Utilising small-region census data in a CGE model

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Abstract

Large-scale multi-regional CGE models of Australia, such as MMRF and TERM, underlie most CoPS consulting work. The regional detail, modelled in bottom-up fashion, greatly interests policy makers and is often needed to answer questions like:

- How would less rainfall in southern Australia affect the economy?
- What are the small-region impacts of a terms-of-trade boom?

To support this work, we have devised a variable disaggregation master database for any combination of over 1,400 statistical local areas (SLAs). Such a database may represent 172 sectors in over 100 regions – indeed, recently we devised a master database covering 206 statistical sub-divisions in bottom-up detail. It would be slow to run simulations with so much detail, so we routinely aggregate the database before using it. Each aggregation is tailored to preserve the regional and sectoral detail that is pertinent to a particular policy issue.

This paper describes the procedure used to generate a master database, starting from a published national 2001-2 input-output table. A levels adjustment program is used to update the published input-output table from 2001-02 to 2005-06. This makes it easier to use regional data from national accounts and the 2006 census, together with international trade data by port.

The whole procedure is automated via a series of programs. This forms a basis for documentation and also allows us to repeat the whole procedure with different inputs. For example, we could reaggregate the SLAs to distinguish zones within each capital city, if desired.

We have adapted the methodology of variable disaggregation to develop the first ever bottom-up representation of the Australian economy by its 150 federal electorates.

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1. How small do we want our regions to be?

The CoPS/IMPACT project started with a top-downs representation of Australia in the ORANI model in the late 1970s (Dixon et al., 1982). The tops-down approach was based on differences in industry composition. It distinguished between sectors whose demands were driven by local income effects and those that followed national outputs in calculating regional impacts. It provided a framework for analysing winners and losers in policy simulations by region – without providing region specific price changes, as in a bottom-up multi-regional model. A decade or so later, Madden (1992) developed a bottom-up, two-region model divided between Tasmania and the rest of Australia. The development of the Monash Multi-Regional Forecasting model (MMRF) followed (Adams et al., 2000).

The advent of TERM (The Enormous Regional Model) was a significant advance on previous multi-regional, sub-national bottom-up models by being able to represent more regions than were possible previously (Horridge, *et al.* 2005). TERM helped cater for the demands of policy-makers for sectoral, temporal, and social detail in policy analyses. Yet it became evident that the 57 regions (mainly statistical divisions) of the original master database of TERM were insufficient to represent some regions satisfactorily.[1] Sydney and Melbourne, which between them account for more the one-third of Australia's population, are represented by just one statistical division each. When modelling the impacts of a new urban motorway, for example, clients wished to distinguish between one part of a large city and other parts within the same statistical division, 50 to 100 kilometres distant. TERM has been in increasing demand in water modelling, as Australia has faced short- and medium-term crises with the onset of recurrent droughts since the turn of the millennium. The most natural regions for modelling irrigation scenarios are catchment regions: these follow statistical sub-divisions more closely than statistical divisions. Urban water infrastructure projects might concern one part of a statistical division that is quite distinct from rural sub-divisions within the same region.

For a time, we chose to maintain our representation of regions by statistical division. We thought that we were exhausting available data to provide this level of representation. Moreover, when regions become too small, people may work in one region and live in another, complicating the relationship between a region's income and a region's spending. Then we discovered that we could obtain further detail in the regional dimension by making use of ABS census data on employment by industry. In the first place, we purchased such data from the 2001 census. This coincided with our development of a top-down representation of the municipalities of West Java as an additional module in IndoTERM, a multi-regional model of the Indonesian economy.

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[1] The statistical division level represents each capital city as a single region. It splits the non-metropolitan part of each state into several regions. The statistical sub-divisions (SSDs), of which there are over 200, split most capitals into several regions, separate regional cities from surrounding rural regions and are closer to catchment regions in irrigation areas. The statistical local areas (SLAs) now exceed 1,400. City and rural regions are usually brought closer to local government areas (except in Brisbane, which has only one local government) and larger towns appear as individual regions.

