Australian Workers' Compensation: A Review

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1. INTRODUCTION

The management of workplace injuries and compensation of injured workers is an important social issue. Many workers are injured or killed during the course of their work each year. Many subsequently discover illnesses which can be traced to workplace hazards that they were unaware of at the time. The financial and social cost of work-related fatalities, injuries and illness are high. In Australia, the cost of WC insurance was close to $6 billion in 2002-03 (Comparative Performance Monitoring Sixth Report, 2004). Injuries also result in a loss of productivity, with more than 50 times as many working days lost to work injuries than labour strikes in a typical year in the United States (Kruger 1990). Workers' compensation (hereafter WC) insurance thus arose from a post industrial labour movement, partly in response to the failure of the negligence system to adequately provide for injured workers (Callinan 2001). WC insurance originated in Europe and was first adopted in the German Compensation Act of 1884. Great Britain adopted the Workers' Compensation Act in 1897. Australia, the United States of America, and Canada adopted their respective scheme by the early 20th century (Fishback and Kantor 1998).

WC insurance is a form of no-fault insurance against workplace accidents, where workers give up the right to sue the employer in return for the right to compensation (Fortin and Lanoie 1998). Firms are considered liable for workplace accidents and pay a premium to a WC insurance agent, who compensates injured workers and pays for medical expenses associated with the workplace injury. In most jurisdiction, the premium is higher for workplaces that have a higher number of injuries in the past. WC insurance, compulsory in Australia, aims to:[1]

- Prevent work-related injury, death and illness,

- Provide a fair treatment and compensation for workers,

- Return injured workers to work,

- Provide a high quality of service to workers and employees, and

- Minimize excessive payments and resulting high premium rates.

Despite having similar objectives, there exists a range of WC schemes in the world. Each jurisdiction, depending on demographic, social, economic and cultural considerations will invariably differ in the design of their scheme. In the United States, the most common form of scheme is private insurance, which is reflective

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[1] See for example, Workcover NSW (2003) as well as Victorian Workcover Authority (2000)

of the private sector entrepreneurial history of the country (Toh, Playford & Neary 2000). In contrast, Australian and New Zealand workers' compensation schemes have heavy government involvement. This is perhaps not surprising given the democratic cultural history of the two countries, which is characterised by strong labour unions.

In Australia, there are three main types of schemes with varying degrees of government control: a private scheme, central scheme and managed scheme. A private scheme operates as a private insurance market where firms compete for customers (workers or employers). This exists in Western Australia, Tasmania and Northern Territory. In a central scheme, such as in Queensland, the government is the sole provider of WC insurance, acting as both regulator and service provider. The third type of scheme, unique to Australia, is the managed scheme. The state government is responsible for underwriting the claims risks and setting premium rates. However, WC service is outsourced to private insurers who are paid by the government, but do not directly bear any insurance claims risk. Managed schemes exist in New South Wales, Victoria and South Australia.

Insurance literature has focused extensively on the effect of WC insurance on the behaviour of workers and employers. These studies reveal claims management problems, partially due to the moral hazard apparent in WC insurance. More recent industry studies have pointed to the possibility of changing the type of WC scheme in place as a means of negating this problem. This paper adds to the limited literature available, by considering the effect that the WC scheme type has on the duration, frequency and nature of claims. First, we provide a literature review of some of the key existing and empirical WC studies. We also review various industry reports of Australian WC schemes. Second, we provide a brief empirical analysis of the schemes in Australia between 1996 to 2004 using panel data analysis.

2. LITERATURE REVIEW

2.1. Incentives of workers and employers

In their review of theoretical and empirical WC studies, Fortin and Lanoie (1998) identified three effects of WC insurance on the frequency, duration and nature of injury claims. The first relates to *ex-ante* injury hazard, where WC insurance has the potential to influence the incentives of workers and employers to prevent accidents from occurring. Studies such as Krueger (1990) and Biddle and Roberts (2003) find that an increase in WC insurance coverage has opposite effects on workers and employers. A worker's incentive to prevent certain injuries may reduced under the knowledge that they will be compensated under WC insurance. In contrast, employers may have greater incentive to invest in workplace health and safety since their premium will be linked to the firm's safety record. The degree to which these two incentives offset one another determines the effect of increasing the claim coverage on the frequency and duration of claim.

The second effect identified by Lanoi and Fortin relates to *ex ante* casualty hazard and *ex post* duration hazard, where WC insurance affects the behaviour of workers after an accident has already occurred. Studies such as Biddle and Roberts (2003) and Biddle (2002) find that workers are more likely to submit a claim and have a longer claim duration when the injury is more difficult to diagnose. This is supported by Butler, Durbin, and Helvacian's (1996) study of soft-tissue injuries, where they find that the injuries which are more difficult to diagnose

are exaggeration or misrepresentation. Dionne and St-Michel (1991) also examine work-related injuries in Quebec associated with temporary disability and find that the duration of injury is higher for injuries that are more difficult to diagnose.

Lanoi and Fortin also identify a third effect of WC insurance, which they call *insurance substitution hazard*. A worker is more likely to claim compensation for an injury if the payout is more generous than the unemployment benefits. When faced with the prospect of a lay-off, workers may also be more inclined to report false or off-the-job accidents if the benefit of WC insurance is higher than unemployment benefits and there is little difficulty in claiming WC payments. This is supported by Biddle (2002), who finds that periods of high claim denial rates in Oregon reduced the proportion to injured workers filing a claim despite being eligible for compensation. Lu, Oswalt and Shields (1999) also show deductibles reduce the propensity to claim, which suggests that it may be useful in deterring workers from making false claims.

These studies point to moral hazard problems in WC insurance, which can become costly for the insurance company or state scheme.

2.2.   Incentives of service providers

An area that has received very little attention is incentives of service providers under different WC schemes. Fishback and Kantor (1996 and 1998) are two of the few empirical studies of claims management under different WC schemes. Their cross-section analysis of over 44 states in America finds that the decision to adopt a state over private WC scheme in the US was typically driven by political factors, such as strong unions and agricultural interests. How effective the scheme might have been in managing claims was often not considered, despite theoretical market studies suggesting that the choice of scheme could potentially have had a large impact.

The benefits of a monopoly public structure compared to a competitive private market has long been discussed in competition studies, although this has not been applied to the area of workers' compensation. Theoretical studies supporting privatised market structures, such as Hicks (1935) and Machlup (1967), argue that competition increased the firms' incentive to innovate since profits were tied to their market share. This was supported by Cragg and Dyck (2003), who shows that the remuneration of managers in private firms are more closely aligned to the firm's performance than in state-owned enterprises. This provides private firm managers with greater incentives to the demands of customers in order to improve the firm's performance through innovation. Private firms also have a stronger incentive to engage in production cost-cutting activities because of harder budget constraints (Kornai, Maskin and Roland 2003).

