

24 October 2018

Mr Todd Buttsworth Secretary House of Assembly Select Committee on Firearms Legislation and Policy Parliament House Hobart

By Email todd.buttsworth@parliament.tas.gov.au

Dear Mr Buttsworth,

I refer to your letter of 2 October 2018 and your invitation to provide new information in response to the terms of reference for the above Select Committee.

This Select Committee has been established in response to a Committee of the Upper House of the Parliament of Tasmania being disbanded as a result of the government abandoning the very policy that the Upper House Committee was established to investigate. The policy abandoned by the Tasmanian government was that which emerged just before the March 2018 election.

This Select Committee has as one of its terms of reference consideration of the public submissions made to the Legislative Council Inquiry, in so far as it relates to the terms of reference of this Select Committee, clauses (1)(a) - (c).

The prism through which this Committee ought understand current firearms laws is that of the National Firearms Agreement ("NFA") made in 1996, and subsequently amended in 2002 and 2017. Some comments need to be made about the NFA.

Firstly, the NFA only ever established minimum uniform standards for firearms control across Australia. All jurisdictions are free to enact more stringent standards, and indeed some, including Tasmania, have done so. An example in Tasmania are current storage requirements introduced in December 2017. Secondly, the NFA and the legislation enacted as a result of it has a high level of popularity. In late 1996 in the order of 88% of the Australian community supported the national uniform gun laws. In March 2018 an Essential Poll showed that approximately the same number of Australians – 87% - regarded Australia's gun laws as either suitable, or too weak. A copy of that Essential Poll is set out below:

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Too weak	62%	66%	66%	59%	52%	Statements about imputation credit	S	
Too weak About right		7%	3%	2%	4%	Party trust		
Too weak About right Don't know	6%	100000				Gun Jaws		

I will deal with (b) first.

Gun Control Australia (Inc.) Telephone: 1300 054 058 GPO Box 1951, Hobart Tas 7001 AUSTRALIA guncontrolaus@gmail.com

(b) Compliance with the Provisions of the National Firearms Agreement

As part of our submission to the Legislative Council inquiry, the ten-yearly reviews conducted by Professor Kate Warner and more recently in 2017 by Associate Professor Philip Alpers, were provided to that Inquiry. These reports assess compliance with the NFA both across Australia and in Tasmania.

Tasmania still falls short in enacting the provisions of the NFA.

Set out as a Schedule to this submission is a summary document examining the various resolutions of the NFA and highlighting the shortcomings of the implementation of those resolutions within Tasmania. Clearly, these shortcomings must be addressed so that Tasmania is fully compliant with the requirements of the NFA.

(a) Current and Future Firearms Licensing Regimes, including Training and Testing, Licence Renewal, Licence Infringements and Licence Categories

It is difficult to know how to address this part of the terms of reference. Licence categories A, B, C, D and H have been stipulated by the NFA. Any further licence category would breach the NFA. The government's February 2018 Policy Proposal put forward a category E, but the description of the category was impossible to understand. Reference was made to "special interests". Of course, the government has abandoned that proposal, so, apart from acknowledging it would breach the NFA, and observing it is a meaningless proposal, there is little to respond to. Put simply, neither the spirit nor the letter of the NFA should be breached.

Again, it is difficult to know how to address that part of the terms of reference dealing with licence renewal. The NFA provided a five year maximum. Tasmania allows for three or five year licences. There are good arguments either for reduction of the maximum licence period from five years to three years, or at least requiring ongoing assessments of shooters through the licence period if their family and life circumstances have changed in a material way. An example of the need for this kind of testing was demonstrated by a case in Western Australia in May 2018 where a licensed handgun owner killed his wife, daughter, 4 grandchildren, then himself.

The best that can be said by way of response to this paragraph of the terms of reference, subject to what is set out below, is that licensing regimes are generally adequate and satisfactory, with licence categories already stipulated by the NFA.

This Committee, however, ought to take notice that recreational shooting, as a good reason to own and use a firearm, allows gun licences to be granted for some shooters who only use their firearm occasionally. This is quite different to target shooters, farmers and those who are licensed for occupational purposes. It is also different to collectors who keenly maintain their collections.

Those who only use their firearm occasionally are likely less practiced and less safe with the gun. Yet there are significant numbers of licences granted for recreational use to urban and semi-urban dwellers, and thus significant numbers of guns stored in urban areas. This state of affairs can only increase the opportunity for theft, even if stored correctly.

Beyond the above, use of a firearm to kill an animal solely as a trophy and for no other reason ought to disqualify a person from being able to have a gun licence. See below as an example, Mr R Borsak, a member of the NSW Shooters Fishers and Farmers Party.

A person should be disqualified from holding a gun licence if they engage in trophy hunting because in my opinion, finding joy in killing an animal and then promoting such event – just for a personal thrill and for no other reason such as protecting crops, for food or to put the animal out of distress – ought be regarded as a product of a disturbed state of mind.



Above: Borsak with deceased elephant

(c) The Roles of Tasmania Police, Firearms Services and the Creation of a broad-based Consultative Group

Gun Control Australia (Inc.) Telephone: 1300 054 058 GPO Box 1951, Hobart Tas 7001 AUSTRALIA guncontrolaus@gmail.com Tasmania Police should continue to have responsibility for licensing, registration, compliance and enforcement of the Firearms Act 1996. If a broad based consultative group is regarded as necessary, it ought to have a focus on public health and the consequences of firearms misuse. Accordingly, it ought to be comprised of mental health experts, advocates and others supporting women who are subject to family violence and criminologists. Gun misuse, however, does not stop at impact on people. Conservation groups and those concerned with animal welfare ought to also be represented on such a consultative group because of the history of the misuse of firearms towards domestic animals and wildlife. An example of the latter is the regular shooting of Wedge-Tailed Eagles in Tasmania. Finally the ongoing damage caused by people with guns – especially using road signs for target practice – requires that any consultative group include a representative of the Local Government Association of Tasmania.

Conclusion

The firearms industry is on the move in Australia. It is putting its money into lobbying efforts to achieve legislative change designed to free up firearm use and increase availability of firearms. The program broadcast on 4 Corners on Monday 22 October 2018 made that point very clearly. See: <u>https://www.abc.net.au/4corners/bigguns/10406306</u>

Some groups such as the Shooters Union want to abrogate the NFA. This would be disastrous.

Significant public health consequences flow from liberalisation of gun laws, as do increased profits to those in the industry. The gun lobby's attack on what it calls "red tape" is a bid for power and a broadening of markets for firearms and ammunitions. It must be resisted.

This pursuit of profit is funded by the major players in the industry such as the large importers and large lobby groups such as the SSAA Inc. There must be a prohibition on these companies and groups making donations to political parties because they are simply buying political influence at the expense of public safety.

Yours Faithfully,

Bland browne

Roland Browne Vice President

Gun Control Australia (Inc.) Telephone: 1300 054 058 GPO Box 1951, Hobart Tas 7001 AUSTRALIA guncontrolaus@gmail.com IZA DP No. 4995

Do Gun Buybacks Save Lives? Evidence from Panel Data

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June 2010

Forschungsinstitut zur Zukunft der Arbeit Institute for the Study of Labor

Do Gun Buybacks Save Lives? Evidence from Panel Data

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Discussion Paper No. 4995 June 2010

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ABSTRACT

Do Gun Buybacks Save Lives? Evidence from Panel Data^{*}

In 1997, Australia implemented a gun buyback program that reduced the stock of firearms by around one-fifth. Using differences across states in the number of firearms withdrawn, we test whether the reduction in firearms availability affected firearm homicide and suicide rates. We find that the buyback led to a drop in the firearm suicide rates of almost 80 per cent, with no statistically significant effect on non-firearm death rates. The estimated effect on firearm homicides is of similar magnitude, but is less precise. The results are robust to a variety of specification checks, and to instrumenting the state-level buyback rate.

JEL Classification: I12, K14

Keywords: firearms ownership, homicide, suicide, panel data

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1. Introduction

Following the 1996 massacre of 35 people in Port Arthur, Tasmania, the Australian federal government persuaded all states and territories to implement tough new gun control laws. Under the National Firearms Agreement (NFA), firearms legislation was tightened and made more consistent across all states and territories. As part of the NFA, it became illegal to hold particular types of firearms, in particular certain long guns. Guns that were no longer legal were subject to a government buyback, with owners being compensated for their newly illegal firearms at market prices.¹ In terms of the absolute numbers of guns destroyed, Australia's gun buyback ranks as the largest destruction of civilian firearms in any country over the period 1991-2006 (Small Arms Survey 2007, Table 2.10). Its effect was to reduce Australia's firearms stock by around one-fifth, more than 650,000 firearms. In United States terms, this would be equivalent to a reduction in the firearms stock of 40 million firearms (Reuter and Mouzos 2003). Although some of the firearms that were handed in came from households with multiple firearms, survey evidence suggests that the buyback reduced the share of Australian households with one or more firearms.²

Previous studies of gun buybacks have typically found that they have little effect on death rates or violent crime (Rosenfeld, 1995; Callahan *et al.*, 1994). Compared with these studies, an investigation of the Australian gun buyback has three major advantages. First, its scale is significantly larger than most other gun buybacks. In absolute numbers, five times as many guns were handed in under the 1997 Australian buyback as were bought back in the United Kingdom's

¹ We use the term 'buyback' here, since that is the terminology used in Australia. The program differed from what have been called buyback programs in the US, however, where buyback programs have typically not been accompanied by a ban on the firearms 'bought back'.

 $^{^{2}}$ We have been unable to locate reliable evidence on the share of Australian households that owned a gun in 1996, immediately prior to the buyback. The best data appear to come from the International Crime Victim Surveys (ICVS), which indicate that 15 percent of Australian households owned a firearm in 1992, compared with just 8 percent in 2000.

much-touted gun buyback in the same year. Since death rate data are typically quite variable, the effects of smaller scale buybacks are unlikely to be able to be distinguished from random noise. Second, the fact that the policy applied across the nation meant that gun owners could not simply travel across jurisdictions to purchase a replacement firearm, as can occur in the case of the more limited buybacks typical in the United States. And third, the ability of an island nation to restrict illegal gun imports, coupled with the absence of any domestic gun manufacturers producing for the retail market, meant that legal restrictions on gun ownership were more likely to 'bite' in Australia than would be the case in countries with porous land borders.³

Although researchers have studied the Australian firearms buyback, most of these studies have looked only at time series variation. This approach suffers from the problem that the control group must be inferred from past time trends. If a time-specific shock affected homicide and suicide rates at the same point as the firearms buyback, it will be impossible for time series approaches to disentangle the policy change from the shock.

By contrast, our approach in this paper exploits variation both across states and over time. The cross-state variation arises from different rates of firearm buyback in different states. Specifically, we ask the question: did firearms death rates decrease more substantially in states where more guns were bought back? To preview our results, we find that the withdrawal of 3500 guns per 100,000 individuals reduced the firearm suicide rate by close to 80 per cent, and had no statistically significant effect on non-firearm death rates. Estimates of the effect on firearm homicides are less precise, but point estimates suggest the firearm homicide rate also dropped by a substantial proportion. These results are robust to the inclusion of state-specific controls and time trends, to allowing for breaks in the state-specific time trends, to flexible modeling of the dynamic

³ Reuter and Mouzos (2003) raise this point, and provide an extensive discussion of the background to and details of Australia's NFA, as well as a preliminary evaluation of its effects.

impact of the NFA, and to using instrumental variables techniques to allow for potential endogeneity in the state-level gun buyback rate. This paper therefore provides evidence that reduced access to firearms lowers firearm death rates, and may also lower overall death by suicide and homicide.

The remainder of this paper is structured as follows. In Section 2, we briefly discuss the international evidence on firearm availability and violent deaths, as well as some of the methodological issues involved in estimating this relationship. Section 3 outlines the institutional details of the Australian firearms buyback, and shows national-level trends. Section 4 presents our cross-state empirical strategy and results. The final section concludes.

2. Evidence on the effects of firearm availability on violent deaths

2.1 Firearm possession and deaths

The relationship between firearms ownership rates and violent death rates is one of the most hotly-contested issues in the economics of crime. From a theoretical standpoint, gun control could either increase or reduce violence, depending on the particular circumstances (Marceau 1998). One set of hypotheses suggests that the relationship should be positive: more guns in the hands of criminals increases the probability that an assault will end in death, while the presence of guns in a home raises the chance that a suicide attempt will be successful. But another set of hypotheses suggests a negative relationship: more guns in the hands of law-abiding citizens may have a deterrent effect, which might in turn reduce the overall incidence of violence.⁴ Cook and Ludwig (2006) provide a comprehensive review of the empirical literature regarding the mechanisms by which firearm ownership may affect death rates.

⁴ Duggan (2001) cites various estimates on the number of US gun owners who successfully defend themselves from criminals each year: ranging from 75,000 to more than 1 million.

There are a number of studies that have found a positive relationship between firearms ownership and firearms deaths using variation across countries or across regions within a country (e.g. Killias 1993). However, it is possible that this does not reflect a causal pattern (Duggan 2001). Cultural, legislative, or socio-economic factors in particular jurisdictions could explain both high gun ownership rates and high firearm death rates.

A more compelling empirical approach is to use panel data. Under this approach, any factors that differ across jurisdictions and remain fixed over time can be controlled for by including jurisdictional-specific fixed effects in a multiple regression model. Similarly, any time-varying factors that affect all jurisdictions in the same way can be controlled for using time-specific fixed effects. Again, such approaches have been used at the sub-national and cross-national levels. Miller *et al.* (2005) find that reductions in firearm ownership rates across US states are associated with declines in firearm suicide rates. Across a panel of 13 countries, Ajdacic-Gross *et al.* (2006) estimate a random effects model, and similarly find a negative relationship between the share of firearms-owning households and the proportion of suicides committed with a gun.

While these models can control for differences in death rates that are fixed geographically or in time, without a fuller causal model of death rates they cannot account for correlations that arise between firearm availability and death rates that are caused by a third factor. For instance, a drought may lead to both increased firearm purchases to deal with wildlife encroaching on farmland and higher suicide rates of farmers due to increased bankruptcy. Or an exogenous rise in drug trafficking could lead to increased purchases of firearms by worried householders and increased homicides due to gang-related conflict. Beyond this, many other socio-economic variables have also been found to affect suicide and homicide, and it is quite plausible that these same factors might affect firearms purchases.⁵ Such factors may be unobservable to the econometrician. Moreover, there is little agreement in the literature as to an appropriate empirical model of either homicide or suicide rates, making it difficult to be sure that all relevant socio-economic factors have been addressed, and therefore that estimates of the effect of firearms availability on death rates reflect a causal relationship.

Further, it may be the case that places with both high firearm ownership and high firearm death rates have relatively low homicide and suicide deaths by non-firearm methods. This suggests substitution between methods; in other words, firearms are used in homicides and suicides in places with high firearm ownership rates simply because the firearms are available. In the extreme case of complete method substitution, access to firearms has no impact on the number of violent deaths, merely the method by which those violent deaths occur. From a policy standpoint, this is clearly an important question, yet pure cross-sectional or time series methods are unable to separate out these effects.

Another concern is the accuracy of data on firearm availability. Duggan (2001) notes that a lack of reliable data on gun ownership makes many of these studies rather difficult to rely on. He uses subscriptions to gun magazines (which he shows are closely correlated with firearm ownership) as a proxy for firearm ownership. Cook and Ludwig (2006) and Bridges and Kunselman (2004) use the percentage of either suicide or accidental deaths that are due to firearms

⁵ Among the factors that have been found to affect suicide rates are New Deal spending (Fishback, Haines and Kantor 2007); the divorce rate (Gruber 2004); divorce laws (Stevenson and Wolfers 2006); the violent crime rate, and the Vietnam War, and the share of the population aged 15-24 (Cebula and Zelenskaya 2006); business cycles (Varen 2004); alcohol use (Carpenter 2004); unemployment rates and permanent income (Hamermesh and Soss 1974); and urbanization rates (Neumayer 2003). Factors correlated with homicide include inequality and poverty, percent of the population that is urban, resident in female headed households, or has recently moved (Cook and Ludwig 2006); and male youth unemployment rates and average weekly earnings (Narayan and Smyth 2004).

as a proxy for firearm availability. All three found that a higher (estimated) firearm availability rate was associated with higher firearm homicide rates.

Finally, the results from such studies may be contaminated by the endogeneity of firearm ownership. For example, in jurisdictions with higher rates of violent crime, individuals may be more likely to own a firearm to protect themselves. In this case, firearms ownership may merely reflect current crime rates or expectations of future crime rates. In order to identify the causal effect of access to firearms on deaths, it is preferable to exploit some exogenous source of variation in firearms ownership rates.

2.2 Firearm regulation and deaths

Perhaps one of the most promising avenues for identifying such exogenous changes in access to firearms is to examine the effects of changes to firearm legislation and regulations. Some caution is required in attributing changes in regulation to changes in access to firearms, since the degree of enforcement may be equally important. Indeed, it is possible that stricter legislation may not in fact reduce firearm access in the absence of enforcement. Another issue is that legislative reforms often include a package of measures – which can make it difficult to separate, for example, regulations on ownership from rules governing the proper storage of firearms.

There have been a very large number of studies of tighter firearms legislation or other related policy changes on death rates. We cannot carry out a comprehensive review of the entire literature here. The majority of these, however, rely mostly on time series methods – including studies of the 1977 Canadian gun control legislation (Carrington 1999; Leenaars and Lester 1996) and of the 1994 US federal assault weapon ban (Koper and Roth 2001a; see also Kleck 2001; Koper and Roth 2001b). These studies tend to find some evidence of a decline in firearm related deaths following the passage of tighter gun control legislation.

Four existing papers study the effects of Australia's 1997 National Firearms Agreement on Australian firearms deaths. Chapman *et al.* (2006) take a purely time series approach to the question, arguing there is evidence of a decline in firearm suicides and perhaps in homicides after 1997. They also note that there were 13 mass shootings in Australia during the period 1979-96, but none in the decade 1997-2006. Baker and McPhedran (2006) also take a simple time series approach. Their empirical findings are similar to those of Chapman *et al.* (2006), although their interpretation of the results is markedly different. Lee and Suardi (2010) estimate an ARIMA model and attempt to find a structural break in the time-series process for firearm and non-firearm homicides and suicides at 1997, but find none.

Ozanne-Smith *et al.* (2004) examine the effects of firearms legislation in Australia on overall firearm deaths, using two periods of policy change. The first was a tightening of firearms legislation in the state of Victoria, which occurred around 1988, preceding by almost a decade the more general tightening of legislation that occurred in the rest of Australia in 1997. Comparing firearm deaths in Victoria and the rest of Australia, they find that such deaths fell more rapidly in Victoria during the period 1988-1995, and fell more rapidly in the rest of Australia from 1997-2000. They conclude that tighter gun controls led to a substantial reduction in firearm-related deaths overall, and in firearm suicides in particular. The results in that paper rely on the assumption that the NFA had no effect on firearm availability in the state of Victoria, which is not consistent with the evidence that substantially more firearms were bought back in Victoria than in many other states.

A problem with studies of national gun control law changes that rely on time series variation is that it is impossible to distinguish between two factors, both of which may be important: (1) the effects of socio-economic or other policy changes on all suicides or homicides; and (2) method substitution.⁶ Unless it is possible to control for all conceivable time-varying shocks, it is not feasible to control for (1) and thus identify (2).

An alternative approach is to exploit sub-national variation in firearms regulations. Since most countries regulate firearms at the national level, studies of this type have tended to use variation across jurisdictions within the US. This has the advantage that crime statistics are more comparable, but the disadvantage that sub-national restrictions can be circumvented by buyers who are willing to travel interstate. The most studied regulatory changes have been the introduction of laws allowing concealed carry permits, shall-issue laws, and restrictions on youth firearm ownership. For example, Rosengart *et al.* (2007) found that the introduction of 'shall-issue' laws, implemented in 23 states over the 1980s and 1990s, led to an increase in the rate of firearm homicide of 1 per 100,000 individuals, after controlling for state-specific differences in death rates. There have also been studies of US firearm buybacks (Rosenfeld 1995; Callahan *et al.* 1994). These typically find the buybacks have little or no effect on death rates, but the programs evaluated are much more modest than the Australian NFA.

Levitt (2004) includes changes in US gun control laws over the 1990s as one of his six factors that do not explain declines in crime over the same period. He notes three reasons why gun buybacks in particular would not be expected to be effective: (1) the guns surrendered are those least likely to be used in crimes because they are surrendered voluntarily; (2) replacement guns are easily obtained; and (3) the typical buyback is relatively small in scale. We describe the NFA in the next section, but to anticipate these arguments: we argue that none of these factors are relevant to the Australian buyback, since the NFA involved a large scale buyback of firearms, the buyback was compulsory in the sense that retaining possession of the firearms was illegal, and the guns could not be easily replaced with similar firearms.

⁶ For a more technical discussion of this problem, see the appendix to Neill and Leigh (2008).

