BARA The leading voice of airlines

Board of Airline Representatives of Australia Inc

Submission to the Productivity Commission's inquiry into price regulation of airport services

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EXECUTIVE SUMMARY

Given concerns over the conduct of Sydney Airport Corporation Limited (SACL), the Australian Government has brought forward the review by the Productivity Commission (the Commission) into the pricing and provision of aeronautical services by price monitored airports.

The Board of Airline Representatives of Australia (BARA) considers that another 'high level' review of the regime by the Commission is the wrong response to concerns over the conduct of SACL. Rather, the Australian Government should have initiated a detailed investigation by the Australian Competition and Consumer Commission (ACCC) into SACL's price and non-price conduct.

Reviews by the Commission were never the intended response to concerns over the conduct of individual airport operators. BARA considers that the Commission's role is to provide guidance and recommendations on the overarching approach to the economic regulation of airports. However, it is noted that the Commission has previously been supportive of SACL, regardless of its poor commercial conduct. The current problems with SACL, therefore, stem from a failure by both the Australian Government and the Commission to hold SACL accountable for its poor commercial conduct.

BARA believes that SACL has probably progressed to a point where only the imposition of stricter economic regulation is likely to be able to correct its long-term commercial conduct. SACL's international aeronautical services and facilities should be 'deemed' for access (negotiate-arbitrate model) for a period of five years. The existing draconian SACL 'Conditions of Use' document needs to be scrapped and a more balanced commercial agreement negotiated with international airlines.

Underlying problems with the regime have been building for some years

BARA maintains that the current problems with the conduct of SACL can be explained, at least in part, by its different privatisation process compared to the other major airports. It is also a function of SACL not being held to account for its poor commercial conduct since the Commission's 2006 Inquiry.

Adelaide, Brisbane, Melbourne and Perth airports' aeronautical assets were sold on a regulatory framework of CPI-X price caps based on the 'single till' prices of the former Federal Airports Corporation (FAC). This regulatory framework suppressed the sale value of the aeronautical assets.

With the removal of the CPI-X price caps on 1 July 2002, Adelaide Airport Limited (AAL), Brisbane Airport Corporation (BAC), Australian Pacific Airport Melbourne (APAM) and Westralia Airports Corporation (WAC) all benefited from substantial increases in prices, revenues and returns far beyond their expectations when forming their bids for the airport leases. BARA estimates that APAM, BAC and WAC obtained a combined windfall gain of around $750 million with the move to the current prices monitoring regime.

Some of the increases in aeronautical prices from 1 July 2002 were justified. Price increases were necessary to fund future investment programs and some were due to lower than expected traffic volumes after the first five years of privatisation. However, a large portion of the price increases represented unnecessary rent transfers from airlines to airport operators. In its 2002 Inquiry, the Commission placed little weight on the issue of rent transfers. The rent transfers are now embedded in the 2005-06 'line in the sand' asset valuations. These rent transfers represent a loss to the Australian community. The Australian Government could have achieved far higher lease sale prices if the basis upon which aeronautical prices were to be set after the first five years of privatisation was known to all potential bidders.

The underlying problem for SACL is that its aeronautical prices were reset on a dual till basis prior to sale. This means the rent gain associated with dual till pricing and asset revaluation appropriately accrued to the Australian Government. As a consequence, SACL's shareholders have not obtained the large rent transfers currently enjoyed by the shareholders of AAL, BAC, APAM and WAC.

The ACCC's monitoring and analysis indicate that SACL is resorting to reducing service standards as a way of reducing costs and increasing profits. BARA has found that negotiating the provision and pricing of international aeronautical services and facilities with SACL has been protracted with less than satisfactory outcomes**.** SACL also has not undertaken timely aeronautical investments and the international terminal presents operational problems for some international airlines, because SACL has put its own retail interests before efficient passenger services.

BARA made it clear to the Commission in its 2006 Inquiry that a failure to deal with SACL would undermine the credibility of the prices monitoring regime. As no action was taken at the time, it is clear SACL has assumed little probability of being held accountable for its poor commercial conduct. As a consequence, the regime is failing to provide an effective long-term discipline on the commercial conduct of price monitored airports.

For AAL, BAC, APAM and WAC, it is clear that substantial windfall gains can be both obtained and endorsed by the Commission. Available evidence suggests that these airport operators now consistently earn more than 20 per cent per year on their actual investments in aeronautical assets. A key issue they now face is whether there is scope to obtain more. As new investment is priced at actual rather than revalued costs, the overall returns to the businesses are likely to be trending downward. Clearly the shareholders of each airport would like to continue to earn the existing very high returns on current and future investments.

BARA is also concerned that the current regime effectively guarantees a high rate of return on all the investments undertaken by airport operators regardless of the efficiency of those investments. This is encouraging excessive pre-funding of major assets, diminishing the incentives for efficient delivery and encouraging airport operators to undertake substantial increases in the scope of capital projects without consulting with airlines.

Airport operators need to be held accountable for their commercial conduct

It is likely that airport operators currently assume a very low probability of being held to account for poor commercial conduct. As a consequence, the additional profits from poor commercial conduct far exceed the expected costs. Threats of stricter price controls serve no useful purpose unless each airport operator assumes poor commercial conduct will be identified and acted upon.

The ACCC undertakes sufficient analysis from the information collected to indentify likely abuses of market power by an airport operator. The ACCC's reporting and analysis is an important component in ensuring the information collected as part of the prices monitoring regime is used effectively in identifying and highlighting potential problems with airport operators. The problem is that the analysis and findings are not acted upon. Until this occurs, airport operators will quite rightly have little regard for the prices monitoring regime in determining their commercial strategies and in undertaking negotiations with airlines.

BARA recommends a package of actions, reforms and findings

BARA again calls for direct action to hold SACL accountable for its poor commercial conduct. The minimum required is a detailed investigation by the ACCC into SACL's price and non-price conduct. If some corrective action is not taken against SACL, one could not reasonably expect that any price monitored airport will take the current regime seriously.

The main structural problem with the current regime is that the Australian Government appears to consider that high level reviews by the Commission are the appropriate response to concerns over the conduct of an individual airport(s). BARA recommends that the Commission clearly defines the respective roles of itself, the ACCC and the Australian Government in administering the prices monitoring regime.

BARA also considers that the Australian Government must undertake a far more active role in enforcing the regime rather than simply calling for its review. One way of strengthening the current regime could be for a small independent body (say three appropriately qualified people) to form a view on the conduct of individual airport operators on a periodic basis (say every one to two years). This could be done through a review of the prices monitoring reports and meetings with the airport operators and users. The body could then report to the Australian Government on emerging issues, together with recommendations about the need for more detailed reviews by the ACCC or, perhaps, stricter forms of economic regulation. By greatly increasing the probability of price monitored airports being held accountable for poor commercial conduct, it should significantly reduce the need to impose stricter forms of price controls, assuming detailed investigations generally occur in the first instance.

However, the evidence put forward in this review also might lead to the conclusion that prices monitoring regimes are not capable of delivering on their intended outcomes for Australia's major privatised airports. Such a conclusion would mean that the move to 'deemed' declaration (negotiate-arbitrate model) across all price monitored airports is justified. This

form of economic regulation is less interventionist than direct price setting, but still allows users access to arbitration if acceptable commercial outcomes cannot be achieved.

For AAL, BAC, APAM and WAC, BARA is concerned that some may have chosen to forget the basis on which they are now obtaining very high rates of return and are becoming increasingly aggressive in their demands in seeking to maintain such levels. For international airlines, more balanced negotiations could be encouraged if:

- there was explicit recognition of the large windfall gains the airport operators received with the removal of the CPI-X price caps;
- the Commission restated that the purpose of the regime is not to deliver windfall gains to the airport operators on a periodic basis;
- airport operators (and especially their shareholders) were reminded that the rates of return they earn on total aeronautical investments are likely to trend downward through time with new investments priced at actual rather than revalued cost; and
- the overall assessment of an airport operator's conduct also included consideration of the efficiency by which it is delivering capital projects.

1 INTRODUCTION

The Board of Airline Representatives of Australia (BARA) represents most of the international airline carriers using Australian airports. BARA members provide over 95 per cent of international passenger flights to and from Australia. Most BARA members operating scheduled passenger services also engage in large scale international freight operations. BARA also represents an international freight-only carrier operating in and out of Australia. A list of current BARA members is attached as Appendix 1.

In their capacity as international carriers operating regular public transport services, BARA members use services provided by eight airports in Australia: Adelaide, Brisbane, Cairns, Darwin, Gold Coast, Melbourne, Perth and Sydney. Some BARA members use services provided by other airports in Australia to deliver domestic and regional services. BARA's comments in this submission are limited to arrangements for international air services.

BARA has authorisation from the Australian Competition and Consumer Commission (ACCC) to collectively negotiate on behalf of its members for the provision and pricing of international aeronautical services and facilities at major international airports, including Gold Coast Airport. BARA's activities are voluntary for all parties. Each airline may choose to negotiate different terms and conditions from those negotiated through BARA. Airport operators are also not required to negotiate with BARA.

BARA has undertaken collective negotiations with Adelaide Airport Limited (AAL), Brisbane Airport Corporation (BAC), Australian Pacific Airports Melbourne (APAM), Westralia Airports Corporation (WAC), Cairns Airport Pty Ltd (CA) and Sydney Airport Corporation Limited (SACL) on a continual basis since 2002. BARA was not supportive of the Commission's recommendation to remove the CPI-X price controls and move to a 'light handed' regulatory regime in 2001. Nevertheless, BARA has sought to negotiate commercially acceptable terms and conditions for international services with each airport operator, consistent with the overarching framework recommended by the Commission and implemented by the Australian Government.

At the cost of extremely large rent transfers, the prices monitoring regime has delivered an environment favourable for AAL, BAC, APAM and WAC to undertake substantial investment programs. CA has undertaken some more moderate capital expenditure. The key challenge for the regime in the future is its ability to encourage meaningful commercial outcomes based on actual levels of investment, rather than revalued amounts.

The problems with SACL are airport specific. BARA has always found discussions with SACL to be a frustrating and protracted process. The final outcomes are often poor, reflecting a 'win-lose' commercial culture.

In 2006 the Commission decided SACL's poor commercial conduct did not warrant any special attention despite the continual concerns raised by BARA. In BARA's opinion, its continual poor conduct represents a rational decision by SACL, as the expected additional

profits from poor commercial conduct exceed the expected cost of being held accountable for such conduct.

The structure of BARA's submission is as follows:

- In Section 2 BARA briefly outlines the key elements of the privatisation process that provide an understanding of the problems with the current regime.
- In section 3 BARA briefly comments on the commercial conduct of price monitored airports.
- In section 4 BARA provides its responses to the questions raised in the Commission's Issues Paper.

2 A SHORT HISTORY OF PRIVATISATION

Key messages

- The sale of Brisbane, Melbourne and Perth (Phase I) and Adelaide airports was based around non-aeronautical revenue potential and constrained aeronautical revenues.
- To date Phase I airport operators probably have obtained around $750 million in windfall gains with the removal of the CPI-X price caps in 2001:
  - this windfall gain is earned continually each year through a rate of return and depreciation charge on revalued aeronautical assets.
- Available evidence shows that Phase I airport operators earn very high rates of returns on the actual amounts they have invested, probably in excess of 20 per cent per year.
- SACL's prices were reset prior to sale based on dual till pricing and revalued assets. This means the new owners did not obtain the same windfall gains afforded to Phase I airports and Adelaide Airport.

The underlying problems with the existing regime did not develop overnight. An understanding of how aeronautical prices and service level commitments are currently set is necessary to understand the likely causes of the existing problems. Below is a brief overview of privatisation to date, focussing on the issues that have led to the current bringing forward of the Commission's review.

2.1 Phase I – Non-aeronautical potential and aeronautical price caps

On 1 July 1997, 50 year leases, with an option of a further 49 years, were granted over Melbourne, Brisbane and Perth airports to the Australian Pacific Airports Corporation, Brisbane Airport Corporation Ltd and Airstralia Development Group, respectively. Approximately 170 parties registered an interest in the sale process and 60 of these participated in the bidding process.[1]

In deciding how much bidders were prepared to pay for Phase I airports, each airport offered two very different investment opportunities.

Non-aeronautical growth potential

The key selling point of Phase I airports was unexploited commercial, or non-aeronautical, opportunities. One opportunity was to improve and expand on the retail activities within the international terminals. The new owners could draw on the skills and experience in both Australia and from overseas to enhance the level of discretionary expenditure by international passengers at the airport. The other main non-aeronautical opportunity was property development. Phase I airports had substantial amounts of unexploited land. This land could

[1] Australian National Audit Office (1998) *Sale of Brisbane, Melbourne and Perth Airports*, p. 35.

be used for various commercial activities including car parks, hotels, large retail stores, administrative offices or freight centres.

The unexploited opportunities at each airport were reflected in the large 'lease premiums' paid by the successful bidders. In the 1997-98 Regulatory Accounts (the first set of regulatory accounts) the lease premiums were some $940 million, $650 million and $486 million for Brisbane, Melbourne and Perth airports, respectively. The lease premiums represented some half to two thirds of the total purchase prices.

Aeronautical price caps, development commitments and ACCC review

The aeronautical side of Phase I airports was far less attractive from an investor's viewpoint. This is because the pricing regime was designed to share the benefits of privatisation between the airport operators, airlines and passengers. To do this, it was necessary to suppress the amounts bidders were prepared to pay for the aeronautical side of the businesses. If aeronautical prices were to be kept low, this ultimately would be 'funded' by the Australian Government accepting a lower sale value for its aeronautical infrastructure.

CPI-X price caps were applied to the existing 'single till', network charges levied by the former Federal Airports Corporation (FAC). The X values were set at 4.0 per cent for Melbourne Airport, 4.5 per cent for Brisbane Airport and 5.5 per cent for Perth Airport.

The Sale Agreement also required a contractual commitment from bidders to a specific amount of capital expenditure on aeronautical infrastructure development for the initial ten years of the lease (medium term development commitment).[2]

The pricing arrangements also allowed for price increases outside the price caps for the largely undefined 'necessary new investment' (NNI). It was also intended that the ACCC would review the price cap arrangements after four years to determine what arrangements should apply in the future.[3]

The aeronautical side of the business, therefore, represented a highly constrained revenue stream given the high X factors, development commitments, no guarantee of price increases outside the caps and a future review by the economic regulator. One could reasonably expect under such starting arrangements that potential buyers all assumed a continuation of the CPI-X pricing regime after the first five years of privatisation. The only publicly available evidence BARA has obtained is for Adelaide Airport (Phase II), which expected its initial CPI-4 price cap in the first five years to be adjusted to CPI-1 in the second five.[4]

Airport operators were not required to disclose the bid amounts for the aeronautical side of the business. However, some useful estimates can be obtained from published information using standard discounted cash flow models. Using the known price caps, development commitments, published operating costs, cost of capital estimates and a few assumptions over

[2] ANAO (1998), p. 95.
[3] ANAO (1998), p. 98.
[4] See BARA (2006) Submission to the Productivity Commission's inquiry into price regulation of airport services.

growth in traffic volumes and future price caps, the resulting aeronautical asset valuations are:

- Brisbane Airport: $120 million,
- Melbourne Airport: $250 million,
- Perth Airport: $40 million.

As each airport started with the same single till price in 1997, the differences in estimated asset values are largely determined by the size of the each airport's free cash flows in 1997-98 and the X factor applied to aeronautical prices.

Aeronautical asset revaluation – Brisbane and Melbourne airports

One issue largely occurring in the background that would eventually prove of critical importance was the valuation of aeronautical assets. The stated values of the aeronautical assets in the 1997-98 Regulatory Accounts for AAL, BAC and WAC reflected the legacy values obtained from the FAC. BARA understands that APAM revalued its aeronautical assets for the 1997-98 accounts.

Despite the constrained revenue growth opportunities available and low returns earned on the legacy FAC values, BAC revalued its aeronautical assets in its 1999-2000 Regulatory Accounts upwards by some $274 million to over $530 million. APAM's 1997-98 Regulatory Accounts aeronautical asset value was some $460 million.

On face value, BARA finds it difficult to accept these asset values as reasonable. This is because asset revaluations must be subject to 'impairment' tests required under accounting standards. Given it was never intended that aeronautical prices would be based on these revalued amounts, the revenue streams from the most probable pricing outcomes would never approach the revalued amounts when discounted at the airport operator's cost of capital.

However, both BAC and APAM chose not to apply a discount rate in testing whether the asset values were reasonable, given expected revenues and costs (see Box 1.1). This was permissible under accounting standards at the time (it is now no longer deemed acceptable), but it had to be disclosed in the notes to the financial statements.

Box 1.1 **Airport pricing, asset valuation and accounting standards**

Price monitored airports are required to maintain special purpose accounts that allocate revenues, costs and asset values between aeronautical and non-aeronautical services. The accounts must be prepared in accordance with prevailing Australian accounting standards.

In valuing property, plant and equipment, accounting standards require an asset's first value to be at its 'cost' (acquisition or construction). After that, the business must decide to either:

1. retain the initial cost valuation less accumulated depreciated value, or
2. revalue the assets in accordance with the 'revaluation model'.

In deciding to adopt the revaluation model, airport operators are required to continually revalue their property, plant and equipment at regular intervals (see AASB 116).

BARA understands that in revaluing aeronautical assets, airport operators have used:

- an 'opportunity cost' approach to valuing land,
- a depreciated replacement cost (DRC) approach for airfield and terminal assets.

Revalued assets must also be subject to an impairment test. The purpose is to ensure that the net cash flows (revenues minus operating and maintenance costs) generated from the assets justify their valuation given the business' cost of capital (see AASB 136).

Given that the airport operators were subject to CPI-X price caps based on single till prices, it would seem on face value that the DRC valuations would be subject to significant downward impairments. The revenues obtained under the CPI-X caps were never intended to support a DRC valuation. As such, the net cash flows would be unable to support the DRC at the airport operator's cost of capital.

However, prior to 2005 there was no requirement for companies to apply a discount rate to the net cash flows. By not applying a discount rate, a dollar in over 90 years in the future was considered to be worth a dollar today. Not using a discount rate and simply adding up the free cash flows means that DRC valuations could be justified from the CPI-X revenue streams.

If a business chose not to apply a discount rate it was required to disclose this fact in the notes to its financial accounts.

Both BAC and APAM decided not to apply their cost of capital to the net cash flows in undertaking their impairment tests (eg. see note (F) in Brisbane Airport's 1999-2000 Regulatory Accounts and note (g) in Melbourne Airport's 1997-98 Regulatory Accounts).