In contrast, supporters for a monopoly structure argue that there are benefits of increasing returns to scale. Theoretical studies, such as Chamberlin (1933), Spence (1976a, 1976b), Dixit and Stiglitz (1977) and Sutton (1991), have shown that free entry into the market can lead to social inefficiency when there are fixed costs and products offered are similar. Duplicate fixed costs can be avoided with a single firm. Their results are supported by empirical findings by studies such as Berry and Waldfogel (1999). Furthermore, a regulated monopoly allows the regulator to directly control industry price and to implement incentive schemes to achieve the desired outcome. Profits can be taxed directly to generate public funds and reduce the deadweight loss to society. A monopoly structure may be preferred because a

more concentrated industry encourages innovation. A monopolist will generate a higher level of profit, which can be used for research and development (Armstrong and Sappington 2006). Furthermore, the monopolist may be induced to invest in research and development due to a large potential payoff (Schumpeter 1950 and Loury 1979).

These studies suggest that there may be significant disparity across the schemes in Australia in the incentives of firms to manage claims effectively and provide a higher quality of service to workers.

There has been limited evaluation of the cost differentials between private and public provision of WC insurance. One of the few empirical studies is by Butler and Worrall (1986), who finds greater efficiency under private provision of WC insurance since private firms exhibits some economies of scale, whereas public provision exhibits constant returns to scale. However, they conclude that their results are premature, given the difficulty in estimating the true economic costs of state schemes due to differences in taxes, public sector concessions and a lack of public scheme data. There have been some studies which support Butler and Worrall's findings that private-sector experience-rating leads to lower claim. The studies by Ruser (1985 and 1990) also supports the idea that private insurers are likely to have a more intimate knowledge of firm experience.

2.3. Industry studies

While there have been limited empirical studies comparing the types of WC schemes, there have been various industry studies of the performance of particular state schemes. These investigations are often commissioned by the state government in response to problems in the WC scheme during times of rising claims costs and premium rates. These studies focus on issues within a particular state, rather than making a comparison between schemes. Nonetheless, they can provide useful insight into the benefits and costs of private versus public schemes.

One example is the Grellman (1997) report which examines the key drivers behind cost accumulation in New South Wales. These were found to be poor dispute resolution, litigious lump sum benefits, heavy regulation of licensed insurers and a lack of stakeholder ownership. This led to reforms in 2001, which changed the governance structure and the handling of disputes.

Similarly in 1992, the Accident Compensation Commission of Victoria commissioned a review to examine the reasons behind its poor return-to-work outcomes and high claims costs in the early 1990s (The Boston Consulting Group 1992). This review found that Victoria had double the claims costs of NSW and Queensland in 1991-2, resulting from a longer duration of claims. Following a comparison of Victorian WC scheme features between Victoria and NSW, the review made a number of recommendations. These included increased employer involvement in rehabilitation, linking premium rates to return-to-work outcomes and freedom of choice for employers in choosing agents (insurers) leading to more competition. These recommendations were adopted by Victoria, leading to its being one of the lowest cost schemes during 1995 to 2005. These reviews show that the choice of scheme affects claims management.

More recently, Workcover NSW has commissioned a review of its scheme structure which commenced in 2002 (McKinsey & Co. 2006), focusing on the achievement of financial stability through improvements in both claim management and provision of services by agents. The review found that increased competition in

WC insurance was necessary through the use of specialized claims managers and the introduction of performance based remuneration for agents.

There have also been various studies of Australian WC insurance which have not been commissioned by the government. Neary and Walsh (1996) tackle the issue of competitive underwriting in Australian WC insurance. They examine qualitative features of various successful competitive schemes, including Winconsin, Oregon and Texas regimes. Their study advocates a competitive system, arguing that competition provides insurers with the incentive to manage claims risks, encourages greater flexibility in the services and innovation in pricing. This is in line with the conclusions of the McKinsey & Co. (2006) review.

These studies suggest that certain types of schemes may be more effective in managing injured workers and their claims. This may be due to a closer alignment of the firm or managers incentives to the aims of WC insurance. We now explore the differences between claims management across the schemes in Australia more closely in a panel regression analysis.

3. EMPIRICAL INVESTIGATION

3.1. Claims management variables

This chapter contributes towards understanding the impact of the WC scheme on the management of injured workers. As far as we know, it is the first study to use time-series cross-sectional (TSCS) data techniques to assess the claims management in each of the Australian WC schemes. TSCS analysis controls for state heterogeneity, separating the effect of state characteristics on management from the scheme effect. It provides a more robust and in-depth analysis of the aggregate trends identified in the graphical and correlation analysis (Hsaio 1986). We provide an empirical comparison of the Australian WC schemes from 1996 to 2004. The results yield insight into the choice of scheme as a policy tool for achieving the aims of WC.

The WC schemes in Australia are assessed based on four factors: the frequency rate, scheme costs, asset to liability ratio and the average premium rate of the scheme. These factors reflect the scheme's efficiency, cost effectiveness and viability. These factors are described below.

3.1.1. *Frequency rate*

This is defined as the number of occupational injuries and diseases per million hours worked by wage and salary earners. This overcomes the difficulty of comparing schemes with different working hours. It is an indicator of scheme efficiency and reflects the ability of the scheme to promote workplace safety and prevent injuries from occurring.

3.1.2. *Total scheme expenditure as a proportion of wages and salaries*

This provides a measure of the scheme efficiency and cost effectiveness. Total scheme expenditure represents the annual cost of operating the WC scheme in each jurisdiction for the current financial year. It includes all direct compensation and medical expenditure paid to injured workers, as well as administration costs. Unlike premiums, it does not include future costs resulting from claims incurred in the current financial year. Total scheme expenditure is divided by total wages and

Variable	Mean	Median	Std Dev	Minimum	Maximum
Frate	17.729	17.207	1.242	16.287	19.477
AL	0.955	0.959	0.048	0.871	1.031
Costs	0.024	0.024	0.001	0.022	0.026
PremRate	0.023	0.023	0.0007	0.0217	0.024

TABLE 1

National summary statistics for the dependent variables

salaries to provide a comparison over time relative to the level of exposure in each scheme. It will be referred to as the total scheme costs hereafter.

3.1.3. *Average premium rates*

This provides an indication of the cost of WC insurance to employers. It is the estimated average rate needed to cover the current and future costs associated with all compensation claims incurred in the financial year. Rates are been standardised to take into account differences between the states in remuneration, self-insured premiums, employer excess and journey claims.

