Assessing the Regional Economic Impact of an Airport: A Dynamic Multiregional CGE Study of Melbourne Airport

by John Madden

Centre of Policy Studies

Monash University

Melbourne, Australia

Paper presented to Fourth Biennial Regional CGE Modelling Workshop, Melbourne, 16 & 17 September 2004

Economic impact studies are regularly undertaken for major airports around the world

- Wilbur Smith Associates claims it has undertaken economic impact analysis on over a thousand airports
  - "ranging in size from small turf fields to huge passenger air cargo hubs"
- Computer software available to do the job
  - Wisconsin Bureau of Aeronautics estimate economic contribution of Burlington Airport using the WisDOT Airport Benefit-Cost System
- Generally (extended) input-output techniques used to measure backward linkages (and often forward linkages as well)

Economic Contribution of Melbourne Airport

- Australian Pacific Airports wanted an update of the Travers Morgan 1987 study of Melbourne Airport
- Travers Morgan study had adopted following methodology:
  - Collected data on airport activities (e.g. passenger-related activities, freight related activities, airport operations and maintenance services)
  - Used this data to construct I/O accounts for those activities
  - Economic impact of airport computed by comparing "with airport" to "without airport". Essentially computed I/O multipliers from airport activities.
  - Presented results for direct, indirect and induced impacts.
  - But they note that their results could be an overstatement.
- "… if the Airport did not exist or were not allowed to expand, much of the traffic it handles would seek to use substitute transport modes" (Travers Morgan, 1987, page 6)

Melbourne without its Airport?

- Computing exactly what the economy would look like in the absence of such an important airport as Melbourne is not an easy task.
- Probably the reason that airport studies in the past appear to have chosen to ignore any indirect impacts other than those arising from the absence of an airport's demands for intermediate inputs and labour and, sometimes, visitor expenditure.
  - An exception Hakfoort, Poot & Rietveld (2001)
- Omitted effects likely to be extremely large - and can be of either sign.
- Computation of such omitted effects can present considerable difficulties.
- Even including visitor expenditure presents difficulties.
  - Imagine no Melbourne airport. Tourists who would normally have travelled to Victoria by air would either not travel here (went elsewhere or stayed at home) or use some other mode of transport. Negative flow-on effect on Victoria's economy of reduced expenditure on accommodation, restaurants and entertainment.
  - However, Victorians who, without an air travel option, stayed at home, would have a positive effect on spending in the state (spend their money in Victoria rather than interstate or overseas). There would be a welfare cost of course, as Victorians were denied the consumer surplus they enjoyed from travelling outside the state.

No Melbourne Airport!!

- Also be important effects for those who shifted their mode of transport.
- Jobs losses in Victorian air transport partly offset by job gains in alternative forms of transport such as rail and bus.
- In the analysis here we abstract from considering Essendon, Avalon and Moorabbin airports, etc as substitute landing sites. In the Travers Morgan study Essendon airport was included in the "Airport" under examination.

No Melbourne Airport!!

. Also be important effects for those who shifted their mode of transport.

. Jobs losses in Victorian air transport partly offset by job gains in alternative forms of transport such as rail and bus.

- Economics of a high-speed train from Melbourne to Sydney could alter.
- Additional jobs servicing private motor vehicles, etc.
- But, overall efficiency of the Victorian economy would decline.
  - Absence of air passenger travel would curtail business travel
  - Melbourne would have difficulty in attracting/holding skilled workers

And no Melbourne Air Freight Facilities?

- Victorian companies would need to hold higher levels of stocks
- Delays - urgent interstate orders couldn't be filled.
- International deliveries would need to come by land transport from an alternative airport.
- A decline in Victorian industry competitiveness (particularly in industries that relied on speedy delivery to export markets) would see Victoria lose employment to other states.
- **Viewed in this way, the Travers Morgan estimates might in reality be underestimates**

Computing a Without Melbourne Airport - Impossible

- Taking all these effects into account would be massive undertaking.
- However, the alternative of computing old-style economic impact figures that ignored such very large effects, would lead to results that had virtually no economic meaning.
- Indeed, the process of conceptualising what a "without" situation really means, raises the obvious question of whether there is any real justification for estimating the economic impact of an essential facility, such as Melbourne airport.
- After all, the counterfactual – that there were no Melbourne airport – is not a realistic alternative.

