FOREIGN STUDENTS AND REGIONAL ECONOMIES: A MULTIREGIONAL GENERAL EQUILIBRIUM ANALYSIS

James Giesecke
Centre of Policy Studies, PO Box 11E, Monash University, VIC 3800

ABSTRACT: A major development in the Australian higher education sector has been the rapid increase in foreign student enrolments. This growth has been due, in part, to universities responding to limits on federal funding by seeking alternative revenue sources, such as foreign student fees. As a result, universities across the country now compete for foreign student numbers. One expression of this competition has been the undertaking of studies to investigate the regional effects of foreign students and university activity in general. These studies have tended to focus on local economic effects, overlooking that the economic phenomena under study - local foreign student expenditures and university activity in general - are often an irreducible part of a wider national economic phenomenon. This study takes a whole-of-economy perspective on the regional economic consequences of foreign students. Specifically, a dynamic multiregional computable general equilibrium (CGE) model is used to examine the effects of foreign students on the economies of Australia's eight states and territories.

1. INTRODUCTION

Australia has experienced a substantial increase in enrolments of foreign higher education students in recent years[1], and the provision of education services to these students is now a significant export industry, generating approximately $AUD 2.0 billion in export revenue in 2000. This increase is, in part, an expression of the limits on growth in federal funding of Australian universities and the resulting movement by the universities towards alternative revenue sources such as foreign student course fees[2]. Universities throughout the country have increased their marketing efforts in their competition for foreign student numbers, and the further increase of foreign student numbers is a major component of the strategic plans of many universities.

One expression of the universities' marketing efforts has been the commissioning of studies to investigate the regional economic consequences of foreign student expenditures and the regional economic consequences of university activity in general. These studies are used by universities in their

[1] Between 1988 and 2000 the number of foreign higher education students enrolled in Australia grew by 425 percent, or 15 percent per annum. In comparison, the total number of higher education students in Australia grew by only 65 percent, or 4.3 percent per annum (DETYA, 2001).

[2] The success of Australian institutions in this market has also been assisted by cost advantages relative to other major English-speaking destinations for foreign students.

lobbying of Commonwealth and state governments for funding increases[3]. For example Chapman (1997) notes that it is sometimes argued in Australia that an important dimension to policy making relating to higher education is the geographical location of universities because of the economic and social effects of their presence on the regions in which they are located. The Australian Vice-Chancellors' Committee (2001) cites the regional economic benefits of foreign student expenditures as an additional positive effect of greater foreign student numbers, stating "the regional impacts of international education may in some instances be much greater in relative terms than national impacts. Universities are major employers in many regional areas and the spending by thousands of international students would be a major boost to regional economies".

The effects of foreign student expenditures on regional activity in Australia have been investigated by McKay and Lewis (1995), Peter (1997) and Duhs and Duhs (1997). McKay and Lewis (1995) evaluated the effects of foreign student expenditures on the regional economy of Wollongong, concluding that each foreign student at Wollongong University created an average of 0.57 full time equivalent jobs in the region. Peter (1997) used a multi-regional CGE model to investigate the impact on Tasmania of foreign student expenditures in Tasmania alone. He found Tasmanian real GSP to be 0.14 per cent higher in the short-run. Duhs and Duhs (1997) considered the general significance for the Queensland economy of the growth in the export of education services from that region. A feature common to each of these studies is that no account is taken of the indirect effects on the region under study of expenditures by foreign students located in regions outside of that under study.

As part of their marketing and political lobbying efforts, many Australian universities have also thought it worthwhile to commission studies that investigate their contributions to regional economic activity. Examples of such studies include Latrobe University (Michael, 1996), Southern Cross University (Davis *et al*., 1996), the University of Western Australia (Greig, 1997); the University of New South Wales (Milbourne *et al*., 1993), the University of Southern Queensland (Temple-Smith and Elvidge, 1996), the University of Central Queensland (Zimmer, 1992), the three South Australian universities (South Australian Vice-Chancellors, 1996) and the Curtin University of Technology (Cabalu *et al*., 1999). This interest by universities in their impact on the local economy is not confined to Australia. Overseas examples of such studies include the investigation of the economic impact of the University of Waikato (Hughes, 1994); Lancaster University (Armstrong, 1993); the University of Nottingham (Bleany *et al*., 1992); the Wolverhampton Polytechnic (Lewis, 1988); the University of Portsmouth (Harris, 1997); and the University of Exeter (Coates, 1994).

A feature common to each of these studies is a focus on only the activity of the local university or spending by local foreign students. Little or no

[3] Such lobbying can be effective because of the political imbalance favouring the smaller states in the Australian Senate (see Madden, 2002) and the more general importance of regional development issues in attempts by politicians to secure marginal seats.

consideration is given to economy-wide factors such as those relating to the funding of the university, or the indirect effects of university operations and foreign student expenditures in other regions. This focus is not necessarily a shortcoming of these studies, to the extent that the direct effects under investigation (local foreign student enrolments or local university activity) can be said to be independent policy instruments under the control or influence of the decision makers in the region under study. In the Australian case, marginal changes in the direct effects (that is, a change in the current level of foreign students enrolled in the region, or a change in the current level of local university activity) might be influenced by regional decision makers. However, the same cannot necessarily be said for the total of the direct effect. The Australian higher education system remains largely funded by the Commonwealth Government out of taxes levied economy-wide, and foreign students are attracted to Australia as much by general factors (such as the exchange rate, visa requirements, and perceptions of the country as a whole) as by factors specific to the region in which their university of enrolment is located. Hence there is a second dimension to the problem of measuring these impacts, namely, taking account of the indirect effects on the region under investigation of the spending by foreign students taking place in other regions.

This paper attempts to elucidate this dimension of the problem in its assessment of the effects of the provision of higher education services to onshore foreign students on the distribution of economic activity across Australia's eight states and territories (hereafter, "states"). In assessing the consequences of foreign student expenditures in any one region, the modelling takes explicit account of the indirect effects on that region of foreign student expenditures in other regions. The regional economic consequences of foreign students are calculated by considering a hypothetical scenario in which, starting in the year 2000, foreign higher education students do not come to Australia. The implications for the Australian economy of such a scenario are then tracked over the period 2000 to 2005. Examining the question over this time frame illuminates both the short-run and long-run consequences of foreign student expenditures for regional economic activity[4]. The modelling methodology employed in this paper is similar to that used by Dixon, *et al.*, (1998) and Dixon, *et al.*, (2002) who investigated the consequences of changing the future growth rate in foreign student numbers to reflect the (then) expected downturn in student arrivals to Australia following the Asian financial crisis.

The remainder of this paper proceeds by first describing the model in Section 2. Section 3 describes the data used in the analysis. Section 4 presents the results. Naturally, the discussion of results emphasises the regional consequences of foreign student demands. However the regional effects are best

[4] While 2000 to 2005 is not a very long period, the modelling of the labour market allows long-run conclusions to be drawn by 2005. We follow the conventional Australian macroeconomic modelling assumption that changes in aggregate employment are largely eliminated by changes in real wages within five years of an initial shock. While adjustments to capital stocks will continue beyond this point, the direction of change in the aggregate capital stock is established by 2005.

understood by first considering the macroeconomic and sectoral consequences of the shock. Hence Section 4 proceeds by first briefly describing the macroeconomic effects. These prove important in explaining the effects of foreign students on the industrial composition of economic activity. After describing the industry impacts, the regional impacts are described in detail.

2. THE MODEL

2.1 The Monash Model

The effects of foreign students on Australian regional economies are evaluated in this paper using the MONASH model of the Australian economy (Dixon and Rimmer, 2002). MONASH is large and detailed, making it impractical to provide a full description of its theoretical structure and database in this paper. However, the discussion of results in Section 4 relies on familiar economic mechanisms, so that the reader is not required to know all the details of MONASH in order to understand the simulation results. The remainder of this section provides a brief overview of MONASH. The reader is referred to Dixon and Rimmer (2002) for a detailed discussion of the model.