3.1.4. *Asset to liability ratio*

This is defined as the ratio of assets to net outstanding claim liabilities over the financial year and measures scheme viability. Ratios above 100 per cent indicate that the scheme has more than sufficient assets to meet its predicted future liabilities. Conversely, low ratios could be an indication of the need for a scheme to increase its premium rates to ensure assets are available for future claim payments. This is referred to as the "funding ratio" of the scheme.

3.2. Data characteristics

Data on the four claims management variables are obtained from the "Comparative Performance Monitoring" report on Australian and New Zealand WC Schemes (CPM report). It is produced yearly by the Workplace Relations Ministers Council and the National Workers' Compensation Statistics Database.[2] Data on the frequency rate is available from 1996 to 2004, and data on the other variables are available from 1998 to 2004. Data for these variables are available for all seven states and territories. Therefore, in a time-series, cross-sectional analysis, this represents 49 data units for all variables other than the frequency rate, which has 63 data units. Summary statistics of these variables are given in Table 1.

The CPM Report uses injury data sourced from the National Data Set for Compensation-based Statistics (NDS) and non-injury data from the Australian Bureau of Statistics (Labour Force Survey & of Employee Earnings & Hours). The CPM report figures were then indirectly standardised to take into account differences in industry mix between the states and territories, different definitions

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[2] The CPM report has been used instead of the Head of Workers' Compensation Authorities report or state reports because it employs consistent claims definitions, whereas the other sources does not.

of a claim (time frame and excesses) and are adjusted for GST. They exclude injuries suffered by people who are not covered by WC schemes, such as the self-employed; members of the Defence Forces; injuries that occurred while travelling to or from work; and work-related illnesses and disease-related deaths.

A survey of workers on the quality of service provided by the insurer or scheme is obtained from the "National Return to Work Monitor" Report. This report is prepared for the National Medical Services Group of the Heads of Workers Compensation Authorities by Campbell Research & Consulting on an annual basis. The report has been available from the financial years 1999 to 2005. Previously injured workers were selected in each jurisdiction from their claims database. Approximately 300 workers were interviewed in each jurisdiction, with the exception of Tasmania (where 200 workers where interviewed) and Northern Territory (where 60 workers were interviewed).

A graphical analysis reveal differences in the performance of the schemes. Private schemes have a lower frequency and duration of injury than managed schemes, as seen in Figures 1 and 2. The superior experience of private schemes observed is consistent with studies of WC schemes in the United States by Thomason (1993), Ruser (1985 and 1990) and Butler and Worrall (1986).

The comparison between the central scheme and private scheme is less clear. Whilst the central scheme has a higher frequency rate, it consistently returns workers to work in less than half the time compared to the private scheme. Further, Figure 3 shows that the central scheme consistently have the lowest scheme costs—almost half that of the managed scheme. This implies that although more injuries occur in the central scheme than the private scheme, shorter claims duration results in lower total scheme cost. The managed scheme has the highest total scheme cost, as expected from its higher frequency rate and duration of claims.

It is therefore not surprising that the asset to liability ratio, which reflects the degree to which compensation claims are funded, is highest for the central scheme (Figure 4). In contrast, the managed scheme has been under-funded with a ratio less than one between 1996 and 2004. This draws attention to problems in managed scheme states, with New South Wales and South Australia experiencing blow-outs in claims liability in the 1990s.

Examining the quality of service reveals that the central scheme consistently provides a higher quality of service than the other schemes (Figure 5). Service quality for the private scheme has outperformed that of managed schemes, although the quality of both has risen from 2002. From the graphical analysis, we can deduce that differences exist between the schemes, with the central scheme appearing to perform best in claims performance and quality. The managed scheme has the worst claims performance and provides the lowest quality of service. This could be due to state differences or the scheme type in the state. The clear differences between the schemes motivate further investigation with panel data analysis to control for known state factors.

3.3. Panel data analysis

We perform panel data analysis to compare the three main schemes (managed, private and central schemes) across both mean and variance of the claims management variables (frequency rate, total scheme expenditure, asset to liability ratio and premium rate). The base case is the central scheme in Queensland.
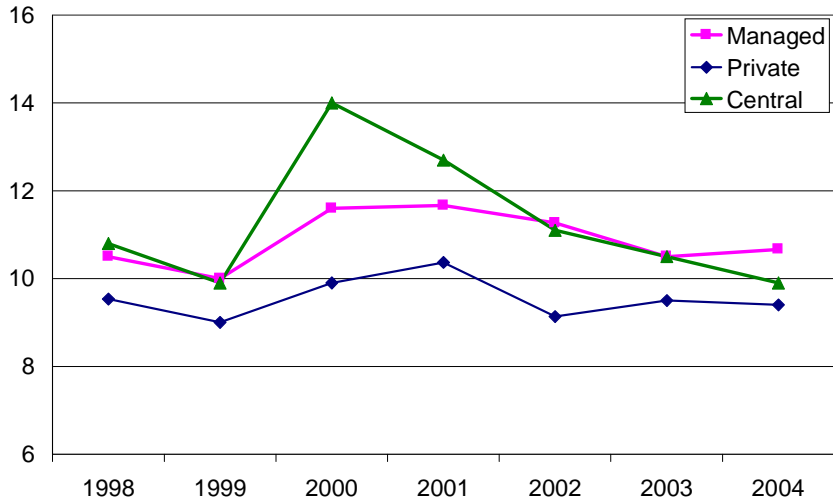
FIG. 1 Frequency rate of claims
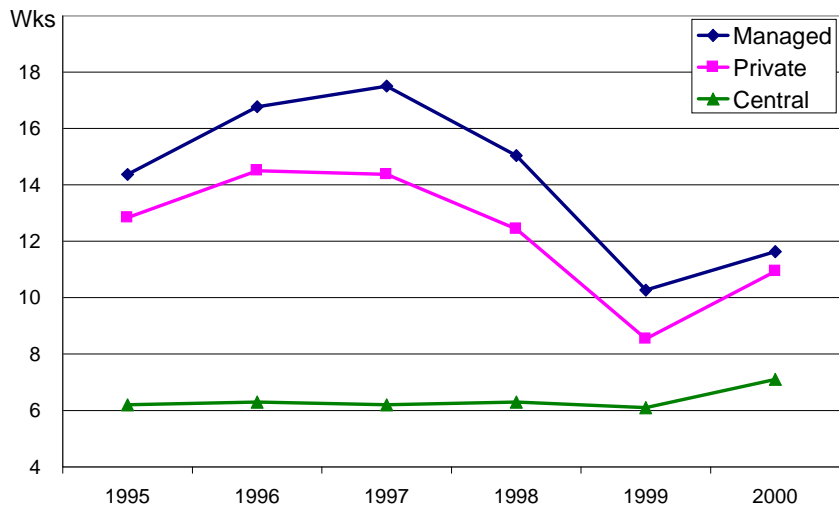