Some of philosophical objections to the problem of workers living in one region and working in other are overcome if we work with data on employment by place of residence. Such data present a few anomalies, the most obvious of which is that fly-in, fly-out miners who reside in Perth lead to the representation in TERM of mining activity within the Perth metropolitan area. This does not concern us, as those mining employees are spending their money in Perth rather than at the mine. The income they earn is relevant to consumption mostly in Perth, consistent with treating their income as though it is earned in the city. The cost of this approach is that some intermediate inputs used in mining are attributed falsely to the residential region.

Having developed a top-down module for TERM, it was a relatively straightforward matter to ascribe top-down shares at the statistical local area (SLA) level with 1,337 regions. The SLA regions were linked by a mapping to statistical divisions represented in the bottom-up core model. There were deficiencies relating to the coarseness of industry representation in some parts of the SLA data.

2. A tops-down representation of electorates

Another idea soon emerged from our foray into SLA representation. If we could represent Australia at least in a bottom-up manner with 1,337 regions, then surely it was possible to represent Australia by its 150 electorates. We contacted the Australia Bureau of Statistics (ABS) and discovered that they had two mappings which could help us. They had mappings from over 20,000 voting collection districts to both SLAs from the 2001 census and the 150 federal electorates of the 2004 election. With these, we devised a two-step, top-down representation: first, we mapped SLAs to bottom-up regional solutions as before. Then we mapped SLAs to electorates, to estimate outcomes by electorate. Regional representation of results by electorates was a first for CGE modeling in Australia. [2]

3. The new frontier: bottom-up representation below the statistical division level

With the release of regional employment data from the 2006 census, we discovered that it was possible to fill some of the gaps we noted in the previous SLA representation. Previously, we had used three digit level ANZSIC (Australia – New Zealand Standard Industry Classification) data on employment from the 2001 census. These were more than sufficient to represent most services sectors of interest to us. There were deficiencies in some sectors in agriculture, mining, manufacturing and utilities. Key regional modelling interests include greenhouse gas emission scenarios, run using MMRF-Green (Adams, et al. 2000), and irrigation activities. The discovery that four digit employment data were available at the SLA level encouraged us to go further with the regional detail.

[2] See www.monash.edu.au/policy/archivep.htm TPHM0074.

In order to take advantage of 2006 census and 2005-06 state accounts data, a necessary first step is to update the input-output data in the national database. [3] Unlike the method of updating a CGE database used in the MONASH (Dixon and Rimmer, 2002) and other dynamic models, the ADJUST program downloadable from the CoPS archive uses value targets rather than a combination of quantity and price targets. The required inputs are broad sectoral value-added data and expenditure-side macro values at the 8 region state level from ABS state accounts, plus international export and import data at the four digit ANZSIC level.

Our strategy was to estimate a master database of regional SLA shares that we could aggregate to any combination of regional shares of interest to us. [4] The next step was to make our target regional (i.e, aggregation of SLAs) industry activity shares consistent with states accounts data. These data include GOS and labour costs for 19 sectors for each of the 8 states and territories. We normalized regional shares at the SLA level so that they summed to state totals at the 19 industry level. Next, we devised shares for investment (which follow production), household consumption, government consumption, exports and imports.

We obtained export and import data at the four digit ANZSIC level for each of 60 ports. These data were sufficient to provide us with international trade data at the statistical sub-division (SSD) level.

In order to use the gravity assumption, we require a set of coordinates of latitude and longitude for each region. We have a master file at the SSD level. From these, we can create a distance matrix, in order to generate inter-regional trade matrices by applying the gravity assumption to excess demands and excess supplies at the regional level.

Initially, we devised a number of master databases which included a combination of SSDs and statistical divisions, with around 100 regions in total. Subsequently, we developed a bottom-up master database based on Australia's 150 federal electorates. With a new 64-bit computer, we were able to produce a 206 region database that covered Australia at the SSD level in one massive master database.