MONASH is a dynamic computable general equilibrium model of the Australian economy, and is descended from the earlier comparative-static model ORANI (Dixon *et al.*, 1982). The model features detailed sectoral disaggregation, with the version employed in this paper featuring 107 industries and commodities. Familiar neoclassical assumptions govern the behaviour of the model's economic agents[5]. Decision-making by firms and households is assumed to be governed by maximising behaviour. Investors allocate new capital to industries on the basis of expected rates of return. The demand for any given Australian commodity by foreigners is assumed to be inversely related to its foreign-currency export price. The model recognises both the consumption of commodities by government, and a variety of direct and indirect taxation instruments. In general, markets are assumed to clear and to be competitive. Purchaser's prices differ from producer prices by the value of any indirect taxes and a variety of margin services. Dynamic equations describe stock-flow relationships, such as those between capital and investment, and debt and savings. Dynamic adjustment equations allow for the gradual movement of a number of variables towards their long-run values. In particular, real wages are assumed to be sticky in the short-run, adjusting over a period of about five years to return the number of unemployed to its base-case level following some economic shock. Other developments to the model facilitate the use of extraneous data from forecasting organisations and official statistical

[5] Of these assumptions, among the most important for the regional analysis reported in this paper are that flexible real wages eventually return national employment to its base case level, and that long-run rates of return on capital are exogenous. Combined with the ORES (see Section 2.1) assumption that capital and labour are mobile between regions, in the absence of changes in productivity, an increase (decrease) in output in one region will typically require a decrease (increase) in output in other regions.

publications during simulations designed to either track history or forecast the future. The model is solved with the GEMPACK suite of computer programs (Harrison and Pearson, 1996).

2.2 The MONASH Regional Equation System

An important part of the modelling reported in this paper is the regional extension to the national MONASH model. The national industry results from the MONASH model are decomposed to the eight states using the ORANI Regional Equation System (ORES) (Dixon *et al*., 1982). ORES is based on the method devised by Leontief *et al*., (1965), for disaggregating to the regional level results from a national input output model. The central assumption in this method of regional decomposition is that industries can be divided into two categories: "national" and "local". National industries are defined as those that produce only national commodities, these being commodities which are readily traded between regions (such as many processed food products, metal products, machinery and equipment, and so on). In the ORES theory, the output of national industries at the regional level is determined independently of changes in regional activity, with the percentage change in the activity of national industry (j) in region (r) being set equal to the percentage change in the Australia-wide activity of industry (j) as determined within MONASH. Local industries are defined as those that produce only local commodities, these being commodities which are not readily traded inter-regionally (such as residential building, water and sewerage, personal services). Activity levels of local industries are determined by regional market clearing conditions for local commodities. While the ORES system has a number of limitations for regional analysis (see Dixon, *et al.,* 1982) it has the advantages of: modest data requirements; possessing the required aggregation properties for commodity outputs and regional aggregate demand variables; and capturing two of the important mechanisms which distinguish the regional consequences of national shocks (these being differences in regional industrial structure, and regional multiplier effects). The method is appropriate in the present application for three reasons: we are investigating an economy-wide demand-side shock; the method is capable of capturing differences in the inter-regional incidence of foreign student demands; and, there are unlikely to be material differences across regions in the input structures of the sectors providing the key inputs to foreign student demands (such as education and housing).

3. DATA

In addition to the core data of the MONASH model, three additional sets of data were required for this modelling exercise. The first two data sets related to foreign student numbers and foreign student expenditures and the third related to the regional distribution of foreign student numbers. A description of these data and their sources is provided below.

3.1 Foreign Student Expenditures

Data on the commodity composition of spending by foreign higher education students was obtained from Australian International Education Foundation (1998) who report the results of a survey of foreign students undertaken by Morgan Research Centre (MRC) in 1997. These data were used to divide, among commodities, the estimate of aggregate expenditure on "goods and services" by onshore foreign higher education students in the year 2000 ($AUD 1009 million) reported in Australian Education International (2001). Australian Education International (AEI) estimate that these students spent approximately $AUD 978 million on course fees in the same year, bringing their total spending within Australia to $AUD 1986 million.

Before the estimates of aggregate expenditure by (MRC) commodity could be input to the model, they were further manipulated in a number of steps. First, the MRC commodity categories in the original data were mapped to the 107 commodity categories recognised in the MONASH model. In accordance with this mapping scheme, expenditure on each of the MRC commodity categories was distributed across the MONASH commodity categories using the household expenditure shares for each MONASH commodity within its given MRC commodity category. At this stage in the data manipulation, the data remained valued in purchaser's prices and did not distinguish whether the commodities were domestically or foreign sourced. Hence, before inputting the disaggregated data to the MONASH model, it was necessary that these purchaser's values be split into their basic-value / indirect tax / margin components, and their domestic / imported components. This split was undertaken using the basic-value / tax / margin shares and import / domestic shares for each commodity from the existing household expenditure data in the MONASH database.

3.2 The Regional Distribution of Foreign Students

Table 1 contains data on the number of onshore foreign higher education students in each region in 2000 (column 1) and each region's share in total student numbers (column 2). The information in Column (2), in conjunction with the information on total fee revenue (Section 3.2) and the values for the total costs of the *Education* sector in each region from the MONASH database, allows us to calculate the share of sales of each region's *Education* sector accounted for by fees paid by onshore foreign higher education students (Column 3). As we shall see in Section 4.4, the values in Table 1 largely determine the direct regional effects of the removal of foreign student expenditures. Table 1 makes clear that, while NSW and Victoria attracted the largest shares of foreign students, relative to the size of each region's education sector, fees from foreign higher education students are most important for the ACT, WA, and QLD.

Table 1. Foreign On-Shore Higher Education Students by State, 2000

Region	Number of students (a)	Share of total students (a)	Foreign fee revenue as share of total revenue (b)
New South Wales	22,172	30.5	3.4
Victoria	22,038	30.3	3.7
Queensland	13,679	18.8	4.1
Western Australia	8,502	11.7	4.9
South Australia	3,349	4.6	2.1
Australian Capital Territory	1,817	2.5	5.1
Tasmania	791	1.1	2.0
Northern Territory	176	0.2	1.3
Multi-state	193	0.3	na.
Total	72,717	100	3.6

Source: (a) AEI (2001), Table 13, (b) MONASH database shares.

4. FOREIGN STUDENTS AND THE REGIONAL DISTRIBUTION OF NATIONAL ACTIVITY

In this section the MONASH model is used to investigate the regional economic effects of foreign on-shore higher education students. This is done by considering a hypothetical scenario in which all expenditures by these students are reduced to zero. This modelling proceeded in two stages. In the first, a base-case forecast for the period 2000-2005 was constructed. In this forecast, student numbers grow at the rates described in Section 4.1 and the values of Australian macroeconomic variables conform to the forecasts of Access Economics (2002). Regional shares in foreign student numbers are given by their 2000 shares (Table 1) throughout the simulation. Note however that the base-case forecasts are not the focus of the present paper, and so only those elements of the base-case that affect how the economy responds to the removal of foreign higher education students will be discussed. The reader is referred to Dixon and Rimmer (2002) for a detailed discussion of how the base-case forecasts are generated with MONASH. In the second stage of the modelling, the number of onshore foreign higher education students is assumed to fall to zero in the year 2000 and remain zero thereafter. It is the resulting deviations for certain key economic variables away from their base-case forecast values that are then discussed in the remainder of Section 4. The explanation of results proceeds by first providing an overview of the main macroeconomic outcomes. These prove important in explaining how the sectoral composition of economic activity changes in response to the removal of foreign student expenditures. Changes in sectoral structure, in turn, are important in explaining how the regional distribution of national economic activity responds to this shock.

4.1 The Macroeconomic Effects of Foreign Higher Education Students

4.1.1 Real Student Expenditures in the base-case

Since foreign students must pay for their Australian education in Australian dollars, the base-case forecast for the trade-weighted index (TWI) exchange rate has an important influence on the macroeconomic consequences of reducing foreign student numbers to zero[6]. In the base-case forecast simulation, real foreign student expenditures are projected to grow rapidly in the first three years (2000-2002), and then less rapidly in the later three years (2003-2005) (row 1, Table 2). This growth path reflects the assumed future growth in student numbers over the simulation period (row 4)[7]. The foreign currency value of foreign higher education student expenditures (row 2) shows a somewhat different growth path to that exhibited by real student spending. Actual and forecast changes in the nominal exchange rate (row 3) in the base-case simulation result in the foreign currency value of spending by foreign higher education students growing relatively slowly over the first three years of the simulation period, and then relatively quickly over the last three years of the simulation period. There was a slight appreciation in the TWI exchange rate between 1999 and 2000, followed by depreciation in 2001. In the base-case simulation, the depreciation in the nominal exchange rate is anticipated to end in 2002. Thereafter, the exchange rate is forecast to appreciate in 2003 and 2004, and to be relatively unchanged between 2004 and 2005 (Access Economics, 2002). Foreign students pay for their Australian education in Australian dollars. Hence the depreciation in the exchange rate in the first half of the simulation period dampens the growth in the foreign currency value of overseas student demands. Likewise, the appreciation in the exchange rate in the second half of the simulation period augments the growth in the foreign currency value of

---

[6] This is one element of the base-case simulation that is important in understanding the deviation simulation.