Interestingly, BAC complained bitterly to the Commission in 2002 that it earned a very low rate of return on its aeronautical assets. In hindsight this outcome should not have been surprising when it was prepared to use a zero rate of return in assessing the adequacy of its asset valuation.

Aeronautical revenues and traffic volumes by 2001-02

The first five years of privatisation was a mixed bag for Phase I airport operators. While APAM achieved reasonable aeronautical revenue growth, BAC's and WAC's was far more modest, at only just over 2 per cent growth per year (see Table 2.1).

Table 2.1 **Passengers and aeronautical revenues, 1997-98 and 2000-01**

	Brisbane	Melbourne	Perth
Passenger numbers ('000)			
1997-98	10.58	14.20	4.86
2001-02	12.32	16.48	4.84
Average annual change (%)	3.9%	3.8%	-0.1%
Aero revenues ($m)			
1997-98	$38.1	$53.0	$19.0
2001-02	$42.3	$65.7	$20.6
Average annual change (%)	2.6%	5.5%	2.1%

Source: 1997-98 and 2000-01 Regulatory Accounts.

In addition, it also took a considerable length of time to define the concept of 'necessary new investment' and it was sometimes difficult to apply in practice. For example, trying to work out how much of a runway overlay represented an increase in capacity and how much was maintenance was somewhat problematic.

The Productivity Commission's 2002 Review

Rather than the ACCC review future economic regulatory arrangements, the Australian Government assigned the task to the Commission.

In its 2002 Inquiry, the Commission recommended that direct price controls be removed from Phase I and II airports. The price caps were to be replaced with a 'light-handed' monitoring regime and review of airport conduct after five years.

The process of lifting the price caps had already started given the events of September 2001 and the collapse of Ansett. Price caps were removed from Phase II airports in October 2001, while one-off price increases of around six to seven per cent were allowed for Phase I airports.

The Australian Government accepted the recommendations of the Commission and the CPI-X price caps were lifted from Phase I airports on 1 July 2002.

All Phase I airports essentially adopted the same approach in resetting prices. A standard 'building block' model was applied using:

- revalued aeronautical assets,
- forecast operating costs,

- forecast capital expenditure,
- rates of return established by the ACCC under the previous NNI arrangements,
- forecast traffic volumes.

In most instances the largest driver of the price increase was not capital expenditure, but rather the new asset valuations. Some of the price increase could also be attributable to the lower than expected initial growth in traffic volumes.

From the prices derived from the building block model, a 'discount' in some form was conceded to airlines. This usually represented a phasing in of price increases to their target levels by the end of the planned five year pricing agreement. The initial price increases reported in 2002-03 Regulatory Accounts were WAC (70 per cent), BAC (50 per cent) and APAM (40 per cent).

Based on the difference between the revalued assets and the likely value at the time of sale, the estimated windfall rent gain was:

- BAC: $400 million, (over 200 per cent increase)
- APAM: $200 million, (around 90 per cent increase)
- WAC: $140 million (over 350 per cent increase).

These windfall gains are not immediately realised, but rather earned continually over time through the prices negotiated with airlines. Based on a depreciation rate of 4 per cent and 11 per cent pre-tax rate of return, the annual rent transfer obtained is:

- BAC: $60 million,
- APAM: $30 million,
- WAC: $20 million.

These amounts will gradually diminish over the next 25 to 30 years as the revaluations are slowly depreciated through time.

Only APAM offered some form of meaningful service level commitment with its price increases. For the other airports, the airlines had to rely on the quality of service monitoring undertaken by the ACCC.

2.2 Sydney Airport

SACL's privatisation followed a very different path to Phase I and II airports. SACL's aeronautical prices were reset based on revalued assets and dual till prices prior to sale. This meant that the rent transfer associated with revalued assets and dual till pricing accrued to the Australian Government rather than company shareholders.

The Government-owned SACL lodged a prices notification with the ACCC in October 2000, seeking an increase in aeronautical charges of around 130 per cent. In May 2001 the ACCC final decision approved an increase of 97 per cent.[5]

The sale of Sydney Airport was delayed until after the industry had recovered from the events of September 2001 and the collapse of Ansett. Following a competitive tender process, the sale of Sydney Airport was completed on 28 June 2002. For a purchase price of $4.233 billion, Southern Cross Airports Corporation Pty Limited acquired all the shares in SACL, which held the long-term lease over the airport site. The sale agreement also granted the purchaser a 30 year right of first refusal over the development and operation of a second Sydney airport, if the Government of the day decided it was needed.[6]

Another key difference with the sale of Sydney Airport was that the new owner disclosed to the investment community the assumptions it made as part of its bid. In particular, in the Macquarie Airports Prospectus, it states that:

> Land value maintained using the ACCC's preferred methodology of indexed historic cost ... whilst the Productivity Commission strongly backed the opportunity cost approach, the adoption of land value based on indexed historic cost is unlikely to be challenged and is consistent with the ACCC's May 2001 Decision.

and,

> Southern Cross Holdings has proposed a policy of 'shadow regulation' and consultation with its airline partners. That is, forecast aeronautical charges have been estimated as if Sydney Airport was still being regulated.

Further, when Virgin Blue sought to have SACL declared under Part IIIA of the Trade Practices Act in 2002, SACL quickly pointed out that declaration was not warranted because SACL had accepted the ACCC's May 2001 pricing decision:

> Although having a difference of opinion on a number of aspects of the ACCC pricing decision, SACL accept[s] the judgement of the ACCC, even though this delivered charges lower than had been proposed. Evidence of this is SACL's pricing behaviour since deregulation on 1 July 2002, with SACL not having made any substantive increases in charges.

Aeronautical asset revaluation moves

Despite all its previous statements, it did not take the management of SACL long to start pushing for increases in aeronautical prices based on revalued assets, particularly aeronautical land. The valuation of aeronautical land had been contentious under the ACCC's May 2001 pricing decision. SACL well understood that its large rent transfer could be obtained by basing prices on aeronautical land valued at its 'opportunity cost' rather than the basis on which it had acquired the airport.

SACL commissioned Access Economics to advocate the revaluation of aeronautical land for pricing purposes. Access Economics argued that airport land was not sunk (despite all the

[5] ACCC (May 2001) Sydney Airport Corporation Limited, Aeronautical Pricing Proposal, Final Decision.
[6] Australian National Audit Office (2003) The Sale of Sydney (Kingsford Smith) Airport, Audit Report No. 43.

requirements of the airport leases). The guiding principles for the revaluation of aeronautical land, according to SACL and Access Economics, were:[7]

> The highest and best alternative use for Sydney Airport's aeronautical land is a mix of residential, commercial and light industrial development. The opportunity cost of the land is what a property developer would be prepared to pay (in the absence of transaction costs) for the aeronautical component of the site.

BARA rejected SACL's proposed increase in aeronautical prices based on revalued aeronautical land and an increase in its rate of return. BARA's arguments were that, first, SACL had never paid the Australian Government an amount consistent with the right to revalue aeronautical land for pricing purposes. SACL disclosed this fact in documentation lodged with the Australian Stock Exchange.

Second, the revaluation of aeronautical land meant nothing for economic efficiency. This is because the bidders had purchased the right to operate and develop an airport. Revaluation, therefore, could not undertake its intended use of signalling the best use of the land because the Australian Government had already decided its use.

2.3 The Productivity Commission's 2006 Review

It was becoming clear to BARA that meaningful price negotiations with airport operators were breaking down. The obsession with further rent transfers from most airports meant that economic rhetoric and consultants now dominated the negotiation process.

Realising these underlying problems, the former Department Transport and Regional Services (DoTaRS) undertook an initial review into the valuation of airport assets. From this initial inquiry the Commission's planned review was brought forward to 2006.

In March 2006, the Government announced that the Commission would undertake a public inquiry into the arrangements for the price regulation of airports. The purpose of the inquiry was to examine the effectiveness of the current light-handed regulatory regime for airport pricing and to advise on any changes to the regime.

The Commission concluded that the prices monitoring regime had encouraged commercial negotiations between airports and airlines and that it had been easier to undertake the investment necessary to sustain and enhance airport services. However, it also found that some non-price outcomes had been less satisfactory and commercial relationships between certain airports and their customers had been strained. At Sydney Airport, negotiations on both price and non-price matters had been protracted.

In terms of constraints on aeronautical prices, the Commission concluded that the previously assumed countervailing power of airlines and the negative impact of higher charges for aeronautical services on passenger traffic and, hence, on airports' non-aeronautical revenue,

[7] Access Economics (July 2006) Implementing an Opportunity Cost Valuation of Airport Land, Report By Access Economics Pty Limited for Sydney Airport Corporation Limited, p. i.

did not appear to be significant. As a consequence, price monitoring and the threat of re-regulation needed to carry more of the burden in preventing the misuse of market power.

A key recommendation of the Commission's 2006 Inquiry was an end to further asset revaluations as a justification for aeronautical price increases. The returns earned (and in particular, the change in returns) by airport operators were to be assessed against their 'line in the sand' (LIS) assert values. Under the LIS, asset values are only updated from their 2005-06 valuations based on actual investment, depreciation and disposals.

In response to the Commission's report, the Australian Government decided to continue the current light-handed approach to the regulation of aeronautical prices at the major airports. It accepted the Commission's recommendation that Sydney, Melbourne, Brisbane, Perth and Adelaide airports should continue to be subject to price monitoring for a further six years. Price monitoring was removed from Darwin Airport.

The Australian Government also accepted the need for additional review principles, namely that:

- further asset revaluations should not generally provide a basis for higher charges for monitored aeronautical services;
- the parties should negotiate in 'good faith' to achieve outcomes consistent with the principles, including through the negotiation of processes for resolving disputes in a commercial manner; and
- there should be a reasonable sharing of risks and returns between airports and their customers (including those relating to productivity improvements and changes in passenger traffic).

In terms of re-regulation, the Australian Government also accepted that the Minister for Transport and Regional Services, having regard to monitoring reports and other relevant information, should each year be required to publicly indicate either that:

- no further scrutiny of the conduct of the monitored airports was necessary; or
- that one or more airports would be asked to 'show cause' why their conduct should not be subject to more detailed scrutiny through a Part VIIA price inquiry, or other appropriate investigative mechanism.

Draft 'Show Cause' Guideline

In January 2009, the now Department of Infrastructure, Transport, Regional Development and Local Government (DITRDLG) released its Draft Guideline, intended to detail how the Australian Government would undertake the 'show cause' process recommended by the Commission. The Guideline responded to stakeholder concerns that, historically, there had been a lack of transparency and credibility in the process of investigating poor commercial conduct by an airport operator.

BARA provided a written submission on the Draft Guideline. It was BARA's view that the Draft Guideline lacked clarity over how the show cause principles would be implemented in practice.

BARA considers that the benchmark should be a robust and well understood airports' prices monitoring regime. A key element of any regime is a willingness of the Australian Government to intervene and re-impose price controls if an airport operator abuses its market power. The Draft Guideline did not meet this criterion.

2.4 Airport profitability

Generally, the most useful measure of profitability is the rate of return earned on investment. Investors ultimately assess the performance of a business based on the returns the business can generate from the funds they have invested.

The rate of return measures contained in the ACCC's Regulatory Accounts greatly understate the actual financial performance of AAL, BAC, APAM and WAC. This is because they are based on revalued assets, which heavily overstate the actual investments in the aeronautical infrastructure made by the owners. This means it is necessary to examine other sources of information to obtain a more accurate picture of airport profitability.

The Australian Infrastructure Fund (AIX) has investments in both Melbourne and Perth airports and publishes information on the performance of its investments in its annual reports. Table 2.2 contains the overall financial performance of Australia Pacific Airports Corporation (APAC, the owner of Melbourne and Launceston airports) and Perth Airport.

AIX has achieved annual average rates of return of around 25 per cent and 19 per cent on its actual investments in Melbourne and Perth airports, respectively. While the results are for total airport operations, aeronautical revenues still account for around 45 per cent of Melbourne's and Perth's total revenues. As described earlier, APAM and WAC obtain many tens of millions in annual rent transfers each year from airlines through previous asset revaluations. It is, therefore, reasonable to assume that the aeronautical side of the airports are contributing at least equally to the overall high rates of return earned on actual investments.

Table 2.2 **Financial performance of APAC and Perth Airports**

Financial and Operational Performance

AIX Interest in APAC: 10.1% Since Inception Return to AIX (per annum): 25.0%

30 June year end	2005	2006	2007	2008	2009	CAGR* 05/09
AIX Valuation ($m)	150.4	161.1	197.4	296.8	299.4	
Passengers (m)	21.6	22.3	23.5	25.3	25.9	4.6%
Revenue ($m)	323.4	348.5	384.4	449.4	475.8	10.1%
EBITDA ($m)	229.9	245.6	269.8	334.3	351.5	11.2%

* CAGR: Compound Annual Growth Rate

Financial and Operational Performance

AIX Interest in Perth Airport: 29.7% Since Inception Return to AIX (per annum): 19.2%

30 June year end	2005	2006	2007	2008	2009	CAGR* 05/09
AIX Valuation ($m)	180.0	202.0	233.4	353.6	372.1	
Passengers (m)	6.7	7.1	8.1	9.2	9.7	10.0%
Revenue ($m)[1]	121.8	145.9	173.4	183.5	209.7	14.5%
EBITDA ($m)[2]	77.8	86.4	112.6	115.6	130.7	13.9%

* CAGR: Compound Annual Growth Rate
(1) Excluding unrealised valuation gains on investment properties.
(2) Normalised EBITDA.

Source: Reproduced from the Australian Infrastructure Fund 2009 Annual Report.
Notes: (a) The return since inception is calculated by reference to the initial capital investment, all cash inflows and outflows to/from AIX since initial investment and franking credits & revaluation gains or losses booked since initial investment. (b) APAC includes both Melbourne and Launceston Airports.

The Queensland Government sold its $75 million stake in Brisbane Airport in 2008 for some $289 million. This represents an annual average capital growth of around 14 per cent since 1997-98. This is in addition to any dividend payments received on the investment. It is, therefore, not surprising that that the Queensland State Treasurer boasted that:

> This shareholding was acquired by the state in 1997 for approximately $75 million and the successful sale nets a fantastic result for Queensland taxpayers.[8]

While this outcome represents the return on total airport operations, BAC has been the largest beneficiary of aeronautical asset revalutions, estimated at around $400 million.

SACL's profitability can be more usefully gauged from its Regulatory Accounts. As stated earlier, Sydney Airport's prices were reset prior to sale so its stated aeronautical asset values are far closer to its actual investments. BARA understands that the 2005-06 LIS valuation represented a windfall gain of around $50 million compared to the ACCC's valuation updated for depreciation and investment.

Over the last three years SACL has averaged around 8 per cent pre tax on its aeronautical assets. By not obtaining the same rent transfers as BAC, APAM and WAC, SACL's profitability is far less than the very high returns earned by Phase I airport operators.

SACL's situation is further highlighted by its slower growth in passenger numbers over the last five years compared to Phase I airports (see Table 2.3). SACL's annual growth in passenger numbers from 2004-05 to 2008-09 was just over 3 per cent, compared to over 4.5 per cent for Brisbane and Melbourne and 10 per cent for Perth.

[8] The Age, 16 October 2008.

Table 2.3 **Total Passengers, 2004-05 to 2008-09, (thousands)**

	Brisbane	Melbourne	Perth	Sydney
2004-05	15,884	20,776	6,655	28,848
2008-09	19,104	24,772	9,737	32,742
Average annual change (%)	4.7%	4.5%	10.0%	3.2%

Source: 2004-05 and 2008-09 Regulatory Accounts.

The ACCC's 2008-09 Prices and Services Monitoring Report

The ACCC's 2008-09 Prices and Services Monitoring Report raised concerns that SACL was using its market power to increase profitability at the expense of service levels. The Report states that:

> The ACCC's analysis potentially indicates that Sydney Airport has increased profits by permitting service-quality levels to fall below that which could be expected in a competitive environment over a sustained period ... Although Sydney Airport has recently commenced significant capital works at the terminal, it seems that the timing of this investment might have been inefficiently delayed by the airport and, in the meantime, there has been inadequate maintenance. [9]

and:

> Over the whole reporting period, overall ratings have on average decreased since a reporting period high in 2004–05.[10]

Within Macquarie Airports, declining service standards are viewed very differently. As stated in its 2009 Annual Report:

> Sydney Airport delivered a solid performance in 2009, with full year EBITDA growth of 5.6% reflecting excellent cost control.[11]

SACL could well be aggrieved by the ACCC's comments. After all, BAC, APAM and WAC have been able to increase their aeronautical prices to levels far beyond their most optimistic expectations at the time of sale. Combined, they obtain over $100 million per year in windfall gains, underpinning overall rates of return in excess of 20 per cent per year. And all of this is endorsed as reasonable through the 2005-06 LIS aeronautical asset valuations.

SACL, on the on the other hand, has had to resort to declining service standards to boost its profitability. In BARA's opinion, this also extends to reducing the quality of the international terminal, as SACL has put its own commercial interests before efficient passenger services.

[9] ACCC (2010) Airport Monitoring Report 2008-09, p. Vii.
[10] ACCC (2010), p.233.
[11] Macquarie Airports Group (2009) 2009 Annual Report, p. 4.

3 BARA's assessment of individual airport commercial conduct

Key messages

- The commercial conduct of price monitored airports can be summarised as:
  - Adelaide: Approach to aeronautical pricing is principally formula driven.
  - Brisbane: Continues to reap the largest windfall gains while continuing to revalue its assets and claim low returns.
  - Melbourne: Has traditionally been the most reasonable, but commercial conduct has deteriorated in recent times with a marked reduction over the transparency of capital investment programs.
  - Perth: Traditionally very poor, but has improved substantially recently.
  - Sydney: Continues its poor conduct seemingly unconcerned with the existence of the prices monitoring regime.
- The commercial conduct of non price monitored airports can be summarised as:
  - Cairns: Has sought to set prices based on unrealistic asset valuations, unrelated to current passenger throughput levels.

BARA has actively participated in negotiations over the provision and pricing of international aeronautical services and facilities since early 2002. BARA has authorisation from the ACCC to undertake non-binding negotiations on behalf of its member airlines with major international airports, Airservices Australia and the Bureau of Meteorology.