4. A special application of variable disaggregation: electorates bottom-up

A significant motivation for development of ORANI arose from the tariff debate. At the time, a number of marginal electorates in regional Australia had relatively high concentrations of industry protected by high tariffs and import quotas. Some policies devised during the 1970s reflected the concerns of marginal electorates, as effective protection levels rose. With decreasing protection, the curiosity attached to regional representation by electorate in a CGE model may have decreased. Nevertheless, despite the complexities involved in transforming available data into electoral shares of national activity, we have developed a bottom-up CGE representation of Australia's federal electorates.

[3] The archive item www.monash.edu.au/policy/archivep.htm TPMH0058 contains the ADJUST program used in this procedure.
[4] The number of SLA regions grew to 1,414 for the 2006 census.

On the surface, electoral representation in TERM remains appealing. Between the 2004 and 2007 elections, there were two significant economic events which, acting in isolation, did much to alter the income earned across regions. These were the terms-of-trade boom that has arisen from rising demands for raw materials in China and India, plus recurring droughts in south-eastern Australia. Though these events appeared to be less important than other issues that confronted voters in the 2007 election, their impact on regions and electorates is intuitively attractive.

We needed to devise an electorate-to-SLA mapping for our task.[5] We achieved this by purchasing ABS concordances between the 20,000 collection districts and the 150 electorates, and the collection districts and SLAs. There were two complications in using the mapping for the 2007 election: first, there was some realignment of SLA boundaries between the 2004 election and the 2006 census (i.e., our main source of regional activity shares); second, there was an electoral redistribution between the 2004 and 2007 elections. To deal with the first complication, we created a mapping between the 2004 SLAs and the 2006 census SLAs, based on ABS data. We dealt with the second complication directly, by reassigning SLAs from the lost seat of Gwydir in New South Wales to neighbouring electorates, and by taking SLAs or parts of SLAs from neighbouring electorates and reassigning them to the new seat of Flynn in Queensland. The programs we used to reassign SLAs to electorates also checked population totals by electorate. We reassigned SLAs in cases where initial electoral populations were markedly high or low. In estimating electoral shares of national activity, we used naïve splits. That is, if a particular SLA were to be split between different electorates, we imposed the same industry composition on each fragment of the SLA. Dealing with such finely disaggregated data, we felt that we lost little with this assumption.

The choice of aggregation for our simulation depends on the focus of our study. In an election, most interest is in the marginal electorates. For example, following the 2007 election, just 46 of the 150 electorates require a swing of less than 6.0% to oust the sitting member. Only 27 seats changed parties in the 2007 election, which was notable for a large swing against the incumbent government that resulted in a change in government. Of those 27, only 8 were not predominantly urban seats. The problem with urban seats is that they tend to be relatively homogeneous, dominated in industry structure by services sectors, with relatively small shares being contributed by primary or secondary industries. Unless we have additional data by electorate of relevance to swinging voters, such as the ratio of household debt servicing to income, there is little to distinguish one seat from another. Consequently, a simulation based on an aggregation that represents marginal seats individually may reveal little – unless we obtain further relevant data by electorate. This is in marked contrast to several decades ago, when highly protected manufactures were often concentrated in marginal electorates. In our particular scenario, we chose to preserve electoral detail in the resource-rich regions of Western Australia, Northern Territory and non-metropolitan Queensland, while aggregating remaining electorates mostly to relatively broad regions.

[5] In 2007, the ABS released four-digit employment data by electorate based on the census which might have saved us a lot of hard work.

The scenario: hard times from drought and good times from terms-of-trade

In our simulation, we concentrate on two economic events that have affected regional Australia between the 2004 and 2007 elections. The first is the terms-of-trade boom. Demand for raw materials by China and India has resulted in soaring commodity prices relative to those of mid-2004 (the 2004 election was held in October). The second is drought. In 2006, south-eastern Australia and much of the eastern seaboard to the north suffered below average rainfall. The Snowy Mountains area (the main catchment region for the southern Murray-Darling basin irrigation regions) experienced record rainfall deficiencies in 2006. The drought had a moderate impact on water allocations and output in irrigation regions in 2006, with much more severe impacts in 2007 as rainfall in catchment regions remained below average.

