

Introduction

Summary of Discussion

Section 1 provides an overview of the study including the terms of reference and tasks to be undertaken. The background to the decision to test regional caps and other measures implemented by the Victorian Government are outlined. The five specific cap areas are identified as 'high ranking areas' on measures of vulnerability to the potential harm caused by large numbers of gaming machines. The five regions have a high share of EGMs relative to their percentage share of State income. The actual reduction in the number of machines by area and a review of preliminary trends in net gaming expenditure at the local government area level are considered.

1.1 Introduction

The Victorian Gambling Research Panel (GRP) commissioned the South Australian Centre for Economic Studies in July 2002 to undertake a study on the impact of caps on electronic gaming machines (EGMs). The primary objective of this study is to assess the impact of the introduction of caps limiting the number of EGMs in five Victorian regions, particularly the impact on the 'harms' associated with gaming on these communities. In particular, the study aims to address the impact of these caps — or other policy interventions — on the incidence of problem gambling and the associated social and economic effects. This research project is part of the GRP's annual research plan for 2001-02 although a final report could only be provided sometime after the date on which the last tranche of machines were required to be removed and revenue data from venues was able to be supplied to the researchers.

One example of 'other policy interventions' has been the decision of the Bracks Government to introduce smoking bans in restricted gaming areas. The smoking bans were introduced on September 1, 2002 and by early December 2002, Tabcorp had reported to the Australian Stock Exchange an expectation of lower profits, due to the fall in EGM revenue. An examination of the EGM net gaming revenue across venues and LGA regions, to be undertaken as part of this study, will reveal the extent to which this impact occurred across all regions, the timing of the impact and whether any longer term trends can be observed from the data.

A second example of a policy intervention to reduce 'harms' was the decision to cease 24 hour gaming in licensed venues. This restriction commenced in May 2000 and was to be gradually introduced as each venue applied, at the end of their five year liquor licence, to renew the licence. In short, the reduction in hours was introduced in a staggered fashion.

These announcements and policy interventions made the researchers task more challenging. However, they did not affect our choice of control regions or data requirements for the study.

1.2 Terms of Reference and Critical Tasks

The Terms of Reference and the original reporting timelines are shown in Appendix 1. The objectives for this study did not alter over the time frame in which the study was undertaken although the reporting requirements were altered. This was because the Gaming Machine Control Act (1991) was amended to allow the Office of Gaming Regulation to provide to the researchers information at the venue level. This information was only able to be supplied in August 2004. Preliminary reports from the start of the trial up to several intermediate cut-off points were not possible. The researchers and the Gambling Research Panel negotiated new arrangements that required the research team to:

- conduct a literature review and refine the analytical framework for the study;
- to recommend appropriate regions for inclusion in the control group;
- to review historical gaming data for the cap and control regions; and
- conduct data analysis at the venue, regional and state level to assess the effectiveness of the trial.

All of the above are included in this final report.

Issues such as the nature of problem gambling (see Appendix 2) and the role of caps on electronic gaming machines in limiting risk of harm from EGM use, in the context of other policy options implemented in Australia and overseas, are considered in this report.

This report combines the contents of earlier preliminary reports set out in the research programme for this project, namely the identification of the “control” regions for the study and a summary of historical gaming data for the ten regions to be studied.¹ As discussed in Section 2 (Methodological considerations) “control” regions need to be used as opposed to a time series analysis of the cap regions. Over the course of the study period there were other policy interventions which were likely to affect gambling behaviour, however these are likely to impact reasonably evenly across regions. Using control regions will allow the identification of trends which appear to be peculiar to the cap regions (and therefore potentially influenced by the caps) rather than those which are state-wide and reflect changes in legislation or preferences (such as the introduction of smoking bans).

A series of tasks were undertaken to develop the framework for the study.

The first task was to identify regions that appear to be reasonable matched comparison controls for the cap regions. This was done by conducting econometric analysis on the demographic and regional factors which are correlated with levels of net gaming machine expenditure, and then identifying those regions whose profile in these factors most closely matched that of the cap regions.

¹ See Appendix 1 for reporting structure and timelines.

The second task was to profile each of the regions and provide a brief description of each region, including *inter alia*, population, age, income distribution, tenancy type, marital status and receipt of Commonwealth benefits within the region. Further information on each region was collated from interviews with hotel and venue owners, local councils and other researchers.

The third task was to gather information on machine numbers and venue numbers on each of the regions under study and points in time at which either venue or machine numbers changed. This information has been sourced from the Victorian Office of Gambling Regulation (OGR) for the cap and control regions.

The final task required the approval of the Victorian Government to access venue based data. In this report data is not reported by individual venues for the obvious reason of confidentiality, but is grouped for each region. The delay in the project was due to the time taken to access venue based expenditure data.

1.3 Regional Caps in Victoria

Since the introduction of EGMs into Victoria in the early 1990s, the amount spent on gaming has increased very rapidly, far outstripping growth in the broader economy and representing an increasing share of household income. Figure 1.1 illustrates gaming machine expenditure from \$255 million in 1992-93 rising to \$2,563 million by 2001-02. Gaming machine expenditure actually fell for the first time in 2002-03, falling by \$229 million, down to \$2,334 million. The fall largely reflects the impact of the ban on smoking in gaming areas (introduced from 1st September, 2002) with the ban reducing gambling participation and/or duration of gambling.

Prior to the impact of the smoking ban, gaming machine expenditure had grown strongly throughout the 1990s, despite little growth in machine numbers due to the state-wide cap of 27,500 machines in hotels and clubs.

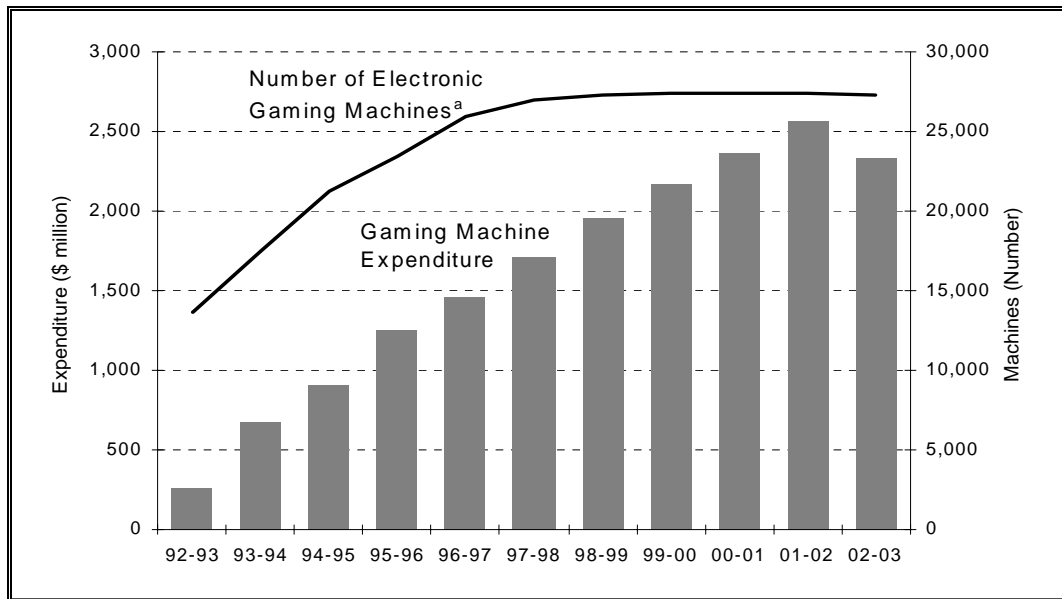
The state-wide cap was introduced by the previous Government in late 1995, whereby the two licensed operators are limited to 13,750 EGMs each. The Casino Control Unit (1991) provides for 2,500 machines within the Crown Casino.

The longer term impact of the smoking ban on gaming machine expenditure is uncertain. One may expect that the ban would have a once-off effect, with growth in gaming machine expenditure eventually resuming its pre-smoking ban course (see Figure 1.1). However, rather interestingly, the latest data indicates that gaming expenditure has remained rather flat in 2003-04. Monthly data from the Office of Gambling Regulation indicates that total expenditure on gaming machines was \$2,291 million in Victoria in 2003-04, down \$43 million on the previous year.

It appears that the smoking ban may have had a rather significant drawn out impact on gaming machine expenditures. However, it may also be that other factors have played a role in bringing about lower levels of expenditure. These factors would include policy responses designed to reduce harm from problem gambling (see below), and changes in household spending patterns.

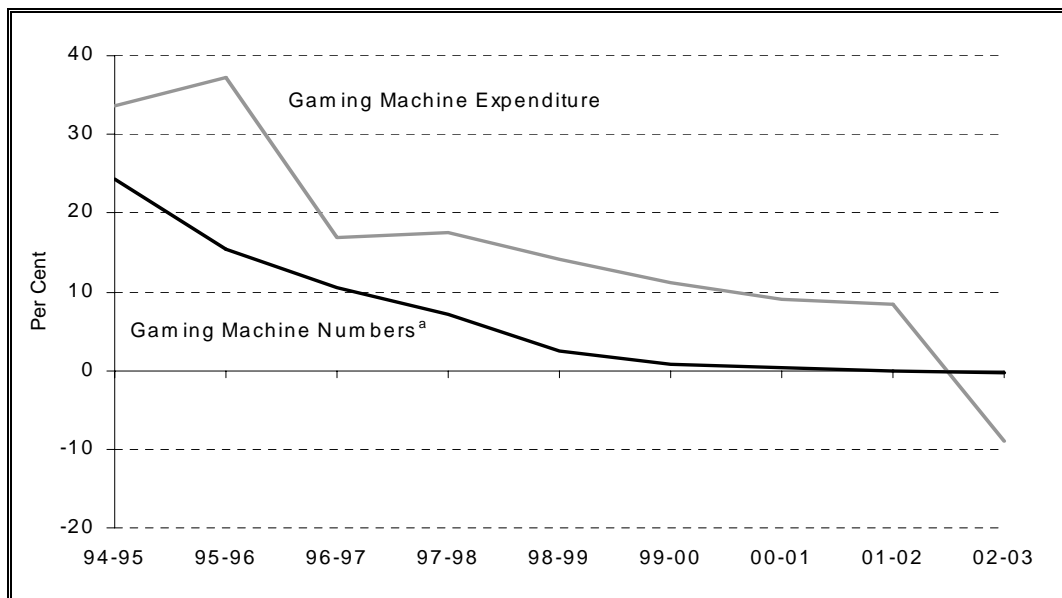
With the stock of machines fixed, it is observed that machines are used more intensively as is illustrated in Figures 1.2 and 1.3. By 2000 the growth in gaming machine numbers had declined to almost zero, while annual growth in total gaming machine expenditure was approximately 10 per cent. Figures 1.3 and 1.4 show that EGM expenditure per machine grew strongly through to 2001-02, but fell sharply in 2002-03 with the introduction of the smoking ban and its impact on gaming activity.