BARA understands that commercial negotiations over the pricing and provision of aeronautical services and facilities may not always progress harmoniously. There is a lot of history between the parties. The provision and pricing of common use assets can involve differing objectives between both the airlines and airport operator and, sometimes, between the airlines themselves. However, in the case of international services, the requirements of airlines are largely generic and disputes between airlines over the provision and pricing of services are rare.

BARA's assessment of individual airport conduct is based on the extent to which each airport operator has engaged in meaningful negotiations and agreed to commercially based outcomes consistent with the airport operator being able to profitably provide existing and new services.

3.1 Adelaide Airport

BARA had little involvement in the determination of the pricing arrangements for the common user domestic/international terminal at Adelaide Airport. BARA's role since that time has been limited to oversight of the application of the pricing arrangements to ensure that aeronautical charges are consistent with the ACCC's building block pricing formula.

Consequently, the approach to pricing adopted by AAL is principally formula driven. There has been no departure from the established pricing arrangements to reflect the commercial circumstances affecting airlines operating to the airport or the returns achieved by AAL through its aeronautical asset revaluations. There are no truly commercial negotiations between AAL and airlines about aeronautical prices.

Further, the consultative (or, more accurately, advisory) procedures adopted by AAL are not well structured or particularly informative in terms of the transparency of the information provided. There have been minimal amounts of capital expenditure at the airport since the time of the major terminal redevelopment, so capital review procedures by AAL have not been tested for rigour or transparency. Operating costs tend to be reported via a five year operational cost plan prepared by consultants for AAL, but the information provided is very high level and lacks supporting information to justify the costs presented.

Similarly, passenger forecasts are prepared by consultants for AAL. The airport uses the same consultants as several other airport operators for this purpose. Notably, the passenger forecast report presented by AAL in the last round of price discussions read remarkably similarly to the passenger forecast report provided by the operator of Perth Airport for its recently completed pricing negotiations. Certainly, in BARA's view, the passenger forecasts in both instances were particularly conservative, thereby facilitating higher aeronautical charges than would otherwise be the case.

In summary, it is BARA's view that the conduct of AAL in setting aeronautical charges should not be categorised as overly aggressive in seeking to extract monopoly profits from its aeronautical assets. This outcome is, perhaps, due to the situation where AAL used the building block formula to price its relatively new common user terminal – a pricing formula that presumably delivers a very satisfactory return on its investment. However, neither can the conduct of AAL be categorised as being commercially driven. Its strict adherence to an ACCC determined pricing arrangement and aeronautical asset values precludes any genuine commercial negotiation of aeronautical charges with airlines.

3.2 Brisbane Airport

BAC has probably been the greatest beneficiary of the price monitoring regime (see section 2). It appears that BAC's main commercial objective, therefore, has been to adjust aeronautical prices to its replacement cost values. Underlying BAC's strategy has been its continual claims to reviews by the Commission that it earns very low rates of return on its aeronautical assets. BARA suspects, however, that BAC has probably earned the highest returns on the actual amounts invested in aeronautical assets by price monitored airports.

BARA is concerned about two aspects of BAC's commercial conduct.

Firstly, BARA is concerned that BAC has booked another $350 million in aeronautical asset revaluations – about one third of its valuation for pricing purposes. It is possible that the revaluations might only be a result of accounting requirements rather than an expectation by

BAC regarding the value of its aeronautical assets for pricing purposes. However, BARA questions the motive of BAC in undertaking the revaluations as the sensible outcome is that any upward asset revaluation cannot be justified based on its impairment test.

Secondly, BARA is concerned that BAC is seeking to pre-finance major capital expenditure. BARA is strongly opposed to the pre-financing of aeronautical asset developments.

A major capital project proposed by BAC is a second runway. The development and construction timeframe for the runway is about 7-8 years and there are two distinct phases in the runway construction. Initially, about 11 million cubic metres of sand has to be collected from Moreton Bay and placed on site to permit settlement to occur for about two to four years. BARA understands that the cost of this preliminary earthworks activity is estimated at many hundreds of millions of dollars and BAC has advised that it expects to receive its full weighted average cost of capital on that investment, despite airlines receiving no beneficial improvement in service quality until the opening of the runway some four to five years after the preliminary earthworks are completed. BAC has steadfastly refused to consider alternative funding arrangements to avoid pre-financing of the asset. BARA is concerned that, by effectively guaranteeing BAC's return on its initial investment, BAC has little incentive to complete the project in a timely and efficient manner.

The new runway development also presents an issue for the long term pricing framework at the airport, given the very long expected life of the new asset. As noted above in comments about BAC's conduct in revaluing its aeronautical assets, BARA considers that the pricing of the asset, both now and over the long term, should be based on the actual amounts invested by BAC. Under these arrangements, it is the airlines, not BAC, who bear all the risk associated with the efficient delivery of the second runway. This risk transfer is not reflected in a reduction in the rate of return sought by BAC.

3.3 Melbourne Airport

APAM has traditionally offered the most commercially acceptable terms and conditions for the provision and pricing of aeronautical services and facilities. However, it should be emphasised that, like AAL, BAC and WAC, APAM's previous conduct was underpinned by large windfall gains.

Unfortunately, the commercial conduct of APAM has deteriorated somewhat in recent times. There has been a marked deterioration in the transparency of its capital investment programs. APAM has recently advised BARA and airlines that the current (2007-12) aeronautical capital budget has been over-spent by a very substantial amount.

The airport operator only recently started to provide information to explain and to justify this expenditure. It appears from the still limited information offered by APAM that about half of the capital over-spend relates to 'changes in cost, scope and timing' of projects, while the other half relates to 'new projects'.

It is unacceptable that an airport operator should proceed to spend significant additional amounts on aeronautical capital projects without engaging in detailed consultations with airlines. It is particularly concerning that almost half of the additional expenditure was due to changes in cost, scope and timing of capital projects. This calls into serious question the management performance of APAM in delivering timely, efficient and cost effective investment outcomes. Airlines have a right to expect that an airport operator will ensure that capital projects are delivered on budget and on time and free from inefficient cost blow-outs.

BARA is concerned that APAM management may be becoming complacent about project management in the knowledge that, under the existing price monitoring arrangements, any investment undertaken in the absence of airline input and any cost over-runs will simply feed into asset values for the purposes of aeronautical charges to apply from 2012 onwards. Under these circumstances it is the airlines, not the airport operator, who bear all the risk associated with the efficient delivery of investment programs. This is not a balanced outcome given the very high rates of return airport operators earn on their actual investments.

The behaviour of any airport operator, in failing to consult with airlines about the details of its additional capital expenditures during the term of an aeronautical pricing agreement, raises a number of questions to which airlines should rightly seek answers, including:

(i) How much of the additional capital expenditure relates to capacity expansion to meet passenger growth?

(ii) Are the scope, scale and cost of the capacity expansion projects appropriate?

(iii) How efficiently were all capital projects managed?

(iv) What was the extent of any waste or cost blow-out of any projects?

It is BARA's view that APAM must improve the transparency of information associated with its proposed capital expenditure program. This is particularly the case given that the airport operator has advised that it intends to invest about $650 million in aeronautical assets during the term of the next aeronautical services contract (2012-17).

3.4 Perth Airport

BARA considers that, since the removal of the CPI-X price caps, the commercial conduct of WAC has been poor – until most recently. For most of that time WAC has sought consistently to obtain maximum prices from airlines with little meaningful negotiation or compromise. However, recently BARA and WAC have reached a commercially acceptable outcome over the provision and pricing of international services and facilities for the next seven years.

BARA believes that WAC abused its market power in setting charges after the removal of direct price controls. Little meaningful negotiation occurred with airlines. A set of prices was simply imposed and the concerns of airlines dismissed. Further, WAC failed to abide by all of the terms of its aeronautical services agreement. It ignored the requirement to consult

with airlines about adjustment to aeronautical prices in response to greater than (or less than) expected growth of passenger numbers. Not surprisingly, this occurred after passenger numbers well exceeded those forecast.

WAC is now undertaking a major airfield redevelopment and terminal consolidation project. In this instance, WAC has undertaken a more structured approach to the negotiation process and provided more information than has previously been made available. It is notable that the change in approach to information and negotiations is also associated with a change of senior management at the airport.

BARA was unimpressed with WAC's initial pricing offer associated with its development proposal. It seemed to be an exercise in satisfying WAC's investors by aggressively seeking to obtain the maximum possible prices, rather than form the basis of meaningful negotiations with airlines. However, rather than engage in endless debate over each element of the 'building block' model, BARA proposed a modest concession on international aeronautical prices that would still allow WAC to profitably expand aeronautical services and facilities. After some further commercial negotiation, an acceptable outcome was achieved.

3.5 Sydney Airport

BARA has been involved in lengthy negotiations with SACL generally aimed at the establishment of a balanced longer term commercial agreement for aeronautical services and facilities. The negotiations have been problematic from the beginning, with SACL simply making demands for higher profits and prices, putting forward pricing proposals designed to generate excessive returns on existing assets and proposing 'commercial' agreements that were in many respects more draconian than those proposed by the previous FAC.

Aeronautical capital projects are nominated by SACL for 'approval' by airlines in a 'consultative' process, but if airlines disagree with the scale or design of a project SACL generally pursues its own commercial interests. Consultative changes to advisory.

The most recent international terminal redevelopment is a good example of SACL pursuing its own commercial interests at the expense of airline operational efficiencies. The new international terminal at Sydney Airport presents serious operational problems for some airlines due to design problems, to which the airlines alerted SACL at the commencement of discussions about the redevelopment project. However, the terminal development was pursued by SACL, without any consideration of the design problems reported by airlines, in order to maximise SACL's non-aeronautical retail returns. It was reported to BARA that SACL could not address the design issues because the airport operator had entered into commercial agreement with retailers ahead of the commencement of discussions with airlines about the project. This is a clear case of an airport operator abusing its market power to boost its non-aeronautical profits at the expense of efficiently developing the international terminal.

At times SACL has also failed to adequately address particular airline requests for capital expenditures to be undertaken, brought forward or addressed as a priority. Airlines give a

high priority to the timely development of aircraft parking facilities at Sydney Airport. Presently, apron space and aircraft parking facilities are at their limit, especially during the airport's peak traffic times. Airlines have urged SACL to give priority to investment in the development of further aircraft parking facilities. However, SACL has not addressed the matter with the urgency sought by airlines. While SACL has a forward program of investment in aircraft parking facilities, the scheduling of delivery of new facilities is, in the view of airlines, not timely enough to meet likely traffic growth and to provide sufficient capacity to meet unforeseen airline operational problems that occur from time to time.

SACL has aggressively pursued excessive charges for other airline facilities, including:

(i) Staff car parking

(ii) Charge for parking vehicles on the ramp

(iii) New charge for potable water

In 2008 SACL transferred all international airline staff car parking spaces from the south west sector staff car parking area to the new T1 multi storey car park. As a result of this forced move of airline staff car parking spaces, SACL expected those airlines with staff previously accessing car parking spaces in the south west sector car parking area to pay a 75% increase in monthly car parking rates. SACL ultimately offered to maintain the staff car parking rate at the south west sector rate for those airline employees transferred to the T1 multi storey car park. However, it should be noted that the staff car parking charges imposed by the operators of Brisbane and Melbourne airports are about one-quarter to one-third the amount charged by SACL. BARA has requested that SACL give consideration to providing another low cost staff car parking option as a permanent replacement for the south west sector car parking area and an alternative to the high cost T1 multi storey car park. BARA is still waiting for SACL to provide airlines with such an option.

In 2008 SACL distributed to some airlines a Licence Agreement for parking vehicles, ramp equipment and machinery at specified sites on the airport ramp. SACL demanded a substantial annual fee for these designated parking spaces. BARA rejected this Licence Agreement in its entirety. The Permitted Use addressed by the proposed Licence Agreement was already addressed by the existing Ground Handling Conditions of Use agreement between SACL and airlines. Further, the Ground Handling Conditions of Use agreement provides that SACL will not, during the term of the agreement, introduce any new charges payable under the agreement for the Permitted Use. BARA rejected SACL's charge for parking equipment as set out in the proposed Licence Agreement and ultimately SACL withdrew the demand.

However, SACL's behaviour in seeking a new ramp parking fee also reneged on a specific commitment SACL made to airlines as part of the current five year pricing agreement between airlines and the airport operator. In a letter dated 30 September 2005 from the SACL Chairman to BARA, SACL gave "an undertaking not to further increase user charges over the

term of the agreement other than in limited circumstances." He also stated that "This includes a commitment not to introduce ground handling charges over the five years …".

Again in 2008, SACL notified airlines that it envisaged imposing a charge to tenants of the international terminal building for potable water consumption as of 1 January 2009. SACL's advice to airlines gave no reason for imposing the proposed charge. Neither did it provide any justification for the proposed charge. SACL's advice also ignored the fact that charges for water consumption by SACL tenants are presently covered via lease outgoings imposed by SACL on tenants. Further, SACL's advice failed to address any measures SACL intended to implement to ensure that double charging for water consumption by SACL tenants did not occur.

3.6 Cairns Airport

While Cairns Airport is not included in the current prices monitoring framework, pricing arrangements at Cairns Airport is an interesting study, especially with regard to the appropriateness of asset valuations for pricing purposes.

The international airlines negotiated a five year pricing agreement with the former Cairns Port Authority (CPA), commencing 1 July 2004 to 30 June 2009.

At the time, CPA had forecast strong growth in international passengers, rising from around 1 million in 2004-05 to 1.3 million in 2009-10 (30 percent growth). To facilitate this growth, CPA intended to invest some $70 million in international terminal and airfield works. This growth in costs exceeded passenger growth, so substantial increases in international aeronautical charges were required.

BARA proposed a staged increase in the prices necessary to fund the terminal and airfield works. CPA accepted BARA's proposed prices to 30 June 2009. Nevertheless, over the seven year period to 2010-11, aeronautical charges at Cairns Airport increased by over 250%.

Unfortunately, the expected growth in international passenger numbers did not occur. Rather than increasing, they declined significantly. In 2010-11 passenger numbers are expected to be less than 700,000, some 30% less than 2004-05 levels.

Airport privatisation

Cairns Airport Pty Ltd (CA) purchased the airport from the Queensland Government in January 2009. The new owners paid $530 million for the airport[12]. The decline in passenger numbers had occurred well before CA purchased the airport.

A purchase price of $530 million would appear an excessive amount for the airport. In 2007-08 the airport was valued at around $350 million (CPA Annual Report). Based on a simple discounted cash flow (DCF) model and using a mixture of data provided by CA and CPA, it is difficult to generate a valuation above $440 million, some $100 million less than the purchase price, even based on the most generous growth, profit and cost assumptions.

[12] Sourced from an ABC internet article.

CA advised they expect very strong, long term growth in both the domestic and international passenger markets. However, the forecast growth in international passenger numbers is, in BARA's opinion, unrealistically high, at over 10 per cent per year for the next 5 years. This suggests that the owners paid an 'emotional' price for the airport (ie they wanted it very badly) and, as a consequence, have probably paid $100 million more than it is worth.

CA pricing proposal from 2010-11

CA proposed to maintain international prices in real terms (ie CPI indexation) for the next five years. They also reserved the right to increase charges for 'unexpected' capital or operating expenditures.

Cairns Airport has some of the highest international aeronautical prices in Australia. It is questionable whether these prices are commercially viable in the long term given the markets served by Cairns Airport, ie the most price sensitive, international leisure travel market. The CA proposal strains credibility because it assumes CA can fully recover the cost of the new, oversized terminal.

BARA response

BARA rejected CA's pricing proposal at the time. In essence, BARA considered that the new owners of Cairns Airport should have taken better account of the fact that the profitability of the market at Cairns is highly uncertain and that the very high aeronautical charges levied reflected an assumed sustained growth in international passenger numbers from 2004.

BARA was surprised at CA's claims that it may be entitled to charge prices based on the replacement cost valuation of the assets. Those assets in many cases were probably twice their necessary capacity for many years into the future.

BARA proposed a short term pricing agreement between CA and BARA's member airlines. The short term agreement was adopted and is currently under review.

The position of CA is indicative of the attitude of many airport operators, in that they consider any investments undertaken should be included in aeronautical charges without regard to the efficiency of those investments.

BARA is becoming increasingly concerned that the shareholders of some airports seem to consider that they are entitled to simply invest and recover without due consultation with airlines about the scale and scope of the investments. What this behaviour demonstrates is that airport operators obtain very favourable returns on their investments in aeronautical infrastructure. The returns are more than enough to support required investments and, in fact, seem to be driving investment levels perhaps not fully justified in some instances.

4 Response to questions raised in the Issues Paper

Key messages

- The prices monitoring regime is being rendered largely ineffective because of the low probability of price monitored airports being held to account for poor commercial conduct.
- SACL has now probably progressed to a point were only the imposition of stricter economic regulation is likely to be capable of improving its long term commercial conduct.
- For other price monitored airports, making the probability of being 'caught and convicted' of poor commercial conduct high will likely remedy their behaviour without the need to impose stricter price controls.
- BARA recommends a package of actions, reforms and findings. They involve:
  - either deeming SACL's international services and facilities for access or having the ACCC undertake a detailed investigation into its commercial conduct;
  - possibly, an ACCC investigation of the car parking activities of APAM;
  - the Commission clarifying the respective roles of itself, the Australian Government and ACCC;
  - creating a small independent body to make recommendations to the Australian Government on the need for further investigation of an airport operator, based on the prices monitoring reports and discussions with the airport operator and users;
  - the Commission explicitly recognising the large rent transfers that accrued to AAL, BAC, APAM and WAC airports to encourage more balance commercial negotiations; and
  - the overall review of an airport operator's conduct including consideration of the efficiency by which it is delivering capital projects.

4.1 The economic regulatory regime

Is there evidence that the price monitored airports have increased charges by more than could be justified on the basis of costs, new investment requirements and/or other enhancements to service quality?

Whether the airport operators have increased charges greater than justified depends on the definition of 'costs'. If the benchmark used is their actual investment in aeronautical services and facilities, then current prices far exceed those that would prevail in even weakly competitive markets at Adelaide, Brisbane, Melbourne and Perth airports. However, prices

are currently set around the 2005-06 LIS valuations, which far exceed actual levels of investment.

For BAC, APAM and WAC, the real test of their commercial conduct is occurring with the pricing of new large planned investment programs. As described earlier, BARA has reached a commercially acceptable agreement with WAC. Whether similar agreements can be achieved at other airports is yet to be determined.