Droughts since the turn of the millennium have resulted in other crises. All mainland capital cities other than Darwin, plus many regional cities, have been placed on water restrictions as a combination of drought and rising populations have placed severe pressure on existing urban water resources. We do not attempt to model the economic impact of urban water restrictions in this simulation. Recurrent droughts have also fuelled severe bushfires – even in capital cities (Sydney late in 2002, with more outbreaks since and Canberra in January 2003). Community perceptions of climate change have altered in the wake of recurrent droughts over the past half a dozen years. Differences persisted in the attitudes of the main political parties to climate change, and appeared to have some impact on voting patterns at the 2007 election. Again, we have not attempted to model anything to do with drought other than the direct impact on farm output. There are a number of election issues that may have been much more significant in the final analysis than the terms-of-trade boom or drought. We have chosen these events because they translate readily to regional economic impacts.

We have chosen a short-run environment: we assume that there is insufficient time to adjust capital stocks in each industry, so that rates-of-return on capital vary between sectors. In the labour market, we assume that labour is imperfectly mobile between regions, and – reflecting a tight labour market – national aggregate employment is fixed. At the same time, we assume that although national aggregate investment is fixed, investment by sector follows variations in rates-of-return. National aggregate household consumption is fixed, while following income earned by labour at the regional level. Fixed national consumption might be consistent with the Reserve Bank keeping a lid on excessive demand by adjusting interest rates. Similarly, we assume that aggregate government consumption is exogenous, so that windfall royalties from the terms-of-trade contribute to increases in the budget surplus.

Table 1: Shocks to export and import prices

	Exports	Imports
Sheep	10	10
Grains	20	40
Coal	25	25
Oil & gas	50	63
Iron ores	100	100
Non-ferrous ores	60	60
Other mining	0	60
Meat products	0	0
Dairy products	10	0
Wine & spirits	-10	-10
Other manufactures	0	-15
Petroleum & coal products	20	20
Iron & steel	-25	-25
Non-ferrous metals	60	60
Other metal products	0	25

Source: ABARE (2007).

Table 2: Productivity level due to drought by region/electorate (100=average year)

Rural NSW	50
Regional VIC	50
Capricornia QLD	87
Groom QLD	83
Maranoa QLD	67
Flynn QLD	91
Rural SA dryland	50
Rural SA irrigated	59
Brand WA	87
Forrest WA	91
OConnor WA	71
Bass TAS	67
Braddon TAS	67
Denison TAS	67
Lyons TAS	67

Source: Authors' estimates based on two-year rainfall deficiencies provided by the Bureau of Meteorology.

Table 1 shows the price shocks ascribed to selected commodities. Australia is a large exporter of gas and significant net importer of oil. Hence, the export price shock to oil and gas is smaller than the corresponding import price shock, as gas has a significant weight in exports and zero weight in imports. Some of the commodity prices are relatively moderate, as sharp price increases occurred in the months prior to the 2004 election – we have ascribed shocks to reflect price hikes from the 2004 to 2007 elections. The productivity impacts due to drought shown in table 2 are based on annual rainfall deficits for 2006 and 2007 across regions. The drought in 2006 was most severe in south-eastern Australia, with irrigators experiencing substantial shortfalls in allocations in 2007 in the southern Murray-Darling basin.

Regional outcomes

Table 3 shows macroeconomic outcomes by region. The bottom row shows national results. The real GDP loss (-0.7%) shown for the national economy is a consequence of drought.