FIG. 2 Duration of claims (weeks)

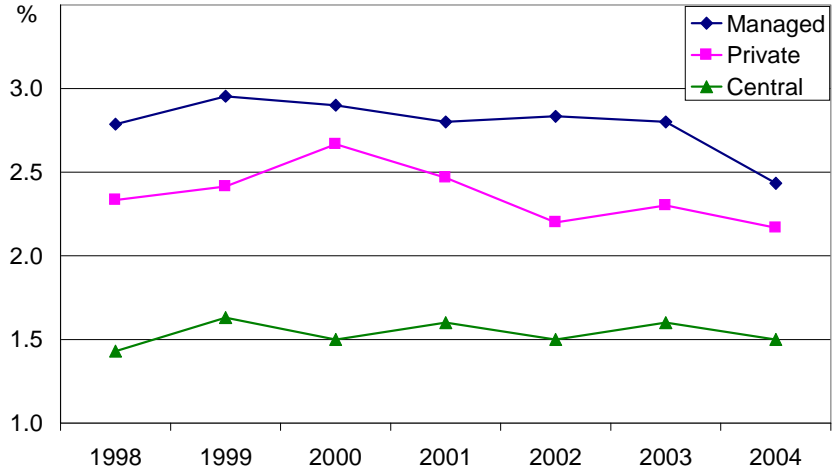**FIG. 3** Total scheme expenditure/wages

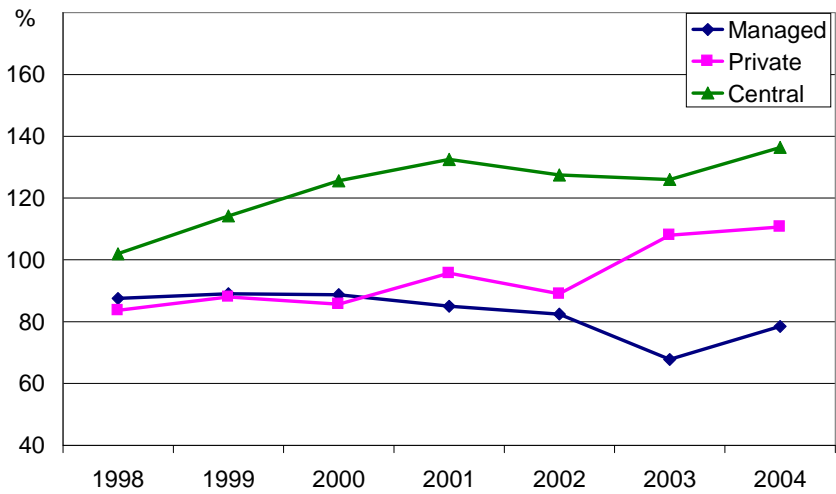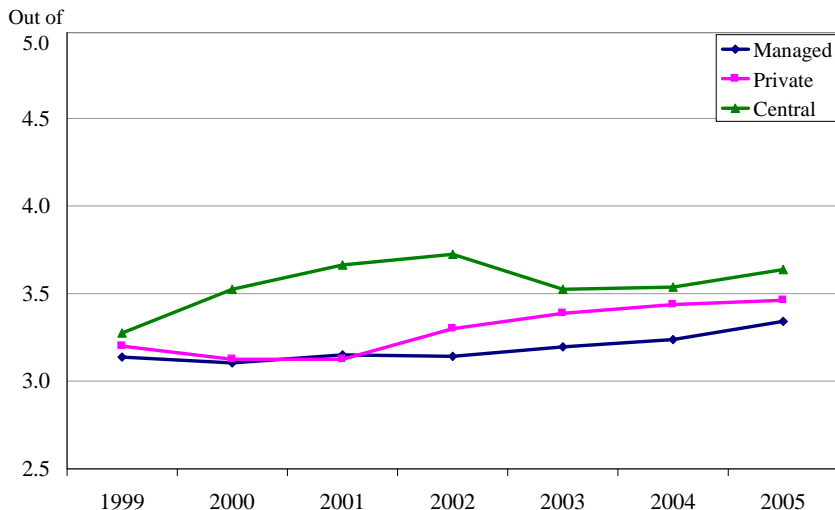

FIG. 4 Asset to liability ratio

FIG. 5 Average quality of service, rated by customers

$$y_{it} = \alpha_0 + \sum_{k=1}^{n} \beta_k X_{ikt} + \delta_1 M_i + \delta_2 P_i + \epsilon_{it} \qquad (1)$$

where,

i denotes the states and territories in Australia ($N = 7$).

t denotes the yearly time period, where $t = 1, ...$, T.

y_{it} = dependent variable.

X_{ikt} = a exogenous state factor k at time t.

M_i = indicator (dummy) variable for the state scheme being a managed scheme.

P_i = indicator (dummy) variable for the state scheme being a private scheme.

ϵ_{it} = random error term.

Model (1) is run for the mean and variance of the claims management variables. Modeling the variability in claims management is of interest because it is indicative of the stability of the scheme. Greater variability suggests claims management problems and constant reforms to the scheme. Stable claims management is preferred because it leads to scheme sustainability in the long term.[3]

In addition, known state characteristics which affect the claims management variables, but are unrelated to the type of scheme, are controlled for in the regression. The state based heterogeneity controlled for in model (1) consist of the state's unemployment rate, average benefit level, proportion of workers over the age of 55, male workers and full-time workers. The correlations of these state factors are not large and fall below ± 0.6 (Table 2).[4] These are discussed further below.

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[3] Unfortunately, duration is not modelled in this study due to the limited availability of consistent data. Duration is a useful indicator of management of injured workers. It is, however, indirectly reflected in total scheme costs.

[4] Thus, no multicollinearity problems arise when including all of these explanatory variables in a regression model to account for known and observable state effects.

Variable	% male	% full-time	% worker > 55	Unemp Rate	AWE
% male	1				
% full-time	-0.132	1			
% worker > 55	0.497	0.272	1		
Unemp Rate	0.436	0.118	0.022	1	
AWE	-0.196	0.161	0.495	-0.586	1

TABLE 2
Correlation of state factors

3.3.1. Unemployment rate

Past studies have indicated that there may be a strong interdependency between unemployment and WC claims. Higher unemployment *rates* are likely to indicate an oversupply of labour in the market, making it more difficult to find work compared to times of lower unemployment. In such times, a worker is arguably more likely to undertake activities to benefit from WC when faced with potential lay-off (Fortin and Lanoie 1992, 1998 and 1999). This is because WC benefits are generally greater than unemployment benefits.