3. Australian Firearms Regulation and Firearms Deaths

3.1 Trends in Australian suicides and homicides

In the decade following the NFA, there has been a substantial drop in firearm deaths in Australia (Figures 1a and 1b). Firearm suicides have dropped from 2.2 per 100,000 people in 1995 to 0.8 per 100,000 in 2006. Firearm homicides have dropped from 0.37 per 100,000 people in 1995 to 0.15 per 100,000 people in 2006. These are drops of 65 per cent and 59 per cent respectively, and among a population of 20 million individuals, represent a decline in the number of deaths by firearm suicide of about 300 and in the number of deaths by firearm homicide of about 40 per year. At the same time, the non-firearm suicide rate has fallen by 27 per cent, and the non-firearm homicide rate by 59 per cent.⁷

It is also clear from Figure 1 that firearm deaths have been falling on a consistent basis in recent decades, while a similar trend is not as clear in the case of non-firearm deaths.⁸ Firearm deaths – both homicide and suicide – are currently at exceptionally low levels by historical standards. The previous low in the rate of firearm suicide was in 1944, at 1.63 per 100,000. The firearm suicide rate has been below that level since 1998. The firearm homicide rate is considerably more volatile, but for the years 2004 to 2007 has been recorded as at or below 0.15 per 100,000 people. It has dipped below 0.2 per 100,000 on only one other occasion, in 1950.⁹

⁷ There are concerns that data on external causes of death may be affected by changes to collection methods in 2002 (AIHW 2009), leading in particular to a decline in deaths categorised as self-harm (suicide) and an increase in deaths that are identified as due to external causes of undetermined intent.

⁸ Note again that there may be some inconsistencies in the homicide (death by assault) statistics after 2002. The figures for 2004 and 2005 seem exceptionally low, and do not align with the justice statistics on homicides in those years. See Chapman *et al.* (2006). Recently released data from 2006 and 2007, however, do appear to be consistent with the figures from 2004 and 2005.

⁹ Again, however, this may reflect an inconsistency in the data.

Non-firearm suicides, on the other hand, have remained relatively high compared to historical averages, despite declines in the early-2000s. The increase in non-firearm suicides from 1996 to 1998 is noteworthy, since some commentators (for instance, Baker and McPhedran, 2007) have pointed to this as possible evidence of substitution from guns to other methods of suicide following the gun buyback. Non-firearm homicides have likewise remained relatively high compared to long-run historical averages, although they appear to have dropped sharply since 2004.

3.2 The National Firearms Agreement

Following the April 1996 Port Arthur killings, the Australasian Police Ministers' Council achieved agreement between federal and state governments to toughen and harmonize firearm laws across Australian states and territories. The key element of the National Firearms Agreement (NFA) was the ban of the sale, importation or possession of particular types of previously legal firearms – mostly automatic and semi-automatic long arms. A buyback scheme was implemented to compensate owners for the compulsory forfeiture of any newly illegal weapons. Reuter and Mouzos (2003) state that the agreement

"effectively introduced uniform licensing and registration of firearms in all eight states and territories of Australia, replacing a patchwork that included regimes of varying stringency. Moreover, certain classes of weapons (self-loading rifles, self-loading and pump-action shotguns) were prohibited, as was the importation of these weapons. To encourage compliance with the new prohibitions, the federal government financed a large-scale gun buyback program, conducted by the states. The buyback initially covered only newly prohibited weapons, primarily long arms; later it was extended to include nonconventional weapons, such as submachine guns and heavy machine guns.

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There was also an amnesty for handing in unlicensed firearms during that same period,

but no payments were made for these weapons" (p. 129).¹⁰

Prices were centrally determined by an expert committee, based on the retail price of the firearm, and did not vary across states. Altogether, almost 650,000 prohibited firearms were bought back during the initial amnesty. Substantial numbers of non-prohibited but unlicensed firearms were also handed in.¹¹ Although it is difficult to be certain, due to the unreliability of survey data on gun ownership, Reuter and Mouzos (2003) state that this most likely constituted a withdrawal of around 20 per cent of the total stock of firearms from the community.

It is extremely unlikely that this withdrawal of firearms could have been quickly reversed in Australia. There are no domestic firearms manufacturers, so that all firearms must be imported into the country. Records from the Australian Customs Service show that in the three years prior to 1996, Australian firearms imports averaged around 50,000 per year, of which about 25,000 were rifles. After the buyback, average imports fell to about 30,000 per year, of which 10,000 were rifles. Thus, if anything, there appears to have been a slowdown in imports after 1997. Although the available data are incomplete, it appears that law enforcement agencies were responsible for a large percentage of overall purchases. For example, one source indicates that more than one quarter of all handguns purchases in the period 1999-2002 were by law enforcement. Even if we made the extreme assumption that all imported firearms were added to the civilian firearm stock and no firearms were ever destroyed, at current import levels of 30,000 per year it would take around 20 years for the civilian firearm stock to recover to pre-buyback levels. Publicly available data on

¹⁰ The distinguishing feature of self-loading and pump-action weapons is that they do not require the user to insert fresh ammunition after each pull of the trigger.

¹¹ For NSW, Australia's most populous state, Reuter and Mouzos (2003) were able to obtain data on the number of non-prohibited firearms that were handed in. In that state, 37,000 non-prohibited firearms were handed in, for no compensation. That figure was 24 per cent of the 156,000 prohibited firearms handed in to NSW authorities.

imports by state suggests there may have been a slight negative relationship between subsequent imports of firearms per capita and the buyback rate – that is, states with a high buyback rate also saw somewhat lower growth in firearm imports. This relationship is not, however, statistically significant, and we do not have information that allows us to separate out civilian purchases from law enforcement and military purchases, so we cannot be sure that this reflects primarily civilian purchases.

Although the NFA buyback targeted firearms that were of the type that had been commonly used in crimes, an important feature of the buyback is that very few of the firearms handed in to police were military-style automatic-fire weapons. For the state of Victoria (the only jurisdiction to provide a breakdown of the types of guns handed in), Reuter and Mouzos (2003) report that nearly half of the guns were .22 caliber rifles, and almost all the remainder were shotguns. Less than one in 1000 of the weapons handed back in Victoria was an automatic. Further, given the very strict Australian legislation restricting access to hand guns, there was limited opportunity to substitute away from newly prohibited firearms towards other automatic or semi-automatic firearms.

National statistics on firearms deaths separate deaths caused by handguns from those caused by long guns.¹² This is useful because the NFA applied primarily to long guns. Prior to the 1997 law change, handguns accounted for 4 per cent of all firearm suicides and 8 per cent of all firearm homicides (Table 1). Afterwards, the figures increased to 11 per cent and 21 per cent respectively, largely because of a decline in deaths attributable to long guns.¹³ Overall, 71 per cent of suicides were with identified long guns, and the same was true of 53 per cent of homicides. Of course, not

¹² We were unable to obtain a breakdown of firearms deaths by state by firearm type (which might otherwise have allowed us to estimate a triple-difference model).

¹³ Note that a tightening of handgun regulations was implemented in 2002. In general, this is thought to have been relatively ineffective compared with the 1997 NFA. However, the data do suggest that after the 2002 law change, handgun homicides and suicides dropped more than did homicides and suicides using other firearms.

all of the long guns used in these homicides and suicides would have been subject to the buyback, but the fact that the drop in deaths was larger among the type of firearm most affected by the buyback provides suggestive evidence that the NFA played a role in the fall in firearm deaths.

The oft-heard claim that buybacks remove mostly low risk guns (because only an individual who was not planning to use a firearm would hand it in) is typically based on US-style buybacks which are entirely voluntary. It is more an argument about the characteristics of the owner than about the characteristics of the firearm. Such concerns have less force in the case of Australia's program, which was accompanied by a ban, than in the US cases. In general, however, one might hypothesize effects in either direction. For example, if firearms owners were more likely to hand in a firearm if they had a depressed teenager in the house, the guns handed back might reasonably be described as 'high risk'. Conversely, if an owner's probability of handing back a firearm is negatively correlated with his or her predisposition towards violence, the guns handed back might reasonably be described as 'low risk'.

Because the Australian buyback was both targeted at firearms that police and the government considered high risk, and that had been relatively unregulated previously, and because the buyback was accompanied by a ban and other tightening of firearm regulations, we do not think it is reasonable to describe the program as having removed primarily low risk weapons from the Australian community. This distinguishes it from programs in the US, where such a judgment appears more reasonable.

We have focused here on the buyback elements of the NFA. However, there were other elements of the NFA that may have led to a stronger tightening of firearm ownership legislation and enforcement in some states than in others. The most important of these were:

• that a national register of all firearms would be established (previously, only Victoria required registration of long guns);

- that there would be a requirement to give a valid reason for owning a firearm in order for an individual to be licensed (personal security was specifically excluded as a valid reason);
- that a permit would be required to purchase a firearm, with a required 28 day waiting period; and
- the introduction of storage and safety standards.¹⁴

To the extent, that states that had initially high firearm ownership rates did so because of weaker legislation surrounding, say, sale or licensing, the NFA may have had two effects: first, to reduce the number of firearms held per capita, and second to impose more stringent legislation. There is evidence that states with higher initial rates of gun ownership (including Tasmania and Queensland) had fewer legislative restrictions related to firearm ownership than other states (Reuter and Mouzos 2003). It is important to keep this possibility in mind when interpreting the results in this paper. Insofar as a higher buyback rate is associated with greater stringency in the overall regulatory and enforcement environment, our estimates need to be interpreted as the effect of the entire NFA policy package.

In summary, the NFA led to consistent legislation across Australian states, required licensing of gun owners and registration of guns, and significantly tightened restrictions on the types of firearms that could be legally held. In focusing on long guns, the legislation covered the group of firearms that had been most commonly used in firearm suicides and homicides, and in particular outlawed firearms of the type that had been used in recent mass shootings in Australia. Internationally, the gun buyback associated with the Australian NFA was the largest of its kind in

¹⁴ A more complete description of the legal changes associated with the NFA is provided by several sources, including Reuter and Mouzos (2003).

recent decades, withdrawing one fifth of the stock of firearms from the community and likely reducing the number of households possessing a firearm.

4. Empirical Strategy and Results

4.1 Identification issues

While the time series evidence suggests that the NFA reduced gun deaths (Chapman *et al.* 2006; Ozanne-Smith *et al.* 2004), it suffers from the lack of a credible control group, or of a fully specified model of the determinants of suicide and homicide. An alternative to developing a full predictive model of death rates is to use panel techniques, relying on variation in the intensity of the law changes associated with the NFA at the sub-national level.

Due to administrative limitations, the finest geographic level for which we are able to obtain buyback data is the state and territory.¹⁵ Australia has six states and two territories. Data on the number of firearms bought back in each jurisdiction were provided to the federal Attorney-General's department by each of these jurisdictions, and are tabulated in Reuter and Mouzos (2003). These data are set out in Table 2, which demonstrates that the number of guns withdrawn per 100,000 state residents differed substantially across Australian states and territories, ranging from a low of 1698 in the Australian Capital Territory to a high of 7302 in Tasmania.

In this paper, we ask whether firearm deaths dropped proportionately more in states where relatively more firearms were bought back. If the gun buyback itself was effective in reducing firearms-related deaths, then this would imply that states where more firearms were removed from the population should have seen a greater reduction in firearm death rates than the Australian

¹⁵ We inquired to see whether it was possible to obtain buyback statistics for smaller geographic units, but the Attorney-General's Department (which collated statistics on the buyback) advises that such data do not exist in any systematic form.

average. Because we are comparing across states, we are able to account for time-specific shocks affecting all of Australia, something that is impossible using a simple time series approach.¹⁶

This 'differences-in-differences' approach relates changes in death rates to changes in states' gun ownership rates (caused by different gun buyback rates). It assumes that all Australian states and territories would have had the same change in death rates if they had experienced the same change in firearms ownership. If states with higher initial firearm ownership rates also had weaker firearm legislation or enforcement, and if the NFA led to a reduction in the relative weakness of the legislation and/or its enforcement, then any estimated effect cannot be interpreted purely as the impact of the buyback. Rather, it will be the result of both the removal of firearms, and the tightening of firearms legislation and enforcement.

A second assumption in using this identification strategy is that the buyback rate in each state was exogenous, in the sense that it was not the result of pre-existing trends at the state level.¹⁷ We do, however, show that allowing for a national or state-level trend break beginning in 1988 – the time at which the decline in firearm homicides and suicides appears to have begun – does not affect our qualitative results, and that to the extent that there is any evidence that pre-existing trends may bias our results, it would tend to bias our results towards the buyback having a larger impact on firearms deaths.

Implicitly, our strategy also ignores the possibility that firearms are transported across state boundaries prior to being handed in. Given that the compensation regimes were similar across

¹⁶ This approach is similar to that taken by Ludwig and Cook (2000), in evaluating the effects of the Brady Handgun Violence Prevention Act, which required all states to implement a system of background checks and waiting periods for the purchase of handguns from licensed dealers. They ask whether death rates fell more in states that did not already meet the new federal requirements than in states that already had at least as stringent a system of checks in place, and find little evidence that death rates fell as a result of the Brady Act.

¹⁷ National-level time trends are controlled by year fixed effects. We also include state-level linear time trends as a robustness check in all specifications.

Australia, we believe this is unlikely. To the extent that firearms were moved from one state to another, this will likely bias our estimates towards zero.

For the purposes of our empirical strategy, what matters is that differences in buyback rates were not correlated with other factors that might have affected gun deaths. In particular, we are concerned about two potential confounders. First, if differences in buyback rates were driven by pre-existing gun ownership rates, and if the relationship between gun ownership and gun deaths is non-linear, this could lead to a spurious correlation. However, although a non-linear relationship is theoretically plausible, we have been unable to locate any studies supporting such a theory.

Second, our empirical strategy relies on the assumption that the state-level gun buyback rate is exogenous with respect to firearms death rates. It is thus important to consider the various factors that might explain why the buyback rate varied across states. By definition, the overall buyback rate is equal to the rate of ownership of the newly illegal firearms multiplied by the compliance rate. To the extent that differences are driven by initial differences in firearm ownership rates, the withdrawal of firearms can be considered plausibly exogenous – driven by the initial social norms, industrial composition, and laws in each state. To test this, we estimated the relationship between two proxies of state-level gun ownership rates in 1997 and the gun buyback rate. The first proxy is data on ownership rates of all types of guns taken from the 1989 and 1992 International Crime Victim Surveys (ICVS). Since the sample size at a state level is quite small, we pool data from both waves. This is likely to be a good proxy for gun ownership when the buyback commenced, so long as gun ownership rates did not change differentially across states in the period 1989-97. The second proxy, following Cook and Ludwig (2006), is the percentage of suicides in which a firearm was used. Results are shown in Table 3. As can be seen from the R^2 statistics, the correlations are very high. Over 60 per cent of the state level variation can be accounted for by each proxy individually, and the relationship is significant at around the 1 per cent level. When both proxies

are included in the regression, the high degree of correlation between the 1989-1992 gun ownership rate and the percentage of suicides using firearms leads to each individual relationship being insignificant, but the combined effect of the two is statistically significant at the 5 per cent level. These results strongly suggest that a very substantial proportion of the variation in the gun buyback rate was simply due to differences in prior gun ownership rates.

Differences in compliance rates are nonetheless likely to play some role. Combining data from several sources, Reuter and Mouzos (2003) estimate that compliance was about 50 per cent in Queensland and New South Wales, 70 per cent in Victoria (the only state that previously required firearms to be registered) and 90 per cent in Tasmania. Due to the paucity of data on firearm ownership rates prior to 1997, however, these estimates are imprecise. Differences in compliance rates would not be a concern if they were driven by factors unrelated to changes in death rates, or if they were driven by factors that are controlled in our regression. For instance, farmers were more likely to be granted a license for a firearm than urban residents, so that the less urban states would be expected to have had lower buyback rates. Since we include both state fixed effects and the percentage of the population in urban areas as controls, however, any such correlation will not bias estimates of the effect of the buyback rate on death rates. However, if the compliance rate was in part determined by factors that may also have driven differences in death rates across states, this could bias our estimates.

It is also possible that the number of guns handed back varied according to the impact of the Port Arthur massacre on each state. The most direct way in which states were affected by the massacre was if a significant number of their residents were killed. If a large number of state residents were victims of the massacre, this might have led the state's media to devote more coverage to the massacre, and slanted public debate in the state in favor of the buyback. To the extent that states with more victims had higher rates of compliance with the buyback, this can be regarded as a valid source of variation (in the sense that it would only affect firearms deaths through its effect on the buyback). However, if it is also the case that a higher number of victims had a direct effect on the propensity of residents in that state to use a firearm for homicide or suicide, this would not be a valid variation (since it might affect firearms deaths directly). From the perspective of our empirical strategy, we would be concerned if exposure to the Port Arthur massacre affected social norms about gun use in a state, but not if it affected a state's gun buyback rate.

The data do indeed show that states with greater exposure to the Port Arthur massacre had higher buyback rates (Table 2). We observe a correlation between the number of massacre victims and the number of guns handed back per 100,000 residents of 0.5. However, this relationship is not robust to also including the gun ownership rate in the regression. When we regress the buyback rate on both the previous gun ownership rate and the number of massacre victims, the former is positive and statistically significant, while the latter becomes insignificant, though the coefficient remains positive. As we have noted, this would be a valid source of variation, but it appears that relatively little of the cross-state variation in buyback rates was actually driven by states' 'exposure' to the Port Arthur massacre.

We have been unable to find appropriate attitudinal data that would allow us to test the impact of the Port Arthur massacre on a state's social norms about gun use. However, two things can be noted about this. First, to the extent that the Port Arthur massacre affected social norms about gun use in a state, we believe that it is more likely to have affected gun homicides than gun suicides (since the event itself was a mass homicide). And second, such an impact would likely have 'faded out' within a few years after the massacre. In our empirical results, we test this by separately looking at the effects of the buyback on firearm deaths in the short-run and medium-run.

Another possibility is that some people kept their firearms in order to defend themselves against the threat of violence in the future. If individuals were able to correctly predict trends in future crime rates (including homicide), this could lead to a negative correlation between the number of guns handed back (as a share of the population) and the future change in crime rates. To address this, we use the same information that such a 'rational home defender' would have had - namely the past trend in crime rates.¹⁸ If this defensive gun-use hypothesis is valid, we would expect to see our results disappear when we control for state-specific time trends.

Finally, it is possible that buyback rates varied across states due to differences in enforcement of the new legislation across states. For instance, the state police forces may have been more active in encouraging firearm owners to hand in their newly illegal weapons in some states than in others. However, it seems improbable that this type of variation would be related to expectations of future changes in death rates. Indeed, to the extent that any relationship existed, state authorities who anticipated a rise in gun deaths would probably have enforced the legislation more strictly. This would bias the results towards finding that a higher buyback rate led to higher death rates.

4.2 Main Results

We begin by plotting the change in the number of guns (per 100,000 people) against the change in homicide and the change in suicide, in each case comparing the period 1990-95 with the period 1998-2003. Note that this comparison drops 1996 (the year in which the Port Arthur massacre took place), as well as 1997 (the year during which the buyback occurred). It also omits the most recent years in which firearm death rates have been very low. Figure 2 shows graphically the results from this exercise. For both gun homicide and gun suicide, we observe a negative relationship between the death rate and the buyback rate. A similar relationship is not visible in the case of non-firearm deaths.

¹⁸ The assumption that the general public forecasts future crime rates by using past trends seems reasonable to us, though we know of no empirical evidence on this point. In the US context, Levitt (2004) shows that even experts appear to predict future crime rates through linear projection.

More formally, these results can be shown in the stripped-down regression model:

$$\Delta D_s = \alpha + \beta \Delta G_s + \varepsilon_s \tag{1}$$

where *s* indexes states, ΔD is the change in the gun death rate, ΔG is the change in the gun ownership rate and ε is an IID error term. Econometrically, this differenced specification is similar to a model with state and year fixed effects.¹⁹

The results are shown in Table 4. The effect of the buyback on firearm suicides is clear. Withdrawing 3,500 guns per 100,000 individuals (approximately the rate of withdrawal due to the NFA) is estimated to reduce the firearm suicides by 1.9 per 100,000. This represents a 74 per cent decline from the 1990-95 average of 2.55, or 376 fewer deaths per year given Australia's population of around 20 million. The 95 per cent confidence interval on the firearm suicide rate ranges from -0.8 deaths per 100,000 (a 33 per cent fall compared with the 1990-95 average death rate) to -2.9 deaths per 100,000, a figure that is larger than the average firearm suicide rate during 1990-95. The point estimate on firearm homicides is negative and large relative to the actual rate of firearm homicides – implying a decrease in firearm homicides of 36 per cent. The results on firearm homicide and suicide highlight a difficulty with this estimation method. The variability in the data means that the confidence intervals built around estimates based on the level of the death rate often extend so far that they could not exclude a drop in death rates greater than the initial death rate.²⁰ We deal with this concern later in the paper by using a Tobit model (Section 4.1.4).