BARA considers that SACL routinely abuses its market power. First, as found by the ACCC, SACL is resorting to reducing service standards in an attempt to earn at least average rates of return, given its lower average growth in traffic volumes. Second, the new international terminal at Sydney Airport presents operational problems for some airlines due to design problems. These problems exist because SACL put its own non-aeronautical interests before efficient passenger services. As such, the abuse of market power here results in higher non-aeronautical returns rather than aeronautical. Third, SACL has sought to impose a range of unjustified new and/or increased charges. Lastly, SACL's Conditions of Use document falls well short of a balanced commercial agreement.

What is the ability of airports to vary prices year on year given many have long term contracts with airlines?

BARA expects that each airport operator will abide by the terms of its commercial contracts. However, BARA's members are not bound by the terms and conditions negotiated by BARA. Each airline may negotiate different terms and conditions.

Airport operators have largely abided by the terms negotiated through BARA (see the exception of WAC in Section 3.1). This outcome highlights the fact that the key aspects of the commercial agreements are largely determined once every five years when new agreements are negotiated. It should be remembered that the quality of the commercial agreement is broader than price. It also includes service standards (if any) and continual consultation over the airport's development. Each airport operator's conduct needs to be assessed against its overall commercial framework and not just the annual changes in aeronautical prices.

Is price monitoring providing a constraint on aeronautical charges at the major airports?

In evaluating the effectiveness of the prices monitoring regime, it is worth first considering the basis on which an airport operator is likely to abuse its market power.

An airport operator abusing its market power can be usefully examined in the context of committing a crime. While this may seem somewhat extreme on the surface, an airport operator abusing its market power ultimately involves it acting outside what is considered morally acceptable by the Australian Government and society. Intervention by the Australian Government, requiring some sort of sanction, is then considered necessary to correct the behaviour of any airport operator found to be abusing its market power.

A recent paper by Kelahar and Sarafidis (2011) provides a theoretical and empirical examination of non-violent crime in NSW. Assuming rational behaviour, a person may decide to commit a crime if the expected benefits exceed expected costs. Expected costs are a function of the probability of being caught, the probability of conviction and the expected length of the sentence if caught and convicted.

Applying this framework to a price monitored airport, in deciding to abuse its market power, shareholders should expect that the management of each airport balance the profits from abusing its market power against:

a) the probability of the ACCC determining that the airport operator is likely to be abusing its market power over one or more of its activities through the annual monitoring process,

b) the probability of the Australian Government acting on the ACCC's findings (ie, directing the ACCC to undertake a detailed review of their price and non-price conduct), then

c) the probability of the Australian Government then acting on the findings of a detailed investigation by the ACCC, then

d) the severity of the 'punishment', presumably in the form of stricter price controls.

It is, therefore, worth understanding the potential impact of elements (a) to (d) in deterring an airport operator from abusing its market power.

An important empirical finding of the paper by Kelahar and Sarafidis (2011) is that being caught and convicted of a crime is a greater deterrence than the length of the sentence imposed (see Appendix 2). One reason suggested for this outcome is that punishment from being convicted is broader than just the sentence itself. Kelaher and Sarafidis argue that

> A convicted individual may no longer enjoy the same opportunities in the labour market or the same treatment by their peers, and so the opportunity cost of lost income and the cost to the individual of social stigmatisation is implied in the event of conviction. (p.23)

The study by Kelahar and Sarafidis offers two valuable insights on the potential effectiveness of the current regime. First, by not acting on the findings of the ACCC's Price Monitoring reports, the Australian Government is effectively rendering the prices monitoring regime ineffective. This is because the probability of being 'convicted' is zero, setting the expected cost of an airport operator abusing its market power at zero.

Second, correcting the behaviour of an airport operator is unlikely to require a return to stricter price controls. Instead, the combined impact of the ACCC's investigation and findings (which should be made public) is likely to be sufficient to persuade the airport operator to correct its behaviour. It is not unreasonable to expect that an airport operator will be willing to enter into meaningful commercial negotiations in response to an impending ACCC investigation or release of its findings.

BARA, therefore, considers that the application of the current regime fails to take advantage of the main deterrents available to promote meaningful commercial negotiations. At present, there is little chance of an airport operator being 'caught and convicted' if it decides to abuse its market power. By making the probability of being caught and convicted high, it is unlikely that it will be necessary to impose stricter price controls on AAL, BNE, APAM and WAC.

The problem with SACL is that the serious concerns raised over its commercial conduct in 2006 were largely dismissed by the Commission. SACL, therefore, can be expected to have little regard for the regime given that its poor commercial conduct to date has attracted no serious attention from either the Commission or the Australian Government. As a consequence, SACL has probably now progressed to a point where only the imposition of stricter economic regulation is likely to be capable of improving its long term commercial behaviour. SACL's international aeronautical services and facilities should be 'deemed' for access (negotiate-arbitrate model) for a period of five years. The existing draconian 'Conditions of Use' document needs to be scrapped and a more balanced commercial agreement negotiated with international airlines.

In BARA's opinion, the existing regulatory framework also makes the shareholders of airports reluctant to enter into long-term frameworks for the setting of aeronautical prices. This is because, on the one hand, each airport operator can profitably expand aeronautical services and facilities if it earns its cost of capital on its investments. On the other hand, shareholders know that very high returns with a considerable economic rent component could be obtained if the Commission endorses the further revaluations of aeronautical assets at some point in the future. Persuading the Commission to endorse further asset revaluations is clearly the easiest way to achieving very large windfall gains. The cost is merely the fees from economic consultants developing a few submissions arguing the virtues of more 'economically efficient' pricing. Given these potential windfall gains, the incentive for airport operators to enter into long-term pricing frameworks for large, long-lived capital projects is greatly reduced.

Has the need to adjust the previous FAC's pricing legacy been fully accommodated?

Each price monitored airport has substantial market power and considerable pricing flexibility. There can be no reason why the prices determined are not sufficient for the airport operator to profitably provide and expand aeronautical services and facilities. Any claim that current prices are too low simply reflects ambit claims on the part of the airport operators in seeking further unjustified rent transfers.

Whether prices need to rise further at each airport is a function of the investment needed to support forecast traffic volumes. As described earlier, BARA negotiates prices around each airport operator earning a reasonable rate of return on its actual investments. It does not, however, accept that these investments should be revalued for pricing purposes at some point in the future.

Has the price monitoring regime promoted efficient investment and facilitated commercially negotiated outcomes?

In any industry very high rates of return will attract investment. It is, therefore, not surprising that AAL, BAC, APAM and WAC have been able to obtain the funding necessary to undertake their planned capital programs.

Therefore, at the cost of extremely large rent transfers, the prices monitoring regime has delivered a favourable environment for AAL, BAC, APAM and WAC to undertake substantial investment programs. The key challenge for the regime moving forward is its ability to encourage meaningful commercial outcomes based on actual levels of investment rather than revalued amounts. BARA is also especially concerned that each airport operator now seems to consider that its return on investment should be guaranteed regardless of the efficiency of the expenditures.

The quality of the commercial negotiations has varied both across airport and through time for individual airports. As noted earlier, BARA considers that WAC's commercial conduct was very poor after the removal of the CPI-X price caps. However, recently BARA and WAC have reached a commercially acceptable agreement. APAM's conduct was the most reasonable after the removal of the CPI-X price caps but has deteriorated recently. Few, if any, of the discussions with SACL can be considered meaningful negotiations.

This all suggests that the effectiveness of the current regime to date is mixed. This is likely to be a result of each airport operator forming a different view on the probability of it being held accountable for its commercial conduct. It is also important to emphasise that individuals conduct negotiations, not businesses or organisations. The quality of commercial negotiations often depends on the understating and motivations of the individuals involved in each negotiation. The improvement in the commercial conduct of WAC is also associated with a change in senior management.

How would it compare relative to counterfactuals of explicit price regulation, or no regulation?

The SACL 2001 pricing decision probably provides the best guide to the counterfactual outcomes for AAL, BAC, APAM and WAC if price controls had continued. The main issue for the ACCC would have been the starting value of the aeronautical assets. It is likely the ACCC would have sought to minimise the rent transfers and limited price increases necessary to earn a reasonable return on the implicit sale value of existing assets and planned investments.

Given that AAL, BAC, APAM and WAC obtained such large windfall gains, there is probably little difference between the current regime and one where there was no regulation. It is likely each airport operator would have still sought to base prices around the replacement cost value of the assets. However, the regime has become increasingly important as new

investments begin to dominate the overall level of costs airport operators seek to recover from airlines.

With no regulation, it is likely SACL would have sought to immediately revalue its assets (especially aeronautical land) for pricing purposes and substantially increase its rate of return. This probably would have triggered an application by BARA for declaration of the international services and facilities at Sydney Airport. In this sense, the prices monitoring regime, at least to date, has probably averted a declaration of SACL's international aeronautical services.

Overall, BARA considers that there is limited worth in trying to predict what could have occurred under different regulatory regimes. What is important is that the current regime should be made more effective in encouraging meaningful commercial negotiations with the airport operators.

Does the information emerging from the price monitoring process assist commercial negotiations between airports and their customers?

The information provided in the regulatory accounts provides important background and contextual information. It does not, however, underpin commercial negotiations as they are mainly based around forecast costs and traffic levels. Negotiations also need to be based on a far greater degree of detail than provided in the regulatory accounts.

The information from the prices monitoring process assists commercial negotiations in that it provides all parties with a history of outcomes of an airport operator's performance. In determining a reasonable outcome for prices and service quality, a negotiating position will generally reflect a combination of both past performance and forecast cost and traffic levels.

Has the 'line in the sand' for asset valuations been effective or have airports, airlines or other users encountered problems with this approach? Should the line in the sand be extended to other airports? Is there a better alternative approach?

Provided all the parties are well aware of the actual investments undertaken by the airport operator, the LIS valuations provide a suitable basis for price negotiations. The LIS valuations become a problem when an airport operator chooses to forget the actual basis on which they purchased the leases over the aeronautical assets.

Given most airports have undertaken and continue to undertake large capital investment programs, the importance of the 2005-06 valuations for price setting is reducing. On balance, therefore, there is little value in seeking to change the basis on which assets are valued in the regulatory accounts. Given SACL has had little regard for the regime to date, BARA would not be surprised if it focused on convincing the Commission of the need for it to revalue its aeronautical assets rather than on improving its commercial conduct.

BARA also sees no problem with an increasing gap emerging between the depreciated replacement cost value and the updated LIS value of the aeronautical assets. This will simply reflect changes in the cost of construction not actually incurred in delivering the assets and the common outcome of 'asset life extension'. It in no way reflects a situation of under pricing such that airport operators cannot profitably maintain and expand aeronautical services and facilities.

It is notable that some airport operators, for example BAC, have chosen to book aeronautical asset valuations above the LIS valuation. As a consequence, they are now required to submit two sets of accounts to the ACCC.

Airport operators can choose to run two sets of books because there is an important difference between how they set aeronautical prices and what is permitted under accounting standards. This difference allows airport operators to justify virtually any upward aeronautical asset revaluation if they choose to do so.

Airport operators usually apply some form of 'building blocks' model to determine the total revenues they are seeking to obtain from airlines. Forecast traffic volumes are then used to set prices based on agreed total revenues.

Under the building blocks model, the revenue obtained from the existing assets actually decreases over time. This is because, as the assets are depreciated, the 'return on' component (ie the rate of return multiplied by the value of the asset base) reduces in line with the falling asset value.

Over the long term, prices set by the building blocks method in five year increments often 'saw tooth' in line with capital expenditure. Prices increase during capital expansions but then decrease when capital expenditure slows.

Prices in competitive markets, however, are not set by the building blocks method. Instead, they are a function of what consumers are willing to pay for the good or service and the level of competition between suppliers.

Accounting standards require an asset valuation to be justified through an impairment test, based on the discounted value of the expected free cash flows that can be generated by the assets. The impairment test required under accounting standards, however, is based around the competitive market paradigm. Critically, when applying impairment tests, accounting standards allow for forecast revenues to be maintained or increased though time based on past outcomes (see AASB 136 Impairment of Assets). This reflects outcomes of competitive markets, where prices are set independently to asset valuations. Total revenues and profits can, therefore, increase as more of an asset's capacity is used. But this is not how airport operators are setting aeronautical prices via the building blocks model.

All this means that while airport operators may claim they are simply 'following accounting standards', in practice they choose whether upward asset revaluations can be justified given the prices they expect to negotiate with airlines.

This issue was recognised by the ACCC in its 2009-10 Prices Monitoring report. The ACCC noted that:

> Importantly, the airports have a significant amount of discretion in valuing their assets for monitoring purposes. Notably, the airports may value assets based on the present value of the expected future net cash flows that the airport can generate from those assets.
>
> For example, the airports could seek to justify an increase in prices through an upwards revaluation of its assets. However, if the reason for the revaluation is to reflect the present value of the higher expected future net cash flows, the valuation of the asset reflects the airports' perceived future pricing opportunities, rather than shaping them. This is a problem because the airports' expectations about future net cash flows would reflect the airports' market power in setting prices.
>
> As such, there is circularity in using the monitoring data to value the airports' assets. This means that a measure of the airports' returns based on this information is unlikely to provide a satisfactory indicator of the 'reasonableness' of the airports' economic returns.[13]

It may be useful for the Commission to obtain some expert accounting advice on how airport operators are valuing aeronautical assets, especially the assumptions used in the impairment tests. This advice could provide useful guidance on an appropriate method of asset valuation in the regulatory accounts given the intended outcomes of the prices monitoring regime.

4.2 Data and methodology

How adequate are the data in the ACCC's price (and quality) monitoring reports for judging the effectiveness of the monitoring regime? Are the regulatory accounts provided by the airport operators sufficient to reveal monopoly pricing and rates of return? Are there material gaps or limitations in that data and can they be practically remedied? What other data sources should the Commission use in its assessment of the price (and quality) monitoring regime?

BARA considers that the information collected by the ACCC and subsequent analysis is a critical element determining whether a more detailed investigation of one or more of an airport operator's activities is required. The problem is the Australian Government's lack of willingness to act on the ACCC's findings and instigate a detailed investigation when significant issues of concern are identified.

The role of the prices monitoring reports is to initially identify any likely issues of concern with each price monitored airport. In doing so, the current reports provide sufficient evidence of emerging issues without requiring each airport operator to provide excessive levels of

[13] ACCC 2009-10 Prices Monitoring Report, p 55.

detail on its prices, revenues, costs and non-price terms and conditions. It is necessary to strike a balance between information, analysis and compliance costs. Evidence to date suggests that the current information is sufficient to identify issues of concern.

BARA, therefore, does not consider that there are any material gaps in the information currently collected by the ACCC for the purposes to which it is put. An important feature of the current regime is that the ACCC also undertakes analysis of the information and provides its opinion of whether abuses of market power are likely to be occurring. This effort by the ACCC greatly increases the probability of an airport operator being identified as engaging in poor commercial conduct. BARA would be concerned if this process of analysis and reporting was diluted under any future regimes.

BARA has also provided its opinion on the commercial conduct of each airport operator. BARA considers that SACL has continued with its poor commercial conduct while an acceptable agreement has been achieved with WAC. BARA, therefore, considers that more than sufficient evidence is available on which to determine whether each airport operator should be subject to a more detailed investigation on some or all of its activities.

Are the ACCC's monitoring methodologies appropriate? Is there adequate consultation with the monitored airports?

BARA has no issue with the ACCC's monitoring methodologies. In limiting the extent of the information sought from each airport operator, the outcomes and conclusions made in the reports must ultimately involve some degree of professional judgement.

The ACCC and airport operators are best placed to comment on the level of consultation in developing the reports each year. However, the Commission's review of this issue should focus on the extent of consultation. It is to be expected that airport operator(s) that receive unfavourable findings are dissatisfied with the ACCC's approach.

How do recent charges for aeronautical services at the price monitored airports compare with those at comparable international airports? What conclusions can be drawn from international comparisons of airport performance?

BARA does not collect information on the prices and charges at other international airports.

4.3 Compliance costs

What are the compliance and administration costs associated with fulfilling the regulatory obligations imposed by the price and service quality monitoring system?

BARA does not consider that the compliance and administration costs of the prices monitoring regime are likely to be excessive. The financial data required by the ACCC is information that each airport operator is likely to be maintaining and using to monitor the performance of its business.

Most businesses also undertake surveys to understand customer perceptions. The service quality information also provides each airport with important information on how users rate service quality at the airport. The additional cost of the service quality information is, therefore, likely to be very low, given well run businesses undertake customer satisfaction surveys. The concerns of airport operators are probably more likely to be the fact that the results of the survey are subject to independent analysis and then made public.

4.4 Car park price monitoring

What percentage of passengers use the airport's car park facilities? What is the level of competition from other sources of transport? Are off-site car parks a real source of competition to the airport car parks? Is there evidence that airports are influencing the level of competition from alternative transport modes?

Has the pricing behaviour of airports indicated the use of market power in car parking? Do the price increases reflect monopoly rent, locational rent (e.g accounting for the opportunity cost of alternative uses of land dedicated to car parking), or both? Are monopoly profits evident for short-term, long-term, or all forms, of parking?

BARA does not collect information on car parking facilities and, obviously, is not involved with the setting of car parking fees for the travelling public.

However, BARA considers that, as a general principle, car parking facilities are far closer to aeronautical facilities than non-aeronautical. Ultimately, passengers require access to and from the airport. For many passengers private cars provide the most practical and convenient form of transport.

With the investment in car parks, aeronautical and non-aeronautical activities are likely to be complementary rather than in competition. As noted earlier, many passengers prefer to travel to and from the airport by private car. Removing or greatly limiting this transport option may reduce the number of flights individuals undertake each year, reducing potential non-aeronautical revenues. Shopping malls and hotels are all characterised by extensive car parking facilities. The provision of car parking facilities is necessary to attract the shoppers and guests, whom otherwise would shop and stay elsewhere.

This means claims by airport operators that the investment in car parking facilities would be put at risk from greater scrutiny is baseless. Airport operators will continue to expand car parking facilities because not to do so would, over the long term, constrain the growth in non-aeronautical revenues. Like aeronautical services and facilities, this does not mean the non-aeronautical streams provide a constraint on the pricing of such services. Rather, it means that an airport operator is unlikely to under invest in the facilities over the long term.

The ACCC's 2009-10 Prices Monitoring report raises concerns that APAM is reducing the ability of off-airport parking and private bus operators to compete with its own car parking services. BARA is not in a position to provide detailed comment as it has not participated in

the negotiation over the fees currently levied by APAM. However, BARA would note that the airport operator, as a rational business, is balancing the expected benefits of abusing its market power against the expected costs of being held to account for poor commercial conduct. Expected costs are currently very low given the way the prices monitoring regime is currently implemented.

