MAXIMISING THE BENEFITS OF DEVELOPMENT IN AUSTRALIA'S FAR NORTH

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ABSTRACT: This paper presents and analyses data from a survey of close to 1000 private and government organisations in seventeen different industries across Australia's Far North. The data are used in a 'bottom-up', Keynesian-type analysis to estimate regionally relevant business-level multipliers (as opposed to using a 'top-down' Input-Output, or General Equilibrium approach). The results allow us to identify the industries whose expansion is likely to generate the largest regional economic benefit, and to comment on how policy might be changed so as to increase size of the local benefits that occur as a result of development.

1. INTRODUCTION

With the election of the Rudd Labour Government in late 2007, came a renewed emphasis on development in Northern Australia – as evidenced by, for example, the decision to transfer the $20 million Northern Land and Water Taskforce to the newly created Office of Northern Australia (Albanese et al, 2008). Yet despite the fact that much of the region is sparsely populated, it is clear that the north will face increasing development pressures - even in the absence of any new-found interest from the south.

The fertility rates in some Indigenous communities, for example, are significantly higher than those of the general Australian Population (ABS, 2006a). So many northern communities are likely to see rising populations. Likewise, there is evidence to suggest that agricultural practices will continue to intensify across the western and middle parts of the region Northern Australia (Stoeckl et al., 2006). Furthermore, Australia is currently in the grips of world-wide minerals boom, and many local councils are trying to encourage the tourism industry, if only to diversify their regional economies.

That there are also development pressures being exerted from 'the south' – as per the northern Australia task force whose task it is "to examine the potential for further land and water development in northern Australia" (EWN Publishing, 2007) – indicates that this part of Australia is likely to change, perhaps radically, in the not too distant future. Yet whilst many northern inhabitants may welcome this new-found interest in the region's future, there are at least some who urge a cautious approach – to wit the World Wildlife Fund (WWF) who say that 'time is running out to ensure development does not ruin northern Australia' (Australian Broadcasting Commission, 2008).

Policy makers may therefore be asked to choose between competing options,

such as: to develop or not to develop; to promote project A or project B. Or policy makers may be asked to consider ways of promoting development in a more 'sustainable' manner. And they may thus be eager to access information that allows one to answer questions like those below:

1. Which industries create the most regional economic benefit?
2. How can policy be changed so as to increase the size of regional benefits that occur as a result of development?
3. How does the total regional economic benefit of an industry compare with its environmental and/or social cost?

In theory, it would be possible to use either a 'fancy' Input-output (IO) model or a Computable General equilibrium (CGE) model to answer questions 1 and 2 (and, in some cases, question 3). And although 'standard' IO models (and very simple CGE's) require researchers to accept many, questionable assumptions, there are many sophisticated models and techniques available. For example, IO analysis has been adapted to allow for dynamic relationships (Leontief & Duchin 1986; Robinson & Duffy-Deno 1996; Nabors et al 2002). The models can also be extended to consider distributional impacts – using what is termed a SAM (social accounting matrix – see Berck and Hoffman, 2002), and they are also able to allow for multiple regions – eg the core-periphery models of Hughes and Holland (1994). Furthermore, models can allow for non-linear relationships between inputs and outputs (Wang 2001; Liew, 2000) and can be extended to include economy-environment interactions (Cumberland 1966; Huang et al. 1994; Hawdon & Pearson 1995; Gustavson et al. 1999; Eder & Narodoslawsky, 1999; Lenzen and Foran, 2001; Doherty and Tol, 2007) – hence the earlier comment re their ability to provide information that might allow one to answer question 3.

The main problem here, however, is that none of the currently available models provide information at a fine enough geographic scale. Table 1 provides an indicative list of a range of different applied models currently in use in Australia. Although Australia is host to many world-class models, none provide information at a fine geographic scale in Australia's North. The most regionally detailed model (TERM)[1] provides genuine 'bottom-up' predictions for 57 regions within Australia, but those regions (statistical divisions) are geographically large in Northern Australia; encompassing, for example, almost all of Northern Territory (except the area in and around Darwin).

Hence, these models can provide good quality information for those living in the more densely populated parts of Northern Australia (Darwin, and perhaps Townsville). But the information produced from models like these may not always be relevant to those living in small, rural communities.

Clearly the 'best' solution to this problem would be to build a regionally specific CGE for Australia's north. Yet it would be extremely costly—in terms of both time and money—to do so. The research described in this paper thus adapted an established methodological 'short-cut' to estimate regionally relevant 'business-level' multipliers, for a range of different industries across Australia's

[1] See the Centre of Policy Studies' website at http://www.monash.edu.au/policy/term.htm.

Far North. It therefore provides information relevant to questions (1) and (2) above. Subsequent, ongoing, research seeks to also shed light on question (3).

Table 1. Overview of Applied Australian Models (non-exhaustive list)

MODEL NAME	REGION	TYPE OF MODEL	GENERAL DESCRIPTION
GRIMP[2] (Grit Impact Program)	Australia	Input-output	An input-output model using cross sectional data by industrial sector. Can simulate impact on output (or employment or energy etc) of a change in final demand.
ORANI[3]	Australia	Comparative static single region CGE	An applied general equilibrium model first developed in the 1970's. It has largely been superseded by the MONASH suite of CGE models.
ORANI-NT	Australia and the NT	Comparative static multi-region CGE	A comparative static multi-region model based on ORANI.
QGEM[4] (Queensland General Equilibrium Model)	Australia and Queensland	Comparative static multi-region CGE	A CGE model developed by Queensland Treasury to assess the impacts of policy changes and shocks. The QGEM-T model variation specifically looks at the tourism sector.
MMR[5] (Murphy Model Regional)	Australia	Comparative static multi-region CGE	MMR is a CGE model of the Australian economy used for regional policy analysis. It can be used to examine the effects of a policy on a specific state or region.
MONASH[6]	Australia	Dynamic multi-region CGE	A dynamic computable general equilibrium (CGE) model of the Australian economy designed for forecasting and for policy analysis. MONASH is a development of the ORANI model, providing greater forecasting opportunities due to a more detailed specification of inter-temporal relationships and enhanced use of up-to-date data.
MMRF-GREEN[7]	Australia	Dynamic multi-region CGE	A dynamic CGE model of Australia's states and territories. Has been used to forecast energy usage and to analyse greenhouse issues.
TERM (The Enormous Regional Model)	Australia	Multi-region CGE	A "bottom-up" CGE model of Australia which can treat specific regions as separate economies. Can handle greater numbers of regions or sectors, in comparison to its predecessor MMRF-GREEN. The original version is a static model, however a dynamic model is being developed.

[2] Developed by West - referred to in Berck and Hoffman (2002).
[3] Developed by the Centre of Policy Studies Largely superseded by the MONASH suite of CGE models
[4] Developed by Queensland treasury, 1994 – see Woolett et al (2003)
[5] See http://www.econtech.com.au/07_Murphy_Models/01_Introduction.htm
[6] Derived from ORANI – see http://www.monash.edu.au/policy/monmod.htm
[7] Derived from the comparative static MMRG model and the MONASH model - with energy sectors

The paper is structured as follows. The methodological approach to estimating these 'business-level' multipliers is described in section 2. In section 3, we describe the surveys used to collect data for this project, and in section 4, we present our results. The policy implications of these results are discussed in section 5, while the final section of the paper offers some concluding remarks.

2. METHODOLOGICAL ISSUES

Many different types of multipliers are commonly estimated within the literature (Australian Bureau of Statistics, 2006a). Each is subtly different but a general observation holds for all: namely that the greater an industry's multiplier, the greater the regional economic impact of that industry's growth. Information about the size of an industry's multiplier is thus vitally important to those interested in targeting specific industries as a means of promoting regional economic growth. This research focuses on the "output" multiplier, and approaches the problem from what is, essentially, a Keynesian perspective, albeit at a microeconomic level.