In export-oriented sectors, the real capital rental will rise as export prices rise in the absence of any increase in capital stocks (*r* is the capital rental minus the GDP deflator). Usually, any increase/decrease in regional aggregate employment (indicating a decrease/increase in the K/L ratio if capital is fixed) must be accompanied by a decrease/increase in real producer wages (*w*, nominal wages minus the GDP deflator) relative to the rate of return on capital (*r*). But since capital is fixed in each industry in the short-run, and by assumption employment is fixed in national aggregate, employment at the regional level is only likely to increase if that region's factor rental ratio *w/r* falls more than the national ratio. The national factor rental ratio falls by 25% (national w falls by 7.8%, national r rises by 23.0%: [100-7.8]/[100+23.0]=0.748). The electorate of Kalgoorlie in Western Australia, due to the doubling of iron ore export prices, has the largest fall in the factor rental ratio and is accompanied by the largest percentage increase in employment of all the regions. But there is not a strict ranking of employment outcomes according to the regional factor rental ratio, because there are compositional differences between regions – and drought reduces productivity in some regions. For example, Rural South Australia has a significant fall in the real factor price ratio, but this is accompanied by a significant fall in productivity due to drought, so that employment decreases. The last column in table 3 shows the regional contribution to the national terms-of-trade (contPxPm). The Kalgoorlie electorate makes the largest positive contribution to the overall terms-of-trade increase.

Since national aggregate consumption is exogenous by assumption, we can expect regions to increase or decrease their share of national GDP according to relative regional outcomes. Nominal household consumption in each region is tied to nominal labour earnings. Aggregate consumption by region increases/decrease as regional employment increases/decreases. Aggregate consumption follows in GDP in showing marked disparities between regions.

Table 3: Regional macro outcomes (% change from base case)