It would appear to BARA that the concerns raised by the ACCC in the prices monitoring relate to APAM misusing its market power to damage the prospects of competing businesses. If this is the case, BARA would understand that the ACC could deal with such conduct directly through section 46 of the Australian Competition and Consumer Act.

4.5 Service quality monitoring

How responsive have the monitored airports been to users' service needs and preferences? Are there any significant quality problems for services under the control of the airports that are not being addressed? Have necessary new investments been made in a timely fashion? How does the quality of service at the monitored airports compare with comparable international airports?

How robust are the survey techniques in indicating quality of service? How useful is quality of service monitoring given the differentiation between DTLs and common user facilities, and how would this affect international comparisons?

As described in section 3, BARA considers that SACL has not undertaken timely investments in aeronautical infrastructure. SACL has put its retail interests ahead of the needs of airlines and created an international terminal that presents operational problems for some airlines. APAM has also spent around $240 million without adequate consultation with international airlines.

4.6 Access arrangements

Has the Federal Court's interpretation led to Part IIIA becoming the operative regulatory instrument for the major airports or has the threat of potentially easier recourse to Part IIIA 'conditioned' negotiations between airports and airport users, or has it had little impact?

Have recent legislative changes (in 2006 and 2010) addressed concerns that Part IIIA could supplant price monitoring as the operative regulatory instrument?

BARA considers that Part IIIA probably has had little impact on the negotiations for international services and facilities to date. The underlying issue in seeking declaration under Part IIIA is that it is an expensive and time consuming process.

BARA's strong preference is to devote its available time and resources to meaningful negotiations with airport operators over the provision and pricing of aeronautical services, rather than hiring consultants and lawyers to develop cases for declaration. However, BARA considers that it has already wasted considerable time and resources in largely fruitless

discussions with SACL. If again no direct action is taken against SACL from this review, then BARA must conclude that the prices monitoring regime has failed in its intended objectives. In such a situation, BARA would need to give careful consideration to the merits of declaration.

4.7 Future arrangements

At a broad level, is there value in continuing the monitoring of aeronautical services and/or parking prices? Is there evidence that the current light-handed approach has not been successful in addressing market power concerns, and if so, what alternatives are available? Is both price and service quality monitoring needed?

For international services and facilities, the outcomes achieved under the prices monitoring regime to date are mixed, with continuing very poor outcomes at Sydney Airport. BARA expects that the domestic airlines also will submit their own evidence about the conduct of airport operators in providing domestic aeronautical services and facilities.

The evidence put forward in this review about both international and domestic aeronautical services and facilities might also lead to the conclusion that prices monitoring regimes are not capable of delivering on their intended outcomes for Australia's major privatised airports. Such a conclusion would mean that the move to 'deemed' declaration (negotiate-arbitrate model) is justified. This form of economic regulation is less interventionist than direct price setting, but still allows users access to arbitration if acceptable commercial outcomes cannot be achieved.

What is clear is the current regime is being rendered largely ineffective because the findings of the ACCC and concerns raised by airlines are not being acted upon by the Australian Government.

Therefore, if the Commission reaches the conclusion that prices monitoring should continue, BARA recommends that the regime be modified to make it potentially effective in holding airport operators accountable for their commercial conduct. To do this BARA recommends that:

1. The Commission should clearly define the respective roles of itself, the ACCC and the Australian Government in administering the regime.
2. The Australian Government should take a far more active role in enforcing the regime.
3. A small independent body should be established to make formal recommendations to the Australian Government about the need for stricter economic regulation (eg detailed reviews or deemed declaration) based on the prices monitoring reports and discussions with airport operators and users.
4. The large rent transfers obtained by AAL, BAC, APAM and WAC should be made explicit.

5. The overall assessment of an airport operator's conduct should include consideration of the efficiency by which it delivers capital projects.

These recommendations are in addition to the direct action that must be taken in relation to SACL to improve its long term commercial conduct.

BARA's recommended reforms do not amount to an additional regulatory burden. Rather, they represent a series of reforms designed to promote a regime where airport operators will place a high probability on being held to account for their commercial conduct.

BARA considers that both price and service quality monitoring is required for there to be sufficient information to form a view on whether an airport operator is likely to be abusing its market power over one or more of its service and facilities. Further, as international airports also represent 'high profile' infrastructure assets that are often the first impression overseas visitors have of Australia, some independent and publicly available information on the service quality of price monitored airports is warranted, both for the regulatory regime and in a broader public policy sense.

Should there be a fixed duration for any future period of price monitoring? Are further prescheduled reviews necessary?

The initial intent of recommending an initial fixed duration before further review was to ensure there was sufficient time for airport operators and airlines to adjust to the new regime. However, the problem with the existing regime is whether it will continue to be rendered ineffective through inaction. At the same time, new issues of concern emerge in the case of this review - airport planning and transport links. This suggests that some flexibility over the timing of reviews is necessary.

That said, as with this inquiry, the scope of inquiry covers many issues that probably do not warrant detailed consideration, such as the need for service quality monitoring or the precise information collected. Future reviews should be more focussed on any issues of concern rather than re-evaluating the merits of some indicators for the fourth or fifth time.

If there is a further period of monitoring, are there opportunities to streamline arrangements to improve reporting, without compromising effectiveness? Could the number of indicators be reduced? In some areas, would more information be desirable? Do reports need to be produced annually?

BARA considers that considerable time and effort has already been devoted into determining the information to be collected and the manner by which it is obtained. Another review of the information requirements is not justified. This is especially the case given the main issue is a willingness to act on the information available.

BARA considers that annual reporting is necessary to increase the probability of an airport operator being held to account for poor commercial conduct. If many of the outcomes

contained in the reports are two or three years out of date before being published, this will reduce the probability of the Australian Government acting on the findings.

4.8 Market power

Have there been changes in the overall market power enjoyed by any of the price monitored airports and if so why? For example, do Avalon and Gold Coast airports materially reduce the market power of Melbourne and Brisbane Airports?

What are the constraints on the airports' market power? Do the airlines have countervailing power in dealing with the airports, especially smaller airports?

BARA seeks to obtain the most reasonable commercial outcome available within the bounds of the regulatory regime. BARA does not, however, have the ability to offer any substantial countervailing market power. BARA's activities do provide for meaningful improvements in the terms and conditions offered by airport operators. However, the basis on which negotiations are undertaken is largely determined around the economic regulatory regime (eg LIS asset valuations).

For international services, BARA does not consider that there has been any material change in the market power of price monitored airports since the 2006 review.

BARA sees little merit in the Commission again evaluating the market power of airports and countervailing market power of airlines in detail for the third time in ten years. The Commission reached sensible conclusions over airport market power and airline countervailing power after the regime had been in operation for around four years. This review was brought forward because of concerns over the commercial conduct of SACL, not because of any change to the market power of price monitored airports.

If monitoring was to continue, should some airports be removed from, or added to, the list of monitored airports? If airports are removed, would the second tier self administered scheme, or some other web-based self-reporting regime for the major airports, suffice?

BARA does not consider that there should be any reduction in the number of price monitored airports. There has been no material change in their market position since 2006. BARA's comments on this are limited to international services and facilities.

Are the definitions of aeronautical services appropriate in reflecting market power in particular services? Should some services be excluded or others included? What is the market power of the major airports in relation to car parking prices?

BARA considers that the current definitions of aeronautical services are appropriate. BARA does note that some additional services, such as staff car parking and airline offices are required by international airlines at each airport. BARA intends to include issues such as staff car parking into the overall negotiations over the provision and pricing of international services and facilities. The intention is to reach an acceptable commercial outcome for all the

services and facilities required by international airlines (excluding airline specific activities, such as commercial lounges) regardless of their prices monitoring status.

4.9 Deterrent and remedies

Is the existing range of remedies effective in deterring misuse of market power? Are these remedies effective 'punishment' for misuse of market power?

The Australian Government has available effective remedies to correct the poor commercial conduct of individual airport operators. As described earlier, the combined impact of the ACCC's investigation and findings (the findings of which should be made public) is likely to be sufficient to persuade the airport operator to correct its commercial conduct. It is not unreasonable to expect that an airport operator will be willing to enter into meaningful commercial negotiations in response to an impending ACCC investigation or release of its findings.

What impact does the lack of a 'show cause' process have on ensuring appropriate pricing and investment outcomes for aeronautical services? Is there a better approach to developing a 'show cause' process or an alternative trigger process? Would there be benefits in a requirement for independent commercial arbitration and if so, how could this be effected? Are there any public interest reasons for such arbitration to be conducted by the ACCC?

Do concerns about the potentially adverse effects of more heavy handed price regulation on investment militate against its reintroduction?

The underlying problem with the development of the 'show-cause' guidelines was an attempt to be over prescriptive for a process that ultimately involves a degree of professional judgement. Ultimately, the decision to initiate a detailed investigation by the ACCC needs to be based on a reasoned assessment of the information available rather than pre-defined set triggers.

The problem, therefore, seems to be the process by which a decision to undertake a more detailed investigation is made based on the information available. One option could be for the ACCC to recommend in each prices monitoring report whether a more detailed investigation of an airport operator is justified based on the evidence available. The relevant Minister would then need to formally respond to the ACCC's recommendation. BARA's option is for a small appointed group to review the information available, undertake some discussions with the airport operator(s) and airlines, then provide a recommendation to the relevant Minister.

4.10 Airport planning regulation and transport

The terms of reference request the Commission to focus on the provision of passenger transport services at and surrounding main passenger airports operating in Australia's major cities. Which major cities should the Commission focus on — those housing the five price

and service monitored airports, all capital cities or some other combination? Should potential links between airports (such as Canberra and Sydney or Melbourne and Avalon) be examined?

Are planning and development regulations working effectively? Can 'excessive' or 'inappropriate' economic development at airports impinge on effective transport linkages to and from airports, or might such development facilitate better transport linkages?

What mechanisms exist at airports to coordinate with local and state governments on planning issues? Can more be done by airports and governments to better coordinate planning of transport options? Will recent changes to legislation to impose additional requirements on airport Master Plans (such as ground transport plans) help to alleviate past problems?

What transport options exist at the major airports in Australia? Are these reliable, frequent and cost effective services? Are they integrated into the suburban transport network? To what extent are they used relative to private cars? Is there evidence that land transport service providers (such as taxis, shuttles, off-airport car parking providers) are impeded unduly in gaining access to airports? Are charges and conditions of access to airports (e.g convenient pick-up and drop-off points) appropriate? Is there a need to monitor such terms and conditions?

BARA does not have any specific comments on these issues at this point of the inquiry. However, BARA may provide some comment once the positions of airports and interested parties are stated to the extent the proposals would impact on the provision and pricing of international aeronautical services and facilities.

APPENDIX 1

BARA Membership
(as at March 2011 – 32 members)

AIRCALIN (SB)

AIR CANADA (AC)

AIR INDIA (AI)

AIR MAURITIUS (MK)

AIR NEW ZEALAND LIMITED (NZ)

AIR PACIFIC LIMITED (FJ)

AIR TAHITI NUI (TN)

AIR VANUATU (NF)

ASIANA AIRLINES (OZ)

CATHAY PACIFIC AIRWAYS LTD (CX)

CHINA SOUTHERN AIRLINES (CZ)

DELTA AIRLINES (DL)

EMIRATES (EK)

ETIHAD AIRWAYS (EY)

EVA AIRWAYS CORPORATION (BR)

FEDERAL EXPRESS (FX)

GARUDA INDONESIAN AIRWAYS (GA)

JAPAN AIRLINES (JL)

KOREAN AIR (KE)

MALAYSIA AIRLINES (MH)

PHILIPPINE AIRLINES (PR)

QANTAS AIRWAYS LIMITED (QF)

QATAR AIRWAYS (QR)

ROYAL BRUNEI AIRLINES (BI)

SINGAPORE AIRLINES (SQ)

SOUTH AFRICAN AIRWAYS (SA)

THAI AIRWAYS INTERNATIONAL (TG)

TURKISH AIRLINES (TK)

UNITED AIRLINES (UA)

VIETNAM AIRLINES (VN)

VIRGIN ATLANTIC AIRWAYS (VS)

VAUSTRALIA (VA)

APPENDIX 2

Crime and Punishment Revisited, January 2011

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Crime and Punishment Revisited*

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This version: January 2011

Abstract

Despite an abundance of empirical evidence on crime spanning over forty years, there exists no consensus on the impact of the criminal justice system on crime activity. We argue that this may be due to the combined effect of simultaneity, omitted variable bias and aggregation bias that may confound many of these studies. We construct a new panel data set of local government areas in Australia and develop a testing framework for the implications of economic theory on crime behaviour. The empirical results suggest that the criminal justice system can potentially exert a much greater influence on crime activity than is the common view in the literature. In addition, we find that increasing the risk of apprehension and conviction is more influential in reducing crime than raising the expected severity of punishment. Violent crime is more persistent and relatively less responsive to law enforcement policies compared to non-violent crime.

Key words: Crime, deterrence, simultaneity, omitted variable bias, aggregation bias, panel data, GMM.

*We are grateful to Eddie Anderson for useful comments and suggestions. The usual disclaimer applies.

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1 Introduction

Crime, originating from the root of Latin cernō ("I decide, I give judgment"), is the behavior judged by the State to be in violation of the prevailing norms that underpin the moral code of society. Where informal social controls are not sufficient to deter such behavior, the State may intervene to punish or reform those responsible through the criminal justice system. The precise sanctions imposed depend on the type of crime and the prevailing cultural norms of the society. For offences deemed to be serious, criminal justice systems have historically imprisoned those responsible, in the hope that a combination of deterrence and incapacitation may lower the crime rate. Currently, more than 9.8 million people in the world are institutionalised for punishment, almost half of which are held in America, China and the U.K. (Walmsley, 2009). Over the past thirty years, the American prison population has more than quadrupled. Such massive increases in the U.S. prison population may be explained almost entirely by an increase in punitiveness rather than an increase in crime rates (see e.g. Raphael and Stoll, 2009), leading some to label this extraordinary measure one of the largest scale policy experiments of the century.

Other countries such as the U.K. and Australia have also experienced rising prison populations. For instance, the incarceration rate in NSW, which is the most populous state in Australia, has increased over 23 percent in the last 10 years and is currently higher than that of Germany. The NSW prison system now costs taxpayers more than $1 billion per year.[1] At the same time crime rates have remained relatively stable, leading some to declare such high rates of incarceration a policy failure.

How effective is the criminal justice system in deterring crime? To what extent do changes in the expected punishment influence the motivation of individuals to engage in illegal pursuits? How much wrong-doing does each additional prisoner avert?

[1] Steering Committee for the Review of Government Service Provision (2010), Report on Covernment Services 2010, Chapter 8, Productivity Commission, Canberra.

In order to address these questions in a constructive way it is important to recognise that changes in the aggregate crime rate stem from individual behavior. Policies such as increased sentence lengths may lower the crime rate through two possible channels; deterrence and incapacitation. It is well accepted in the literature that for a particular policy to be effective it cannot operate on incapacitation effects alone (Durlauf and Nagin, 2010). In turn, for a policy to deter criminal behavior it must be designed with an understanding of what causes individuals to engage in criminal activity.

During the early part of the twentieth century criminal behavior was viewed as a type of social illness. For example, the strain theory of Merton (1938) suggests that crime is a behavioral response to social inequality. The seminal work of Becker (1968) changed this view, postulating that individuals engage in such activity simply because the subjective expected benefit exceeds the expected cost of doing so. Criminals, therefore, do not differ from the rest of society in their basic motivation but in their appraisal of benefits and costs. On this view a rational criminal behaves in a calculated manner, considering the benefit of the illegal act together with the risk of apprehension and conviction as well as the likelihood and severity of potential punishment, which are a function of three separate stages of processing through the criminal justice system pertaining to the roles of police, courts and prison system respectively. The idea of a rational criminal represents a major step forward in criminology and forges an important link with the deterrence hypothesis that underpins the criminal justice system − the notion that the crime rate can be reduced by raising the expected cost of criminal activity.

Since the seminal work of Becker, a large empirical literature has developed, seeking to inform public policy by collecting data on various populations and building econometric models that describe criminal behavior of individuals. The public concern about crime is well justified given the pernicious effects that it has on economic activity, as well as on the quality of one's life in terms of a reduced sense of personal and proprietary security. However, despite the rich history of econometric modeling spanning over forty years, it appears there is

largely a disconnect between theory and evidence as we have not been able to identify a single study that examines statistically the implications of economic theory on crime behavior of individual agents. Furthermore, there is arguably no consensus on whether there is a strong deterrent effect of law enforcement policies on crime activity. For example, Hirsch (1988) argues:

> "Estimates of the magnitude of the deterrent effect vary... Further empirical investigation is necessary in order to gain a more accurate estimate of the magnitude of this deterrent effect coefficient, though the true value of the coefficient is probably closer to 1 than to 0.3." (Hirsch (1988) p. 271).

In contrast, Cornwell and Turmbull (1994) conclude:

> "The ability of the criminal justice system to deter crime is much weaker than previous results indicate... A fundamental flaw in each of the [previous] studies is an inability to control for unobserved heterogeneity in the unit of observation." (Cornwell and Turmbull, 1994, p. 361).

Recent studies also provide mixed evidence that are insufficient to draw clear conclusions (see Section 3). The present paper revisits the economics of crime, deterrence and punishment and provides new findings. In particular, we specify a full econometric model of crime and develop a testing framework for the implications of economic theory on crime activity. The resulting restrictions appear to be supported by the data. Our results show a much stronger effect of the criminal justice system compared to the common view in the literature.

In addition, we find that increasing the risk of apprehension and conviction exhibits a much larger effect in reducing crime compared to raising the expected severity of punishment. This may have significant policy implications. For example, if it were estimated that the cost of keeping a prisoner incarcerated for a year was roughly equivalent to the cost of making a single additional arrest, then one could justify a redirection of resources from prisons to policing.

The difference between our results and those reported in a substantial body of literature may be attributed to several reasons. First, omitted variable bias; it is rarely the case that empirical studies of crime specify a complete econometric model with all deterrence variables included. Using the available data we show that the parameter estimates of the economic model of crime can be very sensitive to model mis-specification and the exclusion of relevant deterrence variables, which can lead practically to under-estimating the true effect of the criminal justice system.