Figure 1.1
Victorian EGM Net Expenditure: 1992-93 to 2002-03



Source: Office of Gambling Regulation; Tasmanian Gaming Commission.

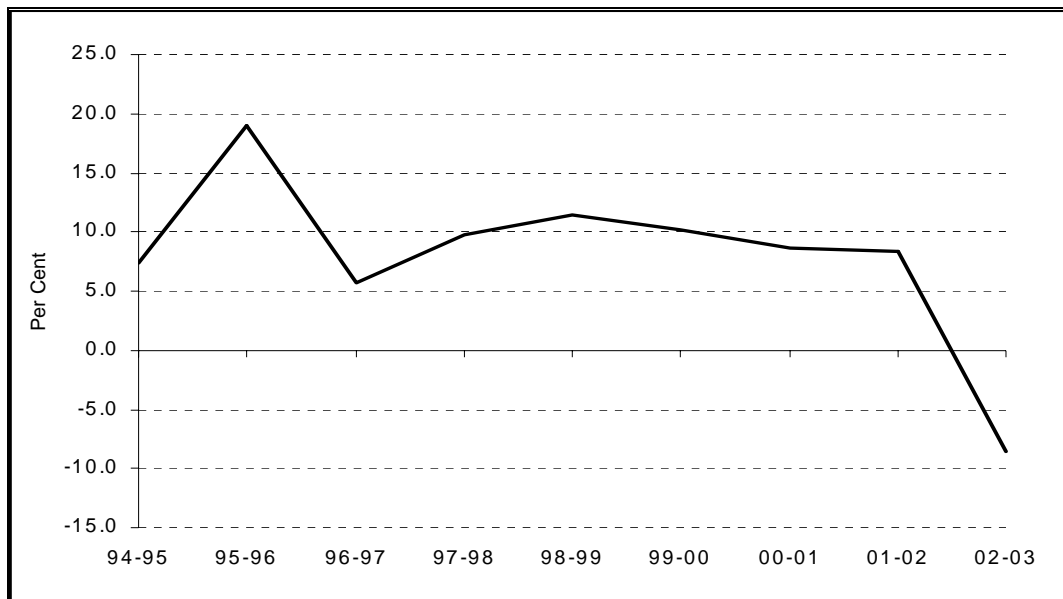
Figure 1.2
Growth in EGM Expenditure and Machine Numbers, Victoria²: 1994-95 to 2002-03 (Per cent)



Source: Office of Gambling Regulation; Tasmanian Gaming Commission.

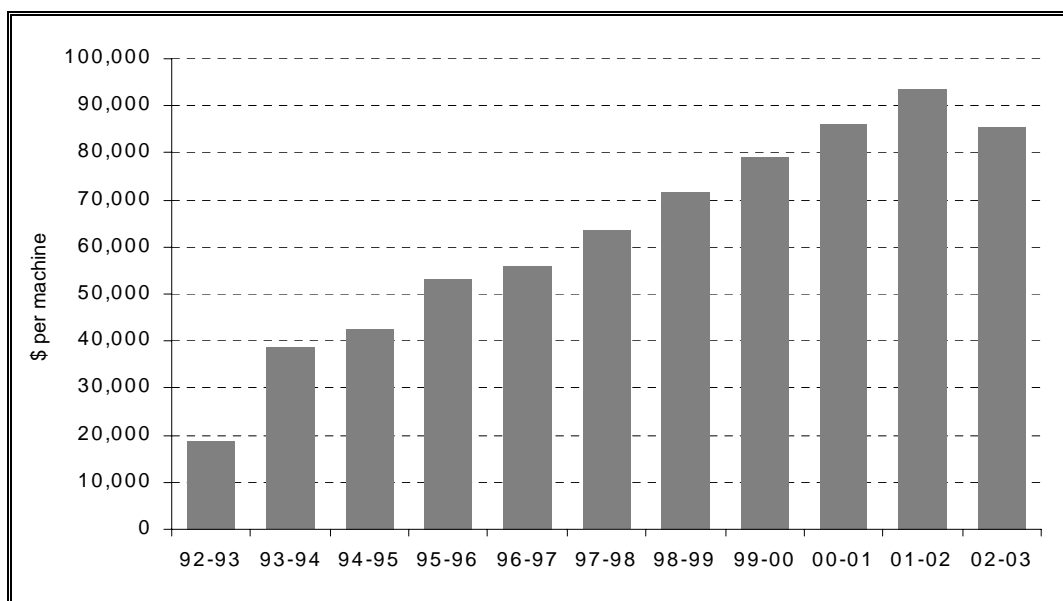
² Gaming machine numbers based on average of start and end period figures.

Figure 1.3
Growth in EGM Expenditure Per Machine, Victoria³ 1994-95 to 2002-03
(Per cent)



Source: Office of Gambling Regulation; Tasmanian Gaming Commission.

Figure 1.4
EGM Expenditure per Machine, Victoria: 1994-95 to 2002-03



Source: Office of Gambling Regulation; Tasmanian Gaming Commission.

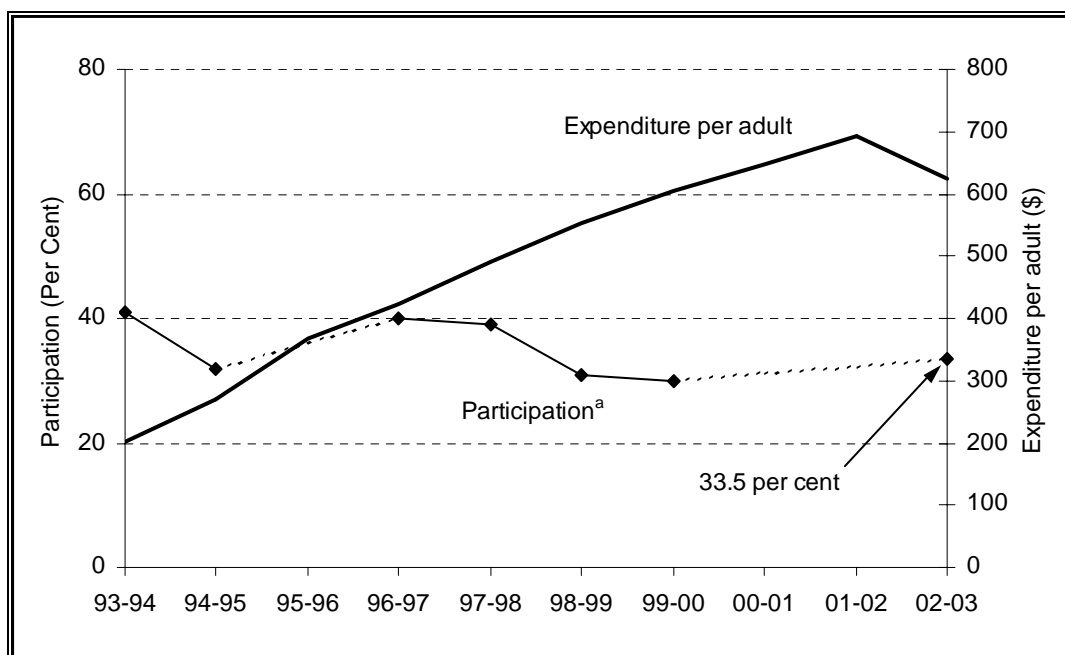
Regional expenditure trends before and after the cap may be a useful guide to the effect on problem gamblers. While we note that it would not be possible from the raw data to determine whether the gamblers being discouraged are those whose gambling is high but controlled, or problem gamblers it does appear that participation rates and expenditure per adult provide some useful insights into the impact of the caps.

³ Gaming machine numbers based on average of start and end period figures.

Surveys on participation in gambling activities are not particularly meaningful with regards to problem gamblers, as the fluctuations in participation rates appear to be primarily driven by low expenditure 'unattached' gamblers. For example the surveys of Victorian community gambling patterns conducted for the Victorian Casino and Gaming Authority indicated that from 1997 to 1998 participation in non-casino electronic gaming machine gambling fell from 39 to 31 per cent, but expenditure on this type of machine continued to increase at its trend rate. The most recent Victorian Community Survey⁴ (April 2004) reported the participation rate at 35.5 per cent, while expenditure continued to climb, until the imposition of the smoking ban in September 2002 and the caps programme commencing in February 2002.

Figure 1.5 draws out this point. Expenditure per adult continued to rise up to September 2002 when smoking bans were introduced and has declined thereafter, while recorded participation rates have trended downwards. That is to say, fewer people indicate they play EGMs over time, yet expenditure per adult has continued to rise. The decline in participation rates by the relatively unattached gamblers over time does not appear to have slowed the upward trend of expenditure per adult.

Figure 1.5
Electronic Gaming Machines:
Participation and Expenditure Per Adult, Victoria



Note: ^a Participation rates are not available for 1995-96, 2000-01 and 2001-02. Data for these years are estimated as a mid point of actual participation rates for most recent years.

Source: Tasmanian Gaming Commission; Victorian Casino and Gaming Authority, *Community Gambling Pattern and Perceptions Surveys* (various), and Gambling Research Panel, *2003 Victorian Longitudinal Community Attitudes Survey*.