So how was the question answered

- Two approaches:
- Approach 1 – contribution to the economy of the immediate locality
- Made estimates of employment, value-added and taxes generated by airport activities within the precincts of Melbourne Airport and in immediately associated offsite activities
- A clear conceptual meaning at least

From a national perspective, the idea of employment contribution has little meaning at any rate

"To us, the contribution that an industry can make to the economy is not measured by employment in the industry and in its suppliers. Employment is an indication of what the industry takes out of the economy. Apart from short-run adjustment issues, the decision by an industry to employ more people is a decision to impose a cost on the economy which must be compensated by increased output.

In the long run, an industry's contribution to the economy should be measured by improvements in the industry's ability to make productive use of the economy's resources. In other words, the main contribution that an industry can make is to improve its own productivity."

Dixon and Rimmer (2002)

Contribution of Melbourne Airport Regionally and Nationally 1997-98 to 2001-02

- Approach 2: An Efficient Melbourne Airport
- Interpret economic contribution of Melbourne Airport as degree to which it has allowed Victoria to make productive use of its resources.
- Rather than unrealistic hypothetical situation of closure of the airport as the counterfactual situation, look at more plausible hypothetical counterfactual
  - Examine how Melbourne Airport has contributed to the economy over the recent past.
- In recent years Australia's Air Transport industry good productivity growth
  - primary factor productivity growing in a typical year around 3 per cent above the all-industry average.
- Simulate the case where Victorian Air Transport enjoyed only the average productivity performance, due perhaps, hypothetically, to Melbourne Airport not being as efficient as it has been in reality.
- Better performance of the economy under actual situation compared with hypothetical situation could be interpreted as economic contribution of having efficient Melbourne Airport over recent years.

Direct Contribution: Local effect (Approach 1)

- Direct contribution of Melbourne Airport defined as activity of businesses and other operations located within the precincts of Melbourne Airport and their associated off-site operations. This encompasses:
  - airline operations (including such ancillary operations as check-in, baggage handling, in-flight meals preparation),
  - supporting operations (such as aircraft maintenance and air traffic control),
  - airport administration,
  - transport operations which use airline services (such as freight forwarders),
  - various government services (such as customs and police), and
  - activities that locate themselves at the airport to service travellers (such as retail outlets, car rentals and buses).
- Comprehensive survey of certain variables; estimated rest using I/O coefficients from existing Airport, Services to Transport and other industries

Direct Contribution of Melbourne Airport

No.	MMRF Industry	Employment	Wage Bill	Gross Operating Surplus	Payroll Tax	Other Taxes
		jobs	$m	$m	$m	$m
16	Aircraft Maintenance	1,258	64.4	16.0	3.3	0.5
23	Retail Trade	629	9.5	1.7	0.3	0.5
25	Accommodation, Cafes, etc	330	9.3	5.0	0.5	1.7
26	Road Transport	320	25.7	14.6	1.3	5.5
29	Air Transport	5,611	286.1	133.5	15.0	55.2
30	Services to Transport	1,671	97.5	129.7	4.7	5.0
32	Finance, Business Services	204	9.8	4.3	0.4	0.3
34	Public Services	403	22.2	3.1	0.0	0.3
35	Other Services	20	0.8	0.1	0.0	0.0
	Total	10,446	525.3	308.0	25.5	69.1

Contribution of a More Efficient Airport

- Conducting MMRF-GREEN simulations over the historical period 1997-98 to 2001-02 for two alternative situations.
- One situation includes the improvements in Melbourne Airport productivity as actually occurred. Other is for hypothetical case where Melbourne Airport had a lower level of productivity improvement – one equal to that which the average Victorian industry experienced.
- Take "actual" productivity figures from historical simulation with MONASH model.
- Lower airport productivity case involved a standard mode simulation which used the same exogenous shocks as the actual-case simulation with one exception.
- Values given to the primary-factor technical change variable for the Victorian Air Transport sector was a lower figure than for the actual-case simulation.
- Interpret the difference between the actual-case and the hypothetical lower-productivity case as the effects of an efficient Melbourne airport.