Second, aggregation bias; while the economic model of crime purports to represent individual behavior, most data involve some form of aggregation − often, measurement takes place at the country or state level. This is likely to yield results that are inconsistent with economic theory. For example, Levitt (2001) argues that relying on national time series data can be particularly problematic since averaging across all of the locales removes useful variation, which may potentially result in misleading inferences. In the present study we are able to achieve a relatively low level of aggregation since the unit of observation is the Local Government Area (LGA) level in NSW. In addition, as it is shown, economic theory bears direct implications on the econometric specification of the model of crime behavior, which are testable using data constructed at the aggregate level. We find that these restrictions are not rejected in our case, which indicates that the level of aggregation used in this study is not harmful to modeling individual behavior.

Third, often the identification strategy employed in the literature is rather problematic since the deterrence variables are treated as exogenous, or if otherwise, the instruments used may not be orthogonal to the error term as they are likely to be correlated with the deterrence variables omitted from the regression. This study makes use of panel data analysis, which provides natural instruments with respect to sufficiently lagged values of the endogenous regressors. Furthermore, panel data analysis allows capturing different sources of unobserved heterogeneity, which makes the orthogonality conditions more likely to be satisfied. The validity of the instruments used is testable based on standard methods.

Finally, we deviate from the majority of the literature by specifying a dynamic model, which captures the essential feature of the behavior of individuals towards crime in that in practice it takes time to adjust fully to changes in law enforcement policies due to habit formation and costs of adjustment. This is important because it permits distinguishing between the effect of law enforcement policies in the short- and the long-run, and deriving equilibrium conditions as well as other meaningful dynamic quantities such as mean and median lag length of the effects.

We note that our estimated results are specific to the type of crime considered in the analysis. In particular, violent crime appears to be much more persistent and relatively less responsive to changes in law enforcement policies compared to non-violent crime. Furthermore, while the restrictions implied by economic theory are found to be supported by the data for non-violent crime, this is not the case for violent crime. These results can be considered natural given that Becker's idea of a criminal behaving in a rational manner is less likely to apply to violent crime, which is often influenced by feelings of anger and jealousy rather than rational behavior.

The remainder of this paper is as follows. Section 2 reviews the economic model of crime and motivates the key deterrence variables to be used in our empirical analysis. Section 3 discusses the empirical evidence pertaining to crime deterrence and analyses the problems inherent in using aggregate data to estimate the economic model of crime. Section 4 presents the econometric specification employed in the paper and its relationship with the underlying theory. Section 5 discusses the empirical results. A final section concludes.

2 A review of the economic model of crime

This section reviews the economic model of crime in order to motivate the theoretical relationship between crime and deterrence and analyse some of its implications. The framework extends Becker's (1968) representation of criminal behavior as a choice based on maximisation of expected utility. Consider an individual i who

engages in an illegal act based on a comparison of the expected benefits and the expected costs of doing so. The expected cost of criminal activity comprises both the direct inputs of the criminal justice system (the likelihood and severity of punishment), as well as the opportunity cost of activity in the legal sector foregone. Individual i will therefore engage in criminal activities if

$$p_i U_i^{NL}(Y_i - (C_i + S_i)) + (1 - p_i)U_i^{NL}(Y_i) > U_i^L(I_i), \tag{1}$$

where p_i is the unconditional probability of conviction[2], Y_i is the "income" flowing from the criminal act, material or otherwise, C_i is the collateral costs of criminal charges, S_i is the cost to the individual of the sanction imposed as punishment and I_i is the income from legal activity. The C_i are costs that are incurred upon being charged with a crime but not necessarily punished; for example, social stigmatisation and diminished employment prospects. The U_i are utility functions representing the way in which individual i subjectively values benefits and costs associated with legal (U_i^L) and illegal (U_i^{NL}) activities respectively. Rearranging, we obtain the equivalent condition

$$p_i \left(U_i^{NL}(Y_i - (C_i + S_i)) - U_i^L(I_i)\right) + (1 - p_i) \left(U_i^{NL}(Y_i) - U_i^L(I_i)\right) > 0. \tag{2}$$

The term on the left-hand side of the inequality is the expected net utility flowing from criminal activity. With probability $(1 - p_i)$ the individual realises the full benefit of criminal activity over and above the opportunity cost of legal activity. With probability p_i the benefit of criminal activity is deflated by $C_i + S_i$. If the expected utility of criminal activity net of the opportunity cost imposed by the legal sector is positive, a rational individual i will engage in criminal behavior. Therefore, under the assumption of rational, utility maximising agents, individual i will engage in criminal behavior if and only if (2) holds. Formally the criminal

[2]It is assumed that an individual is punished if they are found guilty.

decision is

$$\psi_i = \begin{cases} 1 \text{ if } p_i \left(U_i^{NL}(Y_i - (C_i + S_i)) - U_i^L(I_i)\right) + (1 - p_i)\left(U_i^{NL}(Y_i) - U_i^L(I_i)\right) > 0 \\ 0 \text{ otherwise,} \end{cases}$$

where ψ_i is an indicator function taking the value of 1 if individual i chooses to commit a crime and 0 otherwise.

Following Ehrlich (1975) the probability of punishment is decomposed into its three component parts: the probability of arrest, the probability of conviction given arrest, and the probability of imprisonment given conviction. Such an extension of the Becker model more realistically represents the risk posed by the criminal justice system. The transition from committing a criminal act to the realisation of punishment involves multiple stages of processing through the criminal justice system, none of which is certain. In order for punishment to occur, an individual must first be caught and arrested, then be found guilty by a judiciary. A further source of uncertainty follows since a judge must decide both the specific sanction imposed as punishment (eg. imprisonment, fine, home detention) and its severity. Expected utility from criminal activity is therefore represented as a function of the probability of arrest (P_A), the probability of conviction given arrest ($P_{C|A}$), the probability of imprisonment conditional on conviction ($P_{P|C}$) and the expected prison sentence length (S). These variables are the standard deterrence variables that appear in the literature and are the focus of our analysis. For ease of exposition, the opportunity cost flowing from the legal sector is set to zero. Hence, the expected utility from criminal activity can be written as

$$\begin{aligned} E(U_i^{NL}) &= (1 - P_{A_i})U_i^{NL}(Y_i) + P_{A_i}(1 - P_{C|A_i})U_i^{NL}(Y_i - C_i) \\ &\quad + P_{A_i}P_{C|A_i}P_{P|C_i}U_i^{NL}(Y_i - C_i - S_i) \\ &\quad + P_{A_i}P_{C|A_i}(1 - P_{P|C_i})U_i^{NL}(Y_i - C_i - S_i'), \end{aligned} \tag{3}$$

where the first term on the right hand side represents the full benefit of criminal activity in the case that one is not caught, which occurs with probability (1 −

P_{A_i}), the second term represents the benefit from criminal activity in the event that one is arrested but not convicted of the crime (deflated by C_i), occurring with probability $P_{A_i}(1 - P_{C|A_i})$,[3] while the third term represents the benefit from criminal activity in the event that one gets caught, convicted and therefore is punished (deflated by $C_i + S_i$), occurring with probability $P_{A_i}P_{C|A_i}P_{P|C_i}$. The fourth term captures all cases where the criminal is caught and found guilty (as with the previous term), but where an alternative to imprisonment is used. This occurs with probability $P_{A_i}P_{C|A_i}(1-P_{P|C_i})$, and the benefit from criminal activity is deflated by $C_i + S'_i$, where S'_i is the cost to the individual of this alternative punishment. It is assumed that imprisonment is the most severe punishment possible for any given crime − that is, $S_i > S'_i \ \forall \ i$.

The theoretical model has a number of implications for individual behavior towards crime. These can be summarised by the following propositions.

Proposition 1 *Increases in P_{A_i}, $P_{C|A_i}$ or $P_{P|C_i}$ decrease the expected utility derived from criminal activity.*

Proof. See Appendix A.1. ■

Proposition 2 *The marginal deterrence effects of the criminal justice system are ordered such that the effect of P_{A_i} is larger than that of $P_{C|A_i}$, which in turn is larger than the effect of $P_{P|C_i}$.*

Proof. See Appendix A.2. ■

Proposition 1 outlines that a potential criminal behaves in a calculated manner, taking into account the risk of apprehension and conviction as well as the likelihood and severity of punishment for a given level of benefit of the criminal act. Hence, the crime rate can be reduced by increasing the expected cost of criminal activity. The intuition of Proposition 2 lies in that the price of being arrested and convicted includes the cost incurred upon being charged but not necessarily punished, such as social stigmatisation and diminished employment opportunities.

[3] Although it is likely that the collateral costs of criminal charges are greater if the individual is actually convicted of crime, assuming that the full extent of these costs are incurred immediately upon arrest greatly simplifies the exposition of the analysis.

Thus, economic theory suggests that, ceteris paribus, policies targeting the probability of arrest and the probability of conviction can be more effective in deterring criminal activity than those targeting the probability of imprisonment, assuming all policies are equally costly. Despite these important implications, there appears to be a large disconnect between economic theory and empirical evidence in the literature for reasons that may be attributed to factors analysed in Section 3.

3 Evidence on Crime Deterrence

The nature of crime data available render the analysis of the effect of law enforcement policies on criminal activity inherently problematic. Criminological research logically began with the analysis of data collected from individuals. However such data are self-reported and are doubtlessly affected by significant measurement error. Moreover, the time and cost involved in surveying a representative population can be prohibitively large. An alternative is to use some form of aggregate data, which describe crime in locales (for example local areas, states or countries) and are based on official records rather than self-reported information.

However, empirical studies based on aggregate data are also not without problems, leading some to suggest that the use of individual and aggregate data may be regarded as two complementary approaches (Trumbull, 1989). In particular, aggregate data may inherently introduce a form of bias by invoking the "representative agent" assumption, which implies that all individuals are homogeneous and thus they behave in a similar manner. Furthermore, the use of aggregate data introduces a problem of simultaneity that makes the causal effect of law enforcement policies on crime more difficult to identify. For example, an exogenous upward shift in crime rate may overwhelm police resources, given that police resources are fixed in the short term, causing the probability of arrest to decrease. Increases in crime may also cause overcrowding in courts, leading individuals to enter guilty pleas with the understanding that alternatives to imprisonment are

more likely to be used (Nagin, 1978). To the extent that courts behave in this way in response to overcrowding, both the conditional probabilities of conviction and imprisonment are endogenous. Still another argument holds that an exogenous increase in the crime rate may cause courts to increase sentence lengths in an attempt to combat high rates of crime.

Despite the strong potential for simultaneity when the relation between crime, policing and justice is modeled using aggregate data, many studies fail to control for endogeneity, which casts serious doubt on their results (see e.g. Blumstein, Cohen and Nagin, 1978). It is well known that in the presence of endogeneity, least-squares based estimates of the economic model of crime are contaminated by the reverse effect that crime may exhibit on law enforcement policies, and hence are biased and inconsistent. Dills, Miron and Summers (2008) use aggregate data to demonstrate that raw correlations between crime rates and deterrence variables are frequently weak or even perverse due to the problem of simultaneity, and note that any identification strategy would need to be powerful enough to partial out the effect of deterrence on the crime rate and provide a result consistent with economic theory.

A further problem that may arise in empirical studies that use aggregate data is the potential for omitted variable bias in the estimated parameters. In particular, it is hardly ever the case that a complete model is specified that includes all deterrence variables prescribed by economic theory. This is likely to be due to lack of data or the fact that certain experimental designs intended to combat endogeneity preclude the possibility of examining all deterrence variables of interest. Whatever the appropriate explanation is, the evidence on crime deterrence has come to conform broadly to several distinct sub-literatures, in which the effect of the probability of arrest, the probability of conviction, the probability of imprisonment and the length of average sentence are rarely examined together.

Table 1 summarises the empirical results for some of the most widely cited contributions to the crime deterrence literature using aggregate data. For each of the studies noted, the table reports the sampling population, the unit of observation,

the structure of the data followed by the sample size[4], the method used to estimate the model, the type of crime analysed and finally the actual results. Clearly, there is a paucity of studies that estimate a fully specified economic model of crime, with notable exceptions being the papers by Pyle (1984), Trumbull (1989) and Cornwell and Trumbull (1994). However, in both Pyle (1984) and Trumbull (1989) all deterrence variables are treated as exogenous and therefore least-squares based methods are used to obtain estimates of the parameters. Trumbull justifies this choice claiming that simultaneity is not a salient feature of the existing dataset, based on the results of a Wu-Hausman specification test. Cornwell and Trumbull (1994) treat the probability of arrest as endogenous but all remaining variables as exogenous. The authors fail to find a statistically significant relationship between the deterrence variables and crime using a 2SLS procedure. Nevertheless, they produce inferences based on least-squares, arriving at a conclusion similar to Trumbull in that, as it is argued, the probability of arrest is exogenous.

However, even if reverse causality were not present in these data, the probability of arrest (when defined as number of arrests divided by the number of crime incidents) is endogenous in the crime equation by construction, since the numerator of the dependent variable (number of crime incidents) is the denominator in the probability of arrest, which artificially induces a negative correlation between the two variables (Nagin, 1978) − a phenomenon that is known as "ratio bias" in the literature (see e.g. Dills, Miron and Summers, 2008). Figure 1 illustrates this phenomenon using real time series data for NSW, aggregated across Local Government Areas (LGAs).

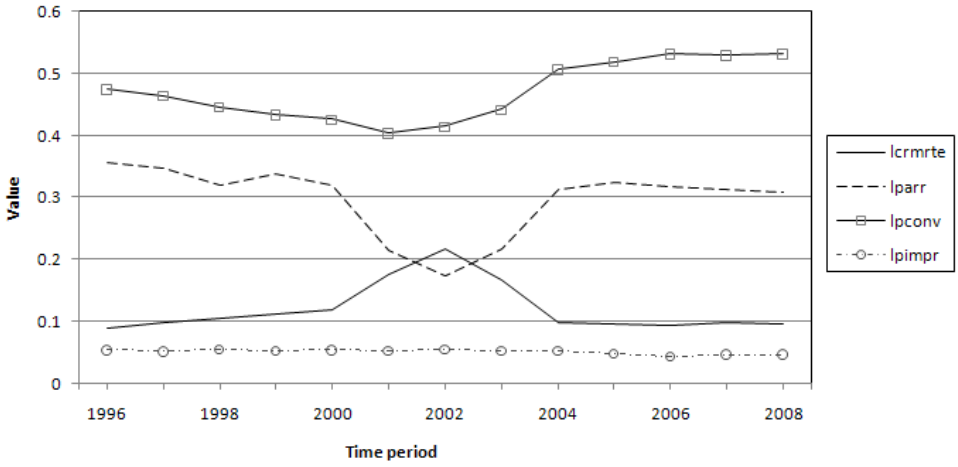
Finally, although Cornwell and Trumbull (1994) observe that the ordering of deterrence coefficients matches the ordering predicted by economic theory, they do not explicitly test the significance of this ordering.[5]

The remaining studies restrict their attention to a particular variable of in-

[4]For panel data models the cross-sectional dimension, N, is given first, followed by the time dimension, T.

[5]The reported coefficient estimates and standard errors in Cornwell and Trumbull (1994) suggest that such a test would fail to reject the null hypothesis of no difference between successive deterrent elasticities.

Figure 1: Crime and deterrence, New South Wales (1996 - 2008)



terest. Failing to include all deterrence variables fosters a disconnect between economic theory and empirical analysis. In order for a criminal to be punished, the person must be arrested and found guilty first; omitting the probability of arrest and conviction clearly ignores a fundamental aspect of the criminal decision and is likely to lead to biased inferences. Furthermore, omitted variables may invalidate estimation based on instrumental variables, as instruments may not be orthogonal to the deterrence variables omitted from the regression. For example, Mustard (2003) shows that arrest rates are likely to be negatively correlated with the probability of conviction and sentence length. As a result the author concludes that previous estimates of the marginal effect of the probability of arrest may understate the true effect of the arrest rate by as much as fifty percent. The following section analyses the econometric specification employed in this paper and discusses some of the implications of the economic model of crime.

Table 1: Empirical estimates of the elasticity of the crime rate with respect to policing and justice

Author	Year	Population	Unit of observation	Data (sample size)	Method	Crime type	Arrest	Conviction	Imprisonment	Sentence length
Panel A: Complete economic models of crime										
Cornwell and Trumbull	1994	North Carolina	County	Panel (90, 7)	OLS, 2SLS	Total	-.455	-.336	-.196	-.03
Trumbull	1989	North Carolina	County	Cross section (98)	OLS	Total	-.217	-.451	-.325	-.149
Pyle	1984	England and Wales	Police authorities	Cross section (41)	OLS	Robbery	-.5	.73	-.48	-.57
						Property	-.32	.4	-.55	-.85
Panel B: Arrest										
Klick and Tabarrok	2005	Washington D.C.	Police district	Panel (7,506)	OLS	Violent	-.3			
						Burglary	-.3			
Fajnzylber et al.	2002	United Nations	Country	Panel (45, 5)	GMM	Robbery	.08			.035
						Homicide	-.09			-.346
Corman and Mocan	2000	New York	City	Time series (108)	OLS	Murder	-.336			
						Burglary	-.355			
Bodman and Maultby	1997	Australia	State	Cross section (60)	2SLS	Robbery	-.258			-.621
						Burglary	-.367			
Levitt	1997	United States	City	Panel (59, 23)	2SLS	Violent	-0.9*			
						Property	-0.24*			
Marvell and Moody	1996	United States	City	Panel (56, 22)	Granger	Total	-.133			
						Homicide	-.241			
						Burglary	-.151			
Sampson and Cohen	1988	United States	City	Cross section (171)	2SLS	Robbery	-.28			
						Burglary	-.12			
Car-Hill and Stern	1973	England and Wales	Police districts	Cross section (64)	FIML	Total	-.59			-.17
Panel C: Imprisonment										
Johnson and Raphael	2006	United States	State	Panel (51, 27)	2SLS	Violent			-.11	
						Property			-.21	
Liedka et al.	2006	United States	State	Panel (51, 29)	Granger	Total			-.245	
						Murder			-.13	
						Burglary			-.136	
Levitt	2002	United States	City	Panel (100, 21)	2SLS	Violent	-.435		-.171	
						Property	-.501		-.305	
Witt and Witte	2000	United States	Country	Time series (38)	VAR	Total			-.55	
Levitt	1996	United States	State	Panel (51, 23)	2SLS	Violent			-.261	
						Property			-.379	
Marvell and Moody	1994	United States	State	Panel (49, 19)	Granger	Total			-.159	
						Homicide			-.065	
						Burglary			-.253	
Ehrlich	1973	United States	State	Cross section (47)	2SLS	Total			-.991	-1.123
Panel D: Conviction and other studies										
Haas	1980	New Jersey	Municipality	Cross section (181)	2SLS	Total		-.02		
Withers	1984	Australia	State	Cross section (104)	OLS	Violent		.29	.09	
						Total		-.62	-.6	
						Property		-.59	-.56	
Sjoquist	1973	United States	Municipality	Cross section (53)	OLS	Theft	-.342	-.678		-.212

* indicates author provided multiple estimates, in which case the median is reported.

