Regional Economic Modelling as a Tool for Local Government.

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Introduction

In this paper it will be argued that regional economic modelling, through the use of input-output analysis, can provide a more than useful tool for regional planners at the local government level and beyond. Once in place, such a tool can facilitate a better understanding of the performance of key sectors in the regional economy, the ability to calculate the value of gross regional product and the ability to assess likely economic impacts of proposed changes. Regional modelling can also foster an understanding of the interdependent nature of the regional economy and provide an essential tool for strategic planning.

The main features of an input-output model

The underlying structure of an input-output model is the transactions table. This table sets out the various economic sectors of a region in a grid or matrix format with each sector listed in both the rows and columns of the matrix. The table is able to show both the source of inputs for each sector by reading down the columns and the destination of the outputs for each sector by reading across the rows. Inputs can be sourced from within the region in the form of intermediate commodities and labour or beyond the region in the form of regional imports. Outputs from sectors will either go to other sectors within the region, to consumers in the form of final consumption, used as capital goods as part of investment or go beyond the region as regional exports.

Approaches to regional input-output modelling

There are basically three approaches to constructing regional models. The first approach is to survey all firms in the entire region to obtain details of the source of supply of all inputs and the destination of outputs, commonly referred to as the *bottom up* approach to economic modelling. Whilst such an approach is seen as the most reliable it is also a very expensive way of assembling the data necessary for the construction of a regional model.

A less expensive approach is to adapt the material available in the form of national tables and modify this to the region under scrutiny. This *top down* approach uses available regional data such as census tables including employment by industry group to disaggregate the national data into a regional table. Various approaches can be used to complete this process. The economic advantages of such an approach are often used to justify any lack of precision coming out of such an approach, which assumes that regional patterns of production and consumption will follow national patterns. The founder of input-output modelling and dual Nobel Prize winner, Wasilly Leontief often referred to “recipes” for production common to particular

industries. These can certainly be observed in many industries operating at the regional level.

A third approach is the *hybrid method* that begins with the top down disaggregation of the national model but is supplemented by selective surveys of key sectors to the region. Such an approach has performed much better than the simple top down approach but given the selective nature of the surveys used, is much more economical to apply than the *bottom up* approach. A number of studies have used the Scottish model based on survey data as a benchmark to test the accuracy of various approaches to regional modelling. One such study (Harrison and Lieu, 1998) showed results from a *top down* approach that was remarkably similar to the original survey data. Even closer was the approach using the *hybrid* method.

What does input-output modelling have to offer?

(a) Understanding the nature of the regional economy

There are a number of benefits gained once an input-output model of the region has been constructed. The first of these is to offer a better understanding of the relative performance of economic sectors in the regional economy. Information gained from the model includes estimates of regional output, regional exports, regional imports and wages for each of the sectors, which can be viewed alongside sectoral employment figures. It is also possible to examine the types of inputs used by each sector and determine the source of supply of these inputs, be it local or from outside the region in question. Similarly, the destination of outputs can be tracked to see whether these can be used as inputs for other sectors in the region, for final consumption by local consumers, or whether these outputs will go beyond the region in the form of intermediate or final goods and services for exports. The most important outcome of all this is to provide a picture of the ***interdependent nature of the regional economy*** and the way all these individual pieces of data fit together. Actions by one sector will have ramifications on many of the other sectors operating in the region.

The data provided such as sectoral outputs, income, employment, regional imports and exports will be invaluable at the local government level in compiling economic reports for ratepayers or potential investors, and supporting applications for funding.

(b) Calculating Gross Regional Product

By following the social accounting conventions used in the National Accounts it is also possible to calculate ***gross regional product*** by measuring regional expenditures on final goods and services for consumption or investment purposes plus exports (the expenditure method), by measuring incomes accruing to the factors of production in the form of wages, gross operating surplus, net taxes less imports (the incomes method) or finally by using total output by all sectors less intermediate goods used in the productive process (the value added method). Whatever method used is incidental to the fact that such a measure provides an opportunity to measure the relative position of a regional economy, set benchmarks and measure this on a per capita basis. Without such a measure, a region will be unable to carry out basic regional economic monitoring and assessment.

(c) Assessing the economic impacts of change

Once a regional economic model is in place it is also possible to model the effects of change by ***assessing the economic impact*** of real or proposed changes in the region. These changes could include proposed increase or decreases to any sector or an assessment of the economic impact of any existing sector in the region. Impacts can be measured in terms of the direct, indirect and induced effects to regional output, income, and employment. Such information can alert regional planners to the need for additional work skills, retraining, employment programs, infrastructure changes and further opportunities industrial support. It can also help planners prioritise in terms of competing strategies and help determine which strategy best matches the particular need of the region in terms of output, income and employment.

The effects of an initial increase in agricultural output of $32m are set out in Table 1. As inputs are required from other sectors, they too need to increase output, which has further ramifications on other sectors. The overall flow-on effects of the initial change in agriculture are shown in the Industrial Effects column. In the economy under review, the increase in agriculture has had a significant effect on sectors such as manufacturing, transport and wholesale trade.