The point estimates for non-firearm suicides and homicides are smaller in magnitude relative to their associated death rates, and have larger standard errors. They are also smaller

¹⁹ This model is one of the two recommended by Bertrand, Duflo and Mullainathan (2004) to deal with serial correlation in a differences-in-differences model. The other key method they suggest is to use a full panel model, but to cluster the standard errors at the jurisdictional level to allow for unspecified forms of serial correlation, which we estimate as equation (2).

²⁰ This is not surprising given that the model has only 8 observations and 6 degrees of freedom.

relative to the pre-existing death rates. Because there are so many more non-firearm suicides (and homicides) than firearm deaths, we cannot reject the possibility that there was 100 per cent method substitution – i.e. that any reduction in firearm deaths was accompanied by an increase in deaths by other methods. This is unfortunate from a statistical perspective, but is the inevitable result of the fortunate fact that Australia already had relatively few firearm deaths relative to non-firearm deaths. However our panel specification – in Section 4.1.2 – suggests that the time path of non-firearms deaths makes it improbable that 100 per cent method substitution occurred.

While the differenced specification is one approach for dealing with differences-indifferences models with serial correlation, it does have some important disadvantages. In particular, it does not provide a natural way for dealing with the possibility that pre-existing trends in firearm deaths were correlated with gun buyback rates. Nor does it allow us to examine the dynamics of the process, or to introduce other socio-economic variables that vary at the state-year level. For these reasons we also consider the model in a levels specification – that is, we use a dataset containing annual data on death rates from each state from 1968 to 2006, so that the total number of observations is now 8 states/territories by 39 years = 312. In this case, the policy change variable (guns bought back) takes a zero value for all years prior to 1996, and for 1997 and later takes a constant value for each state equal to the buyback rate for that state. This variable can be considered in the same light as a typical policy change variable in a differences-in-differences study except that the state-level variation comes not from differences in the timing of the policy change, but rather from differences in its magnitude. Although our main specification includes 1996 and 1997, we show below that most results are robust to dropping the victims of the Port Arthur massacre and/or 1997 firearms deaths.

The regression here, then, is:

$$D_{st} = \alpha + \beta \Delta G_s post97_t + S_s \sigma + Y_t \tau + \mu_{st}$$
⁽²⁾

where $\Delta G_s post 97_t$ is the number of guns bought back per 100,000 population in the state, S_s is a full set of state fixed effects, Y_t is a full set of year fixed effects, and μ is an IID error term. We include a vector of socio-economic variables in some specifications, including the unemployment rate, the percentage of the population that is living in an urban area, the proportion aged 20-24, and the share aged over 65.²¹ Unfortunately, much of this data (although not the unemployment rate) is reliably available only for Census years – we use a simple linear interpolation to estimate data between years where necessary. All standard errors are clustered at the state level. Note that there are disadvantages to using clustered standard errors in a model with only 8 clusters. Bertrand, Duflo and Mullainathan (2004) note in particular the weak power of such tests to correctly reject the null when there is in fact a true effect. In the presence of substantial serial correlation and few clusters, it is also likely that actual rejection rates will remain higher than the asymptotic level of the test. (In simulations with Current Population Survey data, Bertrand, Duflo and Mullainathan look at how often a clustered model rejects the null at the 5 per cent level. With 50 states, they observe a 6 per cent rejection rate, and with 10 states, they observe an 8 per cent rejection rate.)

Table 5 shows the results of these regressions. For each of the six key outcome variables, four regressions are shown. All regressions incorporate state and year fixed effects. The second column adds state-specific time trends, the third adds in the socio-economic variables, and the fourth includes both of these. The results are fairly consistent across these specifications, and in line with the results in Table 4. Introducing the socio-economic variables has little effect on the

²¹ We also examined models including controls for the prisoners and police per capita in any given state/year. There is an extensive literature regarding concerns on inference in reduced form models that include these types of variables, due to likely endogeneity (e.g. Levitt 2004). We also included controls for the number of men aged 15-19 and 20-24. Including these controls did not change our main estimates, but did reduce the number of state-year combinations we could include in our regressions, due to missing observations in some cases. Including information on the percentage of the population that is indigenous also had little effect on our main estimates, but reliable data was only available after 1991 (see Appendix Table 1).

magnitude of the coefficients for firearm suicide or homicide, and typically they are not either individually or jointly statistically significant in the regressions. This may reflect the fact that demographics change quite slowly over time, combined with our reliance on interpolations, making it difficult to separate them out from the Australia-wide year fixed effects. We would not want to conclude from this that socio-economic factors do not affect homicide or suicide rates, since our empirical strategy likely soaks up much of the effects of these factors in either the state or year fixed effects.

The estimates show very consistently a marked relative decline in firearm suicides in states with higher buyback rates after 1997. The point estimates are slightly smaller than those in Table 4, and suggest that a buyback of 3500 guns per 100,000 individuals (the size of the 1997 buyback) in one state would reduce firearm suicide rates by between 1.1 and 2.0 deaths per 100,000 relative to a state with no reduction in firearms; that is between 45 per cent and 78 per cent compared with the average firearm suicide rate in 1990-1995 of 2.55 per 100,000. The 95 per cent confidence interval in all specifications suggests a minimum decline in firearm suicides of 18 per cent compared with the average firearm suicide rate in 1990-1995.

The estimates on firearm homicides are less consistent, likely because of the greater volatility in firearm homicides. Most of the point estimates suggest that a buyback of 3500 guns per 100,000 individuals would reduce death rates to below zero, beginning from a baseline equal to the average firearm homicide rate between 1990 and 1995. This is in part due to the inclusion of the deaths from the Port Arthur incident in 1996 in the model. We show in Section 4.1.3 that if we introduce a dummy variable equal to 1 in Tasmania in 1996 and zero elsewhere that the estimated coefficients fall to more closely resemble the result in Table 4.

Once again, the estimates show no evidence that higher buyback rates were associated with any statistically significant difference in non-firearm homicide or suicide rates. Point estimates on non-firearm suicide rates are larger than those in Table 4, largely due to the inclusion of years after 2003 in the analysis (see Section 4.1.2).

4.1 Robustness checks

4.1.1 Controlling for state-specific trends in death rates

The introduction of state-specific time trends appears to increase the magnitude of the estimated effects of the gun buyback on firearm death rates.²² This suggests that guns were actually returned at a lower rate in states where firearm deaths had been falling more rapidly. We check this result by estimating the correlation between the firearm buyback rate and trends in death rates prior to 1997 (Table 6). The results show that firearm suicide rates had been increasing faster in states with high firearm buyback rates prior to 1995, but that the buyback rate had no effect on the growth rates of other types of deaths. This is not consistent with the notion that different compliance rates were the result of either a self-defense motivation or a desire to retain firearms in order to carry out already established suicide plans. If anything, more guns were handed back in states where firearm suicides and homicides had been falling at a slower rate.

Table 7 shows the effect of including a state-specific linear year trend and allowing for a break in that trend in 1988, around the time when firearm suicide and homicide rates appear to have begun to decline nationwide. Consistent with the evidence in Table 6, this does little to change the qualitative results. Indeed, if anything, the relationship between the buyback rate and firearm death rates becomes stronger, particularly in the case of firearm homicides. Similar results obtain if instead of allowing for a break in trend in 1988, the model is estimated on data from 1988 onwards (see Appendix Table 3). These results are not sensitive to moving the year in which the trend break is estimated to occur forward or backward by several years. The results reported here are clearly,

²² All results here allow for a linear trend, but models with quadratic trends yield similar results (see Appendix Table 2).

then, not an artifact of the decline in deaths evident in the national level data beginning in the late 1980s.

4.1.2 Allowing for dynamics in the impact of the policy change

While it has become common to include state-specific time trends to account for the possibility of either serial correlation or policy endogeneity in policy quasi-experiment studies, Wolfers (2006) argues that this may lead to biased estimates of the policy change in the event that there are important dynamics in the influence of a policy on outcomes. In this case, we might expect that the effects of the differences in gun buyback rates across states might fade out over time as cross-state movements or subsequent firearm purchases mitigated the initial effects of the buyback. In that case, the estimates in Table 5 would underestimate the short-run impact of the buyback on cross-state differences in death rates, and overstate the long-run impact. Table 8 shows that this does not appear to be the case. Here, the gun buyback variable has been interacted with a dummy variable for each of three post-policy change year groupings (1997-1999, 2000-2002 and 2003-2006). In neither the case of firearm homicides nor firearm suicides is it possible to reject that the effect of the firearm buyback is equal across the three time periods.

There do appear to be some interesting dynamics in the case of non-firearm suicides, however. The results suggest that states with larger firearm buybacks initially experienced a slight relative decline in non-firearm suicides, but then saw a large increase in non-firearm suicides in 2002-2006. Note that the bump-up in non-firearm suicides seen in the time series data (Figure 1a) in the 1996-1998 period is not easily attributable to method substitution or other factors associated with firearm withdrawals or other changes in firearm legislation that varied at the state level, since in that case we would expect to see states that had larger falls in firearm suicide also experience increases in non-firearm suicide. There is no empirical support for that in the data. The very late increase in non-firearm suicides in states with higher buyback rates is somewhat of a mystery. The

magnitude of the later increase is two to five times the magnitude of the relative reduction in firearm suicides in the same period. Taken at face value as an indicator of method substitution, it would suggest that individuals only began substituting to other methods six years after the gun buyback, and that the rate of substitution was greater than 100 per cent. It seems unlikely that this is consistent with any reasonable model of method substitution. It is possible that this reflects a change in the collection of suicide data post 2002 – that possibility is explored in Section 4.1.5.

4.1.3 Examining sensitivity to the Port Arthur incident

Two other important checks are excluding the deaths from Tasmania's Port Arthur massacre from the analysis, and considering the possibility that the buyback had no effects on death rates until 1998. We do the first simply by including a dummy variable for Tasmania in 1996, and the second by dropping the year 1997 from the analysis. The results are shown in Table 9. As expected, including a dummy variable for Port Arthur only affects the magnitude of the estimates of firearm homicides. The point estimate falls by just under 40 per cent in the model with no statespecific time trends, but by considerably more in the model including those trends. It appears that models incorporating state-specific time trends may particularly influence estimates of policy effects if either the initial or the final observations are unusually high or low. The inclusion of the Port Arthur dummy increases the standard errors of the estimated effect of the buyback on firearm homicides enough that the estimated effect is now not statistically significantly different from zero, consistent with the 'stripped down' model. The point estimate on firearm homicides in the model with no trends remains large relative to actual death rates, however – it suggests that the buyback of 3500 guns per 100,000 individuals would lead to a decline in firearm homicide death rates of 0.22 per 100,000, or about 50 per cent of the 1990-95 average firearm homicide death rate. Excluding 1997 from the analysis has no important effect on the results. This is consistent with the finding that there are few dynamics in the effects of the buyback on death rates – firearm death rates appear to have fallen to a permanently lower level in relative terms around 1997 in states which had a relatively high buyback rate.

4.1.4 Ensuring that estimated death rates post 1997 remain above zero

The use of the simple levels specification has some drawbacks – in actuality death rates are bounded at zero, and the use of the levels specification allows for a non-zero probability to attach to negative death rates. That said, the only occasions on which there are negative in-sample predictions of death rates from these models are in several states' firearm homicide rates in the years 2004 and 2005, which have already been noted to have abnormally low firearm homicide (and overall homicide) rates.²³ Nonetheless, it is desirable to estimate a model that did not allow this at all. Use of the log specification is not possible here because of the large number of observations where zero homicide deaths are recorded (both firearm and non-firearm). An alternative is to use the Tobit model, which allows for the fact that firearms deaths have a lower bound at zero. Estimates are shown for the homicides in Table 10.²⁴ The results indicate that the point estimates are robust to accounting for censoring at zero.

4.1.5 Allowing for possible endogeneity of buyback rates

Above, we discuss a number of potential ways in which the number of guns bought back in a state might be endogenous with respect to the future firearms death rate.²⁵ While we regard each of these as unlikely, it is useful nonetheless to see whether our results are robust to instrumenting the state buyback rate. Allowing the possibility that the gun buyback rate may itself have varied

²³ This is largely due to the use of year fixed effects in the models; because of these year fixed effects, it is not possible to make out-of-sample predictions of death rates for Australia overall.

²⁴ There is typically a sufficient number of suicides in every state that censoring is not a problem. As a result, Tobit estimates of the effect of the gun buyback on suicides are, like those for homicides, very similar to OLS estimates.

²⁵ These include the possibility that a state's residents are able to forecast non-linear trends in firearms death rates, and these forecasts affected their propensity to hand back their firearms under the NFA; or that the buyback rate in a state was affected by its exposure to the Port Arthur massacre, and the exposure also had a direct impact on subsequent firearms death rates.
with expectations of future changes in the state-level violent crime rate, we estimate instrumental variable models. To do this, we need an appropriate instrument – a variable that affects the buyback rate but is not correlated with firearms death rates after 1997 except through its impact on the buyback rate. We use cross-state differences in firearms ownership in the pre-buyback period as an instrument for the change in firearms ownership that occurred as a result of the buyback. This approach is akin to the use of existing immigrant stocks as an instrument for new immigrant inflows (see, eg. Okkerse 2008). In such specifications, researchers exploit the fact that new immigrants tend to settle in places with large existing migrant stocks. This provides a means of identifying the exogenous 'supply-push' effect of immigration on native wages. Similarly, we use the fact that some states have larger numbers of firearms in the pre-buyback period as a means of identifying differences in buyback rates after the NFA came into effect.

We use our two proxies of gun ownership rates prior to 1997 as instruments. The percentage of all suicides that use firearms is not, however, a valid instrument for models of suicide rates, since it will clearly be correlated with the error term in the base regression – a positive shock to firearm suicides will clearly increase the proportion of suicides committed with a firearm. For firearm suicides, our instrument set is therefore the estimated rate of gun ownership prior to 1996, estimated from the 1989 and 1992 ICVS surveys. For firearm homicides, we add the percentage of suicides that were completed using a firearm over the period 1994-1996 (using a three-year average helps to reduce measurement error). The F-statistics on the first-stage regression range between 8 and 14, suggesting that our instruments have good predictive power. The results in Table 11 show that IV estimates of the effect of differences in the gun buyback rate on suicides are statistically indistinguishable from OLS estimates, and in particular, the IV estimates do not move in a positive direction relative to the OLS estimates. The IV results, then, provide further evidence that the

findings of a statistically significant negative effect of the NFA on firearm homicides and suicides in the OLS estimates is not the result of a negative bias due to endogeneity of the buyback rate.

4.1.5 Testing for inconsistencies in data collection for external causes of death post-2002

As noted by the Australian Institute of Health and Welfare (AIHW, 2009), there are some concerns that a change in the Australian Bureau of Statistics' method of collection of data on external causes of death after 2002 might have led to systemic underestimates of suicide deaths in particular. If this underestimation were consistent throughout Australia, then underestimates would not affect our results, since we include a full set of year fixed effects. However, if there were differences in under-reporting rates by state, and these happened to be correlated with the firearm buyback rate, our estimates might be biased. There is evidence that there were differences underreporting by state. Interestingly, however, the AIHW report shows that Tasmania and the Northern Territory, which had the highest buyback rate, had almost no under-reporting, as did the Australian Capital Territory which had the lowest buyback rate (see Table 7.5). This would certainly not give much reason, then, to think that the results in this paper would be biased downwards. Further, there appears to be little reason to think there is much mis-reporting in the data on firearm deaths. The AIHW report records very few cases in their audit of the data where firearm deaths were mis-coded.

Unlike other studies, our results are relatively insensitive to the particular time period chosen, and the results in Table 5, which show the dynamic effects of the NFA, show that the key estimates of reductions in firearm homicides and suicides are not an artifact of the years after 2002. Indeed, if anything, the only results that do appear to be affected by the post-2002 years are those on non-firearm suicides, which show a larger increase in non-firearm suicide rates in states that had higher buyback rates. As discussed earlier, this is the most important reason for the overall positive point estimates of the effect of the NFA on non-firearm suicide rates. If this is a result of the change in data collection practices in 2002, then our results are if anything stronger.

Nonetheless, concerns about the effect of these data problems on our results may remain. Unfortunately, there is no plan to revise ABS estimates for death rates between 2002 and 2006, so we cannot expect significant improvements in this data in the future. We can, however, examine whether there is any evidence that a recoding of suicides to other external causes of death - in particular accidental deaths or deaths of undetermined intent – could have affected our results. We do this by simply running the same set of regressions for cases of accidental death and deaths of undetermined intent that we ran for homicides and suicides. If we find that the NFA appears to have led to an increase in either of these categories of death, we would be concerned that our results of a relatively large fall in firearm homicide and suicides in states with higher buyback rates represents a recategorisation of deaths, rather than a decrease in actual deaths. In the case of firearm deaths, the small numbers of accidental deaths and deaths of undetermined intent mean that we are forced to group these together. They can be separated in the case of non-firearm deaths, however. The estimates using equation (1) show a very small negative and statistically insignificant (p-value 0.344) effect of the buyback rate on deaths due to firearm accidents and deaths of undetermined intent. There is no reason to think, then, that the estimates on firearm homicides and suicides in particular are a result of mis-classification of deaths. The results are the same for nonfirearm deaths in those two categories, for all accidents, all deaths of undetermined intent, and for deaths due to ill-defined causes (p-values 0.306, 0.247, 0.922 and 0.594 respectively).²⁶

5. Discussion and Conclusions

In most developed countries there are considerable restrictions on the availability of firearms, including outright bans on some types of firearms, licensing requirements which often require individuals to show a need for a firearm, and requirements for the registration of firearms.

²⁶ See Appendix Table 4

Evaluating the effectiveness of these regulations is extremely difficult. Australia's NFA provides a unique opportunity to examine the effects of a large-scale buyback of firearms on homicide and suicide.

With just under a decade of post-NFA deaths data now available, key studies based on time series data have agreed that there has been a significant fall in the number of firearm suicides in Australia since 1997. Firearm homicides too appear to have declined substantially, though with a smaller number of deaths per year, it is more difficult to be sure that this change was caused by the NFA. At a minimum, there is some time series evidence against the notion that stricter gun laws have led to increases in total homicides.

The results in this paper – using a different and more reliable source of identification – support the general findings of those time series studies. We show that the largest falls in firearm deaths occurred in states where more firearms were bought back. Compared to time series studies, this approach has some key benefits. First, it allows us to control for national level trends in death rates through the use of national-level fixed effects, and at the state level through state-specific time trends – the results show that even after controlling for such trends, there was a statistically significant decline in firearm deaths in states with higher firearm buyback rates. Second, we are able to examine in more depth the time pattern of any response of deaths to the NFA – the results show that firearm deaths in states with higher buyback rates fell relative to those with lower buyback rates, and that this relative reduction in the firearm death rate was maintained subsequently. Finally, we use an instrumental variables strategy to allow for possible endogeneity in the gun buyback rate, and find that this makes no substantive difference to the results. That the results in the baseline regression are robust to all three approaches suggests that the relationship between buyback rates and death rates is likely causal.

The estimated change in both firearm homicides and suicides is very large relative to their earlier averages, but confidence intervals on the estimated response of non-firearm homicides and suicides are large enough that it is not possible to rule out method substitution of a sufficient magnitude to offset the changes in firearm deaths. This is largely due to the fact that there are so many more non-firearm suicides (and non-firearms homicides) than firearm deaths. However, two findings mitigate against the notion of substantial method substitution. First, non-firearm suicides and homicides fell substantially on aggregate in Australia in the period 1997-2006. Secondly, the estimated time pattern of the response of non-firearm deaths (suicides in particular) is not what we would expect to see in the case of method substitution. It is also inconsistent with suggestions, based on time series analysis, that the uptick in non-firearm suicides in the period 1997-2000 could have been a consequence of the buyback. Our results show, by contrast, that that jump occurred primarily in the states where the fewest guns were handed in, and where the gun buyback would have been expected to have the least effect.

For a firearm withdrawal equivalent to Australia's buyback, using quite conservative point estimates, our estimates suggest that over 200 firearm deaths per year – mostly suicides – would be averted in a population roughly the size of Australia's. The leading estimate of the value of a statistical life in Australia (Abelson 2003) is A\$2.5 million.²⁷ If we assume that there was no offsetting increase in non-firearm deaths, the economic value of the gun buyback was A\$500 million per year, or more than A\$800,000 per firearm bought back. This estimate is very sensitive

²⁷ Valuing homicide and suicide deaths at A\$2.5 million may be an underestimate if the typical victim is aged less than 40 years of age (the benchmark age in Abelson's estimates), or if society's willingness to pay to avert a death is higher in the case of violent deaths. On the other hand, for cases of rational suicide, one might argue that a lower value should be placed on suicide deaths than on other deaths. Regardless, the figures here should be considered very rough indicators of the overall benefits of the NFA.

to the assumptions, however, and in particular the assumption of no method substitution. The calculation also fails to account for any costs of more stringent firearms legislation.