Past studies have also indicated that unemployment *benefits* affect WC claiming behavior. Ehrenberg (1988) argues that the structure of both programs are similar, both providing insurance against an adverse consequence resulting in time away from work. WC benefits are in general more generous than unemployment benefits. Bolduc, Fortin, Labrecque and Lanoie (1997) and Ehrenberg (1988) provide theoretical models which show that lower unemployment benefits result in higher frequency and duration of WC claims.

Differences in unemployment benefits may be an important factor behind the dispersion in WC claims performance in the US, where most of the empirical studies have been conducted. However, it is arguably less applicable in Australia because unemployment benefits are determined at a federal level rather than a state level.[5] Thus, differences between unemployment benefits across the states in Australia are not expected to exist. Thus this study focuses on the relationship between WC claims and unemployment *rates,* rather than unemployment *benefits.*

3.3.2. Benefit level

One of the most common factors affecting claims management is the level of remuneration. Fortin and Lanoie (1998), Krueger (1990) and Biddle and Roberts (2003) find that workers are more inclined to make a claim and increase the duration of their claiming period when there are increases in benefit generosity. This is because workers have a lower incentive to prevent accidents and a greater incentive to make false claims. The positive relationship between benefit generosity and claims is also found by Butler, Durbin and Helvacian (1996) in their study of soft-tissue injuries. This relationship is supported by Lu, Oswalt and Shields (1999) who find that when the benefit level is reduced with the implementation of deductibles, the

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[5] Unemployment benefits are defined in the Commonwealth Act, *Unemployment and Sickness Benefits Act 1944*, (No.10).

frequency and cost of claims fall. Similar results are found in empirical studies by Dionne and St-Michel (1991) and Fortin, Lanoie and Laporte (1999).

Fortin and Lanoie (1998) find that increased benefit levels also have a second effect on employers. Increased benefit levels represent higher costs to the employer because they are often accompanied by higher premium rates. Fortin and Lanoie argue that when benefits are higher, employers have a greater incentive to spend resources on safety prevention and to challenge claims. These actions reduce the number of claims made. The impact of higher benefit levels on the frequency rate and duration of claims therefore depends on the net effect of the worker and employer incentives. This is supported by Ehrenberg (1988), Krueger (1990) and Lanoie (1992).

These studies highlight that the benefit level impacts claiming behavior and claims management. Therefore differences in average benefit level across the states and territories of Australia could account for the dispersion of claims management observed. The Boston Consulting Report (1992) found that Victorian workers had a lower incentive to return to work compared to New South Wales because long term benefits are higher in the early 1990s. One of the key recommendations of the report was for Victorian Workcover to relate long term benefits to the level of incapacity. Reducing the benefit level for workers who are actually capable of finding alternative work reduces the attractiveness WC as a viable alternative to work.

Neary and Walsh (1996) similarly find that the benefit level is a key factor affecting WC claims. Their study of NSW, Victoria and South Australia finds that one of the principal reasons for instability of the systems in 1980s was the increased benefits, in particular, lump sum and common law payments. Increased benefit levels reduced the incentive for injured workers to return to employment. The Grellman (1997) report also found that increased benefits in the form of increased litigious lump sum payments awarded by courts resulted in higher claims costs and frequency of claims in NSW.

In this study, the average benefit level is proxied by the average weekly earnings (AWE) as WC benefits are based on the workers' earnings prior to injury. Differences in excesses (such as deductibles and time length of coverage) are seen as scheme characteristics. The effect of these features will therefore be absorbed into the scheme factor and not explicitly modelled.

3.3.3. Proportion of workers over the age of 55

The relationship between WC claims and age has been debated, with mixed results in existing empirical studies. A positive and statistically significant relationship between age and duration of claims is found in the empirical study of Michigan workers by Biddle and Roberts (2003). Their result supports the findings by Butler and Worrall (1983) and Butler (1994). In contrast, Krueger (1990) and Hirsch, Macpherson, and DuMond (1997) find that the probability of a worker receiving compensation, and therefore claims costs, fell with age. The conflicting results in these studies suggest that the impact of age on claims therefore depends on the country and jurisdiction being studied.

In Australia, it appears that claims do increase with the age of the worker. The CPM Report (2000) found that workers over the age of 55 age had the highest incidence and frequency rates compared to the other age groups, especially in NSW, Western Australia and Northern Territory. Thus, one factor behind the dispersion

of claim performance in Australian WC insurance is the different proportion of workers over the age of 55 across the states and territories.

3.3.4. Proportion of male workers

A factor behind the differences in WC claims performance could be the gender demography of the state or territory. The "Compendium of WC Statistics Australia, 2001-02", published by the National Occupational Health and Safety Commission, found that male employees reported 69% of claims while females reported 31% of claims. Similar results were found in other years of the report. This could be due to the higher proportion of males employed in riskier industries.

3.3.5. Proportion of full-time workers

The injury rate and severity of injury may differ between states due to the proportion of full-time workers. There are two arguments between this statement. First, claims could increase with the proportion of full-time workers because workers become tired from long shifts and are subsequently more prone to injury. Alternatively, claims could be higher when the proportion of part-time workers is higher. This is arguably due to the fact that part-time and casual workers have less experience and training than full-time workers. As a result, they are more prone to accidents at work. The net effect of the two factors will determine the impact of the proportion of full-time workers on claims.

3.4. Functional form

The mean and variance of the Australian WC insurance data set show nonspherical error structures. First, heteroskedasticiy is found using a modified Wald test after fitting a fixed-effects model (Greene 2000, p.598). Second, residual errors of a fixed-effects model also exhibit first-order serial correlation using the Wooldridge test (Wooldridge 2002, p.274). This means that the errors show temporal dependence, where both the mean and variance of WC claims variables in one specific year are dependent on the value in the past year. Third, the error structure of the frequency rate model also exhibits correlation across panels under the Breush-Pagan Lagrange Multiplier test after fitting a fixed-effects model (Greene 2000, p.601). This means that exogenous shocks affect the frequency rates of different states in a similar fashion, such that the $E(\epsilon_{it}\epsilon_{js}) \neq 0$ for $i \neq j$. The error structure diagnostics results for the mean and the variance of the four dependent variables are summarised in Tables 3 and 4.

We have therefore adopted the OLS model with panel-corrected standard errors (PCSE) and a first-order autoregressive error structure to estimate model (1). A PCSE model performs well in estimating coefficients and standard errors in small sample sizes, such as the one in this paper (Beck and Katz, 1995).