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SECTOR	**F.DEMAND**	**INDUST EFFECTS**	**CONS'M EFFECTS**	**TOTAL**
1.Agric	32,000	3,622	236	35,858
2.Mining	0	21	7	28
3.Manufact	0	3,409	1,086	4,495
4.ElecG&W	0	489	209	698
5.Construc	0	301	23	324
6.WSaleTr	0	1,055	238	1,293
7.RetailTr	0	992	1,300	2,292
8.AccmC&R	0	318	469	788
9.Tran&Ser	0	1,311	349	1,660
10.CommSer	0	397	228	624
11.Fin&In	0	310	152	462
12.Prop&B	0	629	874	1,503
13.GovAdm	0	63	20	83
14.Educ	0	3	144	147
15.Hlth&Co	0	111	557	668
16.Cul&Rec	0	17	103	120
Pers&Oth	0	81	206	287
TOTAL	**32,000**	**13,129**	**6,202**	**51,332**
MULTIPLIER	**1**	**0.41**	**0.19**	**1.6**

Table 1. Flow-on effects of an initial increase in Agricultural output of $32m.

It is reasonable to assume that part of the increased wages earned by the household sector will result in additional consumer spending in the region. This effect is shown in the Consumption Effects column. As would be expected, retail trade is the major beneficiary here followed by manufacturing and property and business services. The sum of the initial effect, the industry effects and the consumption effects are shown in the total column. So an initial effect of an increase in agriculture of $32m generates an overall increase in output of $51.3m once all the flow-on effects have been assessed which amounts to 1.6 times the initial change. This latter number is known as the output multiplier and takes the direct, indirect and induced (consumption) effects into account.

It is also possible to model the employment effects of such a change. Table 2 sets out the initial effect on employment in agriculture and the industrial and consumption effects of such a change. Such information makes it possible to identify the sectors affected and anticipate any resulting labour market changes or shortages. Table 2 suggests that as well as a considerable increase in the demand for agricultural labour there will also be further labour demand in the retail, manufacturing, wholesale trade and transport sectors. The overall employment effects of such a change amount to a further 302 jobs with an employment multiplier of 1.95.

	Equiv. F/t Emplmt	(units)

SECTOR	F.DEMAND	INDUST	CONS'M	TOTAL
1.Agric	154	17	1	173
2.Mining	0	0	0	0
3.Manufact	0	18	6	24
4.ElecG&W	0	2	1	3
5.Construc	0	2	0	2
6.WSaleTr	0	11	3	14
7.RetailTr	0	13	18	31
8.AccmC&R	0	4	6	10
9.Tran&Ser	0	8	2	11
10.CommSer	0	3	2	4
11.Fin&In	0	2	1	3
12.Prop&B	0	3	4	6
13.GovAdm	0	1	0	1
14.Educ	0	0	3	3
15.Hlth&Co	0	2	9	10
16.Cul&Rec	0	0	1	1
Pers&Oth	0	1	3	4
TOTAL	**154**	**89**	**59**	**302**
MULTIPLIER	**1**	**0.57**	**0.38**	**1.95**

Table 2. Employment effects of an initial increase in Agricultural output of $32m.

Table 3 sets out the effects of a shift from existing farming to winegrape production once the direct, indirect and induced effects have been taken into account. These figures come out of a recent study. Using the same amount of water, a scarce resource, it is possible to boost output and employment in the region by a shift away from a traditional farming application. An added bonus has been the freeing up of just over half of the land for more ecologically sustainable uses.

	OUTPUT $'000	**EMPLOYMENT** Units	**LAND** ha	**WATER** Ml
WINE GRAPE PRODUCTION	56,293	612	35	175
EXISTING FARMING	-6,660	-44	-72.3	175
NET GAIN FROM A SHIFT TO WINEGRAPES	**49,633**	**568**	**-37.3**	**0**

Table 3. Economic impact of a switch from existing farming to winegrape production.

Communities are sometimes confronted by changing circumstances without the ability to assess the impact of this change. Electronic gaming machines were legalised in Victoria, Australia in 1992 with the support of the two main political parties and very little consultation with the electorate. Machines were then set up in capital cities and country regions and again no consultation with local governments or their communities was carried out. Table 4 sets out some of the results of a recent analysis of the economic impact on one regional community. The effects of a switch away from normal patterns of consumption to gaming expenditure of $32.35m per annum in a population of 90,000 had a considerable cost to the region once the industrial and consumption effects were modelled.

SECTOR	**OUTPUT** $'000	**INCOME** (Household) $'000	**EMPLOYMENT** (Equiv. F/t Units)	**VALUE ADDED** $'000
Normal Consumption	50,265	13,327	437	28,527
Gaming:	-44,935	-5,851	-200	-7,434
Net Effects of Gaming	**-5,330**	**-7,476**	**-237**	**-21,093**

Table 4. The net effects of a switch of $32.35m to gaming expenditure

Figures in Table 4 suggest that the switch to gaming expenditure has cost the region $5.8m in output, $7.4m in income to households and 237 jobs. It should be noted that the figures above do not include the social costs of gambling. It is arguable that with this sort of information, local governments might have been better able to stave off the influx of gaming machines in their area.