4 Econometric Specification

The starting point of our analysis is to relate the number of offences committed in a given LGA to the number of arrests, the number of convictions, the number of imprisonments and the average sentence length. Since the level of crime in each LGA depends on the size of the population, the latter is also included in the aggregate regression. It will be demonstrated that many of the models estimated in the literature are in fact a restricted version of this aggregate model. We remark that we deviate from the literature in a significant way in that we also allow for persistence in the level of crime due to habit formation and costs of adjustment, thus specifying a dynamic model of crime. In contrast, common practice in the literature presumes a static relation, where the entire effect of law enforcement policies is assumed to be realised immediately within the same time period.

Our aggregate model is given by

$$\begin{aligned} \ln crm_{it} &= \delta \ln crm_{it-1} + \delta_1 \ln arr_{it} + \delta_2 \ln con\mathrm{v}_{it} + \delta_3 \ln impr_{it} + \\ &\quad \delta_4 \ln av sen_{it} + \delta_5 \ln income + \delta_6 \ln unemp + \delta_7 \ln pop_{it} + \\ &\quad \delta_8 \ln pop_{it-1} + u_{it}, \end{aligned} \tag{4}$$

where crm_{it} denotes the number of crime offences in LGA i at time t, and the remaining variables are self-explanatory. Due to incapacitation effects alone, one naturally expects that $\delta_j < 0$ for $j \leq 4$, while $\delta \in (0, 1)$ to ensure stationarity.

The economic model of crime postulates that criminals are rational individuals who assess the risk of apprehension and conviction as well as the likelihood of punishment prior to committing an offence, and ultimately evaluate the expected benefit and cost associated with an illegal activity. Therefore, our hypothesis is

that the model can be expressed in the following form:

$$\begin{aligned}\ln\left(\frac{crm_{it}}{pop_{it}}\right) &= \alpha\ln\left(\frac{crm_{it-1}}{pop_{it-1}}\right)+\beta_1\ln\left(\frac{arr_{it}}{crm_{it}}\right)+\beta_2\ln\left(\frac{conv_{it}}{arr_{it}}\right)\\ &\quad+\beta_3\ln\left(\frac{impr_{it}}{conv_{it}}\right)+\beta_4\ln avsen_{it}+\beta_5\ln income_{it}\\ &\quad+\beta_6\ln unemp_{it}+\upsilon_{it},\quad 0<\alpha<1,\end{aligned}\tag{5}$$

which can be rewritten as

$$\begin{aligned}\ln crmr_{it} &= \alpha\ln crmr_{it-1}+\beta_1\ln prbarr_{it}+\beta_2\ln prbconv_{it}+\beta_3\ln prbimpr_{it}\\ &\quad+\beta_4\ln avsen_{it}+\beta_5\ln income_{it}+\beta_6\ln unemp_{it}+\upsilon_{it}.\end{aligned}\tag{6}$$

Precise definitions of all variables used in our regression modelling are provided in Table 2. Therefore, crime rate is a function of the empirical probability of arrest, *prbarr*, the probability of conviction given arrest, *prbconv*, and the probability of imprisonment given conviction, *prbimpr*, albeit with a dynamic effect of the deterrence variables on the crime rate, for which the speed of adjustment is determined by the coefficient of the lagged value of the dependent variable. The inclusion of sentence length, income and unemployment in the equation captures the expected gains from the illegal and legal sectors.

In this case, we have

$$\delta=\frac{\alpha}{1+\beta_1},\ \delta_1=\frac{\beta_1-\beta_2}{1+\beta_1},\ \delta_2=\frac{\beta_2-\beta_3}{1+\beta_1},\ \delta_7=\frac{1}{1+\beta_1},\ \delta_8=-\frac{\alpha}{1+\beta_1},\tag{7}$$

while the remaining coefficients can be reparameterised conveniently such that $\delta_j=\beta_j/(1+\beta_1)$ for $j=3,...,6$. Therefore, the null hypothesis can be formulated as follows:

$$H_0:\ \delta+\delta_1+\delta_2+\delta_3+\delta_7+\delta_8=1.\tag{8}$$

This set of restrictions is testable in the general model in a standard way. Acknowledging these restrictions leads to an interesting point of symmetry between economic theory and the econometric specification, which is outlined below.

Proposition 3 *The marginal deterrence effects are ordered, such that the coefficient of prbarr in* (6) *is more negative than the coefficient of prbconv, which in turn is more negative than the coefficient of prbimpr − that is,* $|\beta_1| > |\beta_2| > |\beta_3|$.

Proof. The restrictions in (7) imply that $\beta_j = (1 + \beta_1)\,\delta_j + \beta_{j+1}$ for $j = 1, 2$, and also $-1 < \beta_1 < 0$ because α, $\delta \in (0, 1)$. Since $\delta_j < 0$, $\beta_{j+1} < 0$ for $j = 1, 2$, the result follows directly. ■

Thus, Proposition 3 implies the same ordering predicted by economic theory and therefore provides a further restriction that can be used to test the econometric specification.

Many of the models used in the literature (see e.g. Table 1) are restricted versions of (4). For example, static models impose $\alpha = 0$. Omitting the probability of arrest and using the unconditional empirical probability of conviction instead, defined as the ratio between the number of convictions over the number of crime offences, imposes $\delta_1 = 0$. This restriction seems unrealistic and is likely to lead to omitted variable bias if arrests are correlated with convictions and imprisonments. In general, models that use unconditional probabilities are subject to omitted variable bias since they impose invalid restrictions in the aggregate model. Obviously, models that omit conditional probabilities are also subject to the same problem. For instance, conviction rates are rarely studied in the literature and the focus is often on the risk of apprehension and the severity of punishment. Table 5 shows that the parameter estimates of the model of crime can be very sensitive to omitted variables and typically the effect is to underestimate the impact of the criminal justice system as a whole.

Notice that the restricted model induces by construction some form of endogeneity and therefore warrants estimation based on instrumental variables. This is outlined in the following remark.

Remark 4 *Even in the absence of simultaneity, least-squares based estimation methods of the restricted model are subject to "ratio bias" that does not appear in the original model. This is because the denominator in prbarr is endogenous. Therefore,* $E\left(\varepsilon_{it} | \ln prbarr_{it}\right) \neq 0$. *This ratio bias does not necessarily arise in*

Table 2: Definitions of variables included in the econometric model of crime

Variable	Definition
crm	Number of criminal incidents divided by total population
prbarr	Number of arrests divided by criminal incidents
prbconv	Number of convictions divided by arrests
prbimpr	Number of imprisonments divided by convictions
avsen	Average non-parole period (months) imposed for prison sentences
income	Average wage and salary earner income
unemp	Unemployment rate (%)

other econometric models that involve ratios. For example, consider a cost function, $\ln cost_{it} = \beta_1 \ln price_{k,it} + \beta_2 \ln price_{l,it} + \beta_3 \ln price_{e,it} + \gamma \ln output_{it} + u_{it}$*, where* $price_k$*,* $price_l$ *and* $price_e$ *denote the price of capital, labour and energy, respectively, and the remaining variables are self-explanatory. Under linear homogeneity in input prices,* $\beta_1 + \beta_2 + \beta_3 = 1$*, which implies that the model can be written as* $\ln\left(\frac{cost_{it}}{price_{e,it}}\right) = \beta_1 \ln \frac{price_{k,it}}{price_{e,it}} + \beta_2 \ln\left(\frac{price_l}{price_{e,it}}\right) + \gamma \ln output_{it} + u_{it}$*. Assuming that firms are price takers (competitive markets),* $price_e$ *is strongly exogenous and therefore the transformed regressors remain strongly exogenous; for example,* $E\left(u_{it} | \ln \frac{price_{k,it}}{price_{e,it}}\right) = 0$*.*

5 Data Analysis, Estimation and Results

5.1 Data

We construct a new dataset containing information on criminal activity and deterrence for all 153 local government areas in New South Wales, each one observed over a period of thirteen years from 1995/96 to 2007/08. The Australian Standard Geographic Classification (ASGC) defines the LGA as the lowest level of aggregation following the census Collection District (CD) and Statistical Local Area (SLA).[6] Thus, the LGA represents a low level of aggregation compared to standard practice in the literature, where regressions using city-, state- and country-level data are common. To the best of our knowledge, this is the first panel data

[6]Each CD contains on average about 225 households (2001 Census). There are about 37,000 CDs throughout Australia. The boundaries of an SLA are designed to be typically coterminous with Local Government Areas unless the LGA does not fit entirely into a Statistical Subdivision, or is not of a comparative nature to other LGA's. There are 193 SLAs in NSW.

model of crime that has been constructed for Australia. The raw data for crime offences and deterrence variables have been purchased from the NSW Bureau of Crime Statistics and Research. Income and population data have been obtained from the Australian Bureau of Statistics (ABS) website, while the unemployment data have been purchased from the Small Area Labour Markets division of the Department of Education, Employment and Workplace Relations (DEEWR).

The NSW Bureau of Crime Statistics and Research provides two alternative definitions for average prison sentence; average non-parole period and average head sentence. We use the non-parole period in the analysis because this represents more closely the actual amount of time spent in confinement. The raw data for income and population are not readily comparable with the crime data because they are based on different ASGC standards, i.e. LGA boundaries are defined slightly differently by the NSW Bureau and the ABS. To achieve consistency, we mapped the data to a common ASGC standard (2006) using a series of concordance tables. Similarly, the unemployment data were first mapped to the same ASGC standard (2006) to account for name and boundary changes that occured in the LGAs over the sample period. The resulting SLA data were then aggregated to the LGA level to be directly comparable to the other data.

Table 3 reports descriptive statistics for the different categories of crime considered in our analysis. As expected, the mean value of the rate of violent crime is smaller than that of non-violent crime and it exhibits a much smaller dispersion as well, which indicates that violent crime occurs less frequently and is more localised. The empirical probability of arrest and the probability of imprisonment are both higher on average for violent crime, although the opposite occurs for the probability of conviction, which is perhaps reflective of the fact that for violent crime, police are more likely to bring a prosecution when a case is weak and more jury trials. The mean value of average sentence length is much larger than the value in the 90th percentile, which shows that there is a relatively small number of very big sentences in the sample.

Table 3: Descriptive statistics

Variable	Crime type	Mean	Standard deviation	10th Percentile	90th Percentile
Crime rate					
	Total	.133	.088	.064	.218
	Non-violent	.100	.070	.043	.176
	Violent	.034	.024	.016	.049
Probability of arrest					
	Total	.313	.117	.169	.466
	Non-violent	.308	.124	.156	.471
	Violent	.344	.128	.198	.505
Probability of conviction					
	Total	.489	.144	.325	.673
	Non-violent	.506	.177	.301	.739
	Violent	.340	.140	.200	.500
Probability of imprisonment					
	Total	.071	.040	.031	.118
	Non-violent	.071	.046	.031	.119
	Violent	.159	.129	.060	.290
Average sentence (days)					
	Total	280.1	4767.9	5.7	15
	Non-violent	37.9	1013.6	4.5	11.6
	Violent	608.1	9672.3	2	25.6
Income ($ '000)	—	34.01	9.4	25.18	44.03
Unemployment (%)	—	7.07	5.1	3.05	12.36

Descriptive statistics computed for the variables used in regression analysis. $N = 153$ and $T = 13$, yielding a total of 1,989 observations.

5.2 Estimation method and results

We analyse total crime, non-violent and violent crime sequentially, based on the econometric model studied in the previous section. The composite error term is specified as follows:

$$\upsilon_{it} = \eta_i + \tau_t + \mu_{it} + \varepsilon_{it}.$$

Therefore, υ_{it} allows for unobserved regional-level effects that may be correlated with the regressors, η_i, such as geographical location and crime reporting conventions, as well as time effects that capture common variations in crime across regions, τ_t. μ_{it} reflects a serially uncorrelated measurement error and ε_{it} is the usual random error component.[7] The results are obtained using the Generalised Method of Moments (GMM) estimator developed originally by Hansen (1982) and extended for dynamic panel data models by Arellano and Bond (1991), Ahn and

[7]Some measurement error is likely to be present – especially in measuring average sentence length, as this does not control for the criminal history of the offender, or the type of the offence.

Schmidt (1995), Arellano and Bover (1995) and Blundell and Bond (1998), among others. GMM is a natural choice when multiple explanatory variables are endogenous. Furthermore, the GMM approach has the advantage that it avoids full specification of the serial correlation and heteroskedasticity properties of the error, or indeed any other distributional assumptions. Our model specifies all explanatory variables as endogenous. The underlying reason for such treatment of the deterrence variables has already been motivated in Section 3. Errors in measurement may also contribute to endogeneity of the regressors. In addition, we treat average income as endogenous since crime has a direct effect on economic activity and thereby on employment. Similar considerations apply to the unemployment rate.

Table 4 shows the results for the model of total crime. For comparison purposes we also report results based on the within-group (WG), or fixed effects, estimator, which although frequently used is inconsistent under endogeneity. The long-run estimates are computed by dividing the short-run slope coefficients by one minus the estimated autoregressive parameter. Robust standard errors are reported in parentheses, which are valid under arbitrary forms of heteroskedasticity and serial correlation. Furthermore, for GMM specifically we perform the correction proposed by Windmeijer (2005) for the finite-sample bias of the standard errors of the two-step GMM estimator.[8] The standard errors of the long run estimated parameters are subsequently obtained using the formula for the approximation of the variance of a ratio of coefficients.[9] For GMM we also report the p-value of Hansen's test of overidentifying restrictions and the p-value of Arellano and Bond's (1991) test of serial correlation of the disturbances up to third order. The former is used to determine empirically the validity of the overidentifying restrictions in the GMM model. The null hypothesis is that the model is correctly specified. The latter is useful because it provides an indication of the appropriate lag length of the instruments to be used, since instruments are required to be orthogonal to

[8] All results have been obtained using David Roodman's *xtabond*2 algorithm in Stata 11. The interested reader may refer to Roodman (2009).

[9] This is given by $Var(a/b) = (1/b^2)Var(a) + (a^2/b^4)Var(b) - 2(a/b^3)Cov(a,b)$, where $a = \beta_j, j = 1-6$ and $b = (1-\alpha)$.

the error term. On the bottom of the table, we also report the p-value of the test statistic of the joint null hypothesis formulated in (8), as well as the p-value of the hypothesis that the marginal deterrence effects are ordered sequentially. Together, these hypotheses provide a testing framework for the implications of economic theory on crime behavior.

Table 4: Estimated marginal elasticities for total crime

	WG		GMM	
	Short-run	Long-run	Short-run	Long-run
Lagged crime rate	.334***	—	.350***	—
	(.023)		(.082)	
Probability of arrest	-.551***	-.827***	-.865***	-1.33***
	(.035)	(.074)	(.095)	(.249)
Probability of conviction	-.540***	-.811***	-.575***	-.885***
	(.036)	(.068)	(.093)	(.178)
Probability of imprisonment	-.039***	-.059***	-.218**	-.335**
	(.011)	(.017)	(.123)	(.196)
Average sentence	.004	.005	-.251***	-.386**
	(.003)	(.004)	(.107)	(.176)
Income	-.079	-.119	-1.03**	-1.584**
	(.100)	(.150)	(.452)	(.833)
Unemployment	.028**	.042**	.626***	.962***
	(.013)	(.020)	(.162)	(.283)
p-value overidentifying restrictions	—		.674	
p-value serial correlation				
- Lag 1	—		.017	
- Lag 2	—		.199	
- Lag 3	—		.131	
p-value of H_0 in (8)	.033		.814	
p-value of ordered effects				
- $H_0 : \beta_A - \beta_{C\|A} = 0$	.732		.008	
- $H_0 : \beta_{C\|A} - \beta_{P\|C} = 0$	.000		.034	

Robust and bias-corrected standard errors reported in parentheses. Each regression includes LGA-specific effects and time-specific effects. $NT = 153 \times 12 = 1,836$ observations. * indicates significance at the 10 percent level; ** and *** indicate significance at the 5 and 1 percent levels respectively, using one-tail tests.

Clearly there is substantial difference between the WG and GMM estimates; in particular, the former appears to significantly underestimate the effect of all explanatory variables, which demonstrates the importance of accounting for endogeneity in crime activity. The GMM estimates of the parameters are statistically significant and of the expected sign in the short- and the long-run. Thus, one percent increase in the probability of arrest appears to decrease the expected value of the crime rate by .865 percent in the short-run and 1.33 percent in the long-run, ceteris paribus. Likewise, the elasticity of the probability of conviction is about

-.575 and -.885 in the short- and long-run respectively. The fact that the estimated elasticities are larger in the long-run is well anticipated, since typically one needs time to adjust fully to changes in law enforcement policies, due to habitual behavior, imperfect knowledge and uncertainty. In particular, the value of the autoregressive parameter indicates that it takes about 2.5 time periods for ninety percent of the total impact of either one of the explanatory variables on crime to be realised, all else being constant.

The estimated coefficients of the probability of imprisonment and the average sentence length are not statistically different. This is consistent with the result we would expect if criminals responded to the expected length of sentence as a single factor. In particular, define the expected length of sentence as $e = prbimpr \times avsen$. Taking logs yields $\ln e = \ln prbimpr + \ln avsen$. This implies that the likelihood of imprisonment and the severity of punishment bear equal importance in reducing crime. If this is true then policies targeting prison sentence length as opposed to imprisonment probability do not differ in their effectiveness. Furthermore, they both appear to exhibit a much smaller effect on crime compared to the probability of arrest and the probability of conviction. This shows that imprisoning more criminals, or imprisoning them for longer, is not as effective as increasing the risk of apprehension or conviction once captured.

The above provides support to the idea that the consequences of being arrested and found guilty of a criminal offence include the indirect sanctions imposed by society and not just the punishment meted out by the criminal justice system. A convicted individual may no longer enjoy the same opportunities in the labour market or the same treatment by their peers, and so the opportunity cost of lost income and the cost to the individual of social stigmatisation is implied in the event of conviction. For example, Zimring and Hawkins (1973, pg. 174) argue:

> "Official actions can set off societal reactions that may provide potential offenders with more reason to avoid conviction than the officially imposed unpleasantness of punishment" (Zimring and Hawkins, 1973).