[7] This forecast was constructed in the following way. Over the five years 1995 to 2000, the average growth rate in numbers of on-shore foreign higher education students has been very high, at 13.0 percent per annum (Australian Education International, 2001). It is assumed that annual growth rates will be high but declining in the future. By the final year of the simulation period, it is assumed that the growth rate will be double the rate of growth in real Australian GDP in that year. Real GDP growth is forecast to slow to 2 percent by the final year of the simulation period (Access Economics, 2002), hence foreign student numbers are forecast to grow by 4.0 percent in this year. Growth in 2001 is assumed to be equal to the average of the past five years (13.0 percent). This represents a relatively large fall from the growth rate in the previous year (19.4 percent) Growth rates in the intervening period are assumed to follow a straight line path. This provides forecast growth rates for the years 2001 to 2005 inclusive of 13.0, 10.7, 8.5, 6.2, and 4.0 percent. Readers interested in the implications for the regional results of alternative forecasts for student numbers should bear in mind that the regional shares in total foreign student numbers are held at their 2000 levels throughout the forecast. Hence, while this forecast is important in determining the *size* of the impacts reported in Sections 4.1 to 4.3, they have no material effect on the relative sizes and directions of the real regional GDP impacts (Section 4.3) which are the focus of this paper.

overseas student demands. As we shall see in the discussion of the deviation macro results, the rapid growth in the foreign currency value of foreign student expenditures makes the economy's task of accommodating the removal of spending by these students progressively more difficult over the simulation period.

Table 2. Base-Case Values

Variable	1999	2000	2001	2002	2003	2004	2005
Indices of onshore foreign higher education student expenditure:							
1. Real ($2000) domestic currency value (1999 = 1)	1.00	1.19	1.35	1.49	1.62	1.72	1.79
2. Foreign currency value (1999 = 1)	1.00	1.24	1.33	1.50	1.80	2.06	2.21
3. Index of TWI exchange rate (1999 = 1)	1.00	1.02	0.91	0.90	0.97	0.99	0.98
4. Onshore foreign higher education students ('000)	60.9	72.7	82.2	91.0	98.7	104.8	109.0

4.1.2 Employment, capital and GDP

Of all the industry sectors in the model, *Education* experiences the largest employment decline (-3.1 percent in 2000), reflecting the relative importance of the provision of higher education services to foreign students in the total output of the *Education* sector. Compared to those industries in the traded-goods sector that are stimulated by the removal of foreign student expenditures (see Section 4.2 below), *Education* is particularly labour-intensive. Hence the elimination of foreign student expenditures causes national employment to initially fall below its baseline value. National employment in 2000 falls by 0.20 percent (Table 3). Since employment in *Education* is approximately 7.3 percent of national employment, the 3.1 percent fall in employment in this sector contributes 0.23 percentage points (3.1 x 0.073) to the fall in national employment. However national employment falls by less than this amount (row 1), because the fall in employment brings with it a fall in the real wage (row 2) which reduces the extent of the national employment decline. The decline in national employment peaks in the year 2000 (the year in which foreign student demands are eliminated), and thereafter begins to return towards its base-case level. The return of employment towards its base-case level reflects the assumption in MONASH that, so long as employment is below its base level, workers are willing to accept reductions in their post tax real wage rate. By 2005 employment has all but returned to its base-case level. However this has required that the real consumer wage decline by just over half a percent relative to its baseline level. The declining real wage causes industries to move towards higher labour / capital ratios over time, hence the aggregate national capital stock is projected to fall as the real wage falls (row 3). In the first year in which foreign student demands are removed, real GDP falls by 0.12 percent (row 4), reflecting the fall in national employment in this year. Over time, as the real wage falls and employment returns to its base-case level, real GDP also moves

back towards its base-case level. By the final year of the simulation period, real GDP is only 0.03 percent below its forecast level. This deviation from base is due in part to employment not having yet fully returned to its forecast level (the deviation in employment is still -0.02 percent in 2005) and due in part to the contraction in the national capital stock (capital in 2005 is approximately 0.17 percent below its base-case value).

Table 3. Impact on Selected Variables of the Removal of Expenditures by Onshore Foreign Higher Education Students in 2000 (percentage deviation from baseline)

Variable	2000	2001	2002	2003	2004	2005
1. Employment	-0.20	-0.18	-0.16	-0.08	-0.04	-0.02
2. Real consumer wage	-0.10	-0.19	-0.27	-0.40	-0.50	-0.56
3. Capital	0.00	-0.03	-0.07	-0.10	-0.13	-0.17
4. Real gross domestic product (GDP)	-0.12	-0.12	-0.10	-0.06	-0.04	-0.03
5. Real consumption	-0.21	-0.22	-0.25	-0.31	-0.37	-0.41
6. Real investment	-0.33	-0.37	-0.40	-0.40	-0.43	-0.49
7. Real gross national expenditure (GNE)	-0.20	-0.22	-0.24	-0.28	-0.32	-0.36
8. Export volume (foreign student exclusive)	1.79	1.94	2.22	2.69	2.98	3.10
9. Export volume (foreign student inclusive)	0.23	0.29	0.48	0.92	1.23	1.39
10. Import volume	-0.35	-0.34	-0.33	-0.32	-0.32	-0.31
11. Real exchange rate	-1.04	-1.08	-1.19	-1.45	-1.61	-1.65
12. Terms of trade	-0.53	-0.56	-0.67	-0.91	-1.07	-1.12

4.1.3 Consumption, Investment and Net Exports

Real household consumption falls by 0.21 per cent in the first year (row 5). Household consumption in the model is linked to household disposable income. The real value of the latter falls because of the declines in both real GDP (row 4) and the terms of trade (row 12). Real investment (row 6) declines even more sharply than real consumption, reflecting the sensitivity of aggregate investment to changes in the desired national capital stock (row 3). Real government consumption expenditure is assumed to be unaffected by the decline in student numbers. Nevertheless, the declines in consumption and investment spending are sufficient to reduce real GNE (row 7) relative to real GDP (row 4). Relative to GNE, GDP is relatively unaffected by the shock because the nation's usage of primary factor inputs are somewhat insulated from the shock by - on the one hand - the short-run fixity of capital stocks and real wages, and - on the other hand - the long-run fixity of labour supply and rates of return on capital. With real GNE falling relative to real GDP, export volumes must expand relative to import volumes (rows 8-10). Real consumption spending remains approximately 0.2 per cent below its base-case level for each of the first three years of the simulation period. Thereafter, it declines further, falling to 0.41 per cent below its base-case level by 2005. The further contraction in real consumption

spending from 2003 onwards causes an additional increase in the positive deviation of real net exports from their base-case level (rows 8-10).

The path of real consumption spending in the first three years of the simulation period is the net result of two countervailing influences: rising employment (row 1), and the declining terms of trade (row 12). By 2003 employment has recovered almost two-thirds of its year 2000 contraction, and the effects of the terms of trade contraction begin to dominate the real consumption result from this year on. By 2005 the decline in real consumption spending is explained almost entirely by the terms of trade reduction.

4.1.4 Net Exports and the Real Exchange Sector

The increase in the balance of trade surplus (rows 9 and 10) is brought about through a depreciation in the real exchange rate (row 11). In the first year of the simulation period the real exchange rate depreciates by 1.0 per cent. Further real depreciation is required in the years 2003 and 2004, which are years of relatively strong growth in the foreign currency value of student expenditures in the base-case simulation (row 2 of Table 1). The depreciation in the real exchange rate brings about the increase in the balance of trade surplus shown in rows 9 and 10. The expansion in export volumes requires a deterioration in the terms of trade (row 12). The decline in the terms of trade arises from the MONASH assumption that foreign export demand schedules are less than infinitely elastic, so that an expansion in Australian export volumes must be associated with some decline in Australian export prices. As discussed in Section 4.2, the strong growth in aggregate export volumes is an important determinant of the performance of those industries that experience favourable growth prospects from the absence of foreign student expenditures.