4. RESULTS

The managed, private and central schemes in Australia are compared based on the mean and variance of their costs, frequency rate, funding ratio and premium rates. The results are summarised in Table 5 and further discussed below. The regression coefficients and standard errors are detailed in the Appendix.

	Dependent Variable (Mean)			
Hypothesis H0	Costs	FRate	AL	PremRate
Homoscedasticity	Reject	Reject	Reject	Reject
Chi-squared	157.840	39.820	81.690	19.820
P-value	(0.000)	(0.0118)	(0.000)	(0.0060)
No serial correlation	Reject	Reject	Reject	Reject
F(1,6)	36.329	8.766	20.672	43.626
P-value	(0.0009)	(0.0253)	(0.0039)	(0.0006)
No autocorrelation	N/A	Reject	N/A	N/A
Chi-squared		33.894		
P-value		(0.0372)		

*Rejection at a 10% significance level in a one-tailed test.

TABLE 3

Mean dependent variable error structure diagnostics

	Dependent Variable (Variance $= \varepsilon^2$)			
Hypothesis H0	Costs	Frate	AL	PremRate
Homoscedasticity	Reject	Reject	Reject	Reject
Chi-squared	1169.39	117.18	760.05	60.28
P-value	(0.000)	(0.0000)	(0.000)	(0.0000)
No serial correlation	Reject	Reject	Reject	Reject
F(1,6)	6.524	26.012	5.059	12.421
P-value	(0.0432)	(0.0022)	(0.0655)	(0.0125)
No autocorrelation	N/A	Reject	N/A	N/A
Chi-squared		39.450		
P-value		0.0087		

*Rejection at a 10% significance level in a one-tailed test.

TABLE 4

Variance dependent variable error structure diagnostics

4.1. Frequency rate

The regression results show that on average, a private scheme has 1.367 less claims than a central scheme per one million hours worked, after accounting for state characteristics (Appendix C1). In contrast, a managed scheme has 0.120 more claims than a central scheme per one million hours worked. The difference in claims is large when compared with the Australian average of 11.06 claims per one million hours worked.

The private and managed schemes exhibit slightly lower variability in the frequency rate than the central scheme, with corresponding coefficients of -0.196 and -0.850 (Appendix C1).

4.2. Total scheme expenditure as a proportion of wages and salaries

The coefficient for the private scheme indicator variable is 0.009 (37 per cent of the Australian average) and the coefficient for the managed scheme is 0.014 (58 per cent of the Australian average) in the mean regression (Appendix C2). The positive sign of these coefficients implies that on average, a private has higher total costs as a proportion of wages and salaries compared to a central scheme, over the sample period. The managed scheme has the highest cost ratio.

Two drivers of cost are the number of claims and the total duration of claims. Duration is most likely the main driver of the cost differences since the frequency rate of claims was observed to be similar. The central scheme is able to return injured workers back to work faster than other schemes, resulting in lower average costs.

The variability in costs between the schemes is statistically insignificant at a 10 per cent significance level (Appendix C2).

4.3. Asset to liability ratio

The average asset to liability ratio is lower for the private and managed schemes over the sample period, even after accounting for state factors. On average, a private scheme has 33.5 per cent lower funding ratio than a central scheme (Appendix C3). A managed scheme has the poorest funding ratio, which is 61.9 per cent lower than a central scheme. The magnitude of these differences is large. It is likely that the central scheme is better funded due to its lower total costs and higher premium rates.

The private scheme has a lower variability in its funding ratio than the central scheme over the sample period. It has a coefficient of -0.005 after accounting for state effects (Appendix C3). The managed scheme has higher variability than the central scheme with a coefficient of 0.002. However, the differences are not statistically significant.

Thus the regression results indicate that on average, the central scheme is much better than funded than the other schemes. Furthermore, the schemes exhibit similar variability in the funding ratio over the sample period.

4.4. Average premium rate

The average premium rate is higher in a private scheme than a central scheme by 1 per cent. A managed scheme has the highest average premium rate, at about 1.2 per cent higher than the rate under a central scheme (Appendix C4). The

TABLE 5
Summary ranking of schemes

Mean Variable	Aim	Ranking		
		Central	Private	Managed
Frequency rate	Lower	3	1	2
Total Costs	Lower	1	2	3
AL Ratio	Higher	1	2	3
Premium Rate	Lower	1	2	3
Overall		1	2	3
Variance Variable	Lower	Similar across all schemes.		

higher premium charged to employers is probably due to higher costs in the private and managed schemes.

The private and managed schemes have slightly lower variability than the central scheme, but is not statistically significant at a 10 per cent level (Appendix C4).

5. DISCUSSION

This paper has attempted to rank the three main types of WC schemes in Australia based on their claims management abilities (1996 to 2004) and the quality of service provided (1999 to 2005), which are two important aims of WC insurance. The regression results indicate that there are significant differences in the mean frequency rate, costs, funding ratio and premium rates between the schemes.

On average, the managed scheme had the worst claims management performance. It had the highest frequency rate of injury and the highest cost ratio. Not surprisingly, it also had the highest premium rate on average and was the poorest funded scheme. The private scheme performed slightly better, with the second highest cost ratio and premium rate. While it had the lowest injury rate, this was offset by a higher cost ratio and lower funding ratio.

The empirical results show that the government run central scheme had the best claims management performance. Due to its superior ability to return people to work faster and manage its injured workers appropriately, costs and premium rates were lower and it remained better funded than the other schemes. In fact, it was the only scheme that had a funding ratio above 100 per cent in every year of the sample period. Further, we observe similar variability of the claims management performance of the schemes over the sample period. These results suggest that the claims management performance of the government run central scheme is superior, in contrast to previous studies of WC insurance which advocated private provision (Butler and Worrall 1986, Thomason 1999 and Ruser 1991).

Our study has provided an indication of the average ranking of the schemes. It is important to bear in mind that these results are dependent on the sample period and only aims to give an average ordering of the schemes. This is particularly germane to the case of WC, where legislative reforms and developments in medical treatments means that there are significant changes to WC over time. In addition, as more data becomes publicly available, more sophisticated models can be used to model the claims management performance and provide more robust estimates.