To be more specific, this approach follows Stoeckl (2007) and assumes that the one can calculate the total change to regional income over the course of say, one year, (ΔY) that follows from an initial injection of monies (ΔE) into an individual business (or organisation) as follows:

$$\Delta Y = \frac{1}{1 - \text{proportion of extra income re-spent within the local economy}} \; \mathbf{x} \; \Delta E$$

$$\Delta Y = \kappa \, \Delta E$$

Where: κ is the Keynesian multiplier

(1)

Researchers therefore conducted a large survey (detailed in section 3) whereby businesses and other organisations were asked, inter alia, to provide information on:

- the proportion of total revenues spent on a range of different inputs – j: ($R_j = 1,\ldots,n$); and
- the proportion of expenditure on each input that was purchased from within the local region ($\theta_j = 1,\ldots,n$).

This information was used to estimate the proportion of each organisation's revenue that was spent on local inputs ($E_j = R_j{:}x\ \theta_j$), and these were added together to produce an estimate of the proportion of total revenue each business/organisation spends within their local area ($\rho_i = \Sigma E_j$):

$$\rho_i = \sum_{j=1}^{n} R_j \theta_j \tag{2}$$

These estimates of ρ_i were then used to calculate the multiplier associated with each individual business (M_i) – hereafter referred to as the 'raw' business-level-multiplier:

$$M_i = \frac{1}{1-\rho_i} \tag{3}$$

Since these 'raw' multipliers are estimated for each, individual, business, they can be grouped in almost any way; here they were grouped by industry sector to facilitate comparison with multiplier estimates derived from other studies.

Operationally, if one wishes to use these raw business-level-multipliers to draw inferences about the size of regional multipliers, then one needs to accept all the assumptions attending traditional IO analysis, namely that: all firms within an industry use the same technology regardless of their scale and location; technology does not change; all inputs are used in fixed proportions; the industries exhibit constant returns to scale; all prices are constant; and there are no input constraints (i.e. all firms within all industries are able to access required inputs).[8] Furthermore, since these raw business-level-multipliers are not analytically equivalent to those generated using IO analysis or CGE models (the 'κ' in Equation 1) one also needs to accept another assumption, (unique to this particular methodological approach), namely that the expenditure patterns of all industries and households within the region of enquiry are the same as those of the industry receiving the first injection of funds.

It is unlikely that this later assumption will hold, so attempts to draw inferences about the size of a regional multiplier from the raw business-level multiplier estimates are likely to generate misleading information. Specifically, Equation 3 will generate upwardly biased estimates of the multipliers associated with sectors that spend more than average within their local economy, and downwardly biased estimates of multipliers in sectors that spend less than average within their local economies. To correct for this bias, we therefore assume that when the revenue of just one organisation (i) changes, the total,

[8] In this context, it is therefore best to view multiplier estimates that have been derived from IO analysis as providing a base-line estimate of the change in total demand that is likely to occur in response to change in demand for goods within a particular sector. The final change in output will, necessarily, also depend upon supply-side factors: the more inelastic is supply, the smaller will be the final change in output. Hence the reason CGE models are generally preferred to IO models – since they are capable of allowing for important feedback effects which are likely to modify results. This is likely to be particularly important in Northern Australia, where temporal and geographic shortages of water, together with significant skills shortages are likely to place significant constraints upon development.

combined, changes to the revenues of all organisations will equal:

- the initial change affecting organisation i = ΔE_i
  PLUS
- the extra money which organisation i subsequently spends with other 'local' organisations = $\rho_i.\Delta E_i$
  PLUS
- the extra money which the local organisations who receive some of $\rho_i.\Delta E_i$ subsequently spend with other local organisations = $\rho_i.\Delta E_i$ x $\overline{\rho}$ x 1/(1- $\overline{\rho}$)

  where $\overline{\rho}$ = 'average' proportion of total revenues which organisations spend within their local area.

Hence, we calculate adjusted business-level-multipliers for each organisation (M^A_i):

$$M^A_i = 1 + \rho_i + \rho_i \text{ x } \overline{\rho} \text{ x } 1/(1- \overline{\rho}) \quad (4)$$

This adjusted business-level multiplier does not, therefore, require one to assume that the spending patterns of all firms mimic those of the sector that initially receives a cash injection (sector i). It does not, therefore, impose an automatic downward bias on multiplier estimates associated with low spending sectors, and/or an upward bias on multiplier estimates associated with high spending sectors.

3. SURVEY

Data for this research were collected in two separate, but related, surveys: during a preliminary tourism case-study that focused on the Northern Territory and some parts of Queensland; and during a subsequent large-scale survey of a wide variety of businesses and other organisations across the entire north of Australia. A detailed account of both the tourism and the subsequent multi-sector surveys is provided in Stoeckl and Stanley (2007). Here, we provide just a short overview.

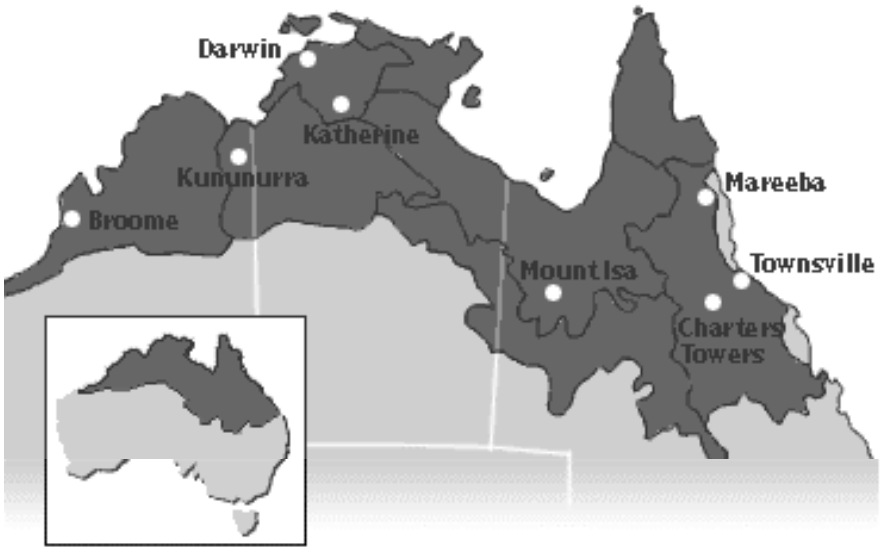
During the initial tourism case-study, researchers used The Yellow Pages (2005) SENSIS website to collect contact details for all tourism enterprises listed under the headings of 'accommodation', 'tours', 'attractions and activities' for all of Northern Territory, for the Douglas Shire, Townsville and 'Outback Queensland'. Across all four regions, this list comprised 699 enterprises, all of which were targeted for surveying. Of the 699 contacted, 429 completed the survey giving a response rate of 61 percent.

For the second phase of work, researchers purchased a large database was purchased from the Media M Group.[9] This database provided contact names and addresses of 38,406 organisations with postcodes that sat either wholly or partially within the study area (formally defined as within Australia's Tropical Savanna – see Figure 1). Some organisations were then removed from the list since they had been listed more than once or had addresses which were clearly

[9] See http://www.dame.com.au/ for further information.

incorrect and/or were not physically located in the target regions (despite having a postal address within the savannas), leaving a 'population' of 28,758 separate organisations.