This apparently small influence on expenditure by the relatively unattached gamblers does have implications for the study on the usefulness of expenditure data. It would appear to suggest that any noticeable fall in regional expenditure levels (i.e., via caps and or other policy changes) is likely to be due to changes in the behaviour of 'acknowledged

⁴ 2003 Victorian Longitudinal Community Attitude Survey, released by the GRP in April 2004.

heavy gamblers' and committed heavy gamblers', the groups into which problem gamblers fit.

1.3.1 Measures Designed to Reduce Harm

Since taking office in late 1999, the Victorian Government has introduced a range of measures designed to reduce the potential for harm from excessive usage of EGMs. These measures have included:

- maintaining a state-wide limit of 30,000 machines (including 2,500 in the Crown Casino);
- introduced in May 2000, when renewing liquor licence 24 hour EGM venues were required to reduce to 20 hours in rural and regional areas outside of the Melbourne Statistical Division (and heightened requirements for impact assessments and justification for extended hours in metropolitan areas);
- informing local governments of applications for gaming venues in their regions and providing the opportunity for local governments to make submissions to the application process;
- regulating lighting in EGM venues and requiring the provision of clocks on all gaming machines; and
- introducing targeted caps on electronic gaming machine numbers in five regions of Victoria.

Other harm minimisation measures announced since the start of this research program, some commencing in January 2003, include:

- a ban on smoking in restricted gaming areas;
- a ban on \$100 note acceptors on machines;
- prohibiting the increase of machine spin rates above current levels;
- a ban on autoplay facilities;
- setting a maximum bet limit of \$10; and
- displaying information about the odds of winning and the amount of time and money spent by the player.

A limited number of restricted access machines that would require the use of a pin number or some type of smart card to access the machine, are also planned to be introduced. They will enable gamblers to pre-set their expenditure during a given period of time. The number of restricted machines will be 10 per cent or 3,000 of the total number of machines. Further new measures were planned, to cover access to credit, limiting withdrawals from ATMs and EFTPOS and payment of winnings by cheque.

Regional caps on the number of gaming machines in three metropolitan and two country regions of Victoria were introduced in April 2001.⁵ The regions that were chosen were those that were considered to be particularly vulnerable to the harm caused by large

⁵ It is not clear why only five regions were capped, although we note that the Government has indicated "it will impose additional caps where necessary".

numbers of gaming machines. The statistical criteria used to determine the degree of vulnerability were:

- the accessibility of gaming machines, as measured by the number of EGMs per 1,000 population;
- the average annual player loss per adult on gaming machines; and
- the socio-economic status of particular areas in Victoria as indicated by the Australian Bureau of Statistics' Socio-Economic Indicators for Areas (SEIFA).

The idea behind these measures is that ready access to gaming machines may increase the likelihood that residents will gamble, and low incomes exaggerate the harm caused by gambling as those gambling losses are more likely to affect the quality of life of gamblers and their families. The resulting ranking of the twenty most vulnerable local government areas is displayed in Table 1.1.

Table 1.1
Twenty Vulnerable Local Government Areas

LGA	EGM per capita Rank	Average loss per adult Rank	Socio-economic indicator Rank	Sum of three criteria
Maribyrnong	2	2	1	5
Greater Dandenong	6	3	2	11
La Trobe	4	11	7	22
Bass Coast	3	14	8	25
Darebin	14	9	4	27
East Gippsland	7	25	9	41
Warrnambool	5	15	25	45
Hobsons Bay	12	22	13	47
Ballarat	8	19	21	48
Melbourne	1	1	47	49
Hume	25	13	12	50
Whittlesea	31	4	17	52
Brimbank	33	16	5	54
Greater Geelong	13	23	20	56
Wyndham	15	6	45	66
Moonee Valley	21	8	38	67
Mildura	24	34	10	68
Moreland	35	29	6	70
Greater Shepparton	27	28	16	71
Monash	16	5	50	71

Source: Premier announces first regional gaming caps, Minister for Gaming, 8 February 2001.

In practice, the five principal regions in which caps were imposed were those with the highest ranking, taken as the sum of the rankings against these three criteria. However, three of the regions were extended to cover areas of similar vulnerability beyond a single

local government area (though the exact criteria for these expansions is not clear).⁶ The five regions selected were:

1. The City of Maribyrnong plus the adjoining postcodes 3015, 3020 and 3031 (“Maribyrnong Plus”);
2. The City of Greater Dandenong plus the adjoining postcodes of 3170, 3177 and 3803 (“Greater Dandenong Plus”);
3. The City of Darebin plus the adjoining postcodes 3058, 3060, 3061, 3074 and 3081 (“Darebin Plus”);
4. The City of La Trobe; and
5. Bass Coast Shire.

EGM statistics by Local Government Area are shown in Tables 1.2a and 1.2b, while the following figure (Figure 1.6) depicts net EGM expenditure from 1992-93 to 2002-03 in the five selected LGAs. It can be observed in Figure 1.6 that the five LGA regions experienced a decline in EGM net expenditure commencing in 2002. A ban on smoking in dining areas was introduced in Victoria in July 2001 while a ban on smoking in gaming areas was introduced in September 2002.

Tables 1.2a and 1.2b provide a snapshot comparison of the 5 LGA regions,⁷ metropolitan and country Victoria and all Victoria for 2 years — Table 1.2a 2000-01, the baseline year for the selection of the cap regions and Table 1.2b for 2002-03. The latter covers a 9 month period of smoking ban, a 16 month period of first machine withdrawals and a 4 month period of second machine withdrawals. The respective impact are not disaggregated in these “global, LGA tables”.

In all areas except Bass Coast Shire EGM net expenditure declined from 2001-02 to 2002-03. In the City of Maribyrnong and the City of La Trobe the number of venues declined by one respectively, contributing to a fall in the ratio of venues per 1,000 adults; in the five control regions and Melbourne metropolitan, country Victoria and all Victoria the ratio of EGMs per 1,000 adults declined with the largest fall in Bass Coast Shire followed by Maribyrnong.

However, the picture in terms of net expenditure per EGM was more mixed. For Melbourne metro, the Cities of Darebin and Greater Dandenong and all Victoria, net expenditure per EGM declined. In Maribyrnong, country Victoria, Bass Coast and La Trobe expenditure per EGM actually increased. This suggests that the remaining machines, following the two rounds of removal of machines, were played more intensively. If this result is due to recreational gamblers “crowding out” problem gamblers then net welfare is likely to have increased, through entertainment enjoyed by recreational gamblers and the partial exclusion of problem gamblers. If on the other hand, the increase in the intensity of gambling is due to problem gamblers then this would be welfare reducing. These issues are taken up in Section 6.

⁶ There has been some criticism that areas of significant socio-economic disadvantage adjacent to declared regions were excluded. See Livingston, May 2001.

⁷ In Tables 1.2a, 1.2b and Figure 1.6 we show the LGA regions not including “the plus” components as a preliminary overview of potential trends.

Table 1.2a: Electronic Gaming Statistics by Selected Local Government Areas: 2000-01

	EGM Net Expenditure 2000-01 (\$)	2001 Population Aged 18+	EGM Venues	EGMs	EGM Net Expenditure per Adult (\$)	Venues per 1000 Adults	EGM per 1000 Adults	Net Expenditure per EGM (\$)
Melbourne Metro	1,878,046,121	2,664,449	341	20,006	704.85	0.13	7.51	93,874
City of Darebin	89,668,795	105,328	16	986	851.33	0.15	9.36	90,941
City of Greater Dandenong	102,078,087	101,937	16	1,164	1,001.38	0.16	11.42	87,695
City of Maribyrnong	60,443,905	52,164	14	789	1,158.73	0.27	15.13	76,608
Country Victoria	487,970,463	974,017	196	7,438	500.99	0.20	7.64	65,605
Bass Coast Shire	16,176,344	19,141	8	261	845.11	0.42	13.64	61,978
City of La Trobe	41,969,258	51,743	16	660	811.11	0.31	12.76	63,589
All Victoria	2,366,016,584	3,638,466	537	27,444	650.28	0.15	7.54	86,212

Note: LGA areas, excludes the "plus component" at this time.

Source: Victorian Office of Gambling Regulation.

Table 1.2b: Electronic Gaming Statistics by Selected Local Government Areas: 2002-03

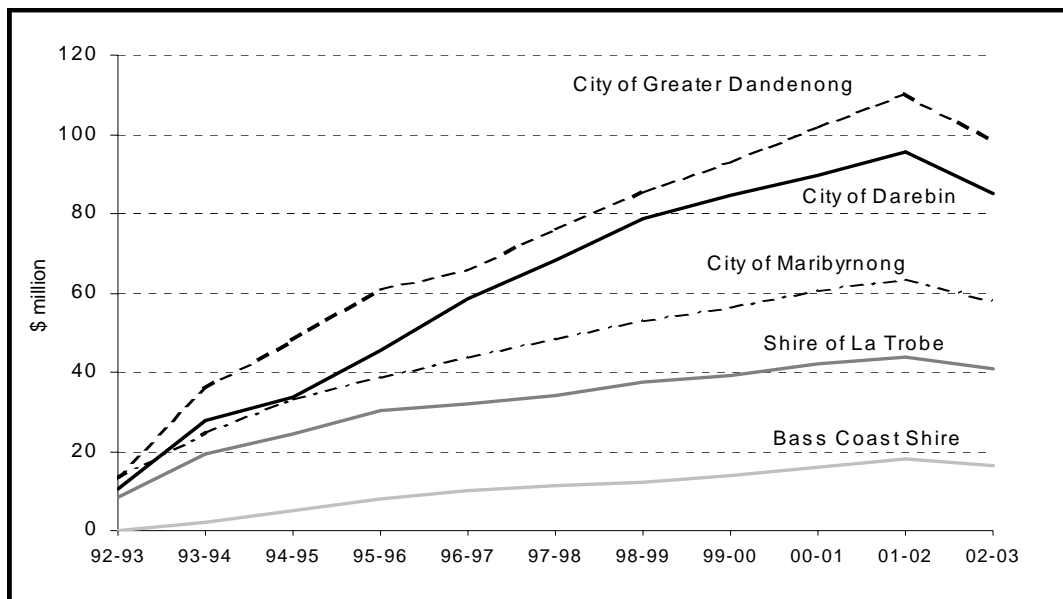
	EGM Net Expenditure 2002-03 (\$)	2003 Population Aged 18+ Projection	EGM Venues ^a	EGMs ^a	EGM Net Expenditure per Adult (\$)	Venues per 1000 Adults	EGM per 1000 Adults	Net Expenditure per EGM (\$)
Melbourne Metro	1,847,321,200	2,727,267	340	19,921	677.35	0.12	7.30	92,732
City of Darebin	85,200,825	106,736	16	986	798.24	0.12	9.24	86,411
City of Greater Dandenong	98,192,823	102,424	16	1,131	958.69	0.16	11.04	86,819
City of Maribyrnong	58,217,999	54,078	13	734	1,076.56	0.24	13.57	79,316
Country Victoria	486,973,314	993,290	192	7,339	490.26	0.19	7.39	66,354
Bass Coast Shire	16,376,077	20,020	8	237	817.99	0.40	11.84	69,097
City of La Trobe	41,050,535	52,459	15	615	782.53	0.29	11.72	66,749
All Victoria	2,334,294,514	3,720,630	532	27,260	627.39	0.14	7.33	85,631

Note: ^a Number as at June.