Table 3: Effects on Key National Aggregates of an Efficient Melbourne Airport

	1997-98	1998-99	1999-00	2000-01	2001-02
Real Consumption ($m)	45.5	93.5	142.2	172.4	207.2
Real GDP ($m)	57.1	120.8	183.6	239.3	298.3
Employment (jobs)	344	565	715	851	881

Table 4: Effects on Victorian Economy of an Efficient Melbourne Airport

		1997-98	1998-99	1999-00	2000-01	2001-02
Real Consumption	$m	74.9	160.4	244.3	302.4	364.9
	%	0.08	0.17	0.24	0.29	0.34
Real GSP	$m	99.4	212.3	331.1	431.1	536.2
	%	0.07	0.15	0.22	0.28	0.33
Employment	jobs	1,229	2,484	3,680	4,382	5,071
	%	0.06	0.12	0.18	0.20	0.23

Effects on North-West Melbourne

- MMRF results decomposed to 3 Victorian regions – using essentially the method of Dixon, Parmenter & Sutton (1978)
- Essence of method:
  - Industries are divided into two categories - those that sell goods traded interregionally (or internationally); and those that sell goods that are traded just within the local region (local goods).
  - In general, the output of a particular non-local industry changes by the same percentage in each region.
  - However, a non-local industry can have differing effects across regions on the total change in aggregate regional activity (gross regional product), depending on how important the industry is to total output in the base year.
  - Output of local industries determined by demand within their own region.
  - It is within the local industries that local multiplier effects are generated.
  - In the version of the model used in this study there are only two local industries, namely Retail trade and Housing (or Ownership of Dwellings).

- Three regions: Airport District, Rest of Melbourne and Rest of Victoria

  Airport District - following areas within north-west Melbourne - city of Hume (includes Broadmeadows, Craigieburn and Sunbury), statistical local area of Keilor (part of city of Brimbank), city of Moreland (includes North Moreland, Brunswick and Coburg), and Moonee Valley (includes Essendon and West Moonee Valley).
- Nature of this spatial division required alteration to theoretical structure of top-down method.
- Standard top-down theory assumes household demand for local commodities in a region depends primarily on wage income and that this income earned by working for industries located within the same region.
- But, ABS journey to work data indicates considerable number of persons work in one of the 3 Victorian regions but reside in another.

  Many residents of Airport Region work in Rest of Melbourne; many workers in Air Transport industry in Airport District reside in Rest of Melbourne or nearby areas in the Rest of Victoria.
- People likely to spend more in the locality in which live, rather than their work location.
- To capture this concept in our simulations, altered the consumption function within the regional decomposition model, so that household expenditure in a region reflected the wage income of residents, plus non-labour income.

Local effects of Efficient Melbourne Airport

Good growth in productivity in Vic Air transport over 5 years of simulation generates increased activity in Air transport in the Melbourne Airport District from just over 2 per cent higher in 1997-98 to almost 9.5 per cent by 2001-02.

But, part of the productivity improvement is greater efficiency in the use of labour, which means a lower amount of labour per unit of output. Despite the increased output of the industry, there are just over 10 less jobs in Air Transport in the Airport District in 1997-98, and 175 less jobs by 2001-02.

Table 5: Effects on Economy of Airport District of an Efficient Melbourne Airport

	1997-98	1998-99	1999-00	2000-01	2001-02
Real Consumption ($m)	-0.3	-1.5	-2.4	-4.3	-6.4
Real GRP ($m)	25.1	49.8	75.9	100.3	124.4
Employment (jobs)	-11	-45	-71	-124	-175

Negative flow-on to real consumption expenditure within the Airport District is relatively small, partly due to a considerable portion of the reduced consumption expenditure of the displaced Air Transport workers relating to purchases made in Rest of Melbourne where most airport workers reside.

Policy Shock: Removal of Curfew-Free Status

- Melbourne Airport, unlike its rivals, enjoys a curfew-free status
- Occasionally local residents object
- Look at consequences if curfew-free status were removed
- Assumed curfew would operate each night from 11 pm to 6 am.
- Examined in detail the 2,800 aircraft movements in a typical week at Melbourne Airport
- 6.6 per cent of movements at night
- But 12.2 per cent of flights vulnerable – since this is percentage that either lands or takes-off at night

Vulnerability of Flights to a Night Curfew

		Vulnerable Flights	Daytime-only Flights	Total Flights	Percentage Vulnerable
Domestic	Passenger planes	46	1,103	1,149	4.0
	Freighters (a)	65	17	82	79.3
International	Passenger planes	64	130	194	33.0
	Freighters	2	20	22	9.1
All flights		177	1,270	1,447	12.2

(a) Based on arrivals data only

But what would be the reduction in flights?