There is no publically available listing of all businesses and organisations in a region with the same geographic boundaries as those of the study area. Consequently, there is no benchmark with which to 'compare' this 28,000 plus data base so as to ascertain its representativeness of the true population of organisations in this region. Nevertheless, it is worth noting that the total number of organisations listed in this database represents approximately 1.5 percent of the 2,265,562 businesses that were registered in Australia in 2003-04 (ABS, 2007). On the surface, this seems to be less than that which might be expected on a per-capita basis,[10] yet is not entirely implausible: the region does not include any major capital cities, and also has a relatively high proportion of Aboriginal and Torres Strait Islanders – groups which are known to have relative low rates of participation in business (See: Commonwealth of Australia, 2003: 25).



Source: Map available at the TSCRC web-site: http://Savannas.ntu.edu.au/information/Savannasexplorer.html

Figure 1. The Australian Savanna

[10] The region contains approximately 3 percent of Australia's population, and might therefore be expected to contain approximately 3 percent of Australia's businesses.

Since it was neither feasible (nor desirable) to collect data from all of these organisations, researchers had to decide on a sampling method. In doing so, researchers were cognizant of the fact that there is a significant data/research gap relating to organisations operating in remote parts of Australia. It was therefore decided to try to collect data from organisations in every ANZIC industry, and to place emphasis on organisations in the remoter parts of the savannas (specifically those located in 'very remote', 'remote' and 'outer regional' areas). To facilitate that, organisations within the database were then stratified according to:

a) ANZSIC industry sectors (agriculture, manufacturing, mining, government services, etc); and.
b) 'Regions of remoteness' – using each the ARIA+ associated with each organisation's postcode.[11]

Recognising that response rates as low as 10 percent are not uncommon, researchers decided to try to contact 200 organisations in each industry/remoteness category – the overall aim being to collect data from at least 20 organisations in each category. In some cases this meant that every organisation in a particular industry/remoteness category was targeted (as in the communications industry, for example, where there were only 31 organisations listed in the very remote parts of the TS). In cases where the database identified more than 200 organisations in a particular industry and region, organisations were selected at random for inclusion in the sample.

The original intention had been to conduct the phase-two surveys via email. However, administrative issues associated with the use of email for data gathering meant that Phase 2 could not be completed as planned.[12] Consequently, researchers collected supplementary data in a postal survey (Phase 3).

Altogether researchers made contact with 4810 organisations across the savannas (either by email or mail), approximately 16.7 percent of those listed in the database, and they received 697 responses. Some of the data from the preliminary tourism study (specifically, that relating to businesses located within the Tropical Savanna) were combined with that collected during phase 2 and 3, giving a (valid) data set on 976 organisations from 17 industry/enterprise sectors across Australia's North (see Table 2).

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[11] Although not without its critics, ARIA+ is the standard measure of remoteness endorsed by the ABS. Values are derived from the road distance measurements between various localities and different sized 'service centres'. They range from 0 (high accessibility) to 15 (high remoteness). Most significant to this analysis, is that separate ARIA+ measures were available at the postcode level. This allowed for the matching of survey data (which included a question about the postcode of each business) with ARIA+ measures. Researchers were thus able to categorise businesses according to the remoteness of their postcode.

[12] Administrators at JCU asked that all email activity cease, pending legal advice as to whether the surveys could potentially be viewed as spam. Researchers were subsequently informed that the emails were NOT spam – but by that time, it was too late to resume that particular methodological approach.

Table 2. Total Number of Respondents by Industry and Remoteness

ANZSIC INDUSTRY	Remoteness					Total across all regions
	Inner Regional	Outer Regional	Remote	Very Remote	Missing	
Accommodation	2	112	51	77	2	244
Agriculture		10	20	24	3	57
Communications		1	2	3		6
Construction	1	30	24	36		91
Cultural		13	6	14	2	35
Education		18	11	17		46
Electricity		1	2	2		5
Finance		22	8	6		36
Government	1	14	6	19	1	41
Health	1	26	23	37	1	88
Manufacturing		5	6	4		15
Health		4	9	6		19
Personal		14	9	12		35
Property		30	6	12		48
Retail		18	33	20		71
Transport		68	29	24		121
Wholesale		8	1	1		10
Missing		1	2	4	1	8
Total across all industries	5	395	248	318	10	976

Although there is no way of telling whether the initial, purchased database represents the 'true' population of all organisations in this region, it is nevertheless possible to say that sample contains observations from organisations in each and every major industry division in relatively remote parts of Northern Australia. As regards the representativeness of the sample: a detailed analysis of response rates, and of the characteristics of respondent organisations can be found in Stoeckl and Stanley (2007), but suffice to say here, that in some sectors, the representativeness of the sample is relatively good. For example, it accounts for 7.8, 7.2, 6.8 and 6.1 percent of organisations listed in the database in the government, electricity, mining and finance industries. However, the sample includes responses from fewer than 2 percent of those in the retail, property, agricultural and manufacturing sectors. Consequently data pertaining to these industries should be treated with caution—if only because the sample may not adequately reflect the population as a whole.

4. RESULTS AND ANALYSIS

In accordance with the method outlined in Section 2, respondents were asked to indicate the approximate proportion of total organisational revenues (or budget, in the case of government organisations) that was: spent on the products of each of the 17 ANZIC industries; spent on wages, salaries and supplements (or kept by owners of businesses for living expenses); allocated to taxes (local,

state and federal); and/or set aside for savings or profits.

In the first instance, researchers calculated the average percentage of all revenues spent within each industry (Figure 2).[13] Across all respondents, the highest average percentage of revenues went towards wages and salaries (19.54 percent). While not directly comparable, this estimate closely approximates ABS (2007) estimates of the 2004-05, average wage and salary expenditure of all Australian businesses (20.2 percent of total expenses; 17.8 percent of total income).

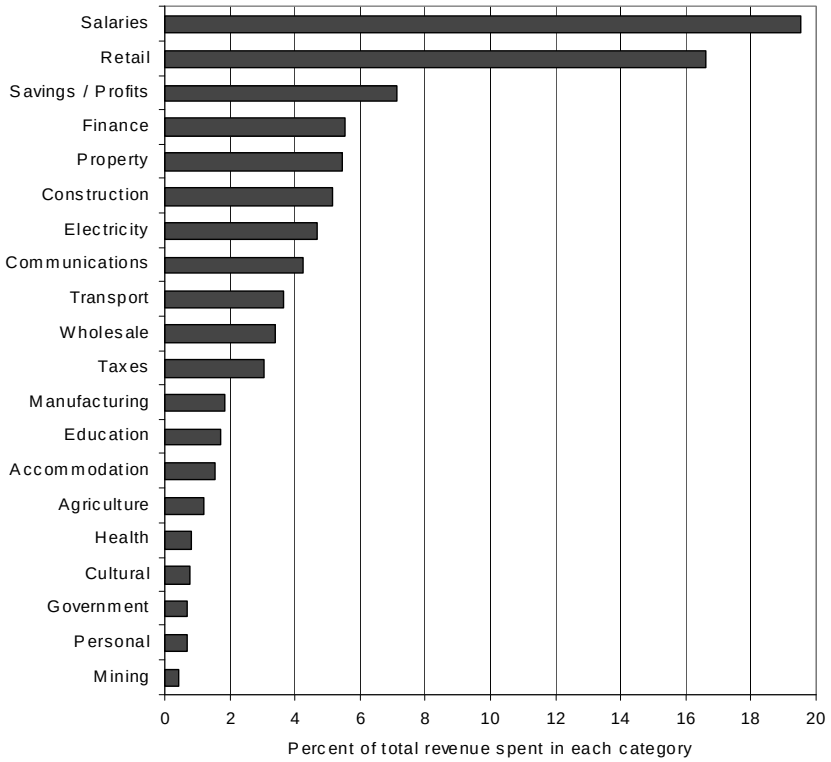

Figure 2. Mean Percent of total revenues spent on different types of goods and services

Respondent organisations also spent a relatively large share of total revenues within the retail sector (16.6 percent of all revenues); monies set aside for savings and profits (7.0 percent of total revenues) were the next big-ticket items.