	Real H'hold consumption	Real Investment	Export Volumes	Import Volume	Real GDP	Aggregate Employment	Avg real wage	GDP deflator	CPI	Real renal on capital	contPxPm
CoastNSW	-0.8	-4.1	-0.9	0.8	-0.3	-0.2	-2.7	-2.1	-0.9	5.2	5.0
RuralNSW	-2.0	-4.4	5.9	0.0	-4.9	-0.4	-10.4	3.8	-1.6	11.6	0.0
MelbourneVIC	-1.6	-4.5	-5.8	0.5	-0.4	-0.3	-2.3	-3.3	-1.0	4.9	2.1
RegionalVIC	-2.6	-5.3	11.1	-0.8	-4.7	-0.5	-8.7	1.9	-1.4	4.7	-0.1
BrisbaneQLD	-0.3	-2.2	-18.6	1.0	-0.2	-0.1	-4.8	0.8	-0.5	11.9	0.1
Capricornia3	3.2	4.3	3.0	5.1	0.1	0.6	-11.9	14.5	3.4	12.9	1.6
Fadden3	0.1	-3.3	0.3	2.6	-0.1	0.0	-3.2	0.0	0.0	7.9	0.0
Fairfax3	-0.2	-3.3	0.7	2.4	-0.2	0.0	-3.8	0.0	-0.3	8.4	0.0
Griffith3	0.4	1.6	-1.2	4.2	0.0	0.1	-9.3	6.4	0.1	11.7	0.0
Groom3	4.1	5.6	5.2	7.1	0.6	0.8	-11.7	15.4	3.9	33.8	-0.1
Herbert3	8.1	14.8	6.6	11.4	1.2	1.6	-16.5	24.7	5.4	39.9	2.2
Hinkler3	12.5	15.9	-19.3	10.6	1.5	2.4	-25.4	42.6	10.9	42.4	0.0
Kennedy3	3.7	2.9	-3.5	5.5	0.5	0.7	-7.9	10.6	3.3	28.8	0.3
Longman3	7.2	14.2	-21.7	10.5	0.7	1.4	-25.6	35.0	7.2	10.2	0.0
Maranoa3	-1.0	-5.4	1.8	1.6	-0.4	-0.2	-2.1	-2.8	-0.8	3.9	0.0
Mcpherson3	-0.9	-5.1	1.5	1.8	-0.3	-0.2	-2.2	-2.5	-0.7	4.2	0.0
Ryan3	2.0	0.0	-2.9	4.2	0.2	0.4	-7.1	6.4	1.0	12.4	0.0
Flynn3	5.3	-3.4	-16.6	4.4	-0.4	1.0	-6.9	11.7	4.0	-0.7	0.0
GrtAdlaideSA	-1.0	-4.8	-6.5	1.1	-0.4	-0.2	-3.2	-0.9	0.0	8.7	0.6
RuralSA	-1.2	0.7	-14.3	2.8	-10.3	-0.2	-25.9	21.5	-0.1	16.6	0.3
Brand5	5.4	4.5	-12.9	5.6	0.6	1.1	-12.2	17.6	4.6	29.2	0.0
Canning5	3.6	0.8	-11.4	5.2	0.5	0.7	-8.3	11.7	3.9	23.0	0.0
Cowan5	2.6	4.1	-8.0	5.2	0.4	0.5	-10.2	12.0	3.1	25.7	0.0
Curtin5	10.4	13.8	8.1	11.1	1.3	2.0	-16.3	28.8	7.9	32.3	1.2
Forrest5	1.3	-1.0	-3.5	-0.9	-0.9	0.3	-8.1	7.7	2.0	21.5	2.0
Fremantle5	2.9	0.2	-10.5	4.2	0.4	0.6	-8.1	10.2	3.2	23.4	0.0
Hasluck5	3.7	1.2	-11.3	5.3	0.5	0.7	-8.3	12.0	4.2	21.9	0.0
Moore5	8.7	13.2	-17.6	12.6	0.9	1.7	-21.5	32.0	7.2	18.0	0.2
OConnor5	4.6	2.5	-5.4	5.6	-1.5	0.9	-12.8	17.3	4.3	22.3	0.4
Pearce5	2.5	2.2	12.6	4.4	0.4	0.5	-8.8	10.5	3.1	24.3	1.1
Perth5	2.9	1.2	-9.3	4.9	0.4	0.6	-8.0	10.1	3.3	22.2	0.0
Stirling5	2.6	2.6	-9.6	3.8	0.4	0.5	-9.6	11.3	3.1	26.2	0.0
Swan5	2.0	1.2	-7.6	2.3	0.3	0.4	-8.0	8.8	2.6	22.0	0.0
Tangney5	2.8	6.5	7.0	6.8	0.4	0.6	-10.5	11.0	1.7	32.3	0.3
Kalgoorlie5	14.3	43.9	1.8	28.2	2.2	2.7	-43.1	82.4	31.8	26.8	8.5
Bass6	0.1	-0.4	17.2	3.1	-1.6	0.0	-9.7	6.7	0.3	18.0	0.2
Braddon6	0.0	-2.4	2.6	4.1	-0.2	0.0	-3.2	-0.1	0.1	12.9	0.0
Denison6	-0.1	-3.1	0.9	3.7	-0.5	0.0	-3.9	0.4	0.0	12.0	0.0
Franklin6	2.6	3.5	-2.8	5.0	0.3	0.5	-11.3	11.5	1.5	28.2	0.0
Lyons6	12.3	22.3	7.6	14.9	0.8	2.3	-26.0	44.7	12.6	42.3	0.6
Lingiari7	4.4	2.9	-8.8	5.0	0.5	0.9	-11.1	17.0	5.8	27.5	0.0
Solomon7	-0.5	-5.7	2.2	2.0	-0.2	-0.1	-0.7	-3.5	-0.4	-0.3	0.0
ACT	2.2	7.1	-3.3	6.9	0.3	0.4	-12.8	13.2	2.1	24.8	0.0
National	0	0	-0.9	2.1	-0.7	0	-7.8	4.8	0.4	23.0	26.7

The impact on relative prices across regions

And now to concentrate on the modelling result which our regional representation can capture like no other model. In response to a large terms-of-trade impact and drought, prices will play a significant adjustment role in the short run. The most volatile short-run price in the model will be the price of housing. This is because housing consists almost entirely of capital, which is fixed by assumption in the short run. Also, housing is income elastic. This implies that when income grows, and the stock of housing is fixed, there will be large increase in the housing price. The 10 regions shown in figure 1 include the five with the largest percentage increase in the price of housing. The figure also includes the five regions with the largest decrease in the housing price. The percentage change in housing price is generally much larger than the percentage change in regional aggregate consumption in this short-run setting.