LGA areas, excludes the "plus component" at this time.

Source: Victorian Office of Gambling Regulation.

Figure 1.6
Victorian EGM Net Expenditure by Selected Local Government Area



Source: Victorian Office of Gambling Regulation.

1.3.2 Phased Withdrawal by Region

In four of the five regions, the Victorian Gaming and Casino Authority directed the gaming operators (Tabcorp and Tattersall's) to reduce the number of gaming machines over the course of the following three years. In determining the extent of reductions, the Minister for Gaming, The Hon. John Pandazopolous, specified that the number of gaming machines per person in these regions must be reduced until it is not higher than the level of the ninth decile of local government areas (i.e. a level of 11.7 EGMs per 1,000 adults, as in Ballarat). Further, the Minister stated that the government may prescribe caps on further regions, or modify the boundaries of the existing regions in the future. The required reductions will avoid altering the proportions of EGMs held by Tabcorp versus Tattersall's and in hotels versus clubs. A total of 406 were required to be withdrawn over a three year period to February 2004 as in Table 1.3, to achieve a maximum permissible number of 5,088 machines at the end of three years. Table 1.4 illustrates the required reductions by each operator in four regions. In Darebin Plus there was no requirement to remove machines.

Notice that while the Treasury has identified vulnerable regions on the basis of these three criteria mentioned:

- accessibility of gaming machines, measured by the number of EGMs per 1,000 population (density);
- average annual player loss per adult; and
- socio-economic status of particular areas;

the policy instrument only directly addresses one of these dimensions – the density of EGMs. While the density of EGMs is closely correlated with the average loss per adult, this does not mean that the effect of a reduction of the former is obvious. In particular, some communities contain more people interested in gambling. This demand

determines the profitability of stationing EGMs in the area, largely determining both the number of machines operators choose to station in a particular area and the total loss experienced by consumers. While the accessibility of gaming opportunities is likely to influence the level of gaming undertaken, this effect is more subtle and cannot be inferred from the aggregate data. It is only possible to meaningfully comment on this link by considering the characteristics of the communities involved or by examining the outcomes of the exogenous change in EGM numbers resulting from a policy decision (such as the regional cap).

Table 1.3
Required Phased Reduction of EGM Numbers in Selected Regions

	Initial number as at 30 June 2000	Cumulative reductions in machine numbers required by		
		14 February 2002	14 February 2003	14 February 2004
Greater Dandenong Plus ¹	1687	29	88	147
Maribyrnong Plus	1329	32	94	157
Darebin Plus	1554	0	0	0
La Trobe	663	13	37	61
Bass Coast Shire	261	8	24	41
Total	5494	82	243	406

Note: ¹ Greater Dandenong Plus was 1,687 with licence revoked for 5 machines subsequent to Minister's direction and prior to end of June 2000, so that 1,682 were in actual operation as at end June. Darebin Plus was 1,553 with one licence revoked during month of June.

Source: Regional caps policy implemented, Minister for Gaming, 5 April 2001.
Direction of the Victorian Casino and Gaming Authority requiring compliance with regional limits (Tabcorp), 5 April 2001.
Direction of the Victorian Casino and Gaming Authority requiring compliance with regional limits (Tattersall's), 5 April 2001.

Table 1.4
Required Phased Reduction of EGMs by Operator

	Tattersall's		Tabcorp	
	EGMs as at 30/6/2000	Reduction	EGMs as at 30/6/2000	Reduction
Greater Dandenong Plus	807	70	880	77
Maribyrnong Plus	643	74	686	83
La Trobe	362	33	301	28
Bass Coast Shire	150	24	111	17
Total Reduction		201		205

Source: Government Gazette, 5 April 2001, Chairman VLGA, 406 machines to be removed by 14 February 2004.

It is interesting to note that the City of Darebin has the 9th highest level of losses per adult but only the 14th highest density of EGMs, suggesting that the machines in Darebin are being used quite intensively. It is possible then that this region would have been most affected by a reduction in machine numbers. However, because of the lower density of EGMs, no cuts will be enforced in Darebin Plus. By contrast, the Bass Coast Shire has a high density of EGMs per capita but a much lower ranking in terms of loss per adult.

The state-wide cap will not be adjusted in line with the removal of machines from the designated regions. As both Tabcorp and Tattersall's have long-term commitments from the State Government to operate 13,750 machines, the machines that are removed are likely to be reinstalled in other communities. Thus, accessibility to gaming machines in some communities will increase, though the intention is that the communities affected are less vulnerable than those communities from which the machines are withdrawn.

Even before an evaluation of the impact of the caps was commenced, Victorian researchers and others were expressing views on the likely impact of the caps. Livingstone (May, 2001) considered that "reducing the number of machines in a local area is likely to reduce losses, which is the best available measure of the impact that gambling has on a local area". While expressing concern about the regions chosen and the criteria or rationale to decide upon the extension of several regions ("the plus", i.e., what was included and what was excluded), the author expressed at least a preliminary view, that "an effective regime of capping machine numbers is likely to significantly reduce the harm associated with poker machines".

Doughney (2002) quotes a representative of the licensed operators suggesting "the cutbacks would not be effective", (p. 23). He offers several reasons "to believe that, even in capped areas the policy will do nothing to alleviate gambling problems and related socio-economic harm to communities" — specifically, because of the limited number of cap regions, the phase-in of reductions, the withdrawal of machines from smaller and lower performing venues and the ability of operators to engage in compensating or off-setting behaviours, when faced with the prospect of actual reductions in the number of machines.

There was also quite strong criticism by the Victorian Local Government Association (VLGA) of the decision of the Victorian Government to enlarge three regions with a "plus component". In the case of Maribyrnong Plus this effectively diluted the poker machine density by expanding the population base and thereby requiring that fewer machines would be required to be removed to meet the level of the 9th decile of poker machine density (approximately 11.7 machines per 1,000 adults) across the enlarged population region.

Table 1.5 shows the 5 municipal regions (minus "the plus") and changes in the number of venues, EGMs and losses per adult for three time periods. Maribyrnong is somewhat of a special case because while the intention of the policy of removal of machines was to approach the 9th decile of machine density (11.7 machines per 1,000 adults) and would be achieved for "Maribyrnong Plus", for the LGA of Maribyrnong alone, the machine density was 13.1 per 1,000 adults by August 2004, down from 15.7 in September 2001. The other 4 LGA regions were below the 9th decile. And because the average net losses per adult in the LGA of Maribyrnong were 19.6 per cent above the average for the four other LGA regions in August 2004, it may be argued that the binding caps did not 'bite hard enough' in this region.

Table 1.5
Municipal Regions, September 2001, September 2003, August 2004

LGA Region	Period	EGMs	Venues	EGMs per 1,000 adults	Net Losses per adult ¹ (\$)
Bass Coast	Sept 2001	261	8	14.8	921
	Sept 2003	237	8	11.8	813
	Aug 2004	220	8	10.9	797
Greater Dandenong	Sept 2001	1,144	16	11.6	1,030
	Sept 2003	1,131	16	11.1	962
	Aug 2004	1,078	16	10.6	946
La Trobe	Sept 2001	632	16	12.1	804
	Sept 2003	615	15	11.7	782
	Aug 2004	602	15	11.5	791
Maribyrnong	Sept 2001	784	15	15.7	1,207
	Sept 2003	734	14	13.7	1,085
	Aug 2004	705	14	13.1	1,054
Darebin	Sept 2001	986	16	9.8	892
	Sept 2003	986	16	9.3	803
	Aug 2004	986	16	9.3	855

Source: Local Gaming Data derived from OGR.

In the five LGA regions the EGM density was well above that for non-metropolitan, metropolitan and all Victoria which was 7.7 machines per 1,000 adults in September 2001 declining to 7.3 per cent by August 2004. In each of the regions, it can be seen that as the machine density declined, then net losses per adult generally declined, although La Trobe and Darebin showed a slight increase in net losses per adult in the last period, August 2004. Maribyrnong experienced a 16.5 per cent decline in machine density and 12.7 per cent fall in average net gaming losses. In each of the municipalities the decline in machine numbers was greater than the decline in average net gaming losses per 1,000 adults. In Table 1.5 we have not controlled for the impact of the smoking ban or any other changes.