[13] These averages are weighted averages – calculated by multiplying the average reported expenditure within any given sector by the number of organisations who reported having made that type of expenditure and then dividing by the total number of organisations responding to the expenditure question. They do not, therefore, sum to 100.

Expenditure in other sectors comprised less than 6 percent of all revenues—the smallest amounts, on average, going to mining, personal, government, cultural and health sectors.

Respondents were also asked to indicate how much of the organisation's expenditure *within* each of the various ANZIC industries, went to locally and non-locally based businesses (θ_j) – where a purchase was deemed to have been made "locally", if it occurred within the same postcode (or same town, if the town was large enough to contain more than one postcode) as that of the respondent organisation. This information was combined with information about the amount that is spent on different types of goods and services (above), to get a true picture of the importance of organisational expenditure within a region – as has been done in Figure 3, which shows the average proportion of total revenue that respondent organisations spent within 'local' ANZIC sectors and with 'local' householders.[14]

Most apparent from this figure is the fact that it is the local household sector that receives the largest share of organisational revenues—17 percent on average. The local retail sector is the next largest recipient of monies, receiving, on average, just over 8 percent of organisational revenues. Financial flows to other local businesses within the other 16 ANZIC sectors are generally small, receiving, together, just 18 percent of total local revenues.

Table 3 uses this information to categorise sectors according to the strength of their forward linkages (i.e. according to the relative, estimated value of inputs provided to other sectors). This is contrasted with similar information provided by the NT Government (2005a) on forward linkages within the NT.

Table 3. Forward linkages in the TS and the NT

	Linkages within the TS	**Linkages within the NT**
Strong forward links	Household Retail	Agriculture Communications Finance Manufacturing Property Transport
Weak forward links	Accommodation Agricultural Cultural Government Education Health Manufacturing Mining Personal Wholesale	Accommodation Construction Cultural Government Health Mining Personal Wholesale and Retail

[14] These averages are weighted averages. Specifically, the values reported here were calculated by multiplying the 'average' value of R_j:x θ_j; by the proportion of respondent organisations who spent money on input 'j'.

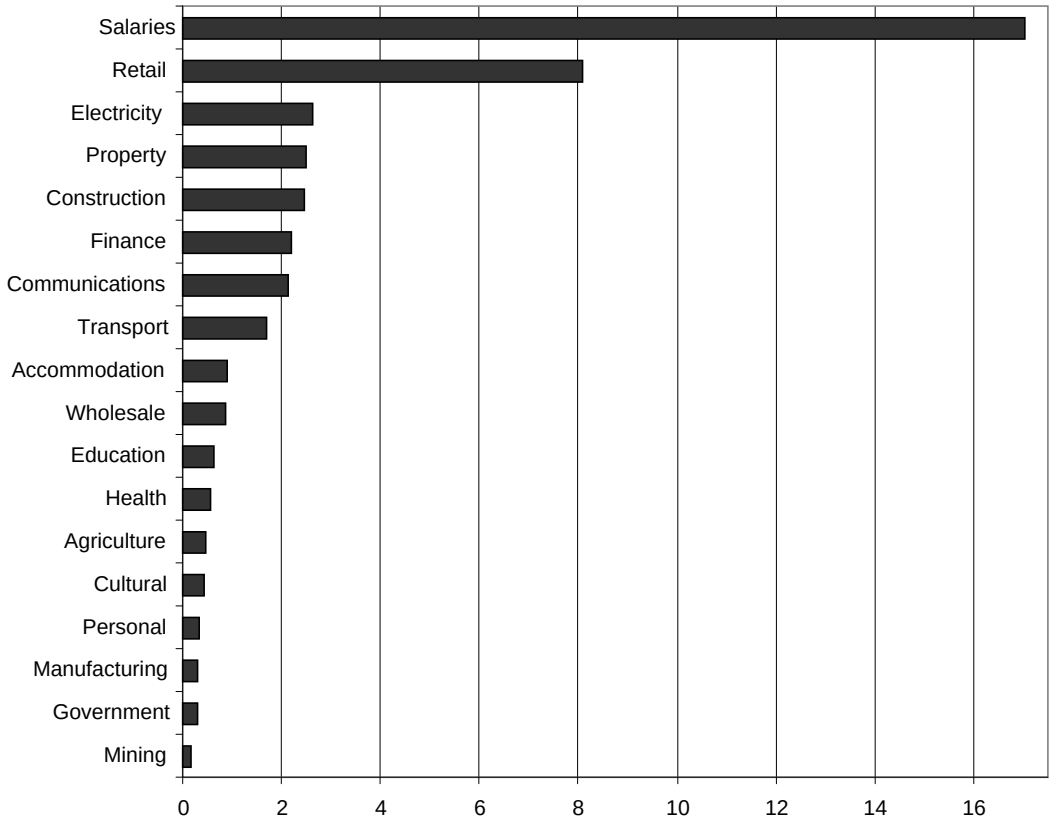

Figure 3. Mean percent of total revenues spent within different 'local' industries

When comparing the results of the two studies, it is important to remember that a sector can have weak forward linkages for either (or both) of two reasons:

i. If other sectors do not, generally, require their goods and services;
ii. If other sectors require their goods and services, but do not choose to purchase them 'locally' (many respondent organisations imported manufacturing products from outside their local area).

The first factor is likely to be the primary cause of the observed low forward linkages in the Agricultural sector—few respondents report having spent a large share of revenues within that sector. The second factor is likely to be the primary cause of the apparently conflicting results regarding the strength of forward linkages within the manufacturing sector (and possibly also some of the other sectors such as communications, finance, property and transport) and arises because this study and the NT study work at different geographic scales.

To be more specific, in this study, purchases were only deemed to have been made locally, if they occurred within the respondent's postcode (or town, if the town contained more than one postcode). So if a service station located in Tennant Creek purchased manufactured goods from Darwin, then those goods would be classified as imports within this study. But the whole-of-NT study, would not classify the products as imports, since they come from within the NT.

Consequently, one expects industries that are all but non-existent in remote areas (e.g. communications, electricity, manufacturing, and wholesale), to have weak forward links within those regions. But these industries may also have strong forward links within larger regions that include towns/centres where such industries exist. The two results are entirely consistent.

In the next analytical step, researchers used Equation 2 to calculate the total proportion of respondent revenues (or budget in the case of government enterprises) spent within the respondent's local community.[15] In the first place, organisations were grouped according to the sector in which they operated, and the ensuing means were calculated. Organisations within government and health sectors were found to spend, on average, more than 60 percent of total revenues/budget within their local community — more than twice that of organisations within accommodation and transport sectors. And these differences were statistically significant – as ascertained by doing an analysis of variance. Furthermore, a post-hoc comparison of means found that the mean ρ_i was higher within government, health and construction sectors, than within accommodation, and transport sectors. The 'average' organisation within the health sector also spends more within the 'local' community than the 'average' organisation within agricultural, property and education sectors.

Table 4 uses that data to categorise sectors according to the strength of their backward linkages and this is contrasted with similar information provided by the NT Government (2005a) on backward linkages that exist within the NT.

Table 4. Backward linkages in the TS and the NT

	Linkages within the TS	**Linkages within the NT**
Strong backward links	Government Health	Communications Electricity Transport
Weak backward links	Accommodation Transport	Agriculture Finance Property Manufacturing

Just as there were differences between this study's and the NT Government (2005a) assessments of the strength of forward links, so too are there differences here. When assessing these differences, it is important to note that an industry

[15] This was also true of organisations within the Electricity Gas and Water sector, however, there were only five respondents from this group and statistical analysis indicates that expenditures within this sector are not statistically different to expenditures in other sectors.

will have weak backward linkages if it does not purchase many local inputs. As is apparent from the preceding analysis, this will occur if:

i. The types of inputs required by that sector are not available locally; or
ii. The inputs required by that sector are available locally, but organisations choose to import those goods from elsewhere.