4.2 Sectoral Results

The final column of Table 4 reports the 2005 deviations in output by industry at the national level. The industries that tend to expand when spending by foreign students is removed are those that benefit from the resulting depreciation in the real exchange rate. These industries either export a significant proportion of their output, or compete directly in the domestic market with imports. The five industries that experience the largest increases in output are *Basic non-ferrous metals and products* (+2.6 percent); *Agricultural services, hunting and trapping* (+2.7 percent); *Mining services* (+2.8 percent); *Other machinery and equipment* (+2.9 percent) and *Leather and leather products* (+4.1 percent). For each of these industries, the real-depreciation-induced increase in their direct export sales accounts for the largest part of the increase in their output. However growth in domestic sales is also important in explaining the growth in the output of these industries. In particular, *Agricultural services* and *Mining services* benefit (via increased intermediate-input sales) from the real-devaluation-induced expansions in the outputs of the agricultural and mining sectors. *Basic non-ferrous metals and products* also benefits from an expansion in the activity of the industries to which it supplies intermediate inputs. In addition to contributing directly to an expansion in the exports of *Other machinery and*

equipment and *Leather products*, the real depreciation is also important in lifting the output of each of these sectors by raising the relative price of competing imports.

Table 4. Regional Industry Activity Levels 2005 (cumulative percentage deviation away from base-case)

Industry	NSW	VIC	QLD	SA	WA	TAS	ACT	NT	Aust
1. Sheep	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3
2. Grains	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
3. Beef cattle	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
4. Dairy	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6
5. Pigs	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
6. Poultry	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
7. Other agriculture	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
8. Agricultural services; hunting & trapping	3.0	2.6	2.7	2.1	2.5	1.5	0.1	1.5	2.7
9. Forestry and logging	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
10. Fishing	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
11. Coal, oil and gas	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
12. Iron ore	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
13. Non-ferrous metal ores	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
14. Other mining	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
15. Mining services	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8
16. Meat products	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
17. Milk products	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6
18. Fruit & vegetable products	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
19. Margarine & oils and fats	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
20. Flour mill & cereal foods	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
21. Bakery products	0.3	0.1	-0.1	0.3	-0.4	0.0	-1.1	0.2	0.1
22. Confectionery products	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
23. Other food products	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
24. Soft drinks, cordials & syrups	-0.4	-0.4	-0.3	0.4	-0.3	0.0	-1.2	0.0	-0.3
25. Beer and malt	-0.6	1.3	-0.8	2.2	1.3	-0.2	-1.3	0.0	0.5
26. Wine & other alcoholic drinks	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
27. Tobacco products	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
28. Textile fibres, yarns & woven fabrics	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
29. Textile products	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
30. Knitting mill products	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
31. Clothing	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
32. Footwear	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4
33. Leather and leather products	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1
34. Sawmill products	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
35. Other wood products	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2
36. Pulp, paper and paperboard	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
37. Paperboard containers; paper bags & sacks	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
38. Printing & services to printing	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
39. Publishing	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
40. Petroleum and coal products	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
41. Basic chemicals	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4
42. Paints	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
43. Pharmaceutical products; pesticides	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6
44. Soap and other detergents	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
45. Cosmetics and toiletry preparations	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
46. Other chemical products	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4

Table 4 (continued)

Industry	NSW	VIC	QLD	SA	WA	TAS	ACT	NT	Aust
47. Rubber products	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
48. Plastic and related products	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
49. Glass and glass products	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
50. Ceramic products	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4
51. Cement, lime and concrete slurry	-0.7	-0.7	-0.8	-0.2	-0.2	0.0	-1.3	0.1	-0.6
52. Plaster and other concrete products	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7
53. Other non-metallic mineral products	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
54. Basic iron and steel	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
55. Basic non-ferrous metals & products	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6
56. Structural metal products	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
57. Sheet metal products	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
58. Fabricated metal products	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
59. Motor vehicles and equipment	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
60. Ship and boat building	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
61. Railway equipment	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
62. Aircraft	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
63. Photographic & scientific equipment	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
64. Electronic equipment	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
65. Household appliances	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
66. Other electrical equipment	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6
67.Agricultural, mining, construction machinery	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
68. Other machinery and equipment	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9
69. Prefabricated buildings	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
70. Furniture	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
71. Other manufacturing	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3
72. Electricity supply	0.0	0.1	0.1	0.4	0.6	0.6	-1.1	0.6	0.1
73. Gas supply	-0.1	0.0	-0.1	0.3	0.5	0.6	-1.4	0.3	0.0
74. Water supply; sewerage and drainage	-0.2	-0.1	-0.4	0.1	0.0	0.1	-0.8	0.1	-0.1
75. Housing construction	-1.5	-1.5	-1.7	-1.0	-1.4	-1.1	-2.1	-0.8	-1.5
76. Other construction	-0.1	0.0	-0.1	0.3	0.4	0.5	-0.4	0.6	0.0
77. Wholesale trade	0.3	0.6	0.1	0.7	0.7	0.6	-1.0	0.5	0.4
78. Retail trade	-0.6	-0.5	-0.9	-0.1	-0.5	-0.3	-1.4	-0.2	-0.6
79. Mechanical repairs	-0.3	-0.2	-0.4	0.1	-0.1	0.1	-1.0	0.2	-0.3
80. Other repairs	-0.1	0.0	-0.2	0.3	0.4	0.3	-0.8	0.5	0.0
81. Accommodation, cafes & restaurants	0.0	-0.1	-0.2	0.3	0.1	0.3	-0.7	0.4	0.0
82. Road freight and passenger transport	0.5	0.6	0.4	0.9	1.0	0.9	-0.7	1.3	0.6
83. Rail, pipeline and other transport	0.4	0.2	0.6	0.7	1.4	0.8	-1.3	0.7	0.6
84. Water transport	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
85. Air and space transport	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
86. Services to transport; storage	0.3	0.4	0.2	0.5	0.5	0.5	-0.2	0.5	0.4
87. Communications	-0.3	-0.3	-0.5	0.1	-0.1	0.0	-0.9	0.3	-0.3
88. Banking	0.0	0.0	-0.2	0.3	0.3	0.3	-0.7	0.4	0.0
89. Non-bank finance	0.0	0.0	-0.2	0.3	0.3	0.3	-0.7	0.3	0.0
90. Insurance	0.1	0.2	-0.1	0.4	0.3	0.4	-0.7	0.3	0.1
91. Services to finance, investment & insurance	0.1	0.2	-0.1	0.4	0.4	0.3	-0.4	0.3	0.1
92. Dwelling ownership and rental	-0.3	-0.3	-0.5	0.1	-0.3	0.1	-0.9	0.3	-0.3
93. Other property services	0.1	0.2	0.0	0.6	0.5	0.5	-0.7	0.5	0.2
94. Research, technical & computer services	0.4	0.6	0.3	0.8	1.0	0.6	0.3	0.8	0.5
95. Legal, accounting, marketing, business services.	0.2	0.4	0.0	0.6	0.5	0.4	-0.4	0.5	0.3
96. Other business services	0.3	0.5	0.1	0.6	0.6	0.5	-0.4	0.5	0.4
97. Public administration	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
98. Defence	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1

Table 4 (continued)

Industry	NSW	VIC	QLD	SA	WA	TAS	ACT	NT	Aust
99. Education	-3.5	-3.8	-4.2	-2.0	-4.9	-1.9	-5.3	-1.3	-3.7
100. Health services	0.0	0.0	-0.1	0.1	0.0	0.1	-0.3	0.1	0.0
101. Community services	-0.2	-0.2	-0.3	0.0	-0.1	-0.1	-0.4	0.0	-0.2
102. Motion picture, radio & television services	0.4	0.4	0.0	0.7	0.4	0.5	-0.1	0.7	0.3
103. Libraries, museums & the arts	-0.3	-0.4	-0.4	0.0	-0.3	0.0	-0.5	0.2	-0.3
104. Sport, gambling & recreational services	-0.2	-0.2	-0.3	0.0	-0.1	0.0	-0.8	0.5	-0.2
105. Personal services	-0.8	-0.8	-1.0	-0.3	-0.7	-0.3	-1.2	-0.1	-0.8
106. Other services	-0.1	0.0	-0.2	0.1	0.0	0.0	-0.5	0.1	-0.1
107. Non-competing imports	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