The caps policy has also received strong criticism in Victorian newspapers, pointing to the perceived failure of the policy to reduce problem gambling and net gaming revenue. Usually accompanied by sensational headlines⁸ most articles point to the decline in revenue following the smoking bans but relatively little impact, if any, from the actual reduction in machine numbers. The experience of hotel owners was usually more informative (e.g., Bass Coast Shire — venue lost three machines):

“It is very rare that all 50 machines are being used at the one time. He said (following reduction of three machines) all it meant was that the other machines took more revenue. He said smoking bans was what made the difference to gambling revenue. It breaks the cycle ... most people that gamble smoke and drink. Smoking bans forced people to pull their money out of machines to go out to have a cigarette, and forced them to think about whether they would go back in “. (*South Gippsland Sentinel Times*, 16 June 2004)

⁸ “Pokies Caps fails city”, *Preston Leader* (29 June, 2004); “Poking at the Pokies”, *South Gippsland Sentinel Times* (16 June, 2004); “Our Pokie Binge”, *Geelong Independent* (13 March, 2004).

Banks (2002) expressed some ambivalence about caps as a harm minimisation measure. Importantly, he questioned their effectiveness in limiting the extent of problem gambling, while acknowledging that a zero cap (outside the casino) in Western Australia has clearly had a positive influence on minimising the prevalence of problem gambling. This raises the question of how severe a cut back or imposition of a binding cap needs to be, to produce downward pressure on the rate of problem gambling. Effectively a cap is an effort to constrain supply and in the case of Victoria, state-wide, regional and now location specific caps are a mechanism to achieve 'geographical equity' in the location or placement of machines. Certainly, we know that Victoria has a higher spend per machine and higher expenditure per capita than other States, where the growth in machine numbers was not subject to a ceiling. Banks (2002) concluded that "venue-based caps [were] preferable to state-wide or regional caps" (p. 17).

The South Australian Independent Gambling Authority (IGA)⁹ proposed to reduce the number of machines in South Australia by some twenty per cent — from approximately 15,000 down to 12,000 following the recent inquiry into machine numbers. The Inquiry concluded the following:

- "... there is a causal relationship between the accessibility of gaming machines and problem gambling and other consequential harm in the community [p. 2];
- ... both the total number of gaming machines and the number of places where gaming machines are available should be reduced [p. 2]; and
- [with a maximum number of 40 machines permissible] that the number of machines would be reduced to the proposed cap by reducing, for every premises with more than 28 gaming machines, the number of machines by 8. Venues licensed for 21 to 27 machines would be reduced to 20". [p. 3]

1.3.3 Keeping an Open Mind

At the commencement of this project the researchers "expressed no view" in regard to the likely impact of the caps, although we noted that in most States policy proposals had preceded research into the potential impact of binding caps. Based on LGA data alone, what was noted at the commencement of the study was, that the cap regions have a high share of EGMs relative to their percentage share of State income.

To properly assess the impact of regional caps, then venue based revenue data was required (in addition to other micro level data) because of the potential transfer of revenue from venues on which caps are imposed, and within and across regions (intra and inter regional transfers).

Caps may induce diversionary expenditure intra-regionally and inter-regionally. *A priori* the direction and extent of revenue flows cannot be predicted as the industry is able to implement a range of strategies to protect revenues and minimise the potential impact of regional caps.

⁹ IGA (2003), Inquiry into management of gaming machine numbers. South Australian Government.

In undertaking this study the researchers were mindful of the considered views of others including, *inter alia*, the industry operators, the venue owners and their representative organisations, government agencies such as Treasury and Human Services, Gamblers Help, local government and researchers (including the Productivity Commission staff) in the field of gambling issues.

2. Methodological Considerations

Summary of Discussion

Section 2 provides an outline of the methodology as originally proposed by the researchers, with some minor refinements based on the literature review. We consider various approaches to program evaluation and outline our reasons for nominating a matched comparisons approach. The steps involved in the Centre's methodology are outlined, including *inter alia*, literature review and on-going consultation with specialist researchers, the selection of control regions, data analysis and annual reviews of available data. The researchers determined that venue level data was required for each region, for the three "plus regions" and potential spillover towns or nearby localities.

The researchers identified critical factors correlated with regional average per capita gaming expenditure and selected five matching regions, a process which included advice from the regions, other researchers and the Victorian GRP.

Econometric analysis was conducted to select control groups or matching regions whose gambling behaviours were as close as possible to the cap regions.

2.1 Approaches to Programme Evaluation

The fundamental objective of programme evaluation is to assess the impacts of a programme. Two pieces of information are essential to make such an assessment: one needs to know what happened to the outcomes of interest for a population under the influence of the programme ("the factual") and what outcomes would have transpired for that population had the programme not existed or existed in some other form ("the counterfactual"). Neither piece of information is more important than the other; the accuracy of the impact assessment depends equally on the factual and the counterfactual.

The collection of data for a counterfactual is typically more difficult than for the factual, the reason for this being that the counterfactual is a hypothetical situation which cannot actually be observed. One needs to hypothesise about its nature. In contrast, the outcomes for the factual can be measured, for instance by analysis of data generated as a consequence of the policy impact or by use of surveys, although there may still be significant costs in undertaking the latter.

In broad terms there are three approaches to modelling a counterfactual, and each has fundamental implications for evaluation design.¹⁰

2.1.1 Experimental Designs

Experimental designs involve the random assignment of individuals to either a treatment group or a control group. Individuals in the 'treatment' group are offered the programme while those in the control group are not. Outcomes for the two groups are then compared, with the control group being used to represent the counterfactual scenario. This treatment is likely to be reasonable so long as:

¹⁰ The approach here draws on Grossman (1994).

- the sample sizes for the treatment and control are large enough to support robust statistical analysis;
- there are no biases in the assignment; and
- the outcomes for the treatment and control groups are not influenced by each other.¹¹

Random assignment approaches are generally agreed in principle to be the best approach to evaluation, but sometimes they will not be possible, for instance because equity considerations require that programme access be universal or because there are unavoidable biases in the selections into the treatment and control groups. In addition, random assignment approaches often take it for granted that a random assignment has actually been achieved, when this is not always the case.

2.1.2 Matched Comparisons

Matched comparisons involve the selection of a comparison group with similar composition to the treatment group. The key point of distinction is that there is not random assignment to the two groups, and it is therefore possible that differences in outcomes for the two groups will arise from non-programme influences, thus contaminating the evidence regarding the programme impact. This *quasi-experimental* procedure introduces a degree of subjectivity, in that the evaluator needs to choose what is a suitable similar group for use as control, and to this extent is less reliable than a pure *experimental* approach. However, analysts of social programmes are often forced to use analysis of this type, and a large amount of work has been carried out to identify how matched comparisons may best be implemented. Even though analysts are forced to use non-randomised treatment and control groups, they can use model specifications which make allowance for these differences and use statistical tests to reject specifications which do so inadequately. While there will always be a degree of subjectivity in the choice of control, it may still be possible to use inference techniques to make an objective rejection of some candidates (in this case some regions) for the comparison group.

2.1.3 Before-and-After Comparisons

Before-and-after comparisons use a 'treatment' group's (or in this case a treatment region's) pre-treatment characteristics as a control group. The main problem with such an approach is that the outcomes of the policy change may differ from earlier outcomes because of factors other than the policy change. For instance, the experience of a group of unemployed under a new programme will be affected by the business cycle, changes in personal characteristics which are unrelated to the new programme (e.g., lifecycle effects), changes in the institutional environment which are separate to the programme, and the programme itself. In practice it can be very difficult satisfactorily to strip out

¹¹ This last point is very important where one seeks to draw population wide inferences from the outcome of an experiment on a sub-population. Suppose, for instance, that we are considering the impact of a cricket training program on the prospects of selection in the national team. In an experiment with random assignment to treatment and control groups we may indeed find that prospects of national selection are higher for those in the treatment group. But it would be misleading to infer from this that extension of the program to the full population can increase everyone's chances of selection – it cannot, because there is a defined number of slots in the team. (Of course the program might improve the performance of the national team.) Maglen (1991) raises this issue in a consideration of the impact of education on earnings in Australia.

these other influences. The task is made easier where there are observations for a substantial number of time periods in the pre- and post-treatment analysis. In some instances it is possible to select a panel across a cross-section of the relevant non-treatment influences (e.g. regional income, machine and venue density), and let the panel data speak about the impact of those factors. Moffitt and Ver Ploeg (1999) say of the before-and-after evaluation method that:

A before-and-after design uses roughly the same data strategy as a monitoring study, namely, the collection of data on outcomes before and after a policy change. However, in a before-and-after design the family and individual outcomes in the “after” phase are intended to be causally related to the policy. A design of this type can be distinguished from a monitoring study if it includes a strong analysis of the influence of alternative, simultaneously occurring forces, such as social and economic trends (e.g., changes in the unemployment rate) that may have been contributing to the trends in outcomes as well as policy. (Because this separation of policy effects and the effects of other forces is so difficult, before-and-after designs are one of the least desirable types of evaluation methodologies ...) [p. 20, emphasis added]

2.2 Approach Adopted

The approach proposed by the Centre for Economic Studies for this task (accepted by the GRP) was to use a matched comparison approach. Obviously, given the areas for the regional caps were determined by the Minister, and as there are a relatively small number of regions in Victoria, an experimental design was not possible. The use of a before and after comparison within the cap regions was not regarded as satisfactory as there have been significant fluctuations in regional net gaming revenue in the past (as well as significant changes in machine numbers and distribution) and the small number of cap regions meant that it was unlikely that this could be adjusted for in a manner that was statistically significant.

The Centre also recognised, that given the presence of unobservable characteristics of persons and regions, and unobservable responses to policy shocks it is not possible to rely solely on inferential analysis in the evaluation of public policy of this type. Instead we adopt a triangulated approach, attempting to use both quantitative analysis of the available data, but also making extensive use of qualitative research, both to cover issues for which data does not exist, and to assist in clarifying the results of the data analysis, particularly the direction of causation.

There were a number of steps involved in the Centre’s methodology for evaluating the effectiveness of caps on electronic gaming machine numbers as a method of controlling problem gambling.

1. Review of the literature, and consultations with other researchers, to highlight the various methods used in other States and countries to control problem gambling.
2. Selection of five ‘control’ regions to study alongside the five trial regions, as well as identifying one town or nearby localities for each of the five trial regions where it is thought that gaming activity may be displaced.