The ability to carry out desktop impact analysis of proposed changes will allow local governments to better support applications for government funding as they would be

able to provide data relating to increased output, income and jobs resulting from the successful funding of the project. It would also allow local governments to better prioritise projects in terms of the projected outcomes and their particular goals. They would also be able to assess the economic benefits resulting from any in-kind or financial support for particular projects and provide warnings in terms of any potential shortfalls in labour, skills or infrastructure that might slow the development of a project.

Regional Economic Modelling as an Aid to Strategic Planning

Regional modelling can be seen as a tool for strategic planners rather than a provider of ready-made answers. Just how this tool can be used will be demonstrated through the use of SWOT analysis (strengths, weaknesses, opportunities and threats), a technique already familiar to most planners. Information provided by the regional economic model can provide a more comprehensive understanding of the regional economy in terms of its strategic position.

(a) Strengths
Economic regional strengths come in many forms and may be related to issues including climate, location and existing physical and human capital. Strengths may also be embodied in certain economic sectors and it is these that can be readily identified through the regional economic model. Some of these sectors might have more influence than others in terms of the relative levels of output, income and employment in the region. Other sectors may have strong linkages with other sectors, either backward linkages where they are important users of the intermediate outputs of other sectors in the region or they have forward linkages where the output of the sector are important inputs for other sectors in the region. Another sectors may be strong exporters to other regions or countries overseas. Any growth in exports will not be at the expense of other sectors and in fact will be more likely to benefit other regional sectors. Any changes in these sectors could be expected to result in stronger than average impacts on the rest of the regional economy. Sectors exhibiting more than one of the above features may be dubbed “propulsive sectors” given the likelihood that growth in one of these sectors will contribute to significant levels of growth in the region. The identification of these propulsive sectors will be most helpful when the economic opportunities for the region are discussed.

(b) Weaknesses
Economic weaknesses at the regional level might include factors such as remoteness and lack of physical or human capital. A regional model might also highlight general over-reliance on unstable or threatened industry sectors. Regional reliance on industries such as the textiles, clothing and footwear sectors might be a sign of economic weakness as might over-reliance on semi-government agencies in a time of government cutbacks. This does raise the issue as to whether regions should be striving for economic specialisation or diversity and much of this will be linked to relative size of the region and the proximity and degree of cooperation with surrounding regions.

(c) Opportunities

A regional model can identify and measure the relative value of a number of possible strategies for change. A focus on further developing those ***propulsive*** sectors that have more than average impact on the regional economy might be one such strategy. The identification of large exports of semi-processed commodities may provide opportunities for ***value-adding*** activities. Large levels of imports in some sectors might also suggest opportunities in the form of ***import replacement*** opportunities. Modelling can also assist in the search for ***new markets*** for existing outputs and for new opportunities on global markets by being able to identify the relative strengths of the region. Similarly, opportunities for the formation of ***economic clusters*** within and beyond the immediate region may be more easily identified through the economic modelling exercise.

The benefit of economic modelling is that it not only assists in the identification process, but it also allows the opportunity to measure the likely impacts of such strategies in terms of benefits to regional output, income and employment to ensure that the outcomes, which most closely match the goals of the region, can be selected. If it is agreed that employment growth is the most important goal to the region at a particular time, then various options can be modelled and their employment outcomes compared. If economic diversity is the goal, then those options that best serve that goal can be selected.

This ability to model the effects of proposed changes and new economic ventures can also help in attracting new industries to the region or in supporting a case for government assistance. The ability to be able to spell out the expected economic impacts of these proposals and quantify these in economic terms must be seen as a very strong opportunity in itself.

(d) Threats

The ability to be able to identify and measure the likely impact of proposed threats to a region is a very important tool in itself. The list of possible threats to a regional economy appears endless. Issues such as increased competition from capital cities, global competition, government cutbacks, falling competiveness of local industries, falling commodity prices, low levels of technological change and the drift of resources away from the region are all possible scenarios for change and threats to regional areas. The ability to identify, quantify and devise strategies to counter or cope with these threats is one that marks the difference between successful and unsuccessful regions, of the empowered and the unempowered regions.

Conclusion

Regional input-output modelling provides regional planners at the local government level with a much clearer understanding of their regional economy and a reliable tool for effective strategic planning. By being able to provide data such as sectoral outputs and gross regional product, planners are better able to understand the interdependent

nature of their regional economies and the linkages that bind the economy together. The ability to quantify these relationships and assess the economic impacts of change provides a further insight and a powerful tool for strategic planning and the selection of appropriate strategies for change. This ability to quantify likely impacts of proposed changes is also of significant assistance in attracting new industries and government support for such projects.

The CSRC is able to set up regional models at the local government level and provide user friendly software capable of generating reports on regional output, income, employment, exports and imports. The software also allows the calculation of Gross Regional Product and allows local planners to carry out basic analysis of the economic impact of proposed changes. Underlying data is updated on an annual basis.

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