It seems that the results reported here, may be largely attributable to (i).

As highlighted in Stoeckl and Stanley (2007), many sectors which are prevalent in regional centres, are all but non-existent in the remoter parts of the TS. Organisations which require inputs from these non-existent sectors must therefore import inputs from outside their local area, and will, thus, have weak backward links. Similarly, organisations which use, predominantly, inputs that are available locally, will import fewer goods and services, and will, therefore, have strong backward links.

The data supports that hypothesis: organisations with strong backward links—those in the government and health sectors—spent more than 50 percent of total revenues within sectors prevalent throughout the TS (households, retail, agriculture and, to a lesser extent, construction). In contrast, organisations with weak backward links—those in the accommodation and transport sectors—spent comparatively less on wages and retail goods and more within sectors uncommon in remote areas (e.g. cultural, wholesale, property, transport, manufacturing sectors). As was the case in the previous section, differences between these findings and those relating to the NT economy, are not inconsistent; they arise because of differences in the way each study defines a 'local' purchase.

In the next part of the analysis, researchers used Equation 3 to calculate the 'raw' business multipliers associated with respondent organisations. Since M_i is calculated directly from ρ_i one expects the average business-level multipliers of organisations within government and health sectors to be significantly higher than those associated with organisations within accommodation and transport[16] — the pattern simply follows that of ρ_i. By extension, the statistically significant differences in ρ_i detected in the previous section also apply here: average business-level multipliers are higher within government, health and construction sectors, than within the accommodation, and transport sectors; and the average health organisation has a higher business-level multiplier than the average organisation within the agricultural, property or education sectors. But there are few statistically significant differences in the business-level multipliers associated with similar organisations located in different regions. The exceptions to this are organisations within the accommodation and transport sectors.

Nevertheless, the distributions were highly skewed, and a few large values of ρ_i (or M_i) were found to have great influence on mean values—particularly

[16] This was also true of organisations within the Electricity Gas and Water sector, however, there were only five respondents from this group and statistical analysis indicates that expenditures within this sector are not statistically different to expenditures in other sectors.

within sectors with relatively few respondents. Consequently, researchers calculated median values, and it is these which are used henceforth.

In accordance with the method outlined in section 2 we set out to calculate adjusted business-level-multipliers for each organisation (M^A) as:

$$M^A_i = 1 + \rho_i + \rho_I \text{ x } \bar{\rho} \text{ x } 1/(1- \bar{\rho}).$$

Yet there was not enough locally relevant data to calculate the 'correct' $\bar{\rho}$ for use within the formula (a locally relevant weighted average, that places most weight on the expenditure patterns of sectors that are most prevalent). So we calculated two different M^A's using two different values for $\bar{\rho}$:

$$M^{A1}_j = 1 + \bar{\rho}_j + \bar{\rho}_j \text{ x } \bar{\rho}^{\text{Total}} \text{ x } 1/(1- \bar{\rho}^{\text{Total}})$$

$$M^{A2}_j = 1 + \bar{\rho}_j + \bar{\rho}_j \text{ x } \bar{\rho}^{\text{Retail}} \text{ x } 1/(1- \bar{\rho}^{\text{Retail}})$$

where:

- $\bar{\rho}_j$ = 'average' (median) proportion of total revenues which all respondent organisations within industry j spent within their local area.
- $\bar{\rho}^{\text{Total}}$ = 0.39 = 'average' (median) proportion of total revenues which all respondent organisations spent within their local area.[17]
- $\bar{\rho}^{\text{Retail}}$ = 0.47 = 'average' (median) proportion of total revenues which all respondent organisations in the retail sector spent within their local area – chosen because (a) the retail sector has the largest number of firms operating within Northern Australia (Stoeckl and Stanley, 2007), and because (b) after households, it is the second largest recipient of 'local' expenditures in Northern Australia – see Figure 3.

The estimates are presented, and compared with the raw estimates, in Figure 4. The adjustments make no change to the overall rankings—multipliers associated with the health and government sectors are still highest—but the extent of the biases associated with the 'raw' multipliers is now apparent. Evidently, the biases are more significant within the health, electricity and government sectors than elsewhere. Also evident is the fact that the M^{A1} and M^{A2} multiplier estimates do not differ significantly from each other; either of these estimates are clear improvements on the biased raw estimates.

When looking at the relative size of these estimates, readers are cautioned to remember that the number of respondents from some industries was small. This is particularly so for the communication, electricity, manufacturing, mining, and wholesale sectors (with just 5, 5, 8, 10 and 6 respondents respectively). Furthermore, our data set does not include information about the expenditure patterns of regional households. Consequently, even the 'adjusted' estimates are

[17] We also considered using $\bar{\rho}^{\text{Weighted}} = 0.393$ = weighted 'average' (median) proportion of total revenues which respondent organisations spend within their local area, calculated by multiplying $\bar{\rho}_j$ by the estimated proportion of total aggregate gross annual turnover within the TS attributable to industry *j*. However, the estimate of $\bar{\rho}^{\text{Weighted}}$ closely approximated $\bar{\rho}^{\text{Total}}$, so we have not presented *adjusted* multiplier estimates based on this.

likely to be biased to the extent that household expenditure patterns differ from business/organisational expenditure patterns. We know that household expenditure is vitally important in this region (since the largest share of business/organisational expenditure is on wages). So its omission is likely to be important. But without further research, we are unable to judge the extent of that bias: we are unaware of any currently available data sources that would help (the ABS household expenditure survey does not include households in remote areas). Consequently, the business-level multiplier estimates associated with these sectors should be treated with particular caution—at least until the results can be verified in other studies.