We shall find that the prospects for a number of other expanding industries will be important when discussing the regional results in Section 4.3. In particular, the increase in output of *Non-ferrous metal ores* (+2.5 percent); *Motor vehicles and equipment* (+2.1 percent); *Wine and other alcoholic drinks* (+1.1 percent); *Sawmill products* (+1.5 percent); *Iron ore* (+2.1 percent); *Other mining* (+0.9 percent); and *Other agriculture* (+1.1 percent) are all important in determining the relative prospects of the eight regions. In general, while some of these industries (such as *Wine* and *Sawmill products*) experience some pressure on their sales because of the contraction in domestic activity, all experience net gains in output because of the real depreciation. All gain through increased export volumes, but *Motor vehicles*, *Sawmill products*, and *Non-ferrous metal ores* also expand through an increase in their domestic market share as the Australian dollar price of competing imports rises.

Of all the industry sectors, *Education* (-3.7 percent) is the most adversely affected by the shock. This reflects the withdrawal from this sector of foreign students' spending on course fees (Table 1). The second most adversely affected sector is *Housing construction* (-1.5 percent). This reflects the fall in activity in *Dwelling ownership and rental.* The latter sector contracts because of both the removal of foreign student demands for Australian housing, and the lower real consumption spending of Australian households. The resulting requirement for a smaller stock of housing capital in the *Dwelling ownership and rental* industry translates into a lower level of activity for the *Housing construction* industry as the stock of housing in the *Dwelling ownership and rental* industry gradually adjusts towards its new long-run level. In turn, the contraction in the *Housing construction* industry is largely responsible for the contractions in the *Plaster and other concrete products* (-0.7 percent) and *Cement, lime and concrete slurry* (-0.6 percent) industries. These two industries provide *Housing construction* with intermediate inputs. The contraction in the *Personal services* industry (-0.8 percent) is due to both the direct effects of the removal of foreign student spending on this industry's output, and the lower level of real consumption spending of Australian households. Similarly, *Retail trade* (-0.6 percent), an industry which primarily provides margin services on sales of commodities, contracts because of both the removal of sales of goods and services to foreign

higher education students, and the general contraction in economy-wide consumption.

4.3 Regional Economic Effects of Foreign Higher Education Students

Table 5 traces the time-paths for gross state product (GSP). The Northern Territory (NT), South Australia (SA), Tasmania, and Western Australia (WA) are projected to expand in the absence of foreign students, while Victoria, Queensland, New South Wales (NSW) and the Australian Capital Territory (ACT) are projected to contract. The remainder of this section discusses the mechanisms in the model that are responsible for generating these deviation paths for real GSP, followed by a detailed discussion of the regional results for 2005.

Table 5. Real GSP by State, 2000-2005 (cumulative percentage deviation from base-case)

State/territory	2000	2001	2002	2003	2004	2005
New South Wales	-0.15	-0.15	-0.15	-0.13	-0.13	-0.13
Victoria	-0.14	-0.14	-0.12	-0.06	-0.03	-0.02
Queensland	-0.29	-0.29	-0.30	-0.29	-0.30	-0.30
South Australia	0.10	0.13	0.17	0.24	0.28	0.29
Western Australia	-0.08	-0.08	-0.04	0.03	0.08	0.10
Tasmania	0.09	0.12	0.14	0.20	0.24	0.24
Australian Capital Territory	-0.50	-0.56	-0.61	-0.67	-0.73	-0.76
Northern Territory	0.20	0.26	0.30	0.36	0.37	0.37

Under the ORES regional theory (see Section 2.2) the impact of a given national shock on a regional economy is largely determined by the industrial composition of the region's economic activity. The ORES regional theory will tend to find that those regions that experience relative expansions in the wake of some economic shock will be those that have above average shares of their economic activity in industries that are relatively favourably affected by the shock, and / or have below average shares of their economic activity in industries that are relatively unfavourably affected by the shock. Since the ORES theory also allows the growth rates of local industries to differ across regions, differences across regions in local industry growth rates will also be important in explaining regional growth rates. Regions that contain local industries growing faster than the national average will tend to experience expansions in GDP, relative to those regions that contain industries growing slower than the national average. These ideas are formalised in the following two equations from Adams, *et al.*, (2000):

$$z_r = z + \sum_j Contribution_{j,r} \qquad (1)$$

$$Contribution_{j,r} = \left[S_{j,r} - S_j\right]\left(z_j - z\right) + S_{j,r}\left(z_{jr} - z_j\right) \qquad (2)$$

where $Contribution_{j,r}$ is the percentage point contribution of regional industry (*j*,*r*) to the difference between the growth in GDP of region (*r*) and the growth in GDP for the nation as a whole;

$S_{j,r}$ is the share of value added in regional industry (*j*,*r*) in the total value added of region (*r*);

S_j is the share of value added in industry (*j*) in national value added;

z_j is the percentage change in output of industry *(j*) at the national level;

z is the percentage change in national GDP;

z_{jr} is the percentage change in output of regional industry (*j*,*r*); and

z_r is the percentage change in GDP for region (*r*).

Equations (1) and (2) together allow us to decompose the differences between regional growth rates and the national growth rate (Equation 1) into the individual contributions attributable to each industry (Equation 2). As Adams, *et al.*, (2000), explain, Equations (1) and (2) demonstrate that an industry can make a positive contribution to a region's relative growth rate if:

- it is a fast growing industry and it is over-represented in the region;
- it is a slow growing industry and it is under-represented in the region;
- it grows more quickly in the region than it does in the nation as a whole.

Indeed we can decompose the right hand side of Equation (2) into two sub-components:

(a) a *share-effect* (equal to $\left[S_{j,r} - S_j\right]\left(z_j - z\right)$), reflecting the importance of items i. and ii. above; and,

(b) an *activity-effect* (equal to $S_{j,r}\left(z_{jr} - z_j\right)$), reflecting the importance of item iii. above.

Equations (1) and (2) are all that we require to understand the regional results. We will make extensive use of these equations (or the ideas behind them) in explaining the regional results for the year 2005 in the remainder of this section. To assist this explanation, Equation (2) has been calculated for 2005 and the results reported in Table 6.

4.3.1 Northern Territory

Of all the states, the NT fares the best from the absence of foreign student demands. The NT is a minor destination for foreign higher education students, with foreign student course fees representing only 1.3 percent of *Education* revenue (Table 1). Hence the direct effect of the removal of foreign students from the regional economy is minor, relative to the direct effect experienced by other states. This is reflected in Table 6 by the two major components of foreign student expenditures (*Education* and *Dwelling ownership and rental*) making significant positive contributions to the region's relative GSP outcome. The reason for this positive contribution is apparent from Table 4. *Education* makes a positive contribution to the difference between the outcomes for NT real GSP

Table 6. Real Gross State Product. Decomposition of Divergence between GSP and GDP, 2005 (*Cumulative Percentage Deviation from base-case, see Equation 1)*