- At one extreme all vulnerable flights would be withdrawn
- At the other extreme all flights would be rescheduled.
- Little information on the matter
- (One of the major determinants of departure and arrival times for the flights that are vulnerable, particularly the international ones, relates to restrictions in destination and origin airports. This is a factor that might prevent a rescheduling of all flights)
- In absence of better information modelled worst-case scenario (no flights rescheduled)
- Also looked at alternative case - half domestic and international flights could be rescheduled

Demand for air transport is a derived demand

- Need to account for withdrawal of expenditure at intended destination
- Foreign travellers purchase a trip (combination of air travel, accommodation and restaurants, and other services)
- Shock restricts number of seats – remaining seats rationed through fare increase (a tax shock)
- Local suppliers lose custom of those who do not travel to Australia
- Also reduce outbound international tourism by Victorians
- Reduction in use of Melbourne by Victorian and interstate travellers
- Expenditure redirected to home state
- Substitution of road freight for air transport

Table 6: Effects on Key National Aggregates of a Melbourne Airport Curfew[(a)]

No Rescheduling of Curtailed Night Flights

	2002-03	2003-04	2004-05	2005-06	2006-07
Real GDP ($m)	-64.6	-69.0	-72.3	-70.1	-78.1
Employment (jobs)	-1,071	-929	-759	-569	-621

Table 7: Effects on Victorian Economy of a Melbourne Airport Curfew

No Rescheduling of Curtailed Night Flights

		2002-03	2003-04	2004-05	2005-06	2006-07
	$m	-190	-212	-227	-242	-283
Real Consumption	%	-0.17	-0.18	-0.19	-0.20	-0.22
	$m	-127	-161	-195	-232	-286
Real GSP	%	-0.35	-0.40	-0.44	-0.49	-0.54
	jobs	-2,680	-2,945	-3,149	-3,423	-4,062
Employment	%	-0.13	-0.14	-0.14	-0.15	-0.18

Table 8: Effects on Economy of Airport District of a Melbourne Airport Curfew

No Rescheduling of Curtailed Night Flights

	2002-03	2003-04	2004-05	2005-06	2006-07
Real Consumption ($m)	-45.6	-48.1	-50.4	-52.3	-55.4
Real GRP ($m)	-45.7	-52.9	-61.7	-71.3	-82.5
Employment (jobs)	-804	-835	-875	-924	-996

Table 9: Effects on Employment by Industry in the Airport District of a Melbourne Airport Curfew No Rescheduling of Curtailed Night Flights

	2002-03	2003-04	2004-05	2005-06	2006-07
Aircraft manufac. & maintenance	-25	-25	-26	-27	-29
Construction	-27	-25	-22	-20	-23
Wholesale trade	-7	-8	-8	-9	-10
Retail trade	-37	-42	-45	-48	-51
Repairs (other than aircraft)	-4	-4	-4	-4	-5
Hotels, cafes & restaurants	-11	-16	-24	-31	-41
Air transport	-525	-545	-588	-627	-659
Road Transport	5	4	3	3	2
Transport services	-23	-18	-16	-15	-16
Finance, business services	-16	-17	-17	-18	-20
Public services	-9	-11	-11	-12	-13
Other services	13	7	1	-6	-16
All other industries	-139	-134	-117	-109	-115
Total Airport District Employment	-804	-835	-875	-924	-996

Table A: Effects on Key National Aggregates of a Melbourne Airport Curfew – 50 % Rescheduling of Curtailed Night Flights

		2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09
Australia								
Real Consumption	$m	-69.7	-72.3	-71.5	-68.3	-76.4	-58.3	-49.7
GDP	$m	-30.4	-32.0	-33.4	-32.2	-36.1	-24.1	-42.6
Employment	Jobs	-569	-486	-395	-297	-323	-39	0
Victoria								
	$m	-97	-108	-116	-124	-144	-150	-131
Real Consumption	%	-0.09	-0.09	-0.10	-0.10	-0.11	-0.10	-0.09
	$m	-65	-82	-99	-118	-145	-170	-178
GSP	%	-0.18	-0.20	-0.22	-0.24	-0.27	-0.28	-0.28
	$m	-1,377	-1,506	-1,607	-1,745	-2,065	-1,992	-1,627
Employment	%	-0.06	-0.07	-0.07	-0.08	-0.09	-0.08	-0.06
Airport District								
Real Consumption	$m	-22.6	-23.9	-25.1	-26.1	-27.8	-27.9	-28.1
GRP	$m	-22.8	-26.3	-30.8	-35.6	-41.3	-43.8	-46.0
Employment	jobs	-400	-415	-436	-461	-497	-464	-436