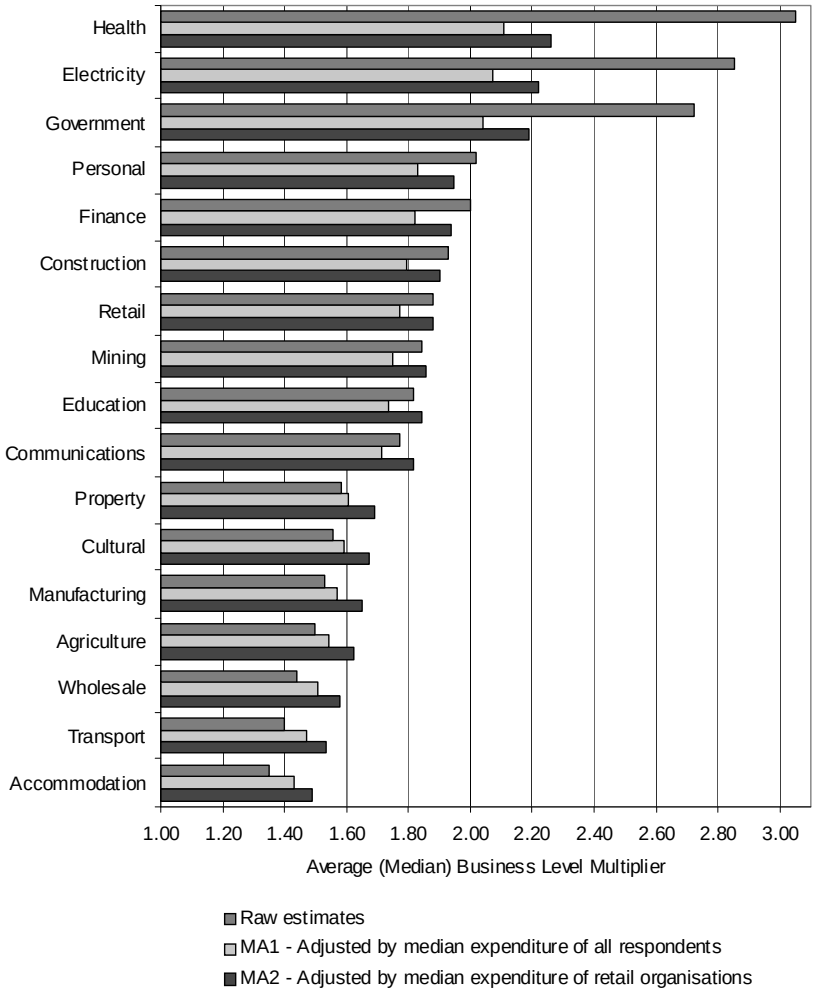

Figure 4. Business-level-multiplier estimates – by industry/sector

Despite those words of warning, it is interesting to compare our business-level multiplier estimates with those of previous studies, as has been done in Table 5. Here, we have omitted estimates for sectors from which relatively little data was collected (communications, electricity, manufacturing, mining and wholesale). So the estimates only show the average (median) business-level multipliers of organisations within each sector for which there were more than 10 respondents. The multiplier estimates in the other columns were collected from a range of other studies that looked at different regions within Australia.

With the exception of Accommodation and Transport[18], our business-level multipliers are reasonably close to the general equilibrium multipliers produced from Johnson's studies of Gascoyne and the Kimberley – economies which are most likely to have structures that are similar to those included in this study (indeed, organisations from the Kimberley were included in the survey). Our estimates are also smaller than those relating to Western Australia and Australia as a whole – which is expected, since multipliers that relate to large regions are typically larger than those relating to small regions where imports tend to be relatively high.

5. POLICY IMPLICATIONS

Our results suggest that an expansion of either the Health or the Government sector could do more to stimulate regional demand than an equal expansion of other sectors. Furthermore, a labour force will be more productive if it is healthy, well-educated, and has access to land, capital, and public infrastructure. So current expenditure on health, education and public infrastructure will not only create short-run benefits but it may also create long-term regional benefits, by significant increases in productivity.[19]

It seems that at least some of the difference in the size of these multipliers across industries is attributable to the fact that different industries/sectors have different input requirements, and that only some inputs are widely available across the tropical savannas. Quite simply, organisations can't purchase goods locally, if goods are not produced locally. This suggests that those interested in promoting regional development might need to consider a two-pronged 'attack': (1) attempting to stimulate local SUPPLY – i.e. increasing the range and number of goods and services that are produced locally; and (2) attempting to stimulate local DEMAND for those new goods and services – at least in the early stages.

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[18] This could be due to fact that most Tourism and Accommodation data was collected during phase 1 survey – and there were slight differences in the survey instrument that may have elicited different responses. Nevertheless, it is also worth noting that other, overseas studies have found that the multipliers associated with the tourism industry are quite small – eg. Fretchling and Horvath (1999) find that the implicit final demand multiplier for tourism in Washington DC is just 1.2, and they cite other studies that have produced regional tourism multiplier estimates for Washington DC of 1.26 and 1.63 and for Miami Florida of 1.76.

[19] See Taylor and Stanley (2005) for a discussion of these matters in relation to remote Indigenous communities.

Table 5. Average (median) RAW business level multipliers compared to multiplier estimates from other Australian studies

Industry	Adjusted Business-level-multipliers	Johnson (2004) Gascoyne	Johnson (2001) Kimberley	Johnson (2001) WA	Johnson (2004) WA	ABS (2001)	Miscellaneous
Accommodation	1.42 - 1.49	2.1	1.68	2.615	2.62	2.991	1.97[20] 1.93[21] 1.25–1.89[22]
Agriculture,	1.54 - 1.62	1.87	1.396	2.25	1.81	2.576	2.5[23]
Communications		2.08	1.66	2.276	2.21	2.537	
Construction	1.79 - 1.90	1.935	1.53	2.449	2.305	2.866	1.87[24]
Cultural	1.59 - 1.67	2.293	1.61	2.315	2.343	2.797	
Education	1.73 - 1.84	2.8	1.75	2.612	2.49	3.034	
Electricity		1.74	1.345	2.041	2	2.346	
Finance	1.82 – 1.93	1.955	1.55	2.16	2.285	2.636	
Government	2.04 – 2.18	2.49	1.81	2.731	2.745	3.228	
Health	2.10 – 2.26	2.67	1.68	2.621	2.56	3.002	
Manufacturing		2.197	1.63	2.471	2.59	2.92	
Mining		1.34	1.295	1.9	1.77	2.38	1.4[25] 2.00[26]
Personal	1.83 – 1.94	2.385	1.565	2.489	2.38	2.891	
Property	1.60 – 1.69	2.318	1.69	2.376	2.374	2.18	1.95[27]
Retail	1.76 – 1.87	2.083	1.51	2.579	2.227	2.757	
Transport	1.46 – 1.53	2.107	1.63	2.395	2.422	2.819	
Wholesale		2.47	1.68	2.62	2.79	3.23	

Members of remote communities could, for example, be encouraged to start-up enterprises that seek to provide needed inputs to other existing local businesses – e.g. food and clean linen for motels. This could work particularly well in cases where there is relatively little demand for 'final' goods. Instead of competing against each other for scarce customers, organizations could profit by

[20] West and Gamage (2001) – Victoria.
[21] Western Australia tourism commission (2003).
[22] McDonald and Wilks (1986)
[23] ABARE estimate for Dairy Australia (2006).
[24] HIA Economics Group (2004) Australia
[25] Rolfe et al (2003), Nebo shire
[26] Clements and Quiang (1995), WA
[27] Northern Territory Govt (2005b)

supplying different types of goods and services along a single 'supply chain'.

Admittedly, businesses that seek to earn money by supplying inputs to other businesses, will only receive a portion of the total revenues received by the businesses at the top of the supply chain. But a small portion of someone else's revenues may still be larger than other alternatives (e.g. no income at all), and some individuals may like the option of running a part-time business. Furthermore, some enterprises may be able to provide inputs to multiple businesses, thereby receiving multiple portions.

When attempting to stimulate local supply chains, policy makers may find it necessary to provide quite specific training and support to aspiring suppliers – e.g. about the types of goods and services that may be required and/or on suitable methods of delivering or presenting their products. This is especially true since "smaller firms, in particular, suffer from inadequate resources ...[and]... the lack of capacity to comprehend and address a wide variety of complex issues simultaneously, may result in a failure to access or respond to information, even when it is rational (and profitable) to do so" (Sinclair, 1997: 551).

The idea of using supply chains to stimulate regional economic growth is not new: "One of the most significant ways of ensuring that tourism contributes to fair and sustainable socio-economic development, is to build links between tourism and local economic activities via the 'supply chain" (Tapper, 2001: 360). But it is difficult to implement effective supply-chain strategies if regional businesses are either unwilling or unable to purchase inputs from within their local area. Hence the need for the second 'prong' of the attack: one needs to encourage existing organisations to 'buy-local' so as to provide financial support for these newly developing businesses.

Before continuing it is important to stress that this does NOT mean that one should consider cart blanche 'buy local' policies: they cannot be guaranteed to reduce aggregate regional imports (and thereby raise multipliers) if the number of local suppliers remains constant (Miyagiwa, 1991). The primary goal here is to encourage the development of NEW firms. Consequently, one may need to ensure that 'buy local' policies provide a diminishing level of 'protection' over time, so as to ensure that the policies do not inadvertently end up encouraging the long-term survival of inefficient firms.