There is a question as to whether it is reasonable to suggest that a withdrawal of about 20 per cent of the stock of firearms could have plausibly led to drops of about 74 per cent in the firearm suicide rate, and perhaps 35 to 50 per cent in firearm homicide rates. It should be noted that the standard errors on these estimates are fairly large, so that estimates of the declines in firearm homicide rates are usually not statistically significantly distinguishable from no effect. In the case of firearm suicides, however, the estimated 95 per cent confidence intervals show that a buyback of 3500 guns per 100,000 people would have reduced firearm suicides by a minimum percentage decline of 8 per cent. As we have noted above, the available data do not allow us to be sure as to whether the firearms withdrawn were relatively 'high risk' or 'low risk' firearms (i.e. whether they were more or less likely to have been used in homicides or suicides than firearms that were not withdrawn through the NFA). This is partly because firearms deaths data are not well disaggregated by the type of firearm, but also because whether or not a firearm is 'high risk' also depends on unobservable characteristics about its owner and other probable users.

A possible interpretation of the magnitude of our results is that the guns handed back were not low risk firearms. The buyback focused mostly on automatic and semi-automatic long guns. In Australia, unlike some other countries, long guns have been the most common type of firearm used in both firearm homicides and firearm suicides, likely because handguns were already quite restricted well before the NFA. There is no data available on how important semi-automatic guns were in firearm deaths compared with other guns, however. While semi-automatic or automatic guns would be potentially more dangerous in the case of homicides, it is not clear that this would also apply to suicides. Perhaps a more likely explanation of the strength of the relationship found is that the NFA led states with relatively weak legislation or enforcement relating to sale, ownership and storage of firearms to strengthen their regimes relative to states with initially stronger standards. There is evidence that states with relatively high firearm ownership and therefore high gun buyback rates also had relatively weak regulation prior to 1996. Then, our estimates need to be interpreted as reflecting a combination of both the removal of firearms and the relative strengthening of legislation and enforcement. We might expect to see smaller effects in the case of a buyback that was not accompanied by stricter firearm legislation.

Several factors are important in assessing the extent to which the results from the Australian buyback can be extrapolated to other countries. Australian borders are more easily controlled than in countries that have land borders. In addition, Australia's government in general, and its policing and customs services in particular, are highly organized and effective. The NFA also had an extremely high degree of political support, and was quite competently executed. And the buyback was accompanied by a uniform national system for licensing and registration of firearms. These factors should be borne in mind in considering the extent to which the results from the Australian NFA might generalize to other countries.

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Source: Australian Bureau of Statistics, Cause of Death collection (data available on request). Data is deaths by self-harm and death by assault.

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Figure 2 Change in firearm suicides and homicides relative to guns a. Firearm suicides

b. Firearm homicides



c. Non-firearm suicides



d. Non-firearm homicides



Source: Australian Bureau of Statistics, Cause of Death collection (data available on request).

	Suicide			Homicide	Homicide				
	Rifle/ Handgun shotgun		Other/ unspec	Handgun	Rifle/ shotgun	Other/ unspec			
1990-95 (A)									
Number of deaths	118	1891	675	34	242	180			
Rate per 1 million	1.1	17.9	6.4	0.3	2.3	1.7			
% of deaths	4.4%	70.5%	25.1%	7.5%	53.1%	39.5%			
1998-2003 (B)									
Number of deaths	153	998	242	64	112	131			
Rate per 1 million	1.3	8.6	2.1	0.6	1.0	1.1			
% of deaths	11.0%	71.6%	17.4%	20.8%	36.5%	42.7%			
Change in deaths (B-A)									
Change in # of deaths	35	-893	-433	30	-130	-49			
% change in death rate	18.1%	-51.9%	-67.3%	71.5%	-57.8%	-33.7%			

Table 1. Number and type of firearm used for homicides and suicides

Source: Australian Bureau of Statistics, Cause of Death collection (data available on request).

Table 2. Guns collected by state

	Total guns collected	Guns collected per 100,000 residents	Gun ownership rate (SE)	Victims in Port Arthur massacre
Australian Capital Territory	5,246	1698	-	0
New South Wales	155,774	2482	0.134 (0.009)	6
Northern Territory	9,474	5069	0.176 (0.067)	0
Queensland	130,893	3856	0.213 (0.016)	0
South Australia	64,811	4375	0.208 (0.022)	2
Tasmania	34,584	7302	0.435 (0.050)	12
Victoria	207,409	4512	0.154 (0.011)	12
Western Australia	51,499	2869	0.209 (0.022)	1
Total	659,690	3563	0.174 (0.006)	33

Notes: Resident calculation is based on 1997 population. Gun ownership rate is the share of households with a firearm, and is estimated from the 1989 and 1992 International Crime Victim Surveys. These surveys did not contain a separate designation for residents of the ACT, though Harding (1981) estimated that in the 1975-77, the gun ownership rate in the ACT was similar to the rate in NSW. Port Arthur massacre victim breakdown by state of residence excludes two victims from Malaysia.

	1	2	3
- Gun ownership (1989-92)	15241	7147	
t-statistic	(3.51)	(0.94)	
p-value	0.012	0.391	
% of suicides that are firearm		15092	24480
t-statistic		(1.27)	(3.82)
p-value		0.261	0.009
Joint significance			
F		7.58	
p-value		0.031	
R^2	0.6759	0.8073	0.7082

Table 3. Relationship between the gun buyback rate and proxies of firearm ownership

Note: p-values are in italics, t-statistics in parentheses. All regressions have 8 observations. We assume that the gun ownership rate in the ACT is the same as in NSW.

	Firearm suicide	Non-firearm suicide	All suicides
Guns bought back	-0.537***	0.497	-0.041
t-statistic	(4.46)	(0.66)	(0.06)
p-value	0.004	0.532	0.956
R ²	0.7685	0.0683	0.0006
1990-1995 average death rate	2.55	10.2	12.7
Implied change in death rate	-1.9	1.7	-0.1
Implied % change in death rate	-74%	17%	-1%
Lower limit of 95% CI for death rate	-2.9	-4.7	-6.2
Upper limit of 95% CI for death rate	-0.8	8.2	5.9
Implied change in number of deaths (at 2005 population)	-376	348	-28
Lower limit of 95% CI for number of deaths	-582	-935	-1230
Upper limit of 95% CI for number of deaths	-170	1631	1173
	Firearm homicide	Non-firearm homicide	All homicides
Curse hought heal	0.044	0 1 1 5	0.460

Table 4. Estimates of the effect of the gun buyback: 'stripped down' methodGuns coefficients represent the impact of buying back 1000 firearms

	Firearm homicide	Non-firearm homicide	All homicides
Guns bought back	-0.044	-0.115	-0.160
t-statistic	(0.54)	(0.45)	(0.47)
p-value	0.608	0.671	0.654
R ²	0.0464	0.0322	0.0358
1990-1995 average death rate	0.43	1.47	1.91
Implied change in death rate	-0.16	-0.40	-0.41
Implied % change in death rate	-36%	-27%	-22%
Lower limit of 95% CI for death rate	-0.9	-2.6	-3.5
Upper limit of 95% CI for death rate	0.5	1.8	2.3
Implied change in number of deaths (at 2005 population)	-31	-81	-82
Lower limit of 95% CI for number of deaths	-172	-522	-691
Upper limit of 95% CI for number of deaths	110	361	468

Note: Death rates are deaths per million people. Gun buyback rate is measured as guns per thousand people. Robust tstatistics in parentheses. Sample is one differenced observation per state for a total of 8 observations. * significant at 10 per cent; ** significant at 5 per cent; *** significant at 1 per cent level.

	Firearm					Non-fir	earm			Tc	tal	
Suicide												
Guns bought back	-0.327***	-0.569***	-0.424***	-0.494**	0.796	0.528	0.691	0.112	0.469	-0.041	0.266	-0.383
Unemployment rate	(5.17)	(0.39)	(0.83) 0.207 0.18	-0.169 (0.19)	(1.20)	(0.97)	(1.71) 0.447 (0.15)	(0.35) -3.117 (1.30)	(0.76)	(0.07)	(0.87) 0.655 (0.33)	-3.286 (1.49)
% of pop urban			-0.502	-1.533			6.353	2.102			5.851 [*]	0.569
% of pop 20-24 yo			(0.74) -3.900* (2.06)	(1.72) -6.32* (1.93)			(1.73) -3.142 (0.57)	(1.35) 12.689* (2.10)			(1.91) -7.042 (1.16)	(0.49) 6.365 (0.99)
% of pop >65yo			3.141 (1.37)	-0.954 (0.19)			-8.113 (0.89)	16.988 (1.11)			-4.972 (0.67)	16.034 (0.89)
R∠	0.731	0.7476	0.7749	0.7934	0.4968	0.6915	0.5645	0.737	0.4032	0.5896	0.4908	0.6331
Homicide												
Guns bought back	-0.100 (1.57)	-0.200*** (4.13)	-0.138** (2.49)	-0.184* (1.90)	-0.150 (0.54)	-0.101 (0.39)	-0.129 (0.68)	-0.079 (0.48)	-0.250 (0.74)	-0.301 (1.11)	-0.266 (1.15)	-0.264** (2.88)
Unemployment rate			-0.677 (1.26)	-0.489 (1.04)			-1.841* (2.08)	-0.402 (0.81)			-2.518* (2.06)	-0.892 (1.14)
% of pop urban			-1.196 (1.56)	-0.678 (1.75)			-2.068 (1.75)	1.844** (3.18)			-3.264 (1.71)	0.166*** (4.10)
% of pop 20-24 yo			-2.932 [*] (2 17)	-5.36** (3.01)			-1.813	-3.757 (0.91)			-4.745 (1.47)	-9.122
% of pop >65yo			2.758 (1.51)	-2.479 (1.08)			(0.17) 6.777 (1.45)	2.268 (0.92)			9.535 (1.51)	-0.212 (0.05)
R ²	0.4028	0.4382	0.4287	0.4973	0.8159	0.8415	0.8102	0.84	0.833	0.8649	0.8423	0.8919
Year Fixed Effects	у	у	у	у	у	у	У	У	у	У	У	у
State Fixed Effects	у	У	У	У	У	у	У	у	У	у	У	У
State-specific Time Tren	ds	y		У	-	У	-	У	-	У	-	У
Socio-economic controls			У	У			У	У			У	У
Number of obs	312	312	275	275	312	312	275	275	312	312	275	275

 Table 5. Estimated effects of firearms bought back on death rates (death rate measured in deaths per million)

 Guns coefficients represent the impact of buying back 1000 firearms

Note: Death rates are deaths per million people. Gun buyback rate is measured as guns per thousand people. Observations: 312, except for those using socioeconomic controls which have 275. Robust t-statistics in parentheses. * significant at 10 per cent; ** significant at 5 per cent; *** significant at 1 per cent level.

	Firearm suicide	Firearm homicide	Non-firearm suicide	Non-firearm homicide	Suicide	Homicide
Guns bought back * year t-statistic	0.0184** (2.68)	-0.0019 (1.14)	0.0019 (0.17)	-0.0039 (0.84)	0.0203 (1.41)	-0.0059 (1.17)
R ²	0.6759	0.5227	0.6167	0.8515	0.4878	0.8865

 Table 6. Estimated correlation between buyback rate and prior trends in death rates

Note: Gun buyback rate is measured as guns per thousand people. Robust t-statistics in parentheses. * significant at 10 per cent; ** significant at 5 per cent; *** significant at 1 per cent level.

Table 7.	Estimated effects of firearms bought back on death rates – allowing for state-specific trends, with a break in	n trend in
1988		

Guns	coefficients	represent	the im	pact of	^c buying	back	1000	firearms
					~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~			/

	Firearm				Non-firearm			Total				
Suicide												
Guns bought back	-0.448*** (10.89)	-0.570*** (6.08)	-0.440*** (6.58)	-0.494** (2.71)	0.683 (1.33)	0.519 (0.92)	0.586 (1.39)	0.073 (0.21)	0.235 (0.46)	-0.050 (0.08)	0.146 (0.32)	-0.421 (0.87)
R^2	0.7433	0.7513	0.7872	0.7962	0.6673	0.7025	0.6616	0.7419	0.5588	0.6029	0.5697	0.6404
Homicide												
Guns bought back	-0.168***	-0.197***	-0.177***	-0.201**	-0.128	-0.101	-0.099	-0.027	-0.295	-0.298	-0.276	-0.228**
	(4.17)	(3.99)	(6.03)	(2.78)	(0.45)	(0.39)	(0.52)	(0.37)	(1.05)	(1.07)	(1.36)	(3.10)
R ²	0.4565	0.4611	0.4982	0.5119	0.8343	0.8422	0.8243	0.8575	0.8607	0.8658	0.8652	0.8967
Year Fixed Effects	У	у	у	у	у	у	У	У	у	У	у	у
State Fixed Effects	У	У	У	у	у	У	у	у	у	у	у	у
State-specific Time Trends	;	У		у		У		у		у		у
State-level socioeconomic	controls		У	У			У	У			У	У

Note: Death rates are deaths per million people. Gun buyback rate is measured as guns per thousand people. Observations: 312, except for those using socioeconomic controls which have 275. Robust t-statistics in parentheses. * significant at 10 per cent; ** significant at 5 per cent; *** significant at 1 per cent level.

		Firea	ırm			Non-fire	earm			Tota	al	
Suicide												
Guns bought back interact	ed by years:											
1997-1999	-0.282***	-0.493***	-0.369***	-0.452**	0.075	-0.034	-0.027	-0.263	-0.208	-0.526	-0.342	-0.715**
	(5.57)	(5.03)	(5.62)	(3.23)	(0.13)	(0.07)	(0.07)	(1.01)	(0.39)	(0.93)	(0.83)	(1.88)
2000-2002	-0.329***	-0.580***	-0.424***	-0.505**	0.658	0.547	0.583	0.201	0.329	-0.034	-0.158	-0.304
	(6.58)	(5.54)	(5.42)	(2.86)	(0.77)	(0.72)	(0.98)	0.38	(0.40)	(0.04)	(0.25)	(-0.46)
2002-2005	-0.360**	-0.667***	-0.473***	-0.579***	1.464*	1.327**	1.369**	0.858**	1.1	0.66	0.895*	0.279
	(3.32)	(9.81)	(5.54)	(3.87)	(2.22)	(2.76)	(3.17)	(3.03)	(1.81)	(1.36)	(2.15)	(0.76)
R²	0.7312	0.7486	0.7753	0.7941	0.5221	0.7148	0.5917	0.7545	0.4262	0.6077	0.5145	0.6472
Homicide												
Guns bought back interact	ed by years:											
1997-1999	-0.076**	-0.161**	-0.111**	-0.162	-0.256	-0.207	-0.233	-0.185	-0.332	-0.368	-0.344	-0.346
	(2.42)	(2.97)	(2.39)	(2.74)	(0.61)	(0.53)	(0.64)	(0.58)	(0.76)	(0.98)	(0.93)	(1.50)
2000-2002	-0.118	-0.221**	-0.148*	-0.199**	-0.003	0.047	0.030	0.075	-0.121	-0.174*	-0.119	-0.124
	(1.31)	(3.25)	(2.02)	(2.74)	(0.06)	(0.75)	(0.31)	(0.66)	(0.88)	(2.02)	(0.93)	(0.80)
2002-2005	-0.105	-0.231***	-0.152**	-0.213*	-0.183	-0.123	-0.173	-0.093	-0.288	-0.354	-0.325	-0.306**
	(1.35)	(4.78)	(2.56)	(1.96)	(0.53)	(0.37)	(0.74)	(0.44)	(0.68)	(0.98)	-1.16	(-2.42)
R ²	0.4031	0.4392	0.4291	0.4979	0.8166	0.8422	0.8114	0.8466	0.8334	0.8653	0.8431	0.8926
Year Fixed Effects	у	у	у	у	у	у	у	у	у	у	у	У
State Fixed Effects	У	У	У	у	у	У	У	У	У	У	у	у
State-specific Time Trends	-	y	-	у	-	У	-	У	-	У	-	у
Socio-economic controls		-	У	У			У	У		-	У	у

Table 8. Estimated effects of firearms bought back on death rates – incorporating dynamics Guns coefficients represent the impact of buying back 1000 firearms

Note: Death rates are deaths per million people. Gun buyback rate is measured as guns per thousand people. Observations: 304, except for those using socioeconomic controls which have 275. Robust t-statistics in parentheses. * significant at 10 per cent; ** significant at 5 per cent; *** significant at 1 per cent level.

Table 9. Robustness to Port Arthur and dropping 1997

	Fire	arm		Non-firearm			
		Incl. state-			Incl. state-		
	No trend	specific trend	No t	rend	specific trend		
- Suicide							
Basic	-0.327***	-0.569***		0.796	0.528		
	(5.17)	(6.39)		(1.20)	(0.97)		
Port Arthur dummy	-0.338***	-0.650***		0.799	0.546		
	(5.61)	(-5.22)		(1.20)	(0.97)		
Drop 1997	-0.337***	-0.594***		0.930	0.707		
	(4.63)	(7.82)		(1.40)	(1.31)		
Homicide							
Basic	-0.100	-0.200***		-0.150	-0.101		
	(1.57)	(4.13)		(0.54)	(0.39)		
Port Arthur dummy	-0.062	-0.018		-0.150	-0.110		
	(-0.81)	(0.20)		(0.54)	(0.40)		
Drop 1997	-0.104	-0.210***		-0.150	-0.097		
·	(1.51)	(4.31)		(-0.62)	(0.46)		

Guns coefficients represent the impact of buying back 1000 firearms

Note: Death rates are deaths per million people. Gun buyback rate is measured as guns per thousand people. All specifications include state and year fixed effects, but not socio-economic controls. Each cell is a separate regression. Robust t-statistics in parentheses. * significant at 10 per cent; ** significant at 5 per cent; *** significant at 1 per cent level.

		Tobit estimates			es (no clusterir	ng)
	Firearm	Non-firearm	Total	Firearm	Non-firearm	Total
No Port Arthur Dummy						
Guns bought back	-0.090	-0.195*	-0.263*	-0.100*	-0.150	-0.250**
(t-statistic)	(1.51)	(1.74)	(2.23)	(1.92)	(1.26)	(1.98)
p-value	0.131	0.0083	0.027	0.056	0.207	0.049
Number censored:	46	8	6			
Pseudo-R2	0.0815	0.1730	0.1782	0.4028	0.8159	0.8330
Port Arthur Dummy						
Guns bought back	-0.048	-0.195*	-0.224*	-0.062	-0.150	-0.212*
(t-statistic)	(1.01)	(1.73)	(1.96)	(1.48)	(1.26)	(1.72)
p-value	0.314	0.085	0.051	0.141	0.208	0.087
Number censored:	46	7	4			
Pseudo-R ²	0.1378	0.1730	0.1843	0.6197	0.8159	0.8431

Table 10. Estimates of the effect of the gun buyback on homicides:Tobit vs OLSGuns coefficients represent the impact of buying back 1000 firearms

Note: Death rates are deaths per million people. Gun buyback rate is measured as guns per thousand people. All specifications include state and year fixed effects, but not socio-economic controls. t-statistics in parentheses are not clustered at the state level, for comparability between Tobit and OLS estimates. * significant at 10 per cent; ** significant at 5 per cent; *** significant at 1 per cent level.

55	1	1	σ.	0	5							
	Basic models						Including Port Arthur Dummy					
	Fire	earm	Non-f	firearm	Т	otal	Fire	earm	Non-f	firearm	Тс	otal
	No trend	Trend	No trend	Trend	No trend	Trend	No trend	Trend	No trend	Trend	No trend	Trend
Suicide (Instrumer	nt = estimated	l gun owners	hip, 1989 an	d 1992)								
Gunsbought t-statistic	-0.312*** (5.20)	-0.675*** (7.48)	0.172 (0.41)	2 0.024 (0.07)	-0.139 (0.37)) -0.652) (1.77)	-0.327*** (5.49)	-0.803*** (7.14)	0.171 (0.40)	0.006 (0.01)	-0.157 (0.40)	-0.797 (1.82)
Hausman test Difference t-statistic	0.015 (0.24)	-0.106 (1.19)	-0.624 (0.94)	-0.504 (0.92)	-0.608 (0.98)	3 -0.611) (1.03)	0.011 (0.19)	-0.153 (1.23)	-0.628 (0.94)	-0.540 (0.95)	-0.617 (0.99)	-0.693 (1.07)
R^2	0.7309	0.7469	0.4752	0.6854	0.3822	0.5805	0.7344	0.7437	0.4751	0.6850	0.3825	0.5802
Homicide (Instrum	nents = gun ov	vnership and	% of suicide	es that are fir	earm)							
Gunsbought t-statistic	-0.122 (1.96)	-0.255*** (3.49)	-0.216 (0.58)	6 -0.156 (0.46)	-0.337 (0.73)	7 -0.411) (1.05)	-0.077 (0.76)	-0.042 (0.34)	-0.217 (0.57)	-0.171 (0.47)	-0.293 (0.61)	-0.213 (0.44)
Hausman test Difference t-statistic	-0.022 (0.34)	-0.055 (1.13)	0.117 (0.42)	0.078 (0.30)	0.255 (0.74)	5 0.312) (1.10)	-0.015 (0.20)	-0.024 (0.27)	-0.067 (0.24)	-0.061 (0.22)	-0.081 (0.23)	-0.086 (0.24)
R ²	0.4024	0.4371	0.8157	0.8415	0.8327	0.8647	0.6195	0.6429	0.8157	0.8415	0.8428	0.8437

Table 11. Instrumental variable estimates of the effect of the gun buyback Guns coefficients represent the impact of buying back 1000 firearms

Note: Death rates are deaths per million people. Gun buyback rate is measured as guns per thousand people. All specifications include state and year fixed effects, but not socio-economic controls. The panel to the right includes the Port Arthur dummy. Instruments used are (a) the estimated rate of firearm ownership from the 1989 and 1992 ICVS surveys (figures provided in Table 2); and (b) the percentage of suicides undertaken with a firearm, using data from 1994 to 1996. (We assume that the firearm ownership rate in the ACT is the same as that in NSW.) Table 3 shows the first stage regressions in the stripped down version of the model. Results are similar for the panel model. Robust t-statistics in parentheses, clustered at the state level. * significant at 10 per cent; ** significant at 5 per cent; *** significant at 1 per cent level.