The results suggest that the lost social standing resulting from a conviction

may well outweigh the effects of prison sentence, let alone a fine or community service order.

The effect of income and unemployment appears to be large and statistically significant. However, these coefficients are substantially different, suggesting that in formulating the crime-no crime decision individuals may consider more the level than the certainty of income flowing from the legal sector, which is consistent with Becker's conception of criminals as risk-seeking. Furthermore, crime appears to be unit-elastic in the short-run with respect to income but elastic in the long-run. On the other hand, crime is inelastic with respect to changes in unemployment.

The joint hypothesis formulated in (8) is not rejected when the test statistic is based on the GMM estimated parameters, while the hypothesis that the deterrence coefficients are statistically the same is rejected at the 5 percent level. This is in stark contrast to the WG-based tests, which yield the opposite results in both cases. Again, this demonstrates the importance of accounting for endogeneity in order to obtain findings consistent with economic theory.

Table 5 reports results with respect to a number of models that are subject to different sources of mis-specification error. For comparison purposes we also include the full model, estimated before and containing all variables prescribed by economic theory. Model (2) is similar to many of the models estimated in the literature, in that it specifies a static relation between crime and deterrence. Clearly the exclusion of the lagged dependent variable results in underestimating all coefficients without exception, which is not surprising given that crime and therefore its lagged value are negatively correlated with most of the regressors. Hansen's test statistic rejects the null hypothesis that the model is correctly specified at the five percent level, while the null of serially uncorrelated disturbances is rejected even for up to third order serial correlation. Model (3) omits the probability of arrest and makes use of the unconditional empirical probability of conviction instead, defined as number of convictions divided by crime offences. The results are similar in the sense that all estimated coefficients are smaller in absolute value compared to the full model. Furthermore, Hansen's test statistic rejects the null hypothesis

that the instruments used are valid at the five percent level. This is expected given that omitted variables may invalidate the restriction that the instruments are orthogonal to the error term. Model (4) commits a common mis-specification error in that it includes only the probability of arrest and the average sentence length from the set of deterrence variables. Finally, Model (5) restricts attention to the likelihood and severity of punishment.[10] It is worth noting that the impact of omitted variables appears to be absorbed by the lagged dependent variable in all of the relevant mis-specified models, thus producing invalid inferences for the dynamic process of the crime equation. In summary, we can see that the estimated parameters of the total crime equation can be very sensitive to the specification of the model, and typically mis-specification errors result in obtaining estimates that show a smaller effect of the deterrence variables compared to the full model, which corroborates the results of Mustard (2003). This is not surprising because as shown in Table 6, most of the explanatory variables are mutually negatively correlated in the sample.

The following table reports estimates of the parameters by type of crime. As we can see, there are some stark differences between non-violent and violent crime. The former seems to resemble relatively more closely the model for total crime, which is expected given that about three quarters of all crime is non-violent. The null hypothesis of correct specification is not rejected in either of the two models. Likewise, the null hypothesis formulated in (8) is supported empirically in both cases. However, the hypothesis of sequential ordering of the coefficients of deterrence variables is supported only for non-violent crime. This indicates that the idea of rational behavior towards illegal activity may apply only to non-violent crime. This is also manifestated through the actual estimates of the model parameters. For example, the effect of punishment, both in terms of likelihood and severity, is statistically significant only for non-violent crime, and even so it remains small compared to the effect of the likelihood of arrest and conviction. Moreover, income and unemployment appear to have an appreciably smaller effect

[10]Similarly as before, the likelihood of imprisonment refers to the unconditional probability, defined as number of imprisonments divided by crime offences.

Table 5: Sensitivity of parameter estimates to omitted variables[†]

	(1)	(2)	(3)	(4)	(5)
Lagged crime rate	.350***		.517***	.617***	.577***
	(.080)		(.108)	(.101)	(.108)
Probability of arrest	-.865***	-.652***		-.485***	
	(.090)	(.223)		(.150)	
Probability of conviction	-.575***	-.380***	-.357***		
	(.090)	(.149)	(.107)		
Probability of imprisonment	-.218**	-.194*	.122**		-.077
	(.120)	(.122)	(.055)		(.080)
Average sentence	-.251***	.129	.077*	-.071	.048
	(.110)	(.126)	(.056)	(.093)	(.078)
Income	-1.03**	-.991***	-.389		
	(.450)	(.395)	(.308)		
Unemployment	.626***	.246*	.266**	.245***	.325***
	(.160)	(.150)	(.124)	(.098)	(.133)
p-value overidentifying restrictions	.002	.032	.011	.004	.009
p-value serial correlation					
- Lag 1	.017	.151	.000	.000	.000
- Lag 2	.199	.072	.687	.792	.458
- Lag 3	.131	.035	.007	.150	.003

Robust and bias-corrected standard errors reported in parentheses. Each regression includes LGA-specific effects and time effects, and is estimated by GMM using $NT = 153 \times 12 = 1,836$ observations. * indicates significance at the 10 percent level; ** and *** indicate significance at the 5 and 1 percent levels respectively.

Table 6: Correlation matrix for explanatory variables in total crime equation

	ln prbarr	ln prbconv	ln prbimpr	ln avsen	ln income	ln unemp
ln prbarr	1					
ln prbconv	-.319	1				
ln prbimpr	.274	-.212	1			
ln avsen	-.174	.111	-.039	1		
ln income	-.542	.340	-.436	.163	1	
ln unemp	.282	-.251	.299	-.021	-.519	1

on violent crime.

Table 7: Elasticity estimates by type of crime

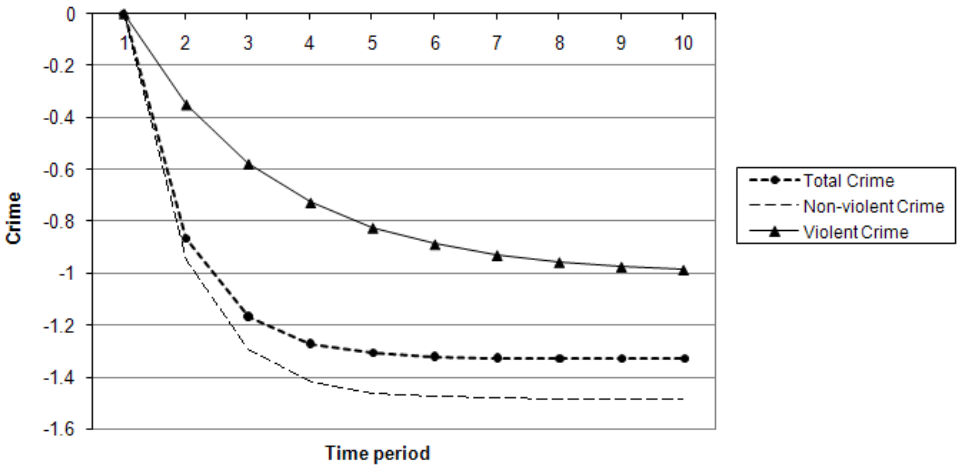
	Violent crime		Non-violent crime	
	Short-run	Long-run	Short-run	Long-run
Lagged crime rate	.642***	—	.366***	—
	(.125)		(.087)	
Probability of arrest	-.258***	-.720**	-.920***	-1.45***
	(.093)	(.367)	(.161)	(.383)
Probability of conviction	-.273***	-.763***	-.581**	-.916***
	(.044)	(.258)	(.103)	(.219)
Probability of imprisonment	-.002	-.005	-.179**	-.282**
	(.054)	(.150)	(.102)	(.170)
Average sentence	.008	.023	-.210***	-.331**
	(.032)	(.087)	(.107)	(.161)
Income	-.268	-.748	-1.115***	-1.759**
	(.294)	(1.029)	(.436)	(.832)
Unemployment	.198***	.554**	.305***	.481***
	(.065)	(.306)	(.111)	(.196)
p-value overidentifying restrictions	.514		.726	
p-value serial correlation				
- Lag 1	.000		.005	
- Lag 2	.631		.316	
- Lag 3	.099		.303	
p-value of H_0 in (8)	.881		.794	
p-value of ordered effects				
- $H_0 : \beta_A - \beta_{C\|A} = 0$	.856		.012	
- $H_0 : \beta_{C\|A} - \beta_{P\|C} = 0$	.000		.000	

Robust and bias-corrected standard errors reported in parentheses. Each regression includes LGA-specific effects and time effects, and is estimated by GMM using $NT = 153 \times 12 = 1,836$ observations. * indicates significance at the 10 percent level; ** and *** indicate significance at the 5 and 1 percent levels respectively.

Finally, it is worth emphasising that violent crime is characterised by higher persistence, since the value of the autoregressive coefficient is almost double that of non-violent crime. Thus, while for non-violent crime it takes about 2.5 periods for ninety percent of the total (i.e. long-run) effect of either one of the deterrence variables to be realised, all other things being constant, violent crime requires about 6 periods for the same effect to occur. This is anticipated since violent crime may be attributed to factors which are fundamentally different and less prone to be calculated in the type of manner implied by economic theory. The following figure illustrates the dynamic path of the various types of crime following a one percent increase in the probability of arrest. One can see that the long-run estimated elasticity of the probability of arrest is smaller for violent crime and it also takes much longer to adjust to equilibrium compared to non-violent crime.

Similar results hold for the remaining explanatory variables, albeit they converge to a different equilibrium level.

Figure 2: Dynamic path of total crime: probability of arrest



6 Concluding Remarks

We estimate an econometric model for crime using a new panel of data set containing information on illegal activity and deterrence variables for local government areas in NSW. Our findings suggest that the criminal justice system can potentially exert a much larger impact on crime compared to previous estimates in the literature, particularly for non-violent crime. We show that the estimated parameters can be very sensitive to model mis-specification, the exclusion of relevant deterrence variables and the lack of a proper identification strategy under endogeneity. These factors typically tend to understate the effect of law enforcement policies, which may explain the difference between the results presented in this paper and those reported in a large body of empirical work.

From a policy design perspective, it appears that targeting the risk of apprehension and conviction are more effective strategies than increasing the severity of punishment, which indicates that the increasingly higher rates of incarceration observed across the world are not justified.

Moreover, violent crime appears to be more persistent and relatively less re-

sponsive to changes in law enforcement policies compared to non-violent crime. This result is natural given that Becker's idea of a criminal behaving in a rational manner is less likely to apply to violent crime, which is often influenced by feelings of anger and jealousy.

There are several interesting issues that remain to be explored. In particular, given our analysis it would be useful to measure the effectiveness of different police activities in influencing the risk of apprehension and determining the empirical probability of arrest following an offence. Furthermore, from an economic point of view it is inviting to examine the costs and benefits associated with crime prevention. We intend to pursue both of these issues in future research.

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A Proof of propositions

A.1 Proof of Proposition 1

Differentiating (3) with respect to each deterrence variable we obtain:

$$\begin{aligned}
\frac{\partial E(U_i^{NL})}{\partial P_{Ai}} &= -[U_i^{NL}(Y_i) - P_{C|Ai}[P_{P|Ci}U_i^{NL}(Y_i - C_i - S_i) + \\
&\quad (1 - P_{P|Ci})U_i^{NL}(Y_i - C_i - S_i')] - (1 - P_{C|Ai})U_i^{NL}(Y_i - C_i)] \quad (9) \\
\frac{\partial E(U_i^{NL})}{\partial P_{C|Ai}} &= -P_{Ai}[U_i^{NL}(Y_i - C_i) - P_{P|Ci}U_i^{NL}(Y_i - C_i - S_i) - \\
&\quad (1 - P_{P|Ci})U_i^{NL}(Y_i - C_i - S_i')] \quad (10) \\
\frac{\partial E(U_i^{NL})}{\partial P_{P|Ci}} &= -P_{Ai}P_{C|Ai}[U_i^{NL}(Y_i - C_i - S_i') - U_i^{NL}(Y_i - C_i - S_i)]. \quad (11)
\end{aligned}$$

Proposition 1 implies that each of (9), (10) and (11) must be negative, and so in each case the terms inside brackets must be positive. For the term in brackets in (9), $U_i^{NL}(Y_i)$ is deflated by a weighted average of two numbers smaller than itself, since the first number in the average is itself a weighted average of two numbers smaller than $U_i^{NL}(Y_i)$ and the second number, $U_i^{NL}(Y_i - C_i)$, is also smaller than $U_i^{NL}(Y_i)$. For the bracketed term in (10), $U_i^{NL}(Y_i - C_i)$ is deflated by a weighted average of two numbers smaller than itself (assuming $S_i, S_i' > 0$). Therefore, (9) and (10) are negative assuming that U_i is an increasing function of the income of criminal activity. The bracket term in (11) is negative if the earlier assumption that prison is the most severe sanction for the particular crime ($S_i > S_i'$) is met.

A.2 Proof of Proposition 2

The negative point elasticities of expected utility with respect to unit increases

in each of the deterrence variables are obtained from (9), (10) and (11) to allow a comparison of the marginal disutility associated with a unit increase in each probability.

$$
\begin{aligned}
& -\frac{\partial E(U_i^{NL})}{\partial P_{Ai}} \frac{P_{Ai}}{E(U_i^{NL})} = \frac{1}{E(U_i^{NL})} P_{Ai} U_i^{NL}(Y_i) \\
& -\frac{1}{E(U_i^{NL})} \left\{ P_{Ai} P_{C|Ai} \left[P_{P|Ci} U_i^{NL}(Y_i - C_i - S_i) + (1 - P_{P|Ci}) U_i^{NL}(Y_i - C_i - S_i') \right] \right\} \\
& -\frac{1}{E(U_i^{NL})} \left[P_{Ai}(1 - P_{C|Ai}) U_i^{NL}(Y_i - C_i) \right] \\
= \; & \frac{1}{E(U_i^{NL})} \left[P_{Ai} U_i^{NL}(Y_i) - P_{Ai} P_{C|Ai} P_{P|Ci} U_i^{NL}(Y_i - C_i - S_i) \right] \\
& -\frac{1}{E(U_i^{NL})} \left[P_{Ai} P_{C|Ai}(1 - P_{P|Ci}) U_i^{NL}(Y_i - C_i - S_i') + P_{Ai}(1 - P_{C|Ai}) U_i^{NL}(Y_i - C_i) \right].
\end{aligned} \tag{12}
$$

$$
\begin{aligned}
& -\frac{\partial E(U_i^{NL})}{\partial P_{C|Ai}} \frac{P_{C|Ai}}{E(U_i^{NL})} = \frac{1}{E(U_i^{NL})} P_{C|Ai} P_{Ai} \left[U_i^{NL}(Y_i - C_i) - P_{P|Ci} U_i^{NL}(Y_i - C_i - S_i) \right] \\
& -\frac{1}{E(U_i^{NL})} P_{C|Ai} P_{Ai}(1 - P_{P|Ci}) U_i^{NL}(Y_i - C_i - S_i') \\
= \; & \frac{1}{E(U_i^{NL})} \left[P_{Ai} P_{C|Ai} U_i^{NL}(Y_i - C_i) - P_{Ai} P_{C|Ai} P_{P|Ci} U_i^{NL}(Y_i - C_i - S_i) \right] \\
& -\frac{1}{E(U_i^{NL})} \left[P_{Ai} P_{C|Ai}(1 - P_{P|Ci}) U_i^{NL}(Y_i - C_i - S_i') \right].
\end{aligned} \tag{13}
$$

$$
\begin{aligned}
& -\frac{\partial E(U_i^{NL})}{\partial P_{P|Ci}} \frac{P_{P|Ci}}{E(U_i^{NL})} = \\
= \; & \frac{1}{E(U_i^{NL})} P_{Ai} P_{C|Ai} P_{P|Ci} \left[U_i^{NL}(Y_i - C_i - S_i') - U_i^{NL}(Y_i - C_i - S_i) \right] \\
= \; & \frac{1}{E(U_i^{NL})} \left[P_{Ai} P_{C|Ai} P_{P|Ci} U_i^{NL}(Y_i - C_i - S_i') - P_{Ai} P_{C|Ai} P_{P|Ci} U_i^{NL}(Y_i - C_i - S_i) \right].
\end{aligned} \tag{14}
$$

Subtracting (13) from (12) yields

$$
\begin{aligned}
& \frac{1}{E(U_i^{NL})}\{P_{Ai}U_i^{NL}(Y_i) - P_{Ai}(1-P_{C|Ai})U_i^{NL}(Y_i - C_i) - P_{Ai}P_{C|Ai}U_i^{NL}(Y_i - C_i)\} \\
= & \frac{P_{Ai}}{E(U_i^{NL})}\{U_i^{NL}(Y_i) - P_{C|Ai}U_i^{NL}(Y_i - C_i) - (1-P_{C|Ai})U_i^{NL}(Y_i - C_i)\} \\
= & \frac{P_{Ai}}{E(U_i^{NL})}\{U_i^{NL}(Y_i) - U_i^{NL}(Y_i - C_i)\} \\
> & \ 0,
\end{aligned}
$$

if $C_i > 0$ and U_i^{NL} is an increasing function of the benefit of criminal activity. Under these conditions, the marginal disutility associated with an increase in P_{Ai} is greater than that associated with a corresponding increase in $P_{C|Ai}$. Subtracting (14) from (13) yields

$$
\begin{aligned}
& \frac{1}{E(U_i^{NL})}\{EP_{Ai}P_{C|Ai}U_i^{NL}(Y_i - C_i) - P_{Ai}P_{C|Ai}(1-P_{P|Ci})U_i^{NL}(Y_i - C_i - S_i') - \\
& P_{Ai}P_{C|Ai}P_{P|Ci}U_i^{NL}(Y_i - C_i - S_i')\} \\
= & \frac{P_{Ai}P_{C|Ai}}{E(U_i^{NL})}\{U_i^{NL}(Y_i - C_i) - P_{P|Ci}U_i^{NL}(Y_i - C_i - S_i') - \\
& (1-P_{P|Ci})U_i^{NL}(Y_i - C_i - S_i')\} \\
= & \frac{P_{Ai}P_{C|Ai}}{E(U_i^{NL})}\{U_i^{NL}(Y_i - C_i) - U_i^{NL}(Y_i - C_i - S_i')\} \\
> & \ 0,
\end{aligned}
$$

provided that $S_i' > 0$ and U_i^{NL} is an increasing function of the benefit from criminal activity. It follows that the deterrent effects of the criminal justice system are ordered according to Proposition 2 if $C_i, S_i' > 0$ and utility increases with the benefit of criminal activity.