The key problem with any buy-local policy, however, is that most businesses need to consider their profitability. They may not, therefore, be willing (or even able) to purchase local goods and services that are more expensive then their imported counterparts. Furthermore, many regional businesses are subsidiaries of larger firms, and may be 'required' to use inputs that are centrally purchased from outside the local area.

Admittedly some businesses may determine that it is in their long-term interest to encourage local suppliers and may thus be willing to pay higher supply costs for an initial few years whilst stimulating local networks. But the owners of private businesses often have short time horizons or high discount rates and are thus unwilling to accept current, higher costs, in exchange for future benefits that are of an uncertain magnitude (Gunningham and Rees, 1997: 374-5). Thus 'short-termism' may prove to be a significant barrier to the

effective implementation of supply-chain policies in regional Australia, and policy makers may therefore need to provide private businesses with an incentive to buy (or employ) locally – one that is large enough to overcome any real, or perceived, 'disadvantages' associated with local purchases.

Little can be done to directly interfere with the purchasing policies of private companies, but it may be possible to influence policies indirectly. Those in charge of approving building applications, for example, might wish to consider the purchasing policy of applicants if deciding whether company A or company B should be given priority. Similarly, those negotiating mining concessions may wish to give preferential treatment to enterprises that have some sort of 'buy local' policy (or, at the very least, are not party to contractual arrangements which require them to purchase goods outside the local area).

In this context it is interesting to note that the legal discovery of Native Title is having beneficial effects in terms of regional development. While the changes to the law have not resulted in Indigenous Australians obtaining greater access to large areas of their traditional estates, in many cases it has forced developers (miners and others) to negotiate directly with local Indigenous people. Sometimes these negotiations result in Indigenous Land Use Agreements (ILUAs), and sometimes they have simply led to a more locals-friendly ('good neighbour') approach by the organisation. Typically, the Indigenous negotiators want some income from the project (which is typically spent locally), employment for the local people and sometimes local purchases of locally supplied goods and services. Sometimes these are in the form of contracting out of services which would have otherwise been supplied in-house. All of these developments are beneficial for local economic development.

There may also be scope to reconsider government purchasing policies. Many government departments (local, state and federal) follow federal government purchasing policies (see, for example: Department of Treasury and Finance, 2006). Amongst other things these policies provide for Common Use Arrangements (CUA). CUAs contain detailed lists of items that are frequently purchased by government, with the names of approved suppliers of those items. Employees of government departments are sometimes bound by those agreements—items listed in a CUA can only be purchased from approved suppliers. Because the government can thus guarantee significant sales to approved suppliers, it has significant leverage when negotiating CUA prices, terms and conditions. When employees purchase goods that are not listed on a CUA, they must often follow guidelines which are designed to ensure that goods and services are obtained at competitive rates; the more expensive is the purchase, the more open are tenders to external competition.[28]

On the surface, these sorts of policies seem to be a wise, justifiable way of promoting competition and thus saving taxpayers' money. But that may not be

[28] The 'spirit buying rules', for example require government employees who wish to purchase goods or services valued at more than $1000 and (and less than $10,000) to obtain at least 3 verbal quotes. Purchases of more than $10,000 must have 'invitations' to more than 3 suppliers; those over $100,000 must involve quotes from at least 6 suppliers (etc) – see Department of Treasury and Finance, 2006.

the case if considered in the broader context. While small rural businesses might stand a good chance of securing small contracts, they could struggle when asked to compete against national and international firms for larger contracts. So the policies may, unintentionally, suppress rural industry. A 'buy-local' policy (or 'buy local' if no CUA supplier within x kilometres and if the local price is no more than y% higher than urban prices) might initially cost taxpayers more, but if such a policy created local employment, then it might also reduce the need for other branches of government to provide regional income-support. If the reductions in income support payments are greater than the increased cost of inputs, then the net effect of the 'purchase local' policy would be to lower the taxpayer burden.

Of course, whether or not governmental buy-local policies are 'appropriate' may depend upon whether they have the potential to create both regional and national economic benefits. This is an empirical question, and there is unlikely to be a 'one size fits all' answer. Buy-local policies may create net benefits in some regions, but probably not in all.

6. CONCLUSION

Despite the fact that our survey respondents were asked to self-nominate their 'industry/sector' (meaning that our industry/sectors may not precisely correspond to those identified by the ABS), and despite fact that our methodological approach is very different from that used in these other studies, it is interesting to see just how similar our estimates are to those from (economically) comparable regions. Consequently, it seems that this methodological approach is as a cost-effective (albeit imperfect) alternative to the theoretically more correct full-model approaches – primarily because it does not require one to produce a complete IO table, from which to estimate multipliers.

And despite the fact that the multiplier estimates generated from this approach are not identical to those estimated in more complex models, they provide very useful information about the way in which expenditure patterns vary across organisations—information that allows one to draw inferences about the way in which regional multipliers vary across industries in northern Australia. Further the micro-level data collected with this methodological approach provides researchers with some detailed information about factors influencing the size of multipliers in regional Australia, about which there has been relatively little previous empirical work (certainly at such a large scale). And this information is vital to those interested in promoting regional economic development in Australia's North.

What is perhaps THE most important policy message of our research is that those who are interested in regional development should not just think about the (final) goods and services that are delivered to or produced within regional communities. They should also think about the inputs that are used to produce, or deliver, those goods and services. The development paths of rural/remote communities will be just as heavily influenced by decisions that are made regarding input sourcing and usage as they are by decisions regarding outputs.

In 2005, Pritchard (2005: 91) argued that:

> *If regional development is to be associated with the improvement of economic and social prospects for people within a region, as opposed to simply optimising the size of gross regional product, then it is incumbent upon analysts and practitioners to construct regional development strategies around an elevated understanding of local scale economic and social interactions.*

The 'elevated' understanding of local economic interactions that this research provides suggests that one could amend Pritchard's recommendation to include the following underlined words:

> *If regional development is to be associated with the improvement of economic and social prospects for people within a region, as opposed to simply optimising the size of gross regional product, then it is incumbent upon analysts and practitioners to construct regional development strategies that provide local people with the opportunity to 'share' the benefits of increased production by actively participating in the production process.*

ACKNOWLDGEMENTS

The research described in this paper is one of the outcomes of a project that was co-funded by the Tropical Savannas CRC and JCU, and we, very gratefully, acknowledge that support. We are also very grateful to those who participated in the project's survey. Without their contributions, we could not have completed this research – and we hope our work can help improve their lives or livelihoods (if only indirectly), thus repaying them for the time they so freely gave us.

REFERENCES

Access Economics (2005) *Measuring the Economic and Financial Value of the Great Barrier Reef Marine Park.* GBRMPA Published Report No.84.

Albanese, A.; Burke, T & Gray, G (2008) *Budget: Strengthening Rural and Regional Australia.* Canberra: Commonwealth of Australia.

Australian Broadcasting Commission (2008) Radio Australia transcript of April 21 interview "Development threatens to 'ruin' northern Australia", available at http://www.radioaustralia.net.au/news/stories/200804/s2222903.htm - accessed June 04 2008.

Australian Bureau of Statistics (2001) *Input-Output Tables Australia.* Available: www.ausstats.abs.gov.au/ausstats/subscriber.nsf/0/479C1745BB15388ACA256A0300022F94/$File/52090_1996-97.pdf [Accessed 13 July 2006].

Australian Bureau of Statistics (2006a) *Australian Economic Indicators.* Available at: www.abs.gov.au/AUSSTATS/abs@.nsf/featurearticlesbyCatalogue/9338D191D5717C48CA256FE600821530?OpenDocument [Accessed 23 June 2006].