3. Construction of data review outlining trends in net gaming machine revenue in each of the ten regions. Where possible data gathered through the Victorian Community Attitude studies would also be analysed at the regional level.
4. Consultation in each of the 10 regions to provide the Centre with ongoing feedback from local community organisations which deal with the impact of gaming machines, and provide data on issues such as the number of persons accessing counselling/support services, the area of origin of gamblers in selected venues and their behaviour in the venue.
5. Annual review of data for five trial regions and control regions. Data will be evaluated at the region level, for towns/suburbs within the region and at the venue basis. At the town/suburb level data for one town in the trial region will also be compared with data for a neighbouring town identified as a possible 'overflow' destination for displaced gamblers from the trial region. Gaming data will also be evaluated on a 'time of day basis',¹² as any changes in the patterns of expenditure may be indicative of the type of game that is being displaced by the caps.
6. Drawing together results of literature review, consultations and data research.

It was originally proposed to conduct an annual survey and consultation with a range of stakeholders once each in 2002, 2003 and 2004. Our intention was to gather data directly from persons participating in gambling (2 venues per region, to be matched in character between matching regions, and two establishments in each of the towns identified as likely 'overflow' destinations). The survey was intended to cover issues such as post code of residence, distance travelled to access venue, the frequency of attendance at venue, and the amount of time spent there per visit. The second planned purpose of these visits was to seek feedback from key stakeholders, such as local community/counselling organisations, local councils, local venue operators, as to the impact of the cap. Data would also be sought as to the number of persons accessing counselling/assistance services as a result of problem gambling. However, a consequence of data problems for this stage of the analysis was that the 'overflow' establishments were not able to be identified for the purposes of consultations and interviews during the course of the study. This was because data analysis at the venue level could not be used to identify venues which have apparently benefited from diversions from venues which have had their machine numbers reduced. As the reductions within regions have not been pro-rata, the 'overflow' venues are as likely to be within the region as they are to be in a neighbouring region. This made it impossible to use regional consultations to assist in determining overflow venues as had originally been planned. However, the Centre did conduct the following:

- survey of hotels/clubs and their experience as a result of the caps policy;
- analysis of counselling organisations data; and
- interviews with various stakeholders at the local community level and one operator¹³ to gauge their experience and assessment of the caps policy.

¹² Subsequently this data was not able to be supplied to the research team by either the OGR or the operators.

¹³ Tattersall's was invited to interview but advised it was listing on the Australian Stock Exchange and was constrained by the Corporations Act "in relation to disclosure of any matters that may be material to the listing process".

Thus, there were on-going exercises in qualitative analysis, information gathering and review over the life of the project.

2.3 Annual Data Review

2.3.1 Proposed Methodology and Progress Reports

It was originally intended, that an annual data review, together with the regional consultations and surveys within gaming venues would form the basis for annual progress reports. The data proposed to be updated was that outlined in the initial data review, namely regional, town/suburb and venue level for each of the 10 regions. However, it was not possible to do this until the revenue data became available in August 2004. Two additional analyses were conducted to identify factors not readily apparent from the general data.

The first was to identify whether or not gaming expenditure in the capped region declines, and also identify whether there has been a net decrease in expenditure by residents in the capped region, or whether gaming expenditure has just been transferred to neighbouring uncap regions. In order to try and address this concern the Centre did, in its local consultations within the trial regions, seek information as to whether there are neighbouring towns, suburbs or venues where residents of the trial area are believed to gamble. This was an aid in identifying the potential leakage points shown in Appendix 3, Tables A3.11 to A3.13. The expenditure in these venues was analysed to determine if it spikes upwards after the commencement of the trial indicating a geographical displacement of gaming activity, rather than a reduction in expenditure.

The OGR alerted the researchers to the potential importance of the phase out of 24 hour gaming — they found in some initial checks they ran that venues lost about 12 per cent of revenue when they switched from 24 to 20 hour trading. This reinforced the importance of having access to venue level data as the impacts of this could potentially distort regional level data, if the current proportion of venues in each region with 24 hour trading, and the rate at which venues lose 24 hour trading, are not perfectly symmetrical.

The other factor which cannot readily be determined from the regional (or even venue level data) is the extent to which any reduction in aggregate expenditure has been due to reduced expenditure by problem gamblers. This is an important factor as the rationale behind caps is to try and ameliorate some of the social problems caused by problem gambling. A reduction in expenditure on gaming by non-problem gamblers is actually welfare decreasing as it is directing expenditure away from the preferred good (gaming) towards some less valued good or service. Reductions in net gaming expenditures by problem gamblers however are welfare increasing as they bring their expenditure patterns closer to their “rational” level. Consequently the goal of policy is generally to reduce problem gambler expenditure with the minimum impact on non-problem gambler expenditure.

Unfortunately the first method proposed by the Centre in its tender response for investigating this issue — examining the changes in gambling patterns by the time of day at which they occur — was not possible as we were advised that data is not collected on this basis in Victoria. However, through customer relationship management data of those gamblers who participate in loyalty card schemes Tattersall's was able to obtain 'performance data by the hour'. Turnover data by time of day/time of play appears to be available. Technically, it appears feasible to monitor this data although the elapse of time since this project commenced reduced the viability of the data. We asked both operators whether "your analysis of the data showed any discernable change in the time of day/time of play as a result of machine removal".¹⁴ Tabcorp responded that they "had not analysed whether the removal of EGMs affected the time of day/time of play. Anecdotally, we do not believe there has been a change".¹⁵ Tattersall's did not respond for the reason already provided. A survey of venue owners (see Section 6) reports on their assessment of whether regular gamblers altered gambling behaviours as a result of both the smoking ban and the reduction in machine numbers.

The second proposed method relied on an analysis of problem gambler services data to assess whether, as a result of the caps policy, this had had an impact in encouraging help seeking, combined with econometric analysis to test whether there had occurred significant falls in gambling expenditure, such as to suggest there had been a significant decline in expenditure by problem gamblers. The Centre combined Gambler Help data, estimates of those who seek counselling relative to the total population of problem gamblers and economic analysis to assess the impact on problem gamblers.

2.3.2 Review of Literature

As well as conducting a review of the available literature on measures that have been introduced in order to reduce the harms associated with problem gambling the researchers also consulted with Australian (and where appropriate overseas based) researchers in this field. The consultations sought feedback on the latest research on harm minimisation policies either just completed or underway, and feedback from professionals as to issues they believe needed to be addressed in the study. This acted as a check to assist in ensuring that the study meets the requirements of potential end users.

2.4 Selection of Matched or Control Regions

The first function of the data analysis conducted was the selection of appropriate 'control' regions. As the approach adopted for the statistical analysis is one of 'matched comparison' it was important that these control regions match the trial regions as closely as possible, otherwise the inferential analysis will not be statistically significant (although it is possible to adjust for small differences in characteristics).

It was decided to adopt a "matched comparison group" approach to the evaluation of this policy. This means that the selection of appropriate "matched" or "control" regions is critical to the ability of the study to deliver meaningful results. This is particularly important in this instance, where the behaviour in question has been expanding rapidly.

¹⁴ Centre correspondence to the two operators, 24 June 2004.

¹⁵ Tabcorp written response to the Centre, 4 August 2004.

An appropriate 'control' group will allow us to make judgements as to whether any changes in gambling (whether in its level or its rate of growth) appear to be due to the trial, or are reflective of broader patterns across the State.

It is important to carefully consider what is meant by a matching region. It would be possible of course to select the 'control' group based on similarity of gambling expenditure and one or two socio-demographic characteristics (perhaps the SEIFA index). However, in this case it is critical to select matching regions whose gambling behaviour is as close as possible to the "cap" regions. Consequently we have started out with no a-priori views on which factors may be statistically significant in the case of Victoria, and used econometric analysis to determine which factors are correlated with higher levels of net gaming expenditure, and to select the regions on the basis of these factors.

The Productivity Commission in its report 'Australia's Gambling Industries' (1999) conducted econometrics on the relationship between regional income and net gaming revenue. This econometrics found evidence of concentration of gaming machines in lower socio-economic areas. In particular they found an inverse relationship between a region's income and the total amount spent on gaming machines. It could just as easily be the case that expenditures and income are both related to some other factor, such as age.

The Centre was interested in testing the factors which influence the differences in net gaming revenue between different areas in an attempt to determine if there was a link between low incomes and electronic gaming machine revenue, or whether it was other factors which were influential. The regression technique used was ordinary least squares (OLS) regression, and the dependant variable chosen was average net gaming revenue per adult.

At the time of the econometric analysis, the provisions of the Gaming Machine Control Act, 1991 regarding release of data, meant that information on Net Gaming Expenditure could only be supplied by the Victorian Office of Gambling Regulation at the local government region level. Not all of Victoria's local government regions were included in the analysis, as the following regions contained no venues with electronic gaming machines located in them:

- Shire of Buloke;
- Shire of Gannawarra;
- Shire of Golden Plains;
- Shire of Hindmarsh;
- Shire of Indigo;
- Shire of Loddon;
- Shire of Moyne;
- Shire of Pyrenees;
- Shire of West Wimmera; and
- Shire of Yarriambiack.

Even at the local government region level, data could only be released where the local government region contains more than three venues licensed with electronic gaming machines. Consequently the following regions could not be included in the analysis as the OGR only released their data aggregated with one or more neighbouring regions:

- Alpine Shire;
- Borough of Queenscliffe;
- City of Moorabool;
- Rural City of Ararat;
- Shire of Central Goldfields;
- Shire of Corangamite;
- Shire of Moira;
- Shire of Mount Alexander;
- Shire of Murrindindi;
- Shire of Southern Grampians;
- Shire of Strathbogie;
- Shire of Towong; and
- Surf Coast Shire.

The local government region of Melbourne was also excluded from the econometric analysis because its venues were regarded as existing more for the purposes of services persons who work in the Melbourne CBD, or visit it to access its entertainment facilities, than for its residents. This means that the impact of the residents of this region is likely to be “drowned out” by the impact of visitors. Consequently it is not possible to identify the impact of the characteristics of its residents on gaming expenditure, rendering statistical analysis of this region meaningless.