	NSW	VIC	QLD	SA	WA	TAS	ACT	NT
Real GDP:	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03
Real GSP:	-0.13	-0.02	-0.30	0.29	0.10	0.24	-0.76	0.37
Difference:	*-0.10*	*0.01*	*-0.27*	*0.32*	*0.13*	*0.27*	*-0.73*	*0.40*
Industry contributions to GSP – GDP result								
1. Sheep	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2. Grains	0.00	0.00	0.00	0.01	0.01	-0.01	-0.01	-0.01
3. Beef cattle	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02
4. Dairy	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
5. Pigs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6. Poultry	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7. Other agriculture	0.00	0.00	0.01	0.01	0.00	0.00	-0.01	-0.01
8. Agricultural services; hunting & trapping	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01
9. Forestry and logging	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00
10. Fishing	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11. Coal, oil and gas	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01	0.02
12. Iron ore	-0.01	-0.01	-0.01	-0.01	0.03	0.00	-0.01	-0.01
13. Non-ferrous metal ores	-0.02	-0.02	0.01	-0.02	0.03	0.01	-0.02	0.10
14. Other mining	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00
15. Mining services	-0.01	-0.01	0.00	-0.01	0.05	0.00	-0.01	0.03
16. Meat products	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17. Milk products	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01
18. Fruit and vegetable products	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19. Margarine and oils and fats	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20. Flour mill and cereal foods	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21. Bakery products	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22. Confectionery products	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23. Other food products	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24. Soft drinks, cordials and syrups	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25. Beer and malt	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26. Wine and other alcoholic drinks	0.00	0.00	0.00	0.03	0.00	0.00	-0.01	-0.01
27. Tobacco products	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28. Textile fibres, yarns & woven fabrics	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29. Textile products	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30. Knitting mill products	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
31. Clothing	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
32. Footwear	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
33. Leather and leather products	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
34. Sawmill products	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00
35. Other wood products	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
36. Pulp, paper and paperboard	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00
37. Paperboard containers; paper bags and sacks	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
38. Printing and services to printing	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
39. Publishing	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
40. Petroleum and coal products	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01	0.00
41. Basic chemicals	0.00	0.00	0.00	-0.01	0.00	-0.01	-0.01	-0.01
42. Paints	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
43. Pharmaceutical products; pesticides	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01
44. Soap and other detergents	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
45. Cosmetics and toiletry preparations	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
46. Other chemical products	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 6 (Continued)

	NSW	VIC	QLD	SA	WA	TAS	ACT	NT
47. Rubber products	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
48. Plastic and related products	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
49. Glass and glass products	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
50. Ceramic products	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
51. Cement, lime and concrete slurry	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
52. Plaster and other concrete products	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
53. Other non-metallic mineral products	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
54. Basic iron and steel	0.00	0.00	-0.01	0.00	-0.01	-0.01	-0.01	-0.01
55. Basic non-ferrous metals and products	-0.01	-0.01	0.01	0.00	0.02	0.02	-0.02	-0.02
56. Structural metal products	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
57. Sheet metal products	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
58. Fabricated metal products	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.00
59. Motor vehicles and equipment	-0.01	0.02	-0.01	0.04	-0.01	-0.01	-0.02	-0.02
60. Ship and boat building	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.03
61. Railway equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
62. Aircraft	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
63. Photographic and scientific equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
64. Electronic equipment	0.00	0.00	-0.01	0.00	0.00	-0.01	0.00	0.00
65. Household appliances	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
66. Other electrical equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
67. Agricultural, mining, construction machinery	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
68. Other machinery and equipment	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01	0.00
69. Prefabricated buildings	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
70. Furniture	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
71. Other manufacturing	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
72. Electricity supply	0.00	0.00	0.00	0.00	0.01	0.02	-0.01	0.01
73. Gas supply	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
74. Water supply; sewerage and drainage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
75. Housing construction	0.00	0.00	-0.02	0.03	0.00	0.03	0.00	0.03
76. Other construction	0.00	0.00	0.00	0.01	0.02	0.01	-0.02	0.02
77. Wholesale trade	0.00	0.01	-0.02	0.01	0.01	0.01	-0.04	0.00
78. Retail trade	0.00	0.00	-0.02	0.02	0.00	0.01	-0.02	0.02
79. Mechanical repairs	0.00	0.00	0.00	0.01	0.00	0.01	-0.01	0.01
80. Other repairs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
81. Accommodation, cafes & restaurants	0.00	0.00	0.00	0.01	0.00	0.01	-0.01	0.01
82. Road freight and passenger transport	0.00	0.00	0.00	0.01	0.01	0.01	-0.02	0.01
83. Rail, pipeline and other transport	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
84. Water transport	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
85. Air and space transport	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
86. Services to transport; storage	0.00	0.00	0.00	0.00	0.01	0.00	-0.01	0.03
87. Communications	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.01
88. Banking	0.00	0.00	0.00	0.01	0.00	0.00	-0.01	0.00
89. Non-bank finance	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
90. Insurance	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.00
91. Services to finance, investment & insurance	0.00	0.00	-0.01	0.00	0.01	0.00	-0.01	-0.01
92. Dwelling ownership and rental	0.00	-0.01	-0.03	0.05	0.00	0.05	-0.07	0.06
93. Other property services	0.00	0.00	-0.01	0.01	0.01	0.00	-0.02	0.01
94. Research, technical & computer services	-0.01	0.00	-0.01	0.02	0.01	0.00	0.01	0.01
95. Legal, accounting, marketing, business services.	0.00	0.01	-0.01	0.01	0.01	0.00	-0.02	0.00
96. Other business services	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.00
97. Public administration	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
98. Defence	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00

Table 6 (Continued)

	NSW	VIC	QLD	SA	WA	TAS	ACT	NT
99. Education	0.01	-0.01	-0.06	0.06	-0.08	0.08	-0.16	0.11
100. Health services	0.00	0.00	0.00	0.01	0.00	0.01	-0.01	0.01
101. Community services	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
102. Motion picture, radio & television services	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103. Libraries, museums &the arts	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.00
104. Sport, gambling & recreational services	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02
105. Personal services	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
106. Other services	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.01
107. Non-competing imports	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	-0.10	0.01	-0.27	0.33	0.13	0.27	-0.73	0.40

and national real GDP primarily because the contraction in the *Education* sector in NT (-1.3 percent) is less than half that of the national average (-3.7 percent). In terms of Equation (2) above, the activity effect accounts for the bulk of *Education*'s 0.11 percentage point contribution to the gap between the outcomes for NT real GSP and national real GDP (Table 6). Similarly, while activity in *Dwelling ownership and rental* contracts in most regions, it expands in the NT. The change in activity in *Dwelling ownership and rental* in each region is the net effect of two countervailing forces: declining student spending on the commodity (spending by foreign students on *Dwelling ownership and rental* represents about 15 percent of their budget) and changing regional household incomes. With relatively few foreign students attending institutions in the NT, and with overall economic activity expanding in the region, the effect of rising household demands outweighs the effects of falling student expenditures for *Dwelling ownership and rental* in NT.

While the NT suffers little direct negative impact from the absence of foreign student demands, it benefits from the resulting devaluation of the national real exchange rate (row 11, Table 3). In particular, the expansion of the *Non-ferrous metal ores* industry in response to the devaluation is particularly important for the NT. As Table 6 makes clear, the expansion in this industry explains approximately 0.10 percentage points of the difference between the 2005 deviations in NT real GSP and national real GDP. This is due to the share effect in Equation (2): approximately 3 per cent of the NT's total value added is in this expanding industry, while the share for the nation as a whole is only around 0.4 per cent.

4.3.2 South Australia

SA also does relatively well from the absence of foreign students. Like the NT, SA is a relatively minor destination for foreign higher education students, with fees from these students representing only about 2.1 percent of the revenue of the region's *Education* sector (Table 1). Hence, like the NT, the SA economy is also somewhat insulated from the direct impact of the removal of foreign student demands. This is reflected in Table 4, where the contraction in the SA *Education* sector (-2.0 percent) is less than half that of the national average (-3.7 percent). This allows *Education* to make a positive contribution (Table 6) to the

gap between the SA real GSP and national real GDP outcomes via the activity effect, even though *Education* - a sector experiencing a significant contraction in this simulation - accounts for a higher than average (6.5 percent compared with 5.5 percent) share of activity in SA relative to the nation as a whole. SA also benefits from the expansion of the *Motor vehicles and equipment* industry. Approximately 2.5 percent of SA economic activity is represented by value added in this sector, compared with 0.6 per cent for the nation as a whole. This industry benefits from the devaluation of the real exchange rate, which allows it to expand both its exports, and its share of the domestic market. Two contracting industries (*Housing construction* and *Retail trade*) also make positive contributions to the region's relative performance. In the case of *Housing construction* this is due in almost equal parts to the share and quantity effects of Equation (2) - not only does *Housing construction* contract by less in SA (-1.0 percent) than it does for the nation (-1.5 percent), but a lower than average share of SA's total economic activity is located in this industry (2.4 percent, compared with 3.5 percent for the nation). *Retail trade* makes a positive contribution to the difference between the real GSP and real GDP outcomes largely because of the activity effect: driven by positive regional multiplier effects and a less-than-proportional contraction in foreign student demands, the contraction in *Retail trade* in SA (-0.1 percent) is significantly lower than that for the nation as a whole (-0.6 percent). SA's relative GSP performance is also assisted by the *Wine and other alcoholic drinks* industry, which expands via a real-depreciation-induced increase in export volumes. Approximately 1.9 percent of SA's real GSP is in this expanding industry, compared with 0.3 percent for the nation as a whole.