Appendix Tables

			Fire	arm					Non-fir	earm		
Suicide												
Guns bought back	-0.424***	-0.409***	-0.462***	-0.520***	-0.394***	-0.341***	0.691	0.576	0.527	0.269	0.141	-0.234
	(6.83)	(7.02)	(6.72)	(4.65)	(14.25)	(9.00)	(1.71)	(1.51)	(1.41)	(0.50)	(0.35)	(0.51)
	0.7749	0.7758	0.7844	0.7884	0.8244	0.8317	0.5645	0.5818	0.5858	0.6155	0.574	0.6431
Homicide												
Guns bought back	-0.138**	-0.118**	-0.141**	-0.201**	-0.186**	-0.180*	-0.129	-0.048	-0.113	-0.006	-0.040	0.070
-	(2.49)	(2.75)	(2.67)	(3.34)	(3.33)	(2.15)	(0.68)	(0.28)	(0.59)	(0.03)	(0.32)	(0.55)
	0.4287	0.4361	0.4402	0.4276	0.3427	0.343	0.8102	0.8198	0.8143	0.8211	0.8625	0.8718
Year Fixed Effects	у	у	У	У	у	У	у	У	у	У	У	У
State Fixed Effects	У	У	У	У	У	У	У	У	У	У	У	У
State-level controls	У	У	У	У	У	У	У	У	У	У	У	У
Include % male 15-24		У						У				
Include Prisoners & Police			*	У					*	У		
Include % indigenous					*	У					*	у
Number of observations	275	275	237	237	128	128	275	275	237	237	128	128

Appendix Table 1. Effects of including additional contractional contractions and the second s	rol variables
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Note: Death rates are deaths per million people. Gun buyback rate is measured as guns per thousand people. All specifications include state and year fixed effects and basic socio-economic controls. Results from Table 5 shown for comparison (first columns). Columns with * indicate that the sample is restricted to states and years for which we have information on prison population and police, and percentage of the population indigenous, for comparison with specifications that include those variables. Robust t-statistics in parentheses, clustered at the state level. * significant at 10 per cent; ** significant at 5 per cent; *** significant at 1 per cent level.

	Firearm				Non-firearm				Total			
Suicide												
Guns bought back	-0.569***	-0.570***	-0.494**	-0.494**	0.528	0.523	0.112	0.107	-0.041	-0.047	-0.383	-0.387
	(6.39)	(6.34)	(3.20)	(3.18)	(0.97)	(0.96)	(0.35)	(0.33)	(0.07)	(0.08)	(0.88)	(0.89)
	0.7476	0.7476	0.7934	0.7934	0.6915	0.6924	0.7370	0.7373	0.5896	0.5904	0.6331	0.6334
Homicide												
Guns bought back	-0.200***	-0.201***	-0.184*	-0.185	-0.101	-0.101	-0.079	-0.079	-0.301	-0.302	-0.264**	-0.265**
	(4.13)	(4.13)	(1.90)	(1.89)	(0.39)	(0.39)	(0.48)	(0.48)	(1.11)	(1.12)	(2.88)	(2.90)
	0.4382	0.4385	0.4973	0.4973	0.8415	0.8417	0.8456	0.8456	0.8649	0.8652	0.8919	0.8919
Year Fixed Effects	У	У	у	У	У	У	У	у	У	У	У	У
State Fixed Effects	у	у	у	у	У	у	у	у	у	у	у	У
State-specific Time Trend	у	у	у	у	У	у	у	у	у	у	у	У
Quadratic State-specific Ti	ime Trend	у		У		У		у		У		У
State-level socioeconomic	controls		У	У			У	У			У	У

Appendix Table 2. Effects of allowing for quadratic trends

Note: Death rates are deaths per million people. Gun buyback rate is measured as guns per thousand people. All specifications include state and year fixed effects and basic socio-economic controls. Results from Table 5 including linear trends shown for comparison. Robust t-statistics in parentheses, clustered at the state level. * significant at 10 per cent; ** significant at 5 per cent; *** significant at 1 per cent level.

		Firearm				Non-fi	rearm			То	tal		
Suicide	-												
1979 and on, tr	rend break in 1988												
Gu	ns bought back	-0.448***	-0.570***	-0.440***	-0.494**	0.683	0.519	0.586	0.073	0.235	-0.050	0.146	-0.421
		(10.89)	(6.08)	(6.58)	(2.71)	(1.33)	(0.92)	(1.39)	(0.21)	(0.46)	(0.08)	(0.32)	(0.87)
R2		0.7433	0.7513	0.7872	0.7962	0.6673	0.7025	0.6616	0.7419	0.5588	0.6029	0.5697	0.6404
1988 and on													
Gu	ns bought back	-0.455***	-0.123*	-0.469***	-0.105*	0.690	-0.617	0.413	-0.819	0.235	-0.741	-0.056	-0.923
		(9.84)	(2.04)	(7.07)	(2.28)	(1.27)	(0.90)	(1.19)	(1.55)	(0.42)	(1.17)	(0.15)	(1.80)
R2		0.8135	0.8539	0.8195	0.8595	0.4317	0.673	0.5105	0.7127	0.4953	0.669	0.5554	0.7055
Homicide													
1979 and on, tr	rend break in 1988												
Gu	ns bought back	-0.168***	-0.197***	-0.177***	-0.201**	-0.128	-0.101	-0.099	-0.027	-0.295	-0.298	-0.276	-0.228**
		(4.17)	(3.99)	(6.03)	(2.78)	(0.45)	(0.39)	(0.52)	(0.37)	(1.05)	(1.07)	(1.36)	(3.10)
R2		0.4565	0.4611	0.4982	0.5119	0.8343	0.8422	0.8243	0.8575	0.8607	0.8658	0.8652	0.8967
1988 and on													
Gu	ns bought back	-0.166**	-0.400	-0.141**	-0.382	-0.083	-0.279	0.001	-0.220	-0.249	-0.678**	-0.140	-0.603**
		(3.35)	(1.76)	(2.48)	(1.63)	(0.35)	(0.79)	(0.01)	(0.57)	(0.92)	(3.03)	(1.15)	(2.47)
R2		0.3344	0.4378	0.3993	0.4519	0.7911	0.8111	0.8054	0.8176	0.8088	0.8536	0.8386	0.8619
Year Fixed Effects		у	у	у	У	у	у	у	у	у	у	у	у
State Fixed Effects		у	у	У	у	У	у	у	У	У	у	У	у
State-specific Time Tre	ends		У		У		У		У		У		У
State-level socioecono	mic controls			У	У			У	У			У	У

Appendix Table 3. Effects of shortening time period to 1988 and after

Note: Death rates are deaths per million people. Gun buyback rate is measured as guns per thousand people. All specifications include state and year fixed effects and basic socio-economic controls. Results from Table 7 including a break in state-specific trends in 1988, shown for comparison. Robust t-statistics in parentheses, clustered at the state level. * significant at 10 per cent; ** significant at 5 per cent; *** significant at 1 per cent level.

Appendix Table 4. Effects of shortening time period to 1988 and after

	ICD 10 codes	Coefficient t	-statistic	p-value
Accidents and undetermined intent				
Firearm accident + undetermined intent	(W32-W34)+(Y22-Y34)	-0.035	(1.03)	0.344
Non-firearm accident + undetermined intent	(V01-X59)+(Y10-Y34)-((W32-W34)+(Y22-Y34))	-1.129	(1.12)	0.306
Suicide-like non-firearm accident*	W75-W84; W00-W19; W65-W74; X40-X49	-0.569	(1.28)	0.247
Suicide-like non-firearm undetermined intent*	Y10-Y19; Y20; Y21; Y30; Y31	0.009	(0.10)	0.922
Total accident + undetermined intent	(V01-X59)+(Y10-Y34)	-0.116	(1.19)	0.281
III-defined causes	R99	-0.419	(0.56)	0.594

Note: Death rates are deaths per million people. Gun buyback rate is measured as guns per thousand people. Regression equation used is equation 1. * significant at 10 per cent; ** significant at 5 per cent; *** significant at 1 per cent level. Suicide-like accidents and deaths of undetermined intent refer to the ICD-10 categories associated with poisoning, threats to breathing, drowning and falling, identified in AIHW (2009) as the most likely categories in which a suicide could be mis-coded as an accidental death, or coded as a death of undetermined intent.

ORIGINAL ARTICLE

Firearm related deaths: the impact of regulatory reform

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Objectives: To examine trends in rates of firearm related deaths in Victoria, Australia, over 22 years in the

context of legislative reform and describe and investigate impact measures to explain trends. **Design:** Mortality data were extracted from vital statistics for 1979–2000. Data on firearm related deaths that were unintentional deaths, assaults, suicides, and of undetermined intent were analyzed. Rates were calculated with population data derived from estimates by the Australian Bureau of Statistics. A quasi-experimental design that used a Poisson regression model was adopted to compare relative rates of firearm related deaths for Victoria and the rest of Australia over three critical periods of legislative reform. The Wilcoxon signed ranks test was used to assess changes in the types of firearm related deaths before and after 1998.

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Correspondence to: Professor Joan Ozanne-Smith, Monash University Accident Research Centre, Building 70, Monash University, Victoria 3800, Australia; joan.ozanne-smith@ general.monash.edu.au **Results:** In Victoria, two periods of legislative reform related to firearms followed mass shooting events in 1988 and 1996. A national firearm amnesty and buyback scheme followed the latter. Victorian and Australian rates of firearm related deaths before reforms (1979–86) were steady. After initial Victorian reforms, a significant downward trend was seen for numbers of all firearm related deaths between 1988 and 1995 (17.3% in Victoria compared with the rest of Australia , p<0.0001). A further significant decline between 1997 and 2000 followed the later reforms. After the later all state legislation, similar strong declines occurred in the rest of Australia from 1997 (14.0% reduction compared with Victoria , p=0.0372). Victorian reductions were observed in frequencies of firearm related suicides, assaults, and unintentional deaths before and after the 1988 reforms, but statistical significance was reached only for suicide.

Conclusion: Dramatic reductions in overall firearm related deaths and particularly suicides by firearms were achieved in the context of the implementation of strong regulatory reform.

Deaths and non-fatal injuries from firearms remain a major public health problem in many countries, including the United States, Mexico, South Africa, Columbia, Estonia, and Brazil.¹ In the United States in 2000, 28 663 firearm related deaths occurred (10.4 per 100 000 population).² In addition, in 1997, an estimated 64 207 firearm related injuries were treated in American hospital emergency departments (24.0 per 100 000 population; 95% confidence interval 13.8 to 34.1), with about 40% of patients needing inpatient hospital care.³ American inpatient care costs for people with firearm related injuries in 1993 were reported as \$4 billion.⁴ Strong correlations have been reported between firearm ownership and firearm related suicide, homicide, assault, and unintentional deaths.⁵⁻¹³

The American annual rate of firearm related deaths decreased by 2% from 10.6 per 100 000 population in 1999 to 10.4 per 100 000 in 2000.2 Other Western industrialised nations also have shown reductions. Canadian rates of firearm related deaths are available for 1970-99 and show a decrease from a peak of 7.2 per 100 000 population in 1977 and 1978 to a low of 3.3 per 100 000 in 1998 and 1999.14 Rates of firearm related deaths in New Zealand over the 12 years from 1988 to 1999 decreased from 4.5 per 100 000 in 1988 to 1.3 per 100 000 in 1999.15 In Australia in 2000, the rate of firearm related deaths had declined to 1.8 per 100 000about 20% of the corresponding rate in the United States. Comparison of the trends and relatively low rate of firearm related deaths in Australia with those of other countries provide contrasts that may be of public health benefit internationally. Furthermore, comparisons of firearm ownership in 2000 showed that about 33% of American households had firearms compared with 11% of Australian households.2 16

The relation between strengthening firearm control regulations and rates of firearm related deaths warrants further investigation. In Australia, regulation of firearms is under state jurisdiction, and variance over time between the strength of state laws provides a natural experiment.

FIREARMS LEGISLATION IN AUSTRALIA

In Victoria, two episodes of tightening of firearm laws followed mass shooting events. The first, in 1988, followed the 1987 Hoddle and Queen Street massacres and the combined deaths of 15 people. After these events, the federal government established a National Committee on Violence, whose recommended reforms included uniform national firearm laws. At a state premiers' conference in 1987, two states refused to adopt this national approach. Victoria tightened restrictions on semiautomatic longarms in 1988 but fell short of the recommended national uniform laws (fig 1).¹⁶

Uniform firearm laws finally were achieved nine years later in the aftermath of the 1996 Port Arthur massacre in Tasmania (35 deaths). In May 1996, the Australian Police Ministers' Council agreed to a 10 point nationwide agreement on firearms, to be implemented by each Australian state and territory. The Victorian response, the Firearms Act 1996, was implemented on 30 April 1997 (fig 1) and changed existing regulations. Table 1 outlines the details of the 10 point nationwide agreement and the Victorian response.

A national firearm buyback scheme was progressively implemented from September 1996 and ran for 12 months. This was supported by a national firearm amnesty in which people in possession of illegal firearms could hand them in without penalty (fig 1).

This study aimed to describe trends in rates of firearm related deaths in the state of Victoria compared with the rest of Australia for the 22 years between 1979 and 2000 in the context of strong legislative reform to prevent firearm



fatalities. It also investigates comparative trends and impact measures to explain the trends.

METHODS

We used data analysis, literature reviews, and key informant interviews to identify details of death rates, trends, and interventions for control of firearms over the period 1979– 2000 in Victoria and Australia. Victoria, which has a population of 4.2 million, is the second most inhabited Australian state, and Australia has a population of 19.8 million. Victoria's largest city is Melbourne, and 75% of Victorians reside in metropolitan areas.

We reviewed changes to firearm regulations with government documents, and we obtained population data from the Australian Bureau of Statistics.

We extracted death data, by intent, from the death unit record file of the Australian Bureau of Statistics. Monash University Accident Research Centre holds this data file from 1990–2000; we obtained earlier data from the National Injury Surveillance Unit. We analyzed data on unintentional firearm related deaths (International Classification of Diseases, ninth revision (ICD-9) codes E922.0–E922.9), assaults (E965.0– E965.4), suicides (E955.0–E955.4), and deaths of undetermined intent (E985.0–E985.4). The last two years studied use the 10th revision of the ICD (ICD-10), so we mapped data to ICD-9 for comparison.

We calculated rates with population figures derived from estimates by the Australian Bureau of Statistics. We adopted a quasiexperimental design with a Poisson regression model to compare relative rates of firearm related deaths between Victoria and the rest of Australia over three critical periods of legislative reform. These three periods represented prelegislative and post-legislative reforms in Victoria and the rest of Australia: period 1-no legislation (1979-86); period 2: legislation introduced in Victoria (1988-95); and period 3: legislation introduced to the rest of Australia (1997–2000). Data from the rest of Australia acted as the "control" for periods 1 and 2, with the Victorian gun control legislation introduced in period 2. In period 3, the roles of the "treatment" and "control" in the analysis were reversed, with Victoria acting as the control because the gun laws for the rest of Australia came into line with Victoria in period 3. Under this analysis design, we assessed the decrease in the rate of firearm related deaths in Victoria in period 2 relative to Australian trends, as well as the decrease in rates of firearm related deaths in Australia in period 3 relative to

Victorian trends. We compared relative shifts in the rates for Victoria and the rest of Australia with a Poisson regression model that incorporated a fixed offset. We used the death counts as the dependent random variable in the model, while we included an offset (the population counts by region and year) to focus the analysis on rates rather than absolute death counts. Equation 1 shows the form of the model fitted to the annual death counts in Victoria and Australia, where *y* is the annual death count; *i* is an indicator for Victoria or the rest of Australia; *j* is the indicator for year; *v* is the indicator for period 2 or 3 in Victoria; *a* is the indicator for period 3 in the rest of Australia; *population* is the population count for the region and year indexed; and α , β , δ , γ , and ϕ are parameters of the model.

$$\ln(y_{ijva}) = \ln(population_{ij}) + \alpha + \beta_i + \delta_j + \phi_v + \lambda_a$$
(1)

The indicators in the model take the values j = 1979, 1980, ..., 2002; i = 0 for Victoria or 1 for the rest of Australia; v = 1 if period is 2 or 3 and region is Victoria and 0 otherwise; and a = 1 if period is 3 and region is Australia and 0 otherwise.

We included the model offset in population levels as a fixed factor, with no associated parameter estimated. Equation 2 gives the net effect of the gun control laws on death rates in Victoria during period 2, relative to Australia, measured as a net percentage reduction in death rate. It measures the change in Victorian death rates from period 1 to period 2, adjusted for corresponding changes in death rates in Australia over the same time period.

$$\Delta Victoria Period2 = (1 - \exp((\phi_1 - \phi_0))) \times 100\%$$
(2)

In practice, parameterisation of the factors in the model given by equation 1 leaves parameters "aliased." Aliased parameters are those that cannot be estimated because they are a linear product of other parameters in the regression design matrix. Aliased parameters are set to zero in the regression equation. With careful parameterisation and fitting of the model in equation 1, the parameters ϕ_0 can be aliased. This leads to a reduction in equation 2 to give equation 3.

w requirement for each state and territory cording to 10 point nationwide agreement	Victorian response to law requirement through Firearms Act 1996 and Firearms (Amendment) Act 1998
Ban on importation, ownership, sale, resale, transfer, possession, manufacture, or use of all self loading centre rifles, all self loading and pump action shotguns, and all self loading rimfire rifles (some exemptions allowable to primary producers and clay target shooters) Compensatory buyback scheme through which firearm owners	 Continuation of existing ban in Victoria of semiautomatic long guns and puaction shotguns Longarms buyback scheme in Victoria in conjunction with the national
Would be paid the market value for prohibited firearms handed in during a 12 month amnesty Registration of all firearms as part of integrated shooter licensing scheme Shooter licensing based on requirement to prove "genuine reason" for owning a firearm, including occupational use, demonstrated membership of an authorized target shooting club, or hunting	 Firearm registration had been required from 1996 to 30 September 1997 Firearm registration had been required from 1984, so Victoria Police nov keep comprehensive list of all firearms in Victoria Several categories of licensing based on new way of categorising firearm (see below for details). Genuine reasons for applying for licence vary wi category for firearm:
(with proof of permission from a rural landowner)	 Category A or B longarms: sport or target shooting; hunting; prim production; employed as security or prison guard; or accepted offic commercial, or other prescribed purpose
	 Category C longarms: primary production; professional hunting; or target shooting; or official, commercial, or other prescribed purper Proof that category A or B firearms would not do required job
	 Category D longarms: professional hunting; accepted official, comm cial, or other prescribed purpose. Proof that category A, B, or C fired would not do required job
	- Category E: accepted official, commercial, or other prescribed purpe
	 Handguns: sport or target shooting; employed as security or pri guard; or official, commercial, or other prescribed purpose
Licensing scheme based on five categories of firearms,	• Adherence to new nationally agreed way of categorizing firearms:
minimum age of 18 years, and criteria for a "fit and proper person"	 Category A: airguns, rimfire rifles, shotguns, or any combination of the other than pump action and semiautomatic types
	 Category B: muzzle loading firearms, centre fire rifles other t semiautomatic or fully automatic, or any combination of these
	 Category C: semiautomatic rimitre rittles with a magazine capacity of more than 10 rounds, semiautomatic shotguns with a magazine capac of no more than five rounds, pump action shotguns with a magaz capacity of no more than five rounds, or tranquillizer guns
	 Category D: semiautomatic rimfire rifles with a magazine capacity more than 10 rounds, semiautomatic shotguns with a magazine capacity of more than five rounds, pump action shotguns with a magazine capacity of more than five rounds, or semiautomatic centre fire rifles
	 Category E: machine guns, tear gas guns or projectors, shotguns or r with a length of less than 75 centimetres parallel to the barrel, cannor mortars, bazookas, rocket propelled grenades, or similar large cali military firearms)
	- Handguns
	A clear ban on prohibited persons owning or using firearms including a person serving a term of imprisonment for an indictable offence, assault drug related offence; a 15 year ban, from completion of the prison term, for person who has served a term of imprisonment of more than 5 years for of the above offences; a 5 year ban, from completion of the prison term, for person who has served a term of imprisonment of less than 5 years for an the above offences; a 5 year ban on persons subject to a domestic violer intervention order in any Australian State or Territory; a 12 month ban against holding a licence for anyone guilty of an offence against the Firea Act 1996; and a 12 month ban against holding a licence for anyone guilt an indictable offence
New licence applicant required to undertake accredited training course in firearm safety	 To own or use longarms or handguns in Victoria, applicants must be abl show they successfully completed a firearms safety training course appro by Victoria Police
As well as licence to own a firearm, separate permit required for each purchase of a firearm subject to a 28 day waiting period	 When applying for renewal of a firearms licence, owners required to list firearms owned When new firearm "acquired" (bought, inherited, received as gift, or ownership in any other way), "permit to acquire" application must be obtained from Eirograms Bagistry. A 28 drawwitting particle and p
Uniform and strict firearm storage requirements	 General security requirement: firearms must be carried and used in a mar that is secure and not dangerous, reasonable precautions must be taken against loss or theft, and firearm must not be allowed to be used or carried person unauthorized to do so

Law requirement for each state and territory according to 10 point nationwide agreement	Victorian response to law requirement through Firearms Act 1996 and Firearms (Amendment) Act 1998				
	• Specific storage requirements for firearm categories:				
	 Category A or B: firearm must be stored in receptacle constructed of ha wood or steel that, if weighs <150 kg when empty, must be fixed to the frame of the floor or wall of premises and must be locked when a firear stored within 				
	 Category C, D, or handgun: firearm must be stored in steel safe that is a thickness not easily penetrable and that, if weighs <150 kg whe empty, must be bolted to the structure of the premises and must be locked when a firearm is stored in it 				
	- All categories: ammunition must be stored in a separate locked contain				
 Firearms sales to be conducted only through licensed firearm dealers and all records of sale to be provided to the police 	 All acquisitions and disposal of firearms must be directly with a licensed firearms dealer Licensed dealers must keep register of all firearm transactions and forward return to Victoria Police of a transaction occurring 				
 Sale of ammunition only for firearms for which purchaser is licensed and limitations on quantities purchased within time period 	reion to viciona ronce of a nansachon occurring				

$$\Delta Victoria Period2 = (1 - \exp(\phi_1)) \times 100\%$$
(3)

The form of equation 3 is much more convenient in practice, as statistical testing of the difference in f1 from zero directly tests the significance of the change in death rate in Victoria in period 2 relative to that in Australia. Similarly, the variance of ϕ_1 can be used to compute confidence limits on the estimated change in rate of firearm related deaths.