Kalgoorlie has the largest percentage increase in the price of housing – had we represented the Pilbara region separately in the simulation, its housing price increase would have been even larger again, due to the concentration of the iron ore export price increase in the region (figure 2). Indeed, when we represented the SSD covering Port Hedland as a separate region, the price of housing rentals more than doubled in the region. The CPI in each region includes a substantial house price weighting. For example, in Kalgoorlie, the contribution of housing is 27.4% out of a total CPI increase of 31.8% (i.e., seven-eighths of the total). Non-housing price hikes have been moderated in most regions particularly by the falling price of imported other manufactures (see table 1).

Figure 2: Prices at the regional level (% change relative to nominal exchange rate)

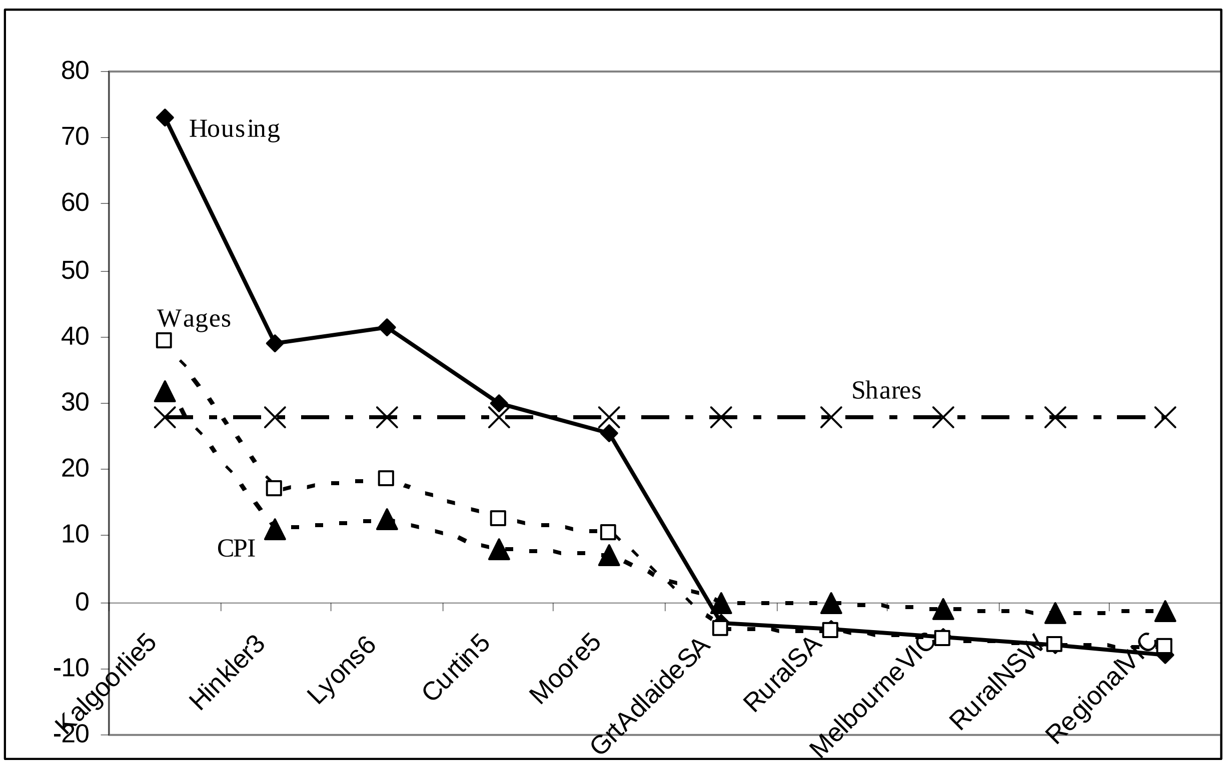

Figure 2 provides some insights into who have been the biggest winners and potentially the biggest losers from the terms-of-trade boom. House owners in mining regions have done well from the boom. Those seeking to rent a house in mining regions would have found that much of the additional salary that attracted them to the mines has gone in housing. Consequently, we have assumed that the labour response to regional wage differentials is relatively small. In addition, mining operations tend to be located in remote regions, so that large wage premiums are necessary to attract workers. The rise in nominal wages exceeds CPI only marginally in mining regions due to housing costs, even with relatively inelastic inter-regional migration. Mining companies may be able to attract new workers with high salary premiums, but what happens to employees in the services sectors whose salaries do not track fluctuations in the local economy?