4.3.3 Tasmania

Tasmania also does relatively well from the removal of foreign student expenditures, being the third-ranked region in terms of real GSP by 2005. As Table 6 makes clear, the performance of the *Education* sector is the main driver of the Tasmanian results, accounting for just over 30 percent of the gap between the outcomes for Tasmanian GSP and national GDP in 2005. The performance of Tasmanian *Education* opens a positive gap between the Tasmanian GSP and national GDP outcomes because output of Tasmanian *Education* declines by only 1.9 per cent, relative to the national decline of 3.7 percent (Table 4). The reason for the relatively better performance of Tasmanian *Education* is clear from Table 1: revenue from foreign higher education students represents only 2.0 percent of Tasmanian *Education*'s revenue. Similarly, Tasmanian *Dwelling ownership and rental* also contributes to the relatively higher GSP outcome for Tasmania - Tasmanian *Dwelling ownership and rental* accounts for about 1.9 percent of the national activity of this sector while Tasmania attracts only about 1.1 percent of foreign student demands. This leaves this sector relatively unaffected by the direct consequences of the removal of foreign student demands, allowing it to expand via indirect regional multiplier effects as aggregate Tasmanian activity expands. Aggregate activity in Tasmania also benefits from the expansion of some of the more trade-exposed industries

(*Sawmill products*; *Pulp, paper and paperboard*; *Basic non-ferrous metals and products*) which are relatively more important to Tasmanian economic activity (accounting for, respectively, 1.9, 1.9, and 1.5 percent of Tasmanian GSP) than national economic activity (where the same industries account for, respectively, 0.2, 0.1, and 0.5 percent of national GDP).

4.3.4 Western Australia

By 2005, in the absence of foreign students, real GSP in WA is projected to be approximately 0.10 percentage points higher than its base-case value. The expansion in real WA GSP is the net effect of two influences: a contraction in activity arising from the direct effects of the loss of foreign student expenditures; and, an expansion in activity arising from the indirect effect of an increase in the activity of trade exposed industries. These two effects are now considered in turn. The contraction in the WA Education sector causes WA GSP to be approximately 0.08 percentage points lower than national GDP (Table 6). This is due primarily to the activity effect: by 2005 WA Education is 4.9 percent lower than base, while for Australia as a whole Education is 3.7 percent lower than base. The larger contraction in WA Education reflects the relative importance of foreign and domestic sales of WA Education in the model's database: by 2005 sales of Education to foreign higher education students are projected to represent approximately 4.9 percent of WA's Education sales, while they are projected to represent 3.6 percent of Australian Education sales. Despite the relatively large contraction in WA's Education sector, activity in the state expands relative to base-case because of the expansions in activity in the state's mining industries, in particular: Basic non-ferrous metals and products, Iron ore, Non-ferrous metal ores, and Mining services. Together, the expansion in these industries accounts for approximately 0.13 percentage points of the difference between the WA and Australian real GDP results for 2005.

4.3.5 Victoria

In the Australia-wide absence of expenditures by foreign students, by 2005 Victorian real GSP is projected to be approximately 0.02 percentage points lower than it would otherwise have been. This is approximately 0.01 percentage points higher than the 2005 national real GDP deviation. Only -0.01 percentage points of this difference is due to the Education sector. This is so for two reasons. First, the Victorian and national Education sectors contract by approximately the same amount, because the shares of Victorian and national Education sales accounted for by foreign higher education student fees are quite similar (3.7 and 3.6 percent respectively). Hence the activity effect is quite small. Secondly, the difference between Victorian and national shares of Education in GSP and GDP respectively are small. Hence the share effect is also small. With the Victorian real GSP result deviating only slightly from the national GDP result, no industries stand out as making significant negative or positive contributions to Victorian GSP. Non-ferrous metal ores causes the deviation in Victorian GSP to be slightly below (-0.02 percentage points) that for the nation because Victoria has a below-average share of its aggregate activity in this expanding sector. The

largest positive contribution (+0.02 percentage points) to the Victorian real GSP result is made by the Motor vehicles and equipment industry because Victoria has an above-average share of its aggregate activity in this expanding sector.

4.3.6 New South Wales

Economic activity in NSW is projected to be 0.13 per cent lower than base-case by 2005. This is approximately 0.10 percentage points below the national real GDP outcome for this year (Table 6). *Education* makes only a small (positive) contribution to NSW's relative GSP performance in this year. Since sales of *Education* to foreign higher education students represent a relatively lower share of total *Education* sales in NSW (3.4 per cent, Table 1) relative to Australia as a whole (3.6 per cent), the industry contracts by less in NSW (3.5 per cent) than the nation as a whole (3.7 per cent). This allows this industry to make a small (0.01 per cent, Table 6) positive contribution to NSW's relative GSP outcome via the activity effect. Relatively fast growing industries in the traded goods sector such as *Non-ferrous metal ores*, *Other mining*, *Mining services*, *Basic non-ferrous metals and products*, and *Motor vehicles and equipment*, make small negative contributions to the difference between the NSW GSP and national GDP outcomes in 2005, because NSW has slightly lower shares of its GSP represented by value added in these industries relative to the nation as a whole.

4.3.7 Queensland

Economic activity in Queensland is relatively adversely affected by the removal of foreign higher education students. Sales of *Education* services to foreign higher educations students are relatively important to the Queensland *Education* sector, accounting for 4.1 percent of total sales, compared with only 3.6 percent Australia-wide (Table 1). As a result, the contraction in the Queensland *Education* sector (-4.2 percent) is larger than that for the nation (-3.7 percent) and so *Education* contributes -0.06 percentage points to the difference between the 2005 deviations in national real GDP and Queensland real GSP (Table 6). The removal of foreign student spending from the Queensland economy also causes contractions in the region's *Dwelling ownership and rental* industry, *Housing construction* industry, and *Retail trade* industry. Together, these industries contribute a further -0.08 percentage points (Table 6) to the difference between the 2005 deviations in Queensland real GSP and national real GDP. Not only is Queensland relatively adversely affected by the removal of spending by foreign higher education students, but unlike regions such as WA and Victoria, Queensland does not have a sufficient proportion of its activity in national industries that do well from the shock to enable it to overcome the negative impact of the removal of foreign student demands on its aggregate economic activity. The region has slightly above-average shares of its activity in *Non-ferrous metal ores*, *Other agriculture*, and *Basic non-ferrous metals and products*, but together these industries only contribute +0.03 percentage points (Table 6) to the difference between the 2005 deviations in Queensland real GSP and Australian real GDP.

4.3.8 The Australian Capital Territory

The ACT is the worst affected of the regions, with its real GSP projected to be 0.76 percent below its base-case level by 2005. This reflects the importance of the *Education* sector, and sales of *Education* to foreign students, in the region's total economic activity. As Table 6 makes clear, the *Education* sector makes the largest contribution (0.16 percentage points) to the difference between the 2005 deviations in ACT real GSP and national real GDP. In terms of the two effects in Equation (2), the 0.15 percentage points are split approximately equally between the share effect (the share of the ACT's GSP accounted for by value added in the slow-growing *Education* sector (6.7 percent) is the highest of all the regions) and activity effects (the contraction in the ACT's *Education* sector is the largest of all the regions because the region has the highest share of its total sales of *Education* (5.1 percent) going to foreign higher education students). *Dwelling ownership and rental* also makes a negative contribution to the difference between the GSP and GDP outcomes, driven in part by the removal of foreign student demands from the region and in part by the general contraction in the region's economic activity. In addition to the negative direct effects of the removal of foreign student demands, the ACT also does poorly relative to the other regions because the industry sectors that benefit from the absence of foreign students - mining, agriculture, and export and import competing manufacturers - are under-represented in the ACT. That is, the ACT does poorly because the contractionary impact of the removal of foreign student demands is not offset by the expansion of the traded goods sector as it is in other regions. These traded goods industries are relatively under-represented in the ACT in part because sectors providing services to the Commonwealth Government (such as *Public administration* and *Defence*) are relatively over-represented in the ACT. Together, these two industries account for approximately 31.8 percent of the ACT's GSP in 2005, while accounting for only 4.6 percent of national GDP. The deviation in the output of these two industries are zero because government consumption is assumed to be unaffected by the shock.