Due to the exclusions of a number of local government regions, the econometric analysis on the factors correlated with per adult net gaming expenditure was undertaken on the basis of the 54 local government regions for which meaningful net gaming revenue data was available.

The SA Centre for Economic Studies conducted an analysis of this type for South Australian local government regions in 2001 in a report for the South Australian Provincial Cities Association examining whether there were regional differences in the ‘harms’ caused by gaming. In that study the following demographic factors and regional characteristics were found to be significantly correlated with regional per capita net electronic gaming machine expenditure levels (SACES, 2001):

- the number of venues per square kilometre (positively correlated);
- the number of electronic gaming machines per 1,000 adults (positively correlated);
- average personal after tax income (positively correlated);
- unemployed persons as a proportion of adults (positively correlated);

-
- persons of an Aboriginal or Torres Straits Islander background as a proportion of the population (positively correlated); and
 - the proportion of the population resident in Housing Trust accommodation (positively correlated).

Of course a variable being significant for South Australia does not mean that it will necessarily be significant for Victoria. Consequently the following potential explanatory variables were included in our analysis for this study:

- the number of gaming venues in the region (Office of Gaming and Regulation data);
- the number of gaming venues per km² (Office of Gaming and Regulation data and ABS data);
- if the region is part of the Melbourne metropolitan area (ABS data);
- the population density of the region ;
- the number of machines per 1,000 adults (Office of Gaming and Regulation and ABS Census data);
- median income per adult, or the proportion of adults with weekly incomes below \$300, between \$1,001 and \$1,500, and above \$1,501 (ABS census data);
- disability pensioners as a proportion of the adult population (based on Centrelink benefit recipient data and ABS census data);
- new-start allowance recipients as a proportion of the adult population (based on Centrelink benefit recipient data and ABS census data);
- sickness benefit recipients as a proportion of the adult population (based on Centrelink benefit recipient data and ABS census data);
- aged pensioners as a proportion of the adult population (based on Centrelink benefit recipient data and ABS census data);
- sole parent pension recipients as a proportion of the adult population (based on Centrelink benefit recipient data and ABS census data);
- the proportion of adults who are sole parents (ABS census data);
- the proportion of residents aged 18 to 25, or the proportion of residents aged 18 to 30 (ABS census data);
- the proportion of residents aged 55+, or the proportion of residents aged 60+, or the proportion of residents aged 65+ (ABS census data);
- the proportion of private dwellings rented from a Housing Authority or community organisation (ABS census data);
- the proportion of private dwellings owned outright (ABS census data);
- the proportion of private dwellings being purchased (ABS census data);
- the proportion of the adult population who have never been married (ABS census data);
- the proportion of the adult population who are divorced (ABS census data);

- the proportion of the adult population who are separated (ABS census data);
- the proportion of the adult population who are from a non-english speaking background; and
- the proportion of the adult population who identify themselves as Aboriginal or Torres Straits Islander.

2.4.1 Econometric Results

As outlined above, the initial data analysis was undertaken using ordinary least squares regression, with the dependant variable being average net gaming revenue per capita. The results of this initial analysis suggested that the following factors were statistically significant (although the degree of significance varied):

- No. of machines/1,000 adults;
- per cent of population who their own home;
- per cent of adults divorced/separated;
- per cent of adults from a non-English speaking background;
- per cent population aged 15 to 30;
- per cent of population aged over 55;
- per cent of population with household income below \$301/week;
- per cent of population with household income above \$1,501/week.

Initial tests of the significance of the model appeared to suggest that it was a good model of the factors influencing the level of Net Gaming Expenditure per adult in Victoria, with significant values for Adjusted R² and the F-statistic. Adjusted R-squared is the most commonly used measure of significance for OLS regressions, measuring the proportion of the actual variation in the dependant variable explained by the estimated equation, with 1 indicating that the model perfectly explains the pattern of the data. The F-test statistic is a measure of the overall significance of the coefficients in the equation, hence the 'Probability F' is the probability that all of the coefficients other than the intercept are zero (hence a low prob. F — in the case of this specification 0.0000 — indicates that the coefficients are meaningful, supporting the model specification).

There was, however, another test needed before these results could be used in identifying potential "matching" regions for those areas in which the cap on machine numbers had been introduced — a test for simultaneity bias. Simultaneity bias exists when one of the explanatory variables is endogenously with the dependant variable, that is, the level of one of the explanatory variables is determined by the other explanatory variables. If simultaneity bias is present the coefficients estimated for the model are not reliable, and OLS regression cannot be used.

In the case of this model of net gaming revenue, the concern is that either venue managers, or gaming machine operators would decide how many machines to install based on their estimate of likely net gaming expenditure per capita in their area; and that this estimate would be produced using a similar range of factors as the model for net

gaming revenue. Given the structure of the Victorian electronic gaming machine industry, where (at least historically) Tabcorp and Tattersall's have had considerable freedom to shift machines between venues to maximise revenue, simultaneity bias would seem likely.

Consequently simultaneity bias was tested for, for the variable 'electronic gaming machines per 1,000 adults', using a version of the Hausman test.¹⁶ The results of this test showed that simultaneity bias was present for this factor, and hence that the results of the modelling were not robust.

As the ordinary least squares regression was not statistically valid, an alternative estimation technique was required. The technique chosen was Two-Stage Least Squares regression, as it is possible to control for simultaneity bias. The first stage of this technique is to develop a list of the factors which determine the endogenously determined explanatory variable from the initial equation (in this case the number of electronic gaming machines per 1,000 adults). This process had already been undertaken for the Hausman test, with the results summarised in Table 2.1.

Table 2.1
Variables Correlated with the No. of Electronic Gaming Machines per 1,000 Adults
(Instrumental Variables)

	Coefficients	Standard Error	t Stat	P-value
Intercept*	2.735	1.154	2.37	0.02
Venue Numbers*	0.220	0.056	3.95	0.00
% adults receiving Aged pension*	0.285	0.079	3.61	0.00
Population density*	-0.003	0.001	-5.12	0.00
Venues per km ² *	22.780	5.001	4.54	0.00

* Significant at the 5 per cent level

** Significant at the 10 per cent level

Adjusted R²: 0.697

F-statistic: 16.245

Prob. F: 0.0000

These results indicate that, all other factors being equal, a higher population density region will have lower electronic gaming machine numbers. Factors correlated with higher numbers of electronic gaming machines per 1,000 adults are the number of venues, the proportion of adults in receipt of the aged pension, and the number of venues per square kilometre.

These variables which are correlated with the number of electronic gaming machines per 1,000 adults, were then entered into the estimation as instrumental variables, and the initial model specification was re-tested. The use of two-stage least squares meant that several variables, which had previously appeared to be correlated with net gaming expenditure, were now no longer statistically significant. The results of this modelling

¹⁶ Davidson, R and JG MacKinnon (1989), "Testing for Consistency using Artificial Regressions," *Econometric Theory*, 5, pp. 363-384.

are shown in Table 2.2. As can be seen from the table, this revised range of explanatory variables appears to be a good model for regional net gaming expenditure per capita in Victoria, with an adjusted R² of 0.82, and an F-Statistic of 56.46 (prob. F = 0.0000).

Table 2.2
Variables Correlated with Net Gaming Expenditure per Adult in Council Areas
Two-Stage Least Squares Estimates

	Coefficients	Standard Error	t Stat	P-value
Intercept*	-2,535.40	637.53	-3.98	0.000
Electronic Gaming Machines/1,000 adults*	70.82	5.31	13.35	0.000
% Adults who own home* ¹⁷	12.09	4.05	2.99	0.004
% population aged 15 to 30*	68.65	12.11	5.67	0.000
% of population aged 55+*	15.55	6.62	2.35	0.023

* Significant at the 5 per cent level

** Significant at the 10 per cent level

Adjusted R²: 0.820
F-statistic: 56.463
Prob. F: 0.0000

Given the size of the coefficients relative to the values of the explanatory variables, each of the first three factors (excluding the intercept) accounts for about 25 to 35 per cent of the variation in expenditure, with the last factor accounting for about 10 per cent. The regional net gaming expenditure per adult is only correlated with a relatively small number of factors, this is in large part due to the fact that machines (at least prior to recent requirements for regional impact statements) were transferred freely between venues and regions in order to maximise the return to the venue operators. This means that the explanatory power of the variable “machines per 1,000 adults” is not only a factor of increased accessibility, but also acts as a proxy for those physical and demographic factors which influence machine location decisions (see Table 2.1). The significance of the proportion of adults who own their own home as an explanatory variable may suggest that wealth is a more significant influence on expenditure than income (which was not significant).

The significance of the proportion of the population who are aged 15 to 30 is expected as a number of epidemiological studies on problem gambling have suggested that young people account for a disproportionate share of ‘problem gamblers’. For example, a meta-analysis of 106 USA and Canadian studies on the prevalence of pathological gambling (Shaffer et al., 1997) found that the lifetime prevalence rates of pathological gambling¹⁸ differed significantly between different segments of the population. Lifetime prevalence rates were 3.88 for adolescents and 4.67 for College students, compared with 1.60 for the

¹⁷ A variable calculated by combining the proportion of adults who own their own home outright, and the proportion purchasing their own home.

¹⁸ Termed ‘Level 3’ gambling in the study, to be assessed as being a pathological gambler means that the individual has fulfilled the clinical criteria set out in the American Psychiatric Association’s Diagnostic and Statistical Manual IV (DSM-IV, 1994). It should be noted that this is only a sub-set of those considered to be ‘problem gamblers’ in Australian literature on gambling.

general adults population.¹⁹ Given that a significant share of net electronic gaming machine revenue comes from problem gamblers it is not surprising that the share of a region's population in this age group is positively correlated with expenditure. It is also possible that persons in this age groups are able to devote a greater proportion of their income to all forms of entertainment (including gambling) because they face fewer fixed expenditures (such as mortgages, or the costs of children).