Similarly, the change in death rate in Australia in period 3, relative to Victoria, is measured by equation 4.

$$\Delta Australia Period3 = (1 - \exp(\lambda_1)) \times 100\%$$
(4)

We fitted the Poisson regression model with the Genmod procedure in SAS software (version 8.02). We considered trends to be statistically significant if the p value of the parameter estimate of the model was less than 0.05.

As deaths from injuries are not distributed normally, we used the non-parametric equivalent of the paired samples t test, the Wilcoxon signed ranks test, to assess changes in types of injury and deaths caused by firearms (assault, suicide, and unintentional death) for Victoria before and after 1988. All p values quoted for the Wilcoxon signed ranks

test are two tailed, and statistical significance was taken as p < 0.05.

Self reported data on firearm ownership for 1992 and 1998 were extracted from surveys by the Australian Bureau of Statistics on hazards and safety features in the home conducted on a representative sample of about 5000 house-holds in Melbourne, Victoria (population 3 122 971 according to statistics from the 1996 census). Victoria Police provided data on registered firearms and licence holding registered shooters for 1979–2000.

RESULTS

Firearm related deaths

Figure 2 shows the trend in rates of firearm related deaths for Victoria and the rest of Australia from 1979 to 2000, with the 1988 and 1996 Victorian legislative changes indicated. The Victorian death rate for firearm related deaths decreased significantly from 4.2 per 100 000 in 1979 to 1.5 per 100 000 in 2000, which represented an estimated annual percentage change of -4.9% (95% confidence interval -5.9 to -3.9) and 64.3% overall. The death rate for firearm related deaths for the rest of Australian decreased significantly from 5.1 per 100 000 in 1979 to 1.8 per 100 000 in 2000, which represented an estimated annual percentage change of -3.9% (-4.8 to -3.1) and an overall reduction of 64.7%.



Figure 2 Observed and modelled rates of firearm related deaths in Victoria and the rest of Australia before and after legislative reforms.¹⁷ Lines show that data from 1987 and 1996 were excluded from these analyses.

Table 2Regression model parameter estimates for rates of firearm related deaths forVictoria and rest of Australia for periods 2 and 3

		Estimated reduction Sign			ificance test		
Effect	Parameter estimate	Calculation	%	χ ²	Degrees of freedom	p Value	
Victoria: period 2 (1988–95)	-0.1903 (SE 0.0478)	1-exp(-0.1903)	17.3	15.88	1	< 0.0001	
Australia: period 3 (1997–2000)	-0.1511 (SE 0.0725)	1-exp(-0.1511)	14.0	4.34	1	0.0372	

The particularly high Victorian rate of 4.9 per 100 000 in 1987 corresponds with the Hoddle and Queen Street massacres. The high rate in the rest of Australia in 1996 corresponds with the 35 deaths at Port Arthur in Tasmania. We excluded the 1987 and 1996 massacre years from analysis, as these would make the declines seem more pronounced. Table 2 reports the estimated percentage reduction in death rates associated with the Victorian gun legislation in period 2 and the nationally agreed legislation in period 3, along with statistical significance levels derived from the model.

The Victorian legislation in period 2 was associated with a statistically significant 17.3% decrease in death rate relative to Australia (p < 0.0001). The Australian (all states and territory) legislation in period 3 was associated with a statistically significant 14.0% drop in death rate in the rest of Australia relative to Victoria (p = 0.0372). Figure 2 shows the fit of the estimated model to the observed data.

A further important analysis outcome was the assessment of the efficacy of the quasiexperimental design. In particular, assessment was needed to determine whether the latent trends in death rates by year were similar in Victoria and the rest of Australia after controlling for the effects of the legislation changes on the series. Similarity in trends indicates each series is a good control for the other. We assessed this by determining the fit of the fitted model by examining the estimated deviance of the model. The model deviance is a χ^2 statistic, with low values indicating adequate model fit.

Analysis of the deviance of the model showed the model was an adequate fit to the data ($\chi^2 = 24.15$, degrees of freedom = 17, p = 0.1154). Consequently, we concluded that the analysis design was valid.

After the 1988 legislative revisions, statistically significant reductions in Victorian frequencies of all firearm related deaths (p = 0.011) and firearm related suicides (p = 0.008) were seen when we compared the periods 1979–87 and 1988–96. Although decreases were also evident in assaults

(p = 0.108) and unintentional firearm related deaths (p = 0.05) over this same time period, they did not reach statistical significance (table 3). Further declines in overall firearm related deaths and firearm related suicides and assaults followed the additional legislative reforms in 1996. Unintentional firearm related deaths increased slightly during 1997–2000 in Victoria. The annual average frequency is low, however, and therefore prone to fluctuation. The reduction in annual frequency for suicide accounted for 78% of the total reduction in annual average frequency of firearm related deaths over this period.

Firearm ownership

Representative household surveys in Melbourne, Victoria, undertaken by the Australian Bureau of Statistics in 1992 and 1998, show that the number of households that reported firearm and ammunition possession decreased in Melbourne over this period. The 1992 survey found that 7.4% of all households and 8.3% of households with children aged <5 years kept a firearm on the property and that 5.2% of all households and 5.6% of households with children aged <5 years kept ammunition. The repeat survey found reductions in all categories. In the 1998 survey, 4.4% of all households and 3.5% of households with children aged <5 years kept a firearm on the property and 3.1% of all households and 2.5% of households with children aged <5 years kept a firearm on the property and 3.1% of all households and 2.5% of households with children aged <5 years kept ammunition.

Data from the Victoria Police firearm registry show that the numbers of registered firearms and current licence holding registered shooters in Victoria declined during the four years between 1997–98 and 2000–01 (fig 3). These figures equate to a 25% reduction in registered firearms and 15% reduction in licences over the four years.

The National Firearms Buyback Scheme and associated publicity operated for 12 months from September 1996 (fig 1). Over this period, 660 959 firearms were collected and destroyed nationwide, with a total compensation cost of

Intent							
Period	Suicide	Assault	Unintentional	Total*			
Average annual	frequency of deaths (p	eriod total frequency)				
1	132.5 (1193)	29.0 (261)	7.7 (69)	174.1 (1567)			
2	90.5 (815)	20.4 (184)	4.1 (37)	118.1 (1063)			
3	60.3 (241)	14.5 (58)	6.0 (24)	82.0 (328)			
Change in avera	age annual frequency b	petween different peri	ods				
1 and 2	-42	-8.6	-3.6	-56			
2 and 3	-30.2	-5.9	+1.9	-36.1			
1 and 3	-72.2	-14.5	-1.7	-92.1			
Change betweer	n different periods (%)						
1 and 2	-31.7	-29.7	-46.8	-32.2			
2 and 3	-33.4	-28.9	+46.3	-30.6			
1 and 3	-54.5	-50.0	-22.1	-52.9			



Figure 3 Gun owner licences and registered firearms in Victoria.¹⁸

285

almost \$A394 million (\$176m). Some 207 409 of the collected firearms were from Victoria.¹⁹

DISCUSSION

This study shows dramatic declines in rates of firearm related deaths in the state of Victoria, and for the rest of Australia, for the 22 years between 1979 and 2000 in the context of strong legislative reform. Earlier legislative reform in Victoria, compared with the rest of Australia, was associated with more rapid initial declines. Evidence for this relation is strengthened by the differential rates associated with the tightening of regulations earlier in Victoria (in 1988) compared with the remainder of Australia and the ultimate "catch up" by the rest of Australia after regulation was introduced in the other states. Declines in household ownership of firearms, firearm licences, and licenced shooters in Victoria and the national firearms buyback scheme (from 1996) were associated with these trends. These changes were associated with substantial publicity, unprecedented community awareness, and advocacy for gun control reform from antigun groups and the broader community.¹⁶

In particular, our data analysis shows significant reductions in firearm related suicides and assaults after both periods of reform in Victoria. Studies that focused only on suicide in the states of Queensland and South Australia support our findings.^{20 21} Similarly, two international studies by Rich *et al* and Loftin *et al*, which examined the effects of strengthened firearm laws in Ontario and Washington, DC in

Key points

- Significant and dramatic declines in rates of firearm related deaths occurred in Victoria and Australia after periods of strong legislative reform.
- Statistically significant reductions in firearm related suicides were observed after legislative reforms.
- In 2000, rates of firearm related deaths were less than two per 100 000 population for Victoria and Australia compared with 10.4 per 100 000 population for the United States.
- In Victoria, reductions in the numbers of registered firearms of 25% and of licensed shooters of 15% were seen over the four years between 1997–98 and 2000–01.

the United States, respectively, reported decreases in firearm related suicides. $^{\rm 22\ 23}$

Supportive evidence for the relation between firearm ownership and prevalence of fatalities also comes from a number of American studies. Miller et al, in a pooled cross sectional time series analysis over 10 years (1988-97), found that a disproportionately high number of children aged 5-14 years died from suicide, homicide, and unintentional firearm related deaths in American states and regions in which firearms were more prevalent.6 Kellermann et al conducted case-control studies to examine the links between firearm ownership as a risk factor for suicide and homicide in the home.10 12 After controlling for several factors, they found that the presence of one or more firearms in the home was associated with an increased risk of suicide (adjusted odds ratio 4.8, 95% confidence interval 2.7 to 8.5).10 Similarly, keeping a firearm in the home was strongly and independently associated with an increased risk of homicide (adjusted odds ratio 2.7, 1.6 to 4.4).12

The methods used in this study were capable of showing a strong association between firearm regulations and the significant decline in firearm related fatalities. This relation was further supported by impact measures. Further evidence would be needed to show that the relation is causal. For reasons associated with coding systems, this study was unable to consider type of firearm.

For the same period, despite the declines related to firearms, overall suicide and homicide rates in Victoria did not show a similar decline. An analysis of substitution or displacement to other methods of suicide or homicide was beyond the scope of this study. Investigation of the rates of non-fatal firearm related injury was also out of the scope of this study.

The very low rate of fatalities from firearms achieved in Australia by the year 2000 (<2 per 100 000 population) raises the question of whether vision zero (elimination of firearm related fatalities) is achievable. In the course of this research, our own institution—Monash University—was the site of a shooting that resulted in the death of two members of our community. In the aftermath of the events at Monash, the Australian, state, and territory governments made a National Handgun Control Agreement. This agreement aims to reduce the number of handguns held in the community, particularly concealable handguns, and to strengthen control over access to handguns.²⁴ The *Firearms (Trafficking and Handgun Control) Act 2003* started in Victoria on 1 July 2003 with a supporting amnesty and buyback scheme to run until 31 December 2003. The impact of this further reform will be monitored.

CONCLUSION

Dramatic reductions in overall firearm related deaths and particularly suicides by firearms are achievable in the context of the implementation of strong regulatory reform.

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2005

PARLIAMENT OF TASMANIA

AUDITOR-GENERAL SPECIAL REPORT NO. 55

GUN CONTROL IN TASMANIA

May 2005

Presented to both Houses of Parliament in accordance with the provisions of Section 57 of the Financial Management and Audit Act 1990

By Authority:

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24 May 2005

President Legislative Council HOBART

Speaker House of Assembly HOBART

Dear Mr President Dear Mr Speaker

PERFORMANCE AUDIT NO. 55 GUN CONTROL IN TASMANIA

This report has been prepared consequent to examinations conducted under section 44 of the *Financial Management and Audit Act 1990*, for submission to Parliament under the provisions of section 57 of the Act.

Performance audits seek to provide Parliament with assessments of the effectiveness and efficiency of public sector programs and activities, thereby identifying opportunities for improved performance.

Yours sincerely

H M Blake AUDITOR-GENERAL
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FOREWORD

Following the Port Arthur tragedy in 1996, a national re-think on gun control led to revised legislation in all jurisdictions. The Tasmanian Government tightened access to and ownership of guns through the *Firearms Act 1996*. Tasmania Police has the key responsibility for administering this Act.

A key goal of *Tasmania Together* is 'Safer communities' and through this performance audit we examined the impact of the above Act on firearm-related crime and injuries. We also reviewed the performance of Tasmania Police in managing the requirements established by the legislation.

This audit has shown, based on information from Tasmania Police and the Department of Health and Human Services, that since 1996 there has been a substantial decline in the use of firearms whether to commit violent crime or suicide. Additionally, there has been a parallel reduction in hospital admissions for firearm trauma, particularly as a result of accidental shootings.

The *Firearms Act 1996* imposes a large administrative burden on the police, particularly in gathering and managing data on firearm registration and the licensing of shooters. Overall, we found that Tasmania Police effectively fulfils its obligations. However, we identified a number of areas where improvements could be achieved, especially in managing the firearms database. My report contains eight recommendations aimed at providing increased effectiveness.

H M Blake Auditor-General May 2005

LIST OF ACRONYMS AND ABBREVIATIONS

Corporate Information 7	Гechnology
	Corporate Information

TAO Tasmanian Audit Office

Executive summary

EXECUTIVE SUMMARY

INTRODUCTION

The mass murder at Port Arthur in 1996 provided the impetus for a national re-think on integrated firearms legislation. In May 1996, the Australasian Police Minister's Council reached a Nationwide Agreement on Firearms that embodied a four-pronged approach aimed at:

- Reducing the overall supply of firearms;
- Restricting access to people deemed 'fit and proper';
- 0 Prohibiting particular kinds of firearms; and
- o Controlling gun use.

All aspects of gun ownership in Tasmania were tightened up in the *Firearms Act 1996* that replaced the earlier and less stringent *Guns Act 1991* and *Guns Amendment Acts 1993* and *1996*.

Under the new Act the role of Tasmania Police is central in restricting and controlling ownership and access to firearms.

OBJECTIVE

The objective of the audit was to determine whether the Tasmania Together goal of 'Safer communities' was being furthered by gun control and to identify any areas for improvement. Specifically, it would examine:

- The extent to which the implementation and enforcement of the *Firearms Act 1996* in Tasmania has reduced the number of firearms as well as its impact on gun crime and gun trauma; and
- Whether there are problems regarding enforcement of the Act.

SCOPE

The scope of the audit was on Tasmania Police's performance of its obligations under the *Firearms Act 1996*.

AUDIT OPINION

Is the Tasmanian Community safer since the Firearms Act 1996 *came into force?*

The impact of the *Firearms Act 1996* has been positive. Tighter legislation, backed by determined law enforcement, has reduced the population of firearms in Tasmania and limited access to those firearms. Statistics that we examined indicated that substantial reductions have occurred in the use of firearms to commit violent crime and suicide. There has been a similar lessening of hospital admissions for gun trauma, particularly as a result of accidental shootings.

Thefts of firearms have also been lowered with an upswing in the proportion of stolen firearms recovered.

Since 2001 almost 6 000 firearms have been surrendered to police and subsequently destroyed.

Are there problems enforcing the Firearms Act 1996?

Our audit did identify some areas where enforcement of the *Firearms Act 1996* could be strengthened, viz:

- Tasmania Police do not appear to be able to meet the legislative requirement to assess the mental condition of licence applicants.
- Inspection of licence holders' storage conditions is only done for handgun applicants. Any other inspections are *ad hoc*.
- Firearms Services needs to further develop guidelines for its activities. Also, it does not speedily follow up dealers' returns and deficiencies in returns are not always actioned.
- The narrow range of available reporting options limits the usefulness of the firearms database. In maintaining the database more efficient methods of detecting deceased licence holders and those who become untraceable should be developed to prevent firearms from falling into the wrong hands.
- Firearms Services should liaise more closely with Corporate Information Technology and have greater ownership of the database than is presently the case.

Notwithstanding the above areas for improvement, Tasmania Police's enforcement of the Act has been effective.

MANAGEMENT RESPONSE

The Department of Police and Public Safety was pleased to assist the Tasmanian Audit Office in conducting this performance audit. I am delighted with the audit opinion that the legislation and our enforcement of it have been effective in reducing the number of firearms in Tasmania and limiting access to those firearms. This was one of the primary objectives of the Australian Police Ministers' Council following the Port Arthur tragedy in 1996.

I also note that the enforcement of the *Firearms Act 1996* by Tasmania Police has been effective. It is particularly pleasing to validate strategies implemented by this department that have seen reductions in the use of firearms to commit violent crime. The numbers of suicides, as well as hospital admissions for gun trauma, have also been reduced.

The Department of Police and Public Safety will review the recommendations arising from the report and consider ways in which our effectiveness in those identified areas can be strengthened.

R McCreadie

Commissioner of Police

SUMMARY OF RECOMMENDATIONS

The following table reproduces the recommendations contained in the body of this report.

Rec No	Report section	Recommendation
1	2.2	Tasmania Police should review current firearm licensing procedures to ensure that they are taking the mental and physical condition of applicants into account as required by section 29(2)(b) of the <i>Firearms Act 1996</i> .
2	2.4	Police should broaden the scope of ongoing random inspections of storage conditions at licence holders' premises. Results of these inspections should be publicised to encourage compliance.
3	2.5	Police should follow up the receipt of returns from firearm dealers promptly.
		Police should address shortcomings in firearm dealers' returns expeditiously.
4	2.5	Police should further develop guidelines for Firearms Services to assist the efficiency and effectiveness of the unit. This would also address the potential problem of replacing senior and experienced staff.
5	2.6	To maintain close control over the state's firearm population, Police should arrange to obtain data from Births Deaths and Marriages regularly to enable automated detection of deceased firearm licence holders.
6	2.6	To improve the chances of tracing the licence holders concerned and recovering firearms that may otherwise be lost, follow up action on expired licences where the licence holder's address is unknown should be initiated quickly.
7	2.6	In the firearms database a separate category should be established for untraceable licence holders who still own firearms.
8	2.6	There should be closer liaison between Firearms Services and CIT to expand management reporting from the firearms database.
		Firearms Services should have a staff member trained to run custom queries on the firearms database.

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Introduction

INTRODUCTION

BACKGROUND

Historically, Tasmania had a reputedly very high level of firearm ownership together with one of the highest firearm suicide rates in the country. In the view of experts, both these factors reflected 'notoriously weak¹' gun laws.

Although gun massacres were not unknown in Australia, the scale of the mass murder at Port Arthur in 1996 provided the impetus for a national re-think on integrated legislation. The Australasian Police Minister's Council reached a Nationwide Agreement on Firearms in May 1996. Essentially, that agreement embodied a four-pronged approach that aimed at:

- Reducing the overall supply of firearms;
- Restricting access to people deemed 'fit and proper';
- o Prohibiting particular kinds of firearms; and
- Controlling gun use.

All aspects of gun ownership in Tasmania were closely reined in through the *Firearms Act 1996* that replaced the earlier and less stringent *Guns Act 1991* and *Guns Amendment Acts 1993* and *1996*.

