910*
p-value	0.977	0.942
Check: 2007=pre-policy, 2008=post-policy		
Overall policy effect	0.006 (0.006)	0.007 (0.005)
N	*10,540*	*10,540*
p-value	0.357	0.214
Check: 2006=pre-policy, 2007=post-policy		
Overall policy effect	-0.004 (0.006)	-0.004 (0.005)
N	*10,655*	*10,655*
p-value	0.517	0.435
Check: 2005=pre-policy, 2006=post-policy		
Overall policy effect	-0.001 (0.007)	-0.002 (0.006)
N	*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 A4: Statistical check – using pre-policy years to estimate policy effect – second wave treatment and control groups

	(i) Pooled OLS	(ii) Random-effects
Check: 2010=pre-policy, 2011=post-policy		
Overall policy effect	0.001 (0.005)	0.002 (0.004)
N	*13,188*	*13,188*
p-value	0.789	0.693
Check: 2009=pre-policy, 2010=post-policy		
Overall policy effect	0.002 (0.006)	0.003 (0.005)
N	*11,439*	*11,439*
p-value	0.732	0.539
Check: 2008=pre-policy, 2009=post-policy		
Overall policy effect	-0.0003 (0.006)	-0.001 (0.005)
N	*10,910*	*10,910*
p-value	0.962	0.924
Check: 2007=pre-policy, 2008=post-policy		
Overall policy effect	0.003 (0.006)	0.005 (0.006)
N	*10,540*	*10,540*
p-value	0.580	0.402
Check: 2006=pre-policy, 2007=post-policy		
Overall policy effect	-0.002 (0.006)	-0.002 (0.005)
N	*10,655*	*10,655*
p-value	0.722	0.707
Check: 2005=pre-policy, 2006=post-policy		

	(i) Pooled OLS	(ii) Random-effects
Overall policy effect	-0.001 (0.007)	-0.001 (0.006)
N	*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.***