Australian Bureau of Statistics (2006b) *Australian and New Zealand Industrial Classification (ANZIC), 1993*. Catalogue Number 1292.0, Available: www.abs.gov.au/Ausstats/abs@.nsf/ accessed 16 February 2006.

Australian Bureau of Statistics (2007) Australian Industry 2003-04. Catalogue Number 8155.0, Available: www.abs.gov.au/Ausstats/abs@.nsf/ accessed 24 January, 2007.

Berck, P. and Hoffman, S. (2002) Assessing the Employment Impacts of Environmental and Natural Resource Policy. *Environmental and Resource Economics,* 22(1-2), pp. 133-156.

Clements, N and Quiang, Y. (1995) Multiplier effects of the Western Australia mining and mineral-processing industries. *Results statement No.1,* Chamber of Minerals and Energy, Perth.

Cumberland, J.H. (1966) A regional interindustry model for analysis of development objectives. *Papers of the Regional Science Association,* 7, pp. 33-42.

Doherty, J. and Tol, R. S. (2007) An environmental input-output model for Ireland. *The Economic and Social Review,* 38(2): 157-190.

Eder, P. and Narodoslawsky, M. (1999) What environmental pressures are a region's industries responsible for? A method of analysis with descriptive indices and input-output models. *Ecological Economics,* 29, pp. 359-374.

EWN Publishing (2007) press release, "Task force to examine potential for further land and water development in northern Australia", Posted by waterweek on 2 October 2007, Available at: http://waterweek.wordpress.com/2007/10/02/task-force-to-examine-potential-for-further-land-and-water-development-in-northern-australia-says-minister/, Accessed June 04 2008.

Dairy Australia *(2006) Australian Dairy Industry in Focus 2006 Final Report.* Available at:

www.dairyaustralia.com.au\index.php?option=com_content&task=view&id=33&Itemid=48, Accessed May 04 2007.

Department of Treasury and Finance (2006) *Office of Government Procurement Buyers Guides, 2006.* Available at: www.dtf.wa.gov.au/cms/pro_index.asp, Accessed April 16 2007.

Frechtling, D. and Horvath, E.(1999) Estimating the multiplier effects of tourism expenditures on a local economy through a Regional Input-Output Model. J*ournal of Travel Research*, 37(4), pp.324-333.

Gunningham, N., and Rees, R. (1997) Industry Self-Regulation: An Institutional Perspective. *Law and Policy*, 19(4), pp. 363-414.

Gustavson, K. R.; Lonergan, S. C., and Ruitenbeek, H. J. (1999) Selection and modelling of sustainable development indicators: a case study of the Fraser River Basin, British Columbia. *Ecological Economics*, 28, pp. 117-132.

Hawden, D. and Pearson, P. (1995) Input-output simulation of energy, environment, economy interaction in the UK. *Energy Economics*, 17(1), pp. 73-86.

HIA Economics Group (2004) *The Economic Multiplier Effects of Australia's Housing Industry*. Available at: economics.hia.asn.au/media/multipliers.pdf, Accessed 14 July 2006.

Huang, G.H., Anderson, W.P. and Baetz, B.W. (1994) Environmental Input-Output Analysis and its Application to Regional Solid-waste Management Planning. *Journal of Environmental Management*, 42(1), pp. 63-79.

Hughes, D., and Holland. D. W. (1994) Core-periphery economic linkage: A measure of spread and possible backwash effects for the Washington economy. *Land Economics*, 70(3), pp. 364-377.

Johnson, P.L. (2001) *An Input-Output Table for the Kimberley Region of Western Australia.* Kimberley Development Commission, Western Australia.

Johnson, P.L. (2004) *An Input-Output Table for the Gascoyne Region of Western Australia.* ACIL Tasman, Australia.

Lenzen, M., and Foran, B. (2001) An input-output analysis of Australian water usage. *Water Policy*, 3, pp. 321-340.

Leontief, W. and Duchin, F. (1986) *The dynamic input-output model: the future of automation on workers.* New York: Oxford University Press.

Liew, C. J. (2000) The dynamic variable input-output model: An advancement from the Leontief dynamic input-output model. *The Annals of Regional Science*, 34(4), pp. 591-614.

McDonald, G. T. and Wilks, L. C. (1986) The regional economic impact of tourism and recreation in national parks. *Environment and Planning B: Planning and Design*, 13(3), pp. 349-366.

Miyagiwa, K. (1991) Oligopoly and Discriminatory Government Purchasing Policy. *The American Economic Review*, 81 (5), pp.1320-1328.

Nabors, O., Backus, G., and Amlin, J. (2002) Simulating Effects of Business Decisions on Regional Economy: Experience During the California Energy Crisis. *Journal of Industry, Competition and Trade*, 2(1-2), pp. 143-158.

Northern Territory Government (2005a) *Northern Territory Industry Sector Snapshots 2005*. Department of Business, Economic and Regional Development: Northern Territory.

Northern Territory Government (2005b) *Business services sector in the Northern Territory: Characteristics and performance.* Department of Business, Industry and Resource Development: Northern Territory.

Pritchard, B. (2005) Beyond the resource enclave: Regional development challenges in northern remote Australia. *Journal of Australian Political Economy*, 55, pp.77–93.

Robinson, H. M. and Duffy-Deno, K. T. (1996) The role of the oil and gas industry in Utah's economy: an economic base/input-output analysis. *Resource and Energy Economics*, 18, pp. 201-218.

Rolfe, J., Lockie, S. & Franettovich, M. (2003) *Economic and social impacts of the Coppabella Mine on the Nebo Shire and the Mackay region.* Report prepared for Australian Premium Coals Pty Ltd., University of Central Queensland, Rockhampton: Queensland.

Rose, A. (1995) Input-output economic and computable general equilibrium models. *Structural Change and Economic Dynamics*, 6, pp. 295-304.

Sinclair, D. (1997) Self-regulation versus command and control? Beyond False Dichotomies. *Law and Policy*, 19(4), pp. 529-559.

Stoeckl, N., Stanley, O., Jackson, S., Straton, A, and Brown, V. (2006) An assessment of social and economic values associated with Australia's Tropical Rivers. *Final Report submitted to Land and Water Australia*. Available at: http://www.lwa.gov.au/Programmes/Current_Programmes/Australias_Tropical_Rivers/Final_reports_and_publications/index.aspx

Stoeckl, N and Stanley, O. (2007) Key Industries in Australia's Tropical Savanna. *Australasian Journal of Regional Studies*, 13(3), pp. 255-286.

Stoeckl, N. (2007) Using Surveys of Business Expenditure to Draw Inferences about the size of Regional Multipliers: A Case-study of Tourism in Northern Australia. *Regional Studies*, 41(7), pp. 1-15.

Tapper, R. (2001) Tourism and Socio-economic Development: UK Tour Operators' Business Approaches in the Context of the New International Agenda. *International Journal of Tourism Research*, 3(5), pp. 351-366.

Taylor J. and Stanley O. (2005) The Opportunity Costs of the Status Quo in the Thamarrumm Region. *Working paper No 28/2005* CAEPR, ANU.

Wang, S. (2001) The neural network approach to input-output analysis for economic systems. Neural Computing and Applications, 10, pp. 22-28.

West, G.,and Gamage, A. (2001) Macro effects of tourism in Victoria, Australia: A nonlinear input-output approach. J*ournal of Travel Research*,.40, August 2001, pp.101-109.

Western Australian Tourism Commission (2003) *Western Australian Tourism Product and Infrastructure Development Plan 2004-2013.* Government of Western Australia: Perth.

Woollett, G., Townsend, J. and Watts, G. (2003) Development of QGEM-T - A Computable General Equilibrium Model of Tourism. *Working Paper of the Office of Economic and Statistical Research.* Queensland Treasury: Brisbane.