4. CONCLUSION

Australia has experienced a substantial increase in numbers of foreign higher education students in the past fifteen years. In part this has been a response by Australia's higher education institutions to limits on the growth of their traditional government funding. Another expression of this pressure on funding has been an increase in lobbying of state and federal governments by universities, and particularly by regional universities. To assist in their lobbying efforts, universities have undertaken studies of the regional impacts of their activities and the regional impacts of foreign students. The interest by higher education institutions in their regional economic impacts is not confined to Australia, with their being many examples in the regional science literature of such studies undertaken overseas. One dimension of the issue that is frequently not explored in either the Australian or international studies is the possibility that the economic phenomena under study are part of wider national shocks, so that

the indirect effects of the wider shocks on the region under study should also be investigated. In the present study, it has been shown that when the indirect effects on regional economic activity of foreign student expenditures in other regions are taken into account, it is not clear that foreign student expenditures will always have a net expansionary effect on regional activity. An interesting case in point is Tasmania. Peter (1997) investigating the short-run impact on Tasmania of the presence of foreign students in Tasmania, found a 0.14 percent rise in real GSP. In contrast, the present paper finds that the absence of foreign students, Australia-wide, would lift Tasmanian real GSP by 0.20 percent in the short run and 0.46 percent in the long-run. The difference in the results is explained by Peter's study not taking account of contractions in the Tasmanian traded goods sector arising from the effects on the real exchange rate of the presence of foreign students in other states. In the present study, this more than offsets the positive effects on Tasmanian economic activity of foreign student spending within Tasmania. Similar effects were found to operate in the Northern Territory, South Australia, and Western Australia. Broadly, it was found that those states that were relatively minor destinations for foreign students, while also having a relatively high proportion of their economic activity in the (non-*Education*) traded goods sector, do well in the absence of foreign students. To the extent that policy makers in regions such as these include among their policy objectives a target of maximising GSP, while they would be advised to support measures that increase their region's share of total foreign students, in general they should not support measures that increase the number of foreign students in the nation as a whole while leaving their region's share of the total unchanged. In general, the regions that were found to experience a contraction in economic activity following the removal of foreign student spending were those that do not stand to gain significantly from expansions in the traded goods sector of their economy (such as Victoria and Queensland) and/or those that attract a disproportionately high share of the total foreign students arriving in Australia (such as Queensland and the Australian Capital Territory). In general, these regions stand to increase their GSP by supporting policies that either lift their share of the nation's foreign student enrolments, or lift the total number of enrolments in the country while leaving their share in the total unchanged.

REFERENCES

Access Economics. (2002) *Business Outlook, March Quarter*. Access Economics: Canberra.

Adams, P.D., Horridge M.J. and Parmenter B.R. (2000) Forecasts for Australian regions using the MMRF-GREEN model. *Australasian Journal of Regional Studies*, 6(3), pp. 293-322.

Armstrong H.W. (1993) The Local Income and Employment Impact of Lancaster University. *Urban Studies*, 30(10), pp 1653-68.

Australian Education International. (2001) *Overseas Student Statistics 2000*. Australian Education International, Commonwealth Department of

Education, Science, and Training, Australian Government Printing Service: Canberra.

Australian International Education Foundation. (1998) *1997 Survey of International Students Studying in Australia*. Australian Government Printing Service: Canberra.

Australian Vice-Chancellors' Committee. (2001) *AVCC Discussion Paper on International Education.* Australian Vice-Chancellors' Committee, Canberra.

Bleaney M.F., Binks M.R., Greenaway D., Reed G.V. and Whynes D. (1992) What does a university add to its local economy? *Applied Economics*, 24(3), pp. 305-311.

Cabalu H., Desai T., Doss N., Kenyon P., Koshy P. and Trotter J. (1999) *Contributing to the community through education and research: quantifying the economic impact of Curtin University of Technology on the Western Australian economy*. Curtin University, Western Australia.

Chapman B. (1997) *Some financing issues for Australian higher education teaching.* A paper prepared for the Review of Higher Education Financing and Policy (West Review), Centre for Economic Policy Research, Australian National University.

Coates J.H. (1994) *The impact of the University of Exeter on the local economy.* Department of Economics, University of Exeter.

Davis D., Buultjens J. and Wheelan M. (1996) *The economic impact of Southern Cross University on the City of Lismore*. Southern Cross University, Lismore.

Department of Education Training and Youth Affairs. (2001) Higher Education Students Time Series Tables: Selected higher education statistics 2000. Department of Education, Training and Youth Affairs, Commonwealth of Australia.

Dixon P.B., Parmenter B.R., Sutton J. and Vincent D.P. (1982). *ORANI: A multisectoral model of the Australian economy*. North-Holland Publishing Company: Amsterdam.

Dixon P.B., Parmenter B.R. and Rimmer M.T. (1998). *The effects of foreign students on the Australian economy and its regions.* Paper presented at the 27th Conference of Economists, University of Sydney, Sep 28 - Oct 1.

Dixon P.B., Parmenter B.R. and Rimmer M.T. (2002). CGE models for practical policy analysis: the Australian experience." In A. Fossati and W. Wiegard (editors) *Policy Evaluation with Computable General Equilibrium Models*, Routledge, pp. 56-82.

Dixon P.B. and Rimmer M. T. (2002). *Dynamic General Equilibrium Modelling for Forecasting and Policy: a Practical Guide and Documentation of MONASH*. North-Holland Publishing Company: Amsterdam.

Duhs T. and Duhs A. (1997) Exports of tertiary education services and the Queensland economy. *Economic Analysis and Policy*, 27 (2), pp. 159-174.

Greig R. (1997) *The importance of the University of Western Australia to the state of Western Australia: A preliminary assessment*. Discussion Paper 98.27, Department of Economics, University of Western Australia, Nedlands.

Harris R. I. (1997) The impact of the University of Portsmouth on the local economy. *Urban Studies*, 34(4), pp. 605-626

Harrison J. and Pearson K.R. (1996) Computing Solutions for Large General Equilibrium Models Using GEMPACK. *Computational Economics*, 9(2), pp. 83-127.

Hughes W R. (1994). Regional Economic Impacts of the University of Waikato. *New Zealand Economic Papers*, 28 (1), pp. 81-87.

Leontief W., Morgan A., Polenske K., Simpson D. and Tower E. (1965) The economic impact - industrial and regional - of an arms cut. *Review of Economics and Statistics*, 47 (3), pp. 217-241.

Lewis J.A. (1988) Assessing the effect of the polytechnic, Wolverhampton on the local community. *Urban Studies*, 25(1), pp. 53-61.

Madden J.R. (2002) *Australian fiscal federalism, global integration and economic reform.* Paper presented at the Workshop on Federalism in a Global Environment, Centre for Research on Economic Development and Policy Reform, Stanford University, June 6-7.

McKay D. and Lewis D. (1995) Domestic economic impact of exporting education: a case study of the University of Wollongong. *Economic Papers*, 14(1), pp. 28-39.

Michael E. (1996) The value of university output – the Latrobe example. *Economic Papers*, 15(3), pp. 88-96.

Milbourne R., Bewley R., Cumberworth M., Spyrakis V. and Baxter P. (1993) *Profitable neighbours: the economic impact of the University of New South Wales on the Randwick Municipality*. The University of New South Wales.

Peter M. (1997). The short run economic effects of foreign student expenditure in Tasmania. *Economic Papers*, 16 (3), pp. 55-72.

South Australian Vice-Chancellors. (1996) *Universities and the economy: the contribution of South Australia's universities to the South Australian economy*. An occasional paper of the South Australian Vice-Chancellors, July.

Temple-Smith R. and Elvidge N. (1996) *The economic impact of the University of Southern Queensland on the Toowoomba economy*. University of Southern Queensland, Toowoomba.

Zimmer B. (1992) Some dimensions of the University of Central Queensland's contribution to the region's economy. *Central Queensland University Journal of Regional Development*, 1(1), pp. 14-23.