The new Act strongly increased the degree of regulation putting the onus squarely on Tasmania Police to tighten access to guns. Various levels of control were applied to both the owners of firearms as well as to the weapons themselves with hefty penalties to be imposed for an extensive assortment of potential breaches.

Ownership of firearms requires possession of a licence (subject to different categories, i.e. user, dealer, museum or heirloom) for which aspiring owners may apply at a *Service* Tasmania outlet. Applicants are subject to rigorous identity requirements and applications have a 28-day cooling off period. In processing applications, Tasmania Police's Firearms Services carries out checks regarding the applicant's police record – including any background of restraining orders.

Where a licence is granted, the licence holder may apply for a permit to acquire a firearm. Firearms are grouped by type (Category A, B, C, D and H) with prospective owners required to demonstrate specific needs commensurate with the

¹ Warner, K. Firearm deaths and firearm crime after gun licensing in Tasmania. 1999

desired category. Again, Firearms Services processes permits and details of the weapon are recorded in the police database that retains details of category, make, model and serial number together with particulars of the registrant. Firearm dealers must furnish quarterly returns to the police outlining their trade in firearms and ammunition. Sale, loss or theft of guns must be reported to the police within a seven-day period.

Restrictions on legitimate ownership and availability of firearms have opened up new opportunities for criminals by making dealing in illegal firearms more lucrative. Consequently, a key condition of firearm ownership is the safe and secure custody of weapons. The Act describes in detail the kinds of storage containers that licence holders have to provide for weapons. Police have powers to seize any firearms or ammunition that are not housed appropriately.

In addition to the penalties that are listed for contravention of the foregoing parts of the Act, a wide range of other offences is also covered. This includes such things as transportation or importation of firearms, firearm parts or ammunition, ownership of ammunition or firearm parts, discharge of firearms in public places, carrying firearms with criminal intent, modifying the construction of firearms and sections relating to licence holders affected by drugs or alcohol.

MANDATE

Under the provisions of section 44(b) of the *Financial Management and Audit Act 1990* the Auditor-General may:

'Carry out examinations of the economy, efficiency and effectiveness of Government departments, public bodies or parts of Government departments or public bodies'.

The conduct of such audits is often referred to as performance auditing.

STANDARDS APPLIED

This audit has been performed in accordance with Australian Auditing Standard AUS 806 ('*Performance Auditing*'), which states that:

'The objective of a performance audit is to enable the auditor to express an opinion whether, in all material respects, all or part of an entity's activities have been carried out economically, and/or efficiently and/or effectively.'

The audit has included such tests and other procedures considered necessary in the circumstances.

OBJECTIVE

The objective of the audit was to determine whether the Tasmania Together goal of 'Safer communities' was being furthered by gun control and to identify any areas for improvement. Specifically, it would examine:

- The extent to which the implementation and enforcement of the *Firearms Act 1996* in Tasmania has reduced the number of firearms as well as its impact on gun crime and gun trauma; and
- Whether there are problems regarding enforcement of the Act.

SCOPE

The scope of the audit was on Tasmania Police's performance of its obligations under the *Firearms Act 1996*.

CRITERIA

To achieve the audit objective, we developed the following audit criteria:

• Did the *Firearms Act 1996* result in reductions of:

Gun-related crimes; Gun-related suicides, accidents and injuries; Thefts of firearms; and The population of firearms through other strategies.

- Level of prosecutions for firearms offences.
- Are there estimates of the number of unregistered firearms?
- What is the cost of police resources involved in gun control?
- Are there specific problems in enforcing the *Firearms Act 1996*?

AUDIT METHODOLOGY

Our audit was conducted through:

- Review of Tasmania Police's performance under the *Firearms Act 1996*;
- o Analysis of data from Tasmania Police; and

 Review of medical and other statistics from Department of Health and Human Services and other relevant sources.

STAKEHOLDER INPUT

In line with the Audit Office's established practice for the conduct of performance audits, an advisory committee was convened to reflect stakeholder views. The committee provided input to the audit's methodology and reviewed the draft report upon its completion.

Nevertheless, the views expressed in this Report are those of the Auditor-General, and are not necessarily shared by other members of the advisory committee.

The Auditor-General chaired the committee and its members were drawn from the following areas:

- o Tasmania Police; and
- University of Tasmania Faculty of Law

TIMING

Planning for the performance audit began in June 2004. Field testing commenced in July 2004 and extended through to February 2005. The audit report was completed in March 2005.

RESOURCES

The total cost of the audit excluding report production costs was approximately \$63 000.

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1 Is the Tasmanian community safer since the *Firearms Act 1996* came into force?

FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

This section of the Report deals with our findings, conclusions and recommendations made in relation to the previously stated audit criteria.

1 IS THE TASMANIAN COMMUNITY SAFER SINCE THE FIREARMS ACT 1996 CAME INTO FORCE?

In forming an opinion in this part of our audit, we sought to determine whether the *Firearms Act 1996* had led to reductions of:

- Gun-related crimes;
- Gun-related suicides, accidents and injuries;
- Thefts of firearms; and
- The population of firearms through other related strategies?

We also examined the level of prosecutions for firearms offences.

1.1 GUN-RELATED CRIMES

Using data obtained from Tasmania Police and the Coroner's office, we examined reported usage patterns of firearms in crimes against the person (e.g. armed robbery, assault, murder/manslaughter and wounding) over the ten-year period 1994-95 to 2003-04.

To discern the underlying pattern, we excluded the Port Arthur tragedy because its inclusion distorted the longer-term data. With that adjustment, the reported use of firearms in the above-mentioned crimes was very low. Over the ten-year period, on average firearms were used in just 1.8% of crimes.

The total number of crimes against the person rose from 2 364 in 1994 to 4 492 in 2004 (increase of 90%), while instances where a firearm was used went down from 69 to 56 (a decrease of 19%). Figure 1 shows the marked upward trend in crimes of this kind generally while the use of firearms has remained at a low level.



Figure 1: Crimes Against the Person - Trendlines: 1994 - 2004

Although it was beyond the scope of our audit to ascertain the reasons for the upswing in violent crime, a Tasmania Police spokesperson indicated that the rise is mainly due to an increased rate of reporting, especially of domestic violence.

In absolute terms, the variation that has occurred in firearm use in crimes against the person is small. Because the incidence of these offences is so low in Tasmania it is difficult to form a conclusion based on movements in the numbers of cases.

However, when we analysed the proportion of crimes against the person in which a firearm was used, the impact of the 1996 Act was unequivocal. Figure 2 compares the rates before and after the *Firearms Act 1996* came into effect.





Although the above reduction in the use of firearms in the commission of reported violent crime may appear to be modest, it should be seen in the light of the large increase of reported violent crime referred to previously.

Even though the overall level of reported offences against the person has increased substantially over the last 10 years, tighter gun control has seen a reduction in those instances where a firearm was used.

1.2 EFFECT ON GUN-RELATED SUICIDES, ACCIDENTS AND INJURIES

To determine the impact of the *Firearms Act 1996* on accidents, injuries and fatalities we relied on data supplied by the Department of Health and Human Services. Because Tasmania's suicide rate had historically been one of the highest in the country we considered it as a separate category from other gun-related trauma.

1.2.1 SUICIDES

Commentators on firearm regulation have made a connection between the number of homes with firearms and firearm suicide². Firearms provide an especially lethal means to those contemplating suicide and proponents of gun control hoped that the introduction of legislation would be an effective way to diminish the use of these weapons in suicide and perhaps to lower the number of suicides overall. Such a reduction could be engineered by:

- Imposing a lengthy cooling-off period between applying for a firearm licence and acquiring a firearm;
- Requiring secure storage conditions that would decrease availability of firearms for impulsive acts of suicide; and
- Raising public awareness of the dangers of firearm ownership.

We accessed data relating to suicides for the period 1985-2003. Our analysis, based on whether or not a firearm had been used, grouped the statistics into three time periods that paralleled changes to the legislative framework in respect of gun control.

In the first phase, prior to January 1993, when the *Guns Act 1991* came into force, there was no system of licensing or registration of firearms other than handguns. Next, the *Guns Act 1991* introduced a system of licensing but only handguns and fully automatic guns had to be registered. Finally, with the *Firearms Act 1996* there was much more rigorous control that included a 28-day cooling off period for new licence applications and safe storage conditions.

² Graycar, A. Crime, Safety and Firearms, Australian Institute of Criminology, Canberra 2000

Figure 3 illustrates the situation in relation to suicides involving the use of a firearm during each of the above periods.



Figure 3: Tasmania Suicides Involving the Use of a Firearm: 1985 - 2003

In the first period, prior to 1993, firearms were used in 46.4% of suicides in Tasmania. In the years when the *Guns Act 1991* was in force that proportion was lowered to 33.2% and since the *Firearms Act 1996* was introduced firearms have been used in 19.1% of suicides.

As can be noted in Figure 3, it is apparent that:

- Any legislative initiative to limit access to firearms has lessened their use in suicides; and
- The downward trend in relation to firearm suicides first appears to manifest itself around the time when the *Guns Act 1991* came into force, 1 January 1993.

In conclusion, although deficient in other respects, the earlier *Guns Act* 1991 appears to have lessened the previous high number of suicides involving firearms. This downward trend was further boosted by the much more stringent *Firearms Act* 1996.

1.2.2 ACCIDENTS AND INJURIES

We examined data for people who had been treated in hospital as a result of gunshot wounds³ in the period 1990–2003.

As noted with suicide data (see section 1.2.1), the introduction of the *Firearms Act 1996* has generated a decline in firearm trauma as indicated by Figure 4 below.



Figure 4: Hospital Admissions for Firearm Trauma: 1990 - 2003*

* Casualties from Port Arthur tragedy not included.

In particular, we looked at injuries caused by accidental discharge that accounted for 67% of hospital admissions since the Act requires new licence applicants to successfully complete firearm safety training. Commentators⁴ have made the following observation:

'Research suggests that properly trained shooters – that is shooters trained in the safe handling and storage of firearms and thus acutely aware of their antisocial propensities – ... have lower accident rates ...'

A marked improvement in the level of hospital admissions for gun trauma as a result of an accidental discharge is apparent when the situation pre- and post-1996 is compared as shown below in Figure 5. Although the earlier legislation had also required some firearms training the *Firearms Act 1996* is more rigorous in this regard.

³ Data was for 'separations', a term defined by the Australian Institute of Health and Welfare (AIHW) as: 'The administrative process by which a hospital records the completion of treatment and/or care and accommodation of a patient (discharge, transfer, or death).'

⁴ Graycar, A. Crime, Safety and Firearms, Australian Institute of Criminology, Canberra 2000



Figure 5: Firearm Trauma Hospital Admissions – Accidents: 1990 – 2003

Figure 5 illustrates not just a reduction in the average number of hospital admissions for accidentally caused gun trauma but also a decrease in the length of the stay in hospital as measured in bed days after 1996. Presumably, the decline in bed days at least in part reflects a drop in the seriousness of the injuries involved requiring less extensive treatment. The substantial reductions in both the number and severity of accidental injuries represent significant savings to the community in terms of suffering and costs.

In summary, since 1996, there has been a reduction in the level of hospital admissions for gun trauma. The leading cause of admission was accidents, a trend that was noticeable pre-1996 as well as after. In that category the number and severity of injuries has almost halved.

1.3 THEFTS OF FIREARMS

Studies in Australia and overseas have indicated that in countries where regulation of firearm ownership exists, criminals often obtain firearms through theft of legally held firearms. We examined thefts between 1994-95 and 2003-04 using data supplied from the Tasmania Police 'Crime Analysis System'. Our analysis reviewed the situation before and after 1996 and we averaged thefts for three years before the *Firearms Act 1996* and for the seven years after (see Figure 6 below).



Figure 6: Annual Average Theft of Firearms: 1994 – 1996 and 1997 – 2004

Figure 6 indicates the dramatic effect of the Act, in terms of items stolen and the number of incidents. Comparing the two periods, the average number of incidents has reduced by 65%. As well, the annual average for numbers of firearms stolen has declined from 365 to 153 (58%). Rifles and shotguns stolen have showed the largest reductions while the numbers of handguns stolen each year has remained almost constant.

Two factors could account for the reduction in the volume of thefts:

- The population of firearms has been reduced thus lowering the potential for theft; and
- The *Firearms Act 1996* stipulates that firearms are securely stored and that storage conditions should have made stealing firearms much more difficult.

However, it did appear that some individual incidents had resulted in larger numbers of firearms being stolen in a single incident. It may be that criminals are targeting collections as a more profitable source of supply of illegal arms. Notwithstanding this observation, it appears that since 1997 the level of firearm theft has been lowered significantly.

Recovery of stolen firearms

A review of the reported recovery of stolen firearms (again from the police 'Crime Analysis System') was made for the same period as thefts. The rate of recovery of stolen firearms is more than double for the post-1996 period compared to the earlier time (13.6% to 6.2%). A possible reason is that illegally acquired firearms would be less usable in the hands of unlicensed users because ammunition is only available to licence holders. Thus, without access to ammunition an illegally acquired firearm is ultimately useless. These factors restrict the criminal

market for stolen firearms and thereby reduce the ability of thieves to sell stolen firearms quickly.

Police data on the theft of firearms reveals that the *Firearms Act 1996* has reduced the level of firearms stolen and improved the chances of their recovery.

1.4 OTHER STRATEGIES TO REDUCE THE POPULATION OF FIREARMS

Surrender

The *Firearms Act 1996* allows for the surrender of firearms under a number of circumstances. Possible scenarios envisaged by the legislation are:

- Licence holders decide that they no longer need or want a firearm; and
- A person who is not authorised under the Act comes into possession of a firearm.

In the three years since 2001 more than 5 600 firearms were surrendered to Tasmania Police. Of this total 5 000 were destroyed, 100 were transferred to the Tasmania Police forensic library while the balance were held pending further action.

Buy back programs, such as that put in place in 1996 as part of a National Agreement on Firearms, are outside the ambit of state legislation. The original gun buy back scheme and the more recent handgun buy back were coordinated by the Commonwealth.

Amnesty

In addition to the preceding categories, Tasmania Police have also used amnesties as a means of reducing the state's firearm population. The Act allows for a permanent amnesty for people surrendering firearms for which they have no licence. In addition, there have been extra amnesty programs aimed at encouraging the surrender of unwanted or unauthorised firearms. The last such separate amnesty was conducted in 2001 and resulted in 344 firearms being handed over to police.

We note that the Commonwealth also instigated a handgun buy back program in 2003 but this was not reviewed as part of our audit because it fell outside the scope of the *Firearms Act 1996*.

1.5 CHARGES UNDER THE FIREARMS ACT 1996

That the *Firearms Act 1996* heralded a much stricter gun control environment than its predecessor is emphasized by the many sections of the Act that impose serious penalties for breaches including fines (of up to \$10 000), imprisonment up to 2 years or both.

Using prosecution data obtained from Tasmania Police, we examined the numbers of charges laid under the *Firearms Act 1996*. Since November 1996 when it came into effect, Tasmania Police has prosecuted offenders for a total of 4 848 charges under 42 sections and subsections of the Act. The following list shows the broad groupings into which those offences fell:

- o Unlawful sale/supply and possession of ammunition;
- Possession of a loaded firearm in public place;
- Licence offences;
- Carrying with criminal intent, barrel-shortening and silencer offences;
- Alcohol and drug offences;
- o Discharge offences;
- o Possession of unregistered/prohibited firearms;
- Safekeeping and storage; and
- 0 Other

The relative proportion of these offences is illustrated in Figure 7.

Figure 7: Charges Laid under the *Firearms Act 1996* Grouped by Type: 1996 - 2003



From the Figure on the previous page, the three largest groupings of charges were for:

- Safe keeping and storage 30% (1,468 charges);
- Licence offences 25% (1,222 charges); and
- Possession of unregistered/prohibited firearms 19% (926 charges).

As noted above in section 1.2.1, one of the principal objectives of tougher legislation was to ensure more secure storage of firearms. While it is evident that police are active in relation to prosecuting people who breach firearms storage conditions, it is a matter of concern that safekeeping and storage offences were predominant. Police inspection of licence-holders storage facilities is considered in more detail in section 2.4 below.

During the audit we noted that there were 40 sections or subsections of the Act that have not yet figured in prosecutions. However, possible explanations are that:

- Some parts of the legislation overlap and Tasmania Police find it preferable to use one part rather than another;
- Those sections may be used to issue cautions that would not have been recorded in the statistics that we reviewed; and
- The prescribed offences have yet come to the attention of police.

Largely, it is clear that Tasmania Police has an array of potential offences to enable enforcement of the Act. There has been a preparedness to apply these powers to prosecute offenders.

1.6 CONCLUSION

The impact of the *Firearms Act 1996* has been positive. Tighter legislation, backed by determined law enforcement, has reduced the population of firearms in Tasmania and limited access to those firearms. Statistics that we examined indicated that substantial reductions have occurred in the use of firearms to commit violent crime and suicide. There has been a similar lessening of hospital admissions for gun trauma, particularly as a result of accidental shootings.

Thefts of firearms have also been lowered with an upswing in the proportion of stolen firearms recovered.

Since 2001 almost 6 000 firearms have been surrendered to police and subsequently destroyed.

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2 Are there problems enforcing the Firearms Act 1996?

2 ARE THERE PROBLEMS ENFORCING THE FIREARMS ACT 1996?

We profiled firearm ownership numbers in Tasmania.

We reviewed police responsibilities under the *Firearms Act 1996* to determine whether there were difficulties in enforcement of the legislation or other obstacles to controlling firearm usage in Tasmania. Specifically, we looked at:

- The level of gun ownership;
- Assessing firearm licence applicants;
- Illegal importation or manufacture;
- Safe-keeping of firearms;
- Dealers' records; and
- Managing the firearms database.

2.1 THE LEVEL OF GUN OWNERSHIP

Firearm licences were introduced under the *Guns Act 1991* and the last figures for active licences before that Act's repeal in 1996 were:

Total	56 786
Gun dealers	133
Gun licences	56 653

Figure 8 outlines movements in the numbers of firearms and licences since 1997.



Figure 8: Movements in the Numbers of Firearms and Licences: 1997 – 2004*

*Data for 1996–1997 was excluded because the Act came into force part way through that period (i.e. November 1996) and data was incomplete for that reporting period.

Although Figure 8 shows that there has been a steady increase in the number of permitted firearms each year, the acquisition process is closely controlled by Tasmania Police. If a current licence holder wishes to obtain more firearms he or she must seek a permit from Tasmania Police. Firearms can only be obtained from dealers whose stock records are regularly submitted to Firearms Services. In cases where licence holders wish to buy or sell firearms private dealings are illegal and such transactions have to be made through a dealer.

Figure 8 also indicates the continual growth in the numbers of registered firearms without commensurate expansion in the number of licences. Indeed, from a high point in 2002–2003 the number of licences fell by 14.4% in the next year. The timing of that reduction does not align with the non-renewal of 5-year licences issued in 1997 although that would appear to be the most likely cause. Regardless of the reasons for the decline, it can be deduced that the average per capita ownership of firearms by licence holders has increased from 2.32 in 1997-98 to 3.08 in 2003-2004.

Unregistered firearms

On average, according to the data illustrated in Figure 8, each firearms licence holder (excluding dealers and their stock) possesses 2 - 3 firearms.

If that level of ownership (say, 2.5 firearms per licence holder) applied prior to 1996, then the state's firearm population at that time could be estimated by the following calculation:

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56 786 licence holders x 2.5 firearms = 141 965.
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According to figures provided to the Commonwealth at 30 June 1998, the post-1996 buy-back saw 34 564 prohibited firearms handed in. This total is just for those firearms that had become illegal under the *Firearms Act 1996*, viz. machineguns, pump action shotguns, self-loading rifles and self-loading shotguns. A further 4 296 legal firearms were also surrendered (without financial compensation) during the buy-back period. Therefore, the total reduction in the State's gun numbers at that time totalled 38 860.

Based on the foregoing figures, the number of firearms that should have been subject to registration after 1996 would have been:

141 965 (total) - 38 860 (surrendered/buy back) = 103 105.

From figure 8, even if the 1998–1999 figure is used (i.e. 94 470) a large discrepancy remains:

 $103\ 105$ - $94\ 470$ = $8\ 635$ (or 8.4%).

Nevertheless, estimates of the number of unregistered firearms are predicated on various assumptions and their reliability is limited. The pool of such firearms may be contracting (through surrender or amnesties) or expanding (through theft, illegal manufacture or smuggling). Criminologists⁵ have reported that firearms used in crime are frequently unregistered but if the crime goes unsolved (and the firearm is not recovered) then even that assertion cannot be verified.

Various estimates of the State's firearms population can be made and it seems possible that Tasmania may have a considerable number of illegal firearms. However, what is certain is that the *Firearms Act 1996* has successfully reduced that population and entirely eliminated legal ownership of and access to the most lethal kinds of guns. Moreover, confining the purchase of ammunition to licence holders must further restrict the usability of illegal firearms.