We have calculated the increase in average share price as the average increase in capital rentals nationally. Also, we have assumed that share portfolios are not region-specific, so that shareholders throughout the nation have experienced the same windfall gain due to the terms-of-trade boom – a snapshot reflecting election 2007 rather than the stock market woes of the second half of 2008.

The biggest losers in this scenario have been farmers directly affected by drought. Consequently, Rural South Australia, Rural New South Wales and Regional Victoria are three of the four regions that lose most. However, a return to better seasons is likely to be accompanied by relatively high farm output prices. It is possible therefore that fortunes on the land could turn around relatively quickly.

The impact of mining booms on regional house prices

The terms-of-trade boom in Australia has brought with it accelerated investment in the mining industry. This in turn has led to huge jumps in house prices in some mining regions. For example, in Port Hedland, the median house price in the twelve months to February 2008 was almost $700,000. [6] With a booming local economy, Port Hedland's housing needs reached a crisis point in 2007. Usually, income-elastic service sectors do well during such boom. But some service industries in Port Hedland have been caught in a cost squeeze: available labour has been too scarce for them to continue operating and their own housing costs have risen beyond affordability.[7] Our modelling is able to depict the housing price pressure associated with the mining boom where other models either underestimate the impact or fail to deal with price pressures at all.

Construction phases in mining towns tend to result in a boom-bust cycle in local housing prices. In the case of a construction phase with a known timetable, the rationality of price increases in questionable. Supposing rents in a town double during a construction phase, as we modelled for the Port Hedland region with a finer regional disaggregation. The price of housing stock should only increase sufficiently to cover the temporary rental hike, plus reflect some expectation of longer term increases in regional income. Using a discounted income stream calculation, a four year construction phase that doubles rentals for the duration of the phase might increase the stock

[6] http://www.domain.com.au/Public/suburbprofile.aspx?mode=research&searchTerm=Port%20Hedland#mapanchor
[7] Radio National based a story on Port Hedland's housing crisis in December 2007: http://www.abc.net.au/rn/streetstories/stories/2007/2106163.htm

price by around 30%. Housing busts are likely to follow when percentage stock price increases approach the percentage increase in rental rates. There may be specific reasons why house prices in one town are high. The perception in Port Hedland might be that the mining boom will last indefinitely. Even if this is so, mining itself is not labour-intensive, whereas construction is – which implies that demand for housing will decline at the end of the construction phase. The need for dwellings to be cyclone-proof in the region, its extreme isolation and its extremely hot climate may each have slowed the housing supply response to escalating prices.

Some Port Hedland residents suffered from the boom: governments were happy to collect mining royalties but apparently slower to fund infrastructure within Port Hedland in response to the boom. Services sector employees on wages not set by local conditions in some cases could no longer afford to live in the town.

Summary of findings from an electoral representation

Previous applications of TERM have shown dispersions between winners and losers by regions or, in the case of drought, a concentration of losers in predominantly agricultural regions. A representation by electorates may make regions more homogeneous than a representation by statistical regions. Some of the insights from TERM simulations in the past have come from capturing the differences between regions in industry composition. At present, marginal seats are concentrated in outer suburban regions with relatively homogenous industry composition.

Most of the insights gained in this study would have been apparent in the usual regional representation of TERM (i.e., based on ABS statistical divisions). The same terms-of-trade and droughts shocks applied to such a representation would have revealed winners among major mining regions, losers in agriculture and losers in urban areas in non-mining states, at least in the short run. The clear new insight from our approach is that by modelling very small regions in a multi-regional CGE model, we able to capture the concentrated short-run price impacts of regional economic shocks. Our model is able to explain short-run price hikes in housing in mining communities in response to a terms-of-trade boom.

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