Nonetheless, these results have a number of policy implications for a government authority that desires to achieve the aims of sustainable claims costs and high quality of service in WC insurance.
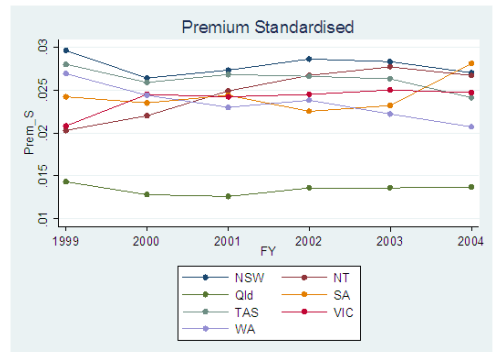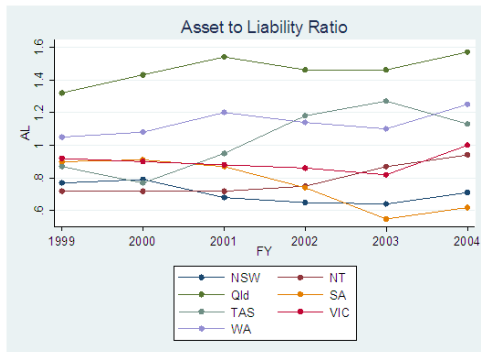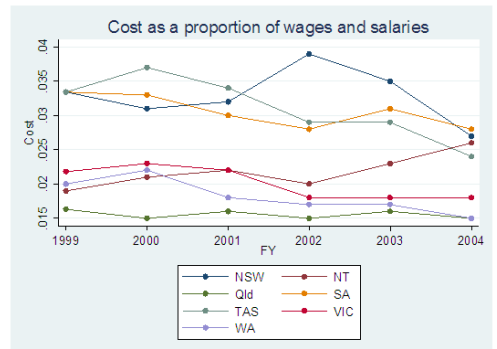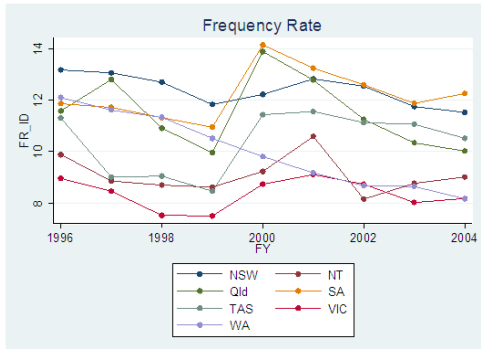
First, the results advocate for a central scheme to be adopted. The government run scheme has the lowest level of agency costs with incentives aligned closest to those desired. The government has greater control over provision of WC service. Furthermore, there may be scale efficiencies from having a single provider, a common argument for monopoly provision of services. We note, however, that whilst the central scheme appears to best achieve the aims of WC insurance, it may be difficult for the state government to switch over to a central scheme. This would involve the government actively taking control of a market which already has some degree of private involvement. Since WC insurance is a very politically sensitive area and therefore subject to many considerations other than simply the welfare of society, opposition to greater government control from private insurers is likely to occur.

Having suggested that greater government control with a central scheme is preferable over the managed and private scheme, it raises the question of whether a national central scheme should be adopted. This study has not explicitly dealt with the question of state schemes versus a national scheme. Neary, Playford and Toh (2000) present both sides of the argument. State schemes have the benefit of being able to adapt policies which are more relevant to the situation and characteristics of the particular state. They are also more able to respond in a timely fashion to any problems because less legislative processes are required. A national scheme, on the other hand, has the benefit of consistency in policies across all of Australia. It also results in cost efficiencies because of the reduced amount of paper work required by businesses that operate in several states. We leave the debate over state and national schemes for further research.
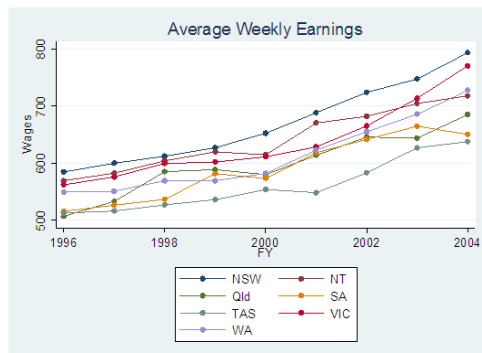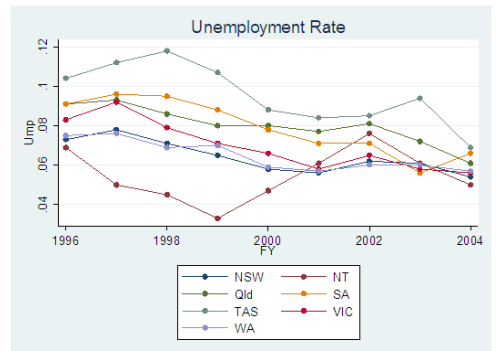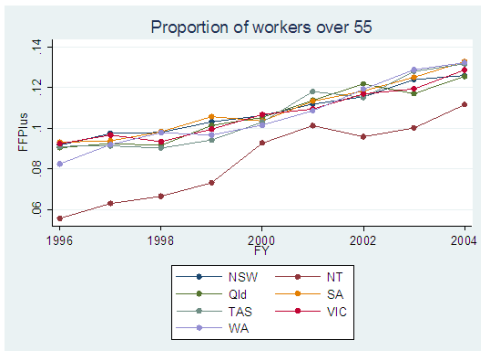
6.   CONCLUSION

There are many ways of achieving the aims of WC insurance. This paper has presented an alternative perspective, based on the structure of the WC scheme, which has received limited attention in literature and previous industry studies. Our study suggests that adopting a government run central scheme best achieves the aims of efficient claims management and high quality of service. One reason could be that the central scheme results in a closer alignment of the service providers with the scheme's objectives. As more empirical data for WC insurance becomes available, it would be interesting to perform an empirical investigation into the schemes and see if the ranking has changed over time. For a large enough data set, it would be possible to control for all state heterogeneity using the hierarchical, Bayesian model with varying coefficient estimates (Western 1998). The hierarchical model will allow for the estimation of time independent variables, whilst controlling for state heterogeneity, unlike the fixed effects model. This model will be able to provide unbiased estimates, allowing statistical inferences to be conducted.