⁵ Mouzos, J. *The Licensing and Registration of Firearms used in Homicide*. Trends and Issues No 151. Australian Institute of Criminology

2.2 ASSESSING FIREARM LICENCE APPLICANTS

The Act requires that firearms licences are only granted to applicants who are 'fit and proper'. In making such determinations, the Commissioner is obliged to consider whether applicants have a criminal record, are the subject of a restraint order and a number of other important matters that are not hard for police to confirm. However, section 29(2)(b) raises some difficulties in that the Commissioner must take into account 'the mental and physical condition of the person'.

To obtain a licence, applicants complete a form that they lodge at a *Service* Tasmania shop with the prescribed fee⁶. The form requires applicants to disclose personal information including any relevant medical history and there are penalties for providing false or incomplete data.

Forms from *Service* Tasmania are forwarded to Tasmania Police for processing. As part of that practice the applicant's details are checked against criminal intelligence databases for past offences and current activity. As well, they are also checked against a national database ensuring that the applicant is not currently the subject of any police investigation.

If an applicant satisfies these checks they must next complete firearm training at TAFE. That is a one-day course that deals with:

- The law relating to firearms;
- Firearms safety and operation;
- o Hunting law and ethics; and
- Safe firearm handling and storage.

The course is conducted by TAFE personnel and does not have any direct Tasmania Police involvement.

As the current procedures stand there is very limited scope for Tasmania Police to assess applicants for a firearm licence at first hand. Police countered our concerns by pointing out that even if there were to be face-to-face contact with applicants there would be no greater certainty that they would be any better able to assess a person's 'mental and physical condition'. Notwithstanding that view, it is our opinion that such contact with experienced police would at least allow the possibility of identifying applicants who may require more detailed evaluation.

⁶ Where there is no *Service* Tasmania shop in an area, applications can be lodged at the local police station.

Recommendation 1

Tasmania Police should review current firearm licensing procedures to ensure that they are taking the mental and physical condition of applicants into account as required by section 29(2)(b) of the *Firearms Act 1996*.

2.3 ILLEGAL IMPORTATION OR MANUFACTURE

There are three possible means by which criminals can obtain firearms – theft, smuggling or illegal manufacture. Theft is reported in section 1.4 of this Report. We checked to see what controls were in place to impede illegal acquisition of firearms and ammunition particularly via such means as mail order or Internet purchasing. Importation to Tasmania from interstate involves Australia Post while overseas transactions also concern the Australian Customs Service.

We met with representatives from these organisations to understand how controls are applied and to review communications with these federal entities and Tasmania Police. Although they have differing areas of responsibility Australia Post and the Australian Customs Service work closely together and, while conceding that no system can be foolproof, they have strategies in place to deter and detect traffic in prohibited items including firearms.

The use of cartridge reloading as a means of securing a supply of ammunition for illegal firearms appears to be adequately controlled by the Act. Cartridge reloading equipment (i.e. presses, dies etc.) is not illegal and as such is not regulated. However, the explosive components of ammunition are controlled and sales restricted to licence holders. Sales of these materials have to be reported to police on dealers' returns.

We concluded that controls are in place to prevent the illegal importation or manufacture of firearms and ammunition.

2.4 SAFE-KEEPING OF FIREARMS

A key issue in control of firearms is their safe storage. It confers safety benefits not just to licence holders and their families, but also has a positive effect on the number of firearms stolen yearly and reduces the possibility of stolen firearms contributing to the pool of illegally held firearms in Australia.

The Act⁷ requires firearms and ammunition to be separately stored in locked receptacles. The need for enforcement of safe

⁷ Refer to *Firearms Act 1996* sections 85 - 86

storage conditions is obvious if the benefits of secure storage are to be realised. That there have been – and continue to be – deficiencies in storage conditions is supported by the fact that safe keeping and storage breaches have generated 1 468 charges being laid between 1996 and June 2004. As noted in section 1.5, this category of offences under the Act is the largest by a clear margin.

Currently, the only inspections made by police are for new applicants applying for a category H (handgun) licence. Otherwise, inspections are conducted in response to thefts or in the course of investigations. Consequently, licence holders could reasonably expect that they will not receive a visit from the police.

We requested data from Tasmania Police on the number of premises inspected and found that the information was not available back to 1996. Previously, any check was noted on the individual licence holder's file rather than being centrally recorded and it was not possible to ascertain total numbers without a manual check of every file. Data had been kept informally for the last few years and showed the followed inspections had occurred:

2003 - 42;
2004 - 111.

A database containing all storage checks was commenced mid-2004 - in the course of the audit.

We contacted police in South Australia, Western Australia and the Australia Capital Territory – as jurisdictions of a similar scale to Tasmania – to ascertain their approach to inspection of storage conditions. The results of our survey are given below in Table 1. It is evident that these states are doing more than Tasmania in respect of inspection activities.
Jurisdiction	Inspection activity
Tasmania	Police do inspect storage for new handgun applicants. Other inspections in response to thefts or in the course of investigations. No routine inspection program.
South Australia	Only <i>ad hoc</i> inspections at present. However, starting this year SAPOL is targeting a 1% inspection of storage conditions. This will be an ongoing, rolling program.
Western Australia	Police do inspect the applicant's storage facilities. This even applies to remote locations where local police are responsible for reporting back to the Firearms Branch on the adequacy of an applicant's storage arrangements
Australia Capital Territory	Anyone who is obtaining a firearms licence for the first time (and intends to register a firearm) is required to allow police to inspect their firearm storage facilities.

Table 1: Inspection of Firearms Storage Conditions in
Tasmania, South Australia, Western Australia and the
Australian Capital Territory

As secure storage is a fundamental control in restricting access to firearms, and is required by the *Firearms Act 1996*, monitoring of licence holders' storage conditions should be carried out regularly. A program of ongoing random inspections (such as that proposed by South Australia) either by local police or a specialised audit team would have a number of advantages:

- Quantifying rates of compliance (including comparisons between regions, urban versus rural, etc.);
- o Identification of reasons for non-compliance;
- Alert licence holders that police do conduct spot checks; and
- Elimination of common breaches of safe storage regulations.

Recommendation 2

Police should broaden the scope of ongoing random inspections of storage conditions at licence holders' premises. Results of these inspections should be publicised to encourage compliance.

2.5 DEALERS' RECORDS

Firearm dealers are the only legal source of firearms and ammunition. Purchases of firearms, parts and ammunition (and firearm repairs) all require the production of a valid firearms licence. Dealers must maintain records of these dealings and regularly provide information to police. At present, police update ownership records on the basis of registration forms that they receive. Quarterly returns from dealers provide a crosscheck that enables the firearms database to be accurately maintained.

Firearms Services keeps a register of dealers and uses it to ensure the receipt of returns (nil returns included). We found that 34.9% of dealer returns had not been received for more than six months and there was no evidence of follow up action by Tasmania Police.

Sample testing of dealer returns indicated that some lacked adequate detail. For instance, returns from a major state-wide business did not comply with legislative requirements:

- Purchasers' name and address not always noted;
- Permit to acquire not detailed on the transaction history; and
- Ammunition and firearm transactions did not have licence number details listed on the report.

We noted that no follow up action had been taken to obtain the missing information.

Recommendation 3

Police should follow up the receipt of returns from firearm dealers promptly.

Police should address shortcomings in firearm dealers' returns expeditiously.

In general, Firearms Services does not have guidelines documenting procedures to be applied in administration of the *Firearms Act 1996*. Instead, there is reliance on staff expertise, especially since several of the staff have worked there since the unit was established in 1996. However, staff turnover will undermine the corporate memory and it is essential that documentation be produced before that knowledge is lost. A manual would confer the following benefits:

- Be a framework for clearly articulated and consistent processes;
- Enable management to analyse the administration and performance of the unit; and
- Become a basis to achieve continual improvement.

Recommendation 4

Police should further develop guidelines for Firearms Services to assist the efficiency and effectiveness of the unit. This would also address the potential problem of replacing senior and experienced staff.

2.6 MANAGING THE FIREARMS DATABASE

Tasmania Police now have information about firearms and licence holders that was not possible to obtain before 1996. Firearms Services has a database that records all relevant particulars of licence holders and firearms registered to them and as such it has the potential to be a powerful management tool. We relied on the database during the audit and conducted some testing to assess the degree to which it is maintained by Firearms Services.

Deceased licence holders

When a licence holder dies their licence should be cancelled and any firearms formerly in their possession should be delivered up to Tasmania Police. As the system is described in the Act⁸, the onus to ensure that this happens is on the person who inherits those firearms. This appears to be a less than satisfactory approach and something that could be easily overlooked in a time of bereavement. We were concerned to establish whether Firearms Services was proactive in identifying deceased licence holders and initiating action to secure firearms.

The system in place relies on staff at Firearms Services noting obituaries published in Tasmanian newspapers and checking each one in the firearms database. This appeared to be a laborious and inefficient process. To test the control we conducted sample testing based on data of male deaths recorded by Births Deaths and Marriages for 2003.

⁸ Refer to *Firearms Act 1996* sections 147

We used a sample of 351 records (from males in the age range 18 to 75 years) for our test. From that group, 61 names were found on the firearms database but only 57 had been cancelled. The outstanding 4 licence holders remained in the database with 'Active' status. These 4 examples equated to an error rate of 6.6%.

A data matching process that compares information from Births Deaths and Marriages against records in the firearms database would be a much more efficient system with a higher degree of accuracy.

Recommendation 5

To maintain close control over the state's firearm population, Police should arrange to obtain data from Births Deaths and Marriages regularly to enable automated detection of deceased firearm licence holders.

Change in licence particulars

Although the Act requires licence holders to report any change to the particulars of a licence (refer to section 57), this does not always happen. At the time of our fieldwork, Firearms Services had 119 files that had been cancelled because the licence holder could not be found. Usually, these cases had come to light when licence renewal notices had been returned as undeliverable and subsequent efforts to find the person had been fruitless.

We selected a judgement sample of 20 files for examination to reflect a broad representation of the population. Firearms Services use a standard procedure with these cases and extensive efforts are made to locate the licence holders, including accessing police intelligence networks. All state and federal police forces are contacted and requested to check their records.

Of the 20 files examined there was a total of 54 firearms (including 3 handguns) that were unable to be traced. Those firearms were listed on the database with a status of 'Lost/Stolen'. With 4 files (20%) the amount of time that elapsed between licence expiry and the commencement of follow-up action by Firearms Services was more than a year.

Recommendation 6

To improve the chances of tracing the licence holders concerned and recovering firearms that may otherwise be lost, follow up action on expired licences where the licence holder's address is unknown should be initiated quickly.

There was no specific status category in the database for expired licences of this type. Instead, they were flagged as 'Expired' and included with all other types of expiry. Although they could be found by a data search this cannot be done directly by Firearms Services. Instead, it necessitates a request to the Corporate Information Technology (CIT) branch at Tasmania Police and may be subject to lengthy delays. Creating a separate category would enable these cases to be more easily managed.

Recommendation 7

In the firearms database a separate category should be established for untraceable licence holders who still own firearms.

Availability of management reports

The suite of reports available from the firearms database focuses on day-to-day issues, understandably, but is quite restricted so far as management reporting is concerned.

The limitations of obtaining management information were evident during fieldwork when seemingly routine enquiries (such as numbers of licences by type, categories of firearms, etc) necessitated custom queries being processed via CIT. This situation was not efficient because of resourcing issues at CIT caused by competing priorities from other areas and system protocols. The result from the perspective of Firearms Services was inevitable delays.

Better quality management reports – and increased flexibility in tailoring one-off queries – would not only aid staff of Firearms Services but also be useful for generating performance data.

One way to achieve this end would be for a Firearms Services' staff member to be trained to run custom queries. This would free up resources at CIT and give a greater degree of ownership and flexibility to Firearms Services.

Recommendation 8

There should be closer liaison between Firearms Services and CIT to expand management reporting from the firearms database.

Firearms Services should have a staff member trained to run custom queries on the firearms database.

2.7 CONCLUSION

Our audit did identify some areas where enforcement of the *Firearms Act 1996* could be strengthened, viz:

- Tasmania Police do not appear to be able to meet the legislative requirement to assess the mental condition of licence applicants.
- Inspection of licence holders' storage conditions is only done for handgun applicants. Any other inspections are *ad hoc*.
- Firearms Services needs to further develop guidelines for its activities. Also, it does not speedily follow up dealers' returns and deficiencies in returns are not always actioned.
- The narrow range of available reporting options limits the usefulness of the firearms database. In maintaining the database more efficient methods of detecting deceased licence holders and those who become untraceable should be developed to prevent firearms from falling into the wrong hands.
- Firearms Services should liaise more closely with CIT and have greater ownership of the database than is presently the case.

Notwithstanding the above areas for improvement, Tasmania Police's enforcement of the Act has been effective.

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3 Recent reports

3 RECENT REPORTS

2001	SPECIAL REPORT NO. 35	SOFTWARE LICENSING
2001	SPECIAL REPORT NO. 36	COLLECTION OF RECEIVABLES AND LOANS IN TASMANIAN GOVERNMENT DEPARTMENTS
2001	SPECIAL REPORT NO. 37	ARCHIVES OFFICE OF TASMANIA
2001	SPECIAL REPORT NO. 38	THE IMPLEMENTATION OF GOODS AND SERVICES TAX IN GOVERNMENT AGENCIES AND LOCAL GOVERNMENT ENTITIES
2001	SPECIAL REPORT NO. 39	BANK ACCOUNT RECONCILIATIONS
2002	SPECIAL REPORT NO. 40	ENVIRONMENTAL MANAGEMENT AND POLLUTION CONTROL
2002	SPECIAL REPORT NO. 41	KEEPING SCHOOLS SAFE
2002	SPECIAL REPORT NO. 42	FOLLOW UP OF PERFORMANCE AUDITS
2002	SPECIAL REPORT NO. 43	ORAL HEALTH SERVICE: SOMETHING TO SMILE ABOUT?
2002	SPECIAL REPORT NO. 44	MANAGING COMMUNITY SERVICE ORDERS
2003	SPECIAL REPORT NO. 45	BUSINESS NAMES AND INCORPORATED ASSOCIATIONS: WHAT'S IN A NAME?
2003	SPECIAL REPORT NO. 46	LEAVE IN GOVERNMENT DEPARTMENTS
2003	SPECIAL REPORT NO. 47	PUBLIC SECTOR WEB SITES
2003	SPECIAL REPORT NO. 48	GRANTS TO THE COMMUNITY SECTOR
2003	SPECIAL REPORT NO. 49	STAFF SELECTION IN GOVERNMENT AGENCIES
2003	SPECIAL REPORT NO. 50	POLICE RESPONSE TIMES
2004	SPECIAL REPORT	EX-GRATIA PAYMENT TO THE FORMER GOVERNOR
		MR R W BUTLER AC
2004	SPECIAL REPORT NO. 51	SPECIAL PURPOSE AND TRUST FUNDS: DEPARTMENT OF HEALTH AND HUMAN SERVICES
2004	SPECIAL REPORT NO. 52	INTERNAL AUDIT IN THE PUBLIC SECTOR
2005	SPECIAL REPORT NO. 53	FOLLOW UP OF PERFORMANCE AUDITS: 2000 - 2001
2005	SPECIAL REPORT NO. 54	COMPLIANCE AUDITS: 2004 - 2005

4 Future projects

4 **FUTURE PROJECTS**

Details of performance and compliance audits that the Auditor-General is considering or is working on are:

PERFOMANCE AUDITS

PUBLIC HOUSING – MANAGEMENT OF	CURRENTLY UNDER WAY
HOUSING STOCK	
ASSET MAINTENANCE – BRIDGES	BEING PLANNED

COMPLIANCE AUDITS

FRINGE BENEFITS TAX	CURRENTLY UNDER WAY
PAYMENT OF ACCOUNTS IN	CURRENTLY UNDER WAY
GOVERNMENT AGENCIES	
DELEGATIONS	BEING PLANNED
BUILDING SECURITY	BEING PLANNED

Compliance with National Firearms Agreement - Tasmania

Summary: the following tables are based on the three national compliance reports provided (dated 1997, 2006 and 2017). The first table sets out the compliance of the *Firearms Act 1996* (Tas) ('the Act') with the 11 resolutions that form the National Firearms Agreement 1996 for each of the report periods. The second table sets out the compliance of the Act with the 2002 National Agreement on Handguns, although it is limited to the eight resolutions discussed in the 2006 and 2017 reports (out of the 28 resolutions made).

	1997	2006	2017
Resolution 1: Bans on Specific Types of Firearms	Compliant with 1(a)	No changes	No changes
(a) that all jurisdictions ban the sale, resale transfer, ownership, manufacture and use of those firearms banned or proposed to be banned	Competitive shooting involving prohibited firearms is not expressly prohibited, however the Act does not allow a class C or D licence for this purpose (ss 31 and 32)		
<i>(b) that all jurisdictions ban competitive shooting involving those firearms banned or proposed to be banned from export</i>			

Resolution 2: Effective Nationwide Registration of All Firearms	Compliant	Compliant	Compliant
Resolution 3: Genuine Reason for Owning, Possessing or Using a firearm	(a) Compliant(b) Compliant, with the exceptionthat an approved club (for the	Only change was the insertion of section 47(2) to require a heirloom firearm	No changes
(a) personal protection not to be regarded as a genuine reason	purposes of sporting shooters with a valid membership) at s 38 is not defined as one with	incapable of being fired (making the Act compliant with resolution 3(g))	
an applicant must show for owning, possessing or using a firearm	participants from shooting sports recognised in the charters of major supporting events such as the Commonwealth Games,		
(c) applicant must also demonstrate a genuine need	Olympic Games or World Championships		
(d) firearms collectors should be regulated	(c) Compliant(d) Not fully compliant -		
(e) ammunition collectors	- No appoint regime for the storage		
(f) museums	of collections (though covered by general provisions ss 84-86)		
(g) heirlooms firearms licence	Possession of ammunition is not expressly prohibited		
	 No limit on the sale and transfer of Category C and D firearms held in a collection (though covered by general provisions ss 24 and 25) 		
	(e) Not fully compliant as no special regime has been enacted for		

	 ammunition collectors. Most of the resolution is however covered by general provisions, except there is no specific provision that all ammunition in a collection must be rendered inert for all sporting ammunition and military ammunition of UN hazard classification code 1.4 up to 20mm calibre, and must not contain high explosive, smoke, chemical, or lachrymatory agents. (f) Compliant (g) Non-compliant as no provision for firearms to be rendered permanently inoperable 		
Resolution 4: Basic Licence Requirements	Compliant, with the exception that s 68 allows for a minor to obtain a permit (contrary to resolution 4(a))	No changes	No changes
 Resolution 5: Training as a pre-requisite for a licence (a) That all jurisdictions require the completion of an accredited coure in safety training for firearms for all first time licence applicants (b) That a specialised course should be established for 	 (a) Compliant (b) Non-compliant as no specific provision is made for courses for persons employed in the security industry 	No changes	No changes

training of persons employed in the security industry			
Resolution 6: Grounds for licence refusal or cancellation	 Not fully compliant with the proposed minimum standards as - Failure to notify of change of address is not listed as a general reason for refusal or cancellation A conviction for assault with a weapon / aggravated assault is not listed as an automatic reason for cancellation of a licence 	No changes	Failure to notify of a change of address is still not a general reason however under s 46(ba) of the Act it is now a condition of a licence that a person must notify the commissioner within 14 days of a change of residential address
Resolution 7: Permit to Acquire	Compliant	Compliant (no changes)	Compliant (no changes)
Resolution 8: Uniform Standard for the Security and Storage of Firearms	Compliant	Compliant (no changes)	Compliant (no changes)
Resolution 9: Recording of Sales	Compliant	Compliant (no changes)	Compliant (no changes)
Resolution 10: Mail Order Sales Control	Compliant	Compliant (no changes)	Compliant (no changes)
Resolution 11: Compensation/Incentive Issues	Compliant	Compliant (no changes)	Compliant (no changes)

Table 2. Compliance with the 2002 National Agreement on Handguns				
	1997	2006	2017	
Resolution 1: Restriction of classes of handguns that can be imported or possessed for sporting purposes	N/A	Compliant	Compliant (no changes)	
Resolution 8: Licencing Requirements	N/A	Compliant	Compliant (no changes)	
Resolution 10: A person wishing to join a club provide details to the club of any other shooting clubs to which they belong and firearms they own	N/A	Non-compliant, no such requirements are in place	Non-compliant (no changes)	
Resolution 11: A person applying to join a shooting club must provide the club with two character references from people they have known for at least 2 years	N/A	Non-compliant, no such requirements are in place	Non-compliant (no changes)	
Resolution 12: Clubs endorse a member's application to acquire a handgun, and should confirm the licensee has adequate storage arrangements in place and specific for which shooting discipline the handgun is required	N/A	Non-compliant, no such requirements are in place	Non-compliant (no changes)	

Resolution 14: Minimum participation	N/A	Non-compliant - whilst compliance	Non-compliant (no changes)
requirements		with the minimum annual participation	
		rates is a condition of a Category H	
		licence (s 47(3)(b)) the Act or	
		Regulations do not state what these	
		participation rates are	