The significance of the proportion of adults aged over 55 is likely to be driven by a range of factors. Possible reasons for its significance as a factor increasing regional net gaming expenditure could include higher potential spending on entertainment by this age group due to relatively high wealth levels and lower savings needs (although lower income levels), and the general absence of dependents. It could also reflect an age related change in preferences away from some other recreational activities towards gaming, or a lack of alternative opportunities for social contact. The often high wealth levels (relative to future expenditure and savings needs) could also mean that those older persons who experience problem gambling have the scope to lose larger amounts of money, consuming their retirement savings and the equity in their house.

2.5 Identification of Matching Regions

Having identified the critical factors which are correlated with regional average per capita gaming expenditure, the next stage of the analysis was to identify 'control' regions that match the cap regions as closely as possible. As discussed previously, the trends in net gaming expenditure in these "control" regions were then compared to those in the cap regions. This allowed the analysis to take account of other changes to the regulatory environment facing the electronic gaming machine industry (such as the ban on 24 hour gaming, and the restrictions on smoking) to identify the changes that are a result of the introduction of the caps, rather than due to other policies.

As the three metropolitan cap regions each include a number of neighbouring post codes, this selection could not be undertaken on the basis of local government regions. Therefore, the data used to identify potential 'control' regions was adjusted for the transfers into the cap regions, producing "plus" and "minus" regions. The transfers into the original cap regions as at April 2001 are detailed below.

Maribyrnong "Plus", is the local government region of Maribyrnong, with additional areas transferred from:

- Hobsons Bay (the 96.5 per cent of postcode 3015 in this LGA; including 1 venue and 66 machines);
- Brimbank (the 98.3 per cent of postcode 3020 in this LGA; including 6 venues and 280 machines);
- Melbourne (the 25.1 per cent of postcode 3031 in this LGA; including 1 venue and 100 machines); and

¹⁹ 95 per cent confidence intervals for these results were 2.33-5.43 per cent for adolescents; 3.44-5.90 per cent for College students; and 1.35-1.85 per cent for the general adults population. This study also highlighted the extent of co-morbidity of pathological gambling with other social problems, with the lifetime prevalence rate of problem gambling amongst adults in treatment for substance abuse or psychiatric disorders being 14.23 per cent.

- Moonee Valley (the 74.9 per cent of postcode 3031 in this LGA; including 2 venues and 79 machines).

Greater Dandenong “Plus”, is the local government region of Greater Dandenong, with additional areas transferred from:

- Monash (all of postcode 3170; including 3 venues and 308 machines); and
- Casey (all of postcodes 3177 and 3803; including 2 venues and 195 machines).

Darebin “Plus”, is the local government region of Darebin, with additional areas transferred from:

- Moreland (all of postcodes 3058 and 3060; including 4 venues and 227 machines);
- Hume (all of postcode 3061; which contained no currently licensed venues);
- Whittlesea (all of postcode 3074; including 1 venue and 105 machines); and
- Banyule (all of postcode 3081; which contained no currently licensed venues).

These transfers into the cap regions produce noticeable changes to the demographics of both the cap regions and the neighbouring regions from which areas were transferred. The profile (on four key factors and population) of the regions affected by these transfers is compared in Table 2.3.

Table 2.3
Changes to the Profile of Metropolitan Areas*

	Local Government Regions					‘Cap’ Regions				
	Pop. ('000)	Venues No.	EGMs No.	EGMs/ 1,000 adults	median income (\$/week)	Pop. ('000)	Venues No.	EGMs No.	EGMs/ 1,000 adults	median income (\$/week)
Maribyrnong	58.5	16	804	17.2	324	117.1	23	1,324	14.3	323
Greater Dandenong	124.5	16	1,187	12.5	278	165.2	21	1,697	13.5	307
Darebin	122.7	17	1,006	10.2	347	204.7	22	1,338	8.3	335
Hobsons Bay	81.4	11	618	10.0	433	67.2	10	552	10.9	435
Brimbank	145.4	15	880	8.2	286	115.4	9	600	7.1	287
Melbourne	59.2	16	904	17.3	392	55.6	15	804	16.3	410
Moonee Valley	108.1	15	757	8.8	392	97.3	13	678	8.8	397
Monash	154.4	16	1,223	9.9	336	132.5	13	915	8.6	323
Casey	177.3	11	801	6.6	415	158.5	9	606	5.6	421
Moreland	130.0	16	795	7.6	347	88.3	12	568	7.9	356
Hume	129.8	13	746	8.3	394	124.3	13	746	8.7	400
Whittlesea	138.7	9	616	7.6	393	90.6	8	511	7.9	377
Banyule	116.3	11	610	6.8	417	102.2	11	610	7.8	399

Note: * The population and income data is drawn from the 2001 census, and the data on the number of venues and electronic gaming machines as from OGR data as at June 2000, that being the most recent data available prior to the reductions in machine numbers occurring in the cap areas. This means that the two sets of data do not perfectly match, but as the machines has already begun to be moved by June 2001 to comply with the cap, and as “cap” regions were selected on the basis of numbers as at June 2000 it was thought that data as at June 2000 was the most appropriate for this table.

Source: ABS 2001 Census, OGR, calculations, SACES.

The transfers between regions had the most significant impact on Maribyrnong, with Maribyrnong Plus having twice the population and half again as many venues as the local government region (from 16 to 23 venues).

In total, the transfers of post codes resulted in a total increase in the population of the cap regions of 181,000, or slightly over fifty per cent, and an additional 17 venues (just over a third). The net effect of this was to reduce the overall concentration of machines in the cap regions, although both Maribyrnong Plus and Greater Dandenong Plus still have significantly higher numbers of machines per resident than their neighbours. The demographic characteristics of the transferred areas (at least in terms of income) seems to be fairly similar to the regions they have been transferred into. For example, despite its population being double that of the local government region, Maribyrnong Plus has virtually the same median income (\$323 per week instead of \$324).

Due to the size of these transfers, the analysis undertaken to identify potential control regions used the areas as adjusted for the cap. As net gaming expenditure is not one of the explanatory variables, all of the local government regions in which electronic gaming machines are located were able to be included in the analysis to identify potential matching regions. As discussed previously, the region of “Melbourne Minus” was excluded from this analysis because of its unusual characteristics.

The potential matching regions which emerged from the data analysis are shown in Table 2.4. Unfortunately because of their unusual demographics (particularly the extreme concentration of machines, and relatively high levels of relative disadvantage) there were no regions which closely matched the profile of “Maribyrnong Plus” or “Greater Dandenong Plus”. The two or three regions which appear to most closely match each of the five “cap” regions (**bolded** in Table 2.4) are listed with the cap region they are thought to most closely match. In this process metropolitan regions were only matched with other metropolitan regions, and rural and regional areas with other rural and regional areas.

Feedback was sought as to which of the potential matching regions were regarded as most appropriate for each of the cap regions. Advice from the GRP member group and other researchers was provided to the Centre. As data is not available on all factors which may be thought of as relevant to this selection, the closest match in terms of predicted expenditure may not be the best matching region. For example, it may be thought that because of differences in preference sets and behaviour patterns within Melbourne it may be more appropriate to match a region in the western suburbs with another region in the western suburbs.

Based on the statistical analysis, and the feedback received, the following control regions were identified:

Cap Region	Selected Control Region
For “Greater Dandenong Plus”	“Monash Minus”;
For “Maribyrnong Plus”	“Hobsons Bay Minus”;
For “Darebin Plus”	“Moreland Minus”;
For the City of La Trobe	The City of Ballarat;
For the Bass Coast Shire	The City of Greater Geelong.

Table 2.4
Potential “Matching” Regions for Each Cap Region
 Selected Characteristics

Region	Predicted EGM exp. per adult (\$)*	EGMs/1000 adults	% who own their own home	% of pop. aged 15 to 30	% of pop. aged 55+
Greater Dandenong Plus	1,156	13.45	70.54	22.41	22.33
City Of Maroondah	940	10.65	77.51	21.05	21.80
Monash Minus	926	8.64	73.51	22.60	26.36
Maribyrnong Plus	1,100	14.28	60.83	22.55	21.90
City Of Maroondah	940	10.65	77.51	21.05	21.80
Monash Minus	926	8.64	73.51	22.60	26.36
Hobsons Bay Minus	831	10.87	73.77	20.03	21.22
Darebin Plus	828	9.59	66.81	21.71	24.81
Hobsons Bay Minus	831	10.87	73.77	20.03	21.22
Moonee Valley Minus	825	8.81	72.60	21.64	23.98
Moreland Minus	824	7.94	64.01	23.96	24.34
City of La Trobe	1,045	13.89	74.90	19.82	20.88
City Of Ballarat	984	11.24	69.43	22.50	22.05
City Of Warrnambool	948	12.63	67.02	20.84	22.54
Bass Coast Shire	845	14.13	72.13	14.23	33.45
City Of Warrnambool	948	12.63	67.02	20.84	22.54
City Of Greater Geelong	840	10.09	74.16	20.21	24.13
Shire Of Central Goldfields	824	12.39	78.86	14.84	31.93

Note: * This is the level of per adult net electronic gaming machine expenditure predicted by the statistical model detailed in Table 4.2. Because a statistical model can never fully explain human behaviour this will not precisely coincide with actual expenditure levels, instead it could usefully be thought of as an index of “risk factors” related to net gaming expenditure levels.

Source: ABS 2001 Census, OGR, calculations, SACES.

There was a potential concern in matching the Bass Coast Shire with the City of Greater Geelong in that they are regions of very different population size (which would suggest that Geelong may well have better levels of amenities, and consequently more alternative forms of entertainment) and that the Bass Coast Shire has more seasonal employment patterns than Geelong, suggesting that expenditure may be more variable through the year. Consequently we also monitored data for the City of Warrnambool — which is closer to the Bass Coast Shire on these factors — so that it could be used as an alternative control should Geelong prove inappropriate.

In Appendix 4 we provide a regional profile of the characteristics of the population, including age, income distribution, housing, marital status and other indicators. Descriptive data is provided for each of the cap and control regions, including a summary of the trends in machine numbers and venues.