APPENDIX A: GRAPHS OF STATE DEPENDENT VARIABLES

APPENDIX B: GRAPHS OF STATE EXPLANATORY VARIABLES

Proportion of male workers — Proportion of full-time workers — Proportion of workers over 55 — Unemployment Rate — Average Weekly Earnings
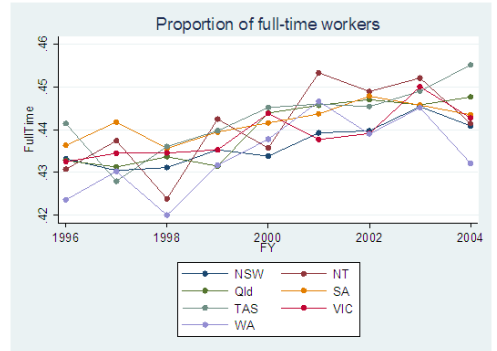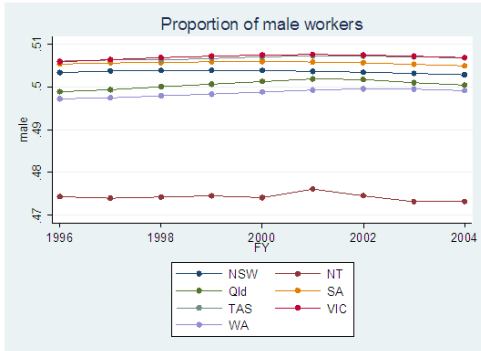
APPENDIX C: ESTIMATES FOR STATE REGRESSIONS

C.1. Frequency rate

Mean	Parameter Estimate	Standard Error	t value	p-value
male	-73.79	221.89	-0.33	0.74
fulltime	32.36	23.83	1.36	0.17
ffplus	25.68	20.52	1.25	0.21
ump	-15.27	13.18	-1.16	0.25
NSW	2.14	0.97	2.20	0.03
NT	-3.43	5.83	-0.59	0.56
SA	0.85	1.25	0.68	0.50
TAS	-1.04	1.49	-0.69	0.49
VIC	-2.10	1.57	-1.34	0.18
WA	-1.35	0.80	-1.69	0.09
wages	-0.02	0.00	-3.22	0.00
_cons	42.02	108.95	0.39	0.70
rho	0.25			

Variance	Parameter Estimate	Standard Error	t value	p-value
male	336.73	199.31	1.69	0.09
fulltime	6.74	25.32	0.27	0.79
ffplus	-37.56	16.64	-2.26	0.02
ump	9.11	9.46	0.96	0.34
wages	0.01	0.00	1.52	0.13
nsw	-2.22	0.84	-2.64	0.01
nt	7.23	5.26	1.38	0.17
sa	-1.81	1.08	-1.68	0.09
tas	-2.39	1.29	-1.86	0.06
vic	-3.15	1.39	-2.27	0.02
wa	0.95	0.69	1.38	0.17
_cons	-170.63	97.73	-1.75	0.08
rho	-0.04			

C.2. Total scheme cost as a proportion of wages and salaries

Mean	Parameter Estimate	Standard Error	t value	p-value
male	-0.325	0.736	-0.440	0.658
fulltime	0.071	0.071	1.000	0.316
ffplus	-0.056	0.038	-1.480	0.140
ump	0.072	0.044	1.630	0.102
nsw	0.019	0.003	6.720	0.000
vic	0.008	0.005	1.630	0.104
wa	0.004	0.002	2.220	0.027
sa	0.018	0.004	5.020	0.000
tas	0.016	0.004	3.700	0.000
nt	-0.002	0.020	-0.100	0.923
_cons	0.148	0.355	0.420	0.678
rho	0.090			

Variance	Parameter Estimate	Standard Error	t value	p-value
male	-0.003445	0.002336	-1.470	0.140
fulltime	0.000195	0.000230	0.850	0.396
ffplus	0.000018	0.000110	0.170	0.867
ump	-0.000042	0.000131	-0.320	0.747
nsw	0.000023	0.000009	2.500	0.012
vic	0.000023	0.000015	1.510	0.131
wa	-0.000006	0.000005	-1.290	0.195
sa	0.000018	0.000011	1.640	0.101
tas	0.000030	0.000014	2.190	0.029
nt	-0.000088	0.000062	-1.410	0.158
_cons	0.001642	0.001116	1.470	0.141
rho	-0.164790			

C.3. Asset to liability ratio

Mean	Parameter Estimate	Standard Error	t value	p-value
male	46.89	31.68	1.48	0.14
fulltime	-2.03	2.61	-0.78	0.44
ffplus	4.08	2.76	1.47	0.14
ump	0.56	1.79	0.31	0.75
nsw	-0.80	0.13	-5.92	0.00
vic	-0.76	0.22	-3.39	0.00
wa	-0.20	0.10	-1.97	0.05
sa	-0.85	0.17	-4.89	0.00
tas	-0.67	0.20	-3.27	0.00
nt	0.74	0.84	0.89	0.37
wages	0.00	0.00	0.08	0.94
_cons	-21.73	15.51	-1.40	0.16
rho	0.39			

Variance	Parameter Estimate	Standard Error	t value	p-value
male	-4.65	3.73	-1.25	0.21
fulltime	0.12	0.34	0.36	0.72
ffplus	0.09	0.34	0.27	0.79
ump	-0.02	0.20	-0.13	0.90
nsw	0.00	0.01	0.15	0.88
vic	0.02	0.03	0.78	0.43
wa	-0.02	0.01	-1.73	0.08
sa	0.03	0.02	1.51	0.13
tas	0.03	0.02	1.32	0.19
nt	-0.13	0.10	-1.29	0.20
wages	0.00	0.00	-0.11	0.92
_cons	2.29	1.84	1.24	0.21
rho	-0.19			

C.4. Standardised average premium rate

Mean	Parameter Estimate	Standard Error	t value	p-value
male	-2.00815	0.514	-3.91	0.000
fulltime	0.20309	0.055	3.71	0.000
ffplus	0.11125	0.044	2.54	0.011
ump	0.11980	0.025	4.76	0.000
nsw	0.02336	0.002	11.22	0.000
vic	0.02447	0.004	6.73	0.000
wa	0.00804	0.001	5.79	0.000
sa	0.01904	0.002	7.72	0.000
tas	0.02073	0.003	7.03	0.000
nt	-0.03862	0.013	-2.86	0.004
wages	-0.00003	0.000	-2.19	0.029
_cons	0.92419	0.250	3.70	0.000
rho	0.10642			

Variance	Parameter Estimate	Standard Error	t value	p-value
male	-0.00109720	0.00077980	-1.41	0.159
fulltime	-0.00010300	0.00009400	-1.10	0.273
ffplus	-0.00007480	0.00008150	-0.92	0.359
ump	-0.00001370	0.00004290	-0.32	0.750
wages	0.00000001	0.00000002	0.40	0.692
nsw	0.00000008	0.00000329	0.03	0.980
vic	0.00000881	0.00000570	1.55	0.122
wa	-0.00000319	0.00000183	-1.74	0.081
sa	0.00000433	0.00000364	1.19	0.235
tas	0.00000656	0.00000440	1.49	0.136
nt	-0.00003190	0.00002040	-1.56	0.118
_cons	0.00060190	0.00037620	1.60	0.110
rho	-0.10116500			

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