

Kazakevitch, Gennadi

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Gennadi Kazakevitch

School of Business and Electronic Commerce, Monash University
Churchill, Victoria, 3842, Australia
Gennadi.Kazakevitch@BusEco.monash.edu.au

**INDUSTRY RESTRUCTURING AND A SMALL OPEN
REGIONAL ECONOMY**

ABSTRACT: The paper examines the regional implications of the microeconomic reform of the electricity generation industry in the state of Victoria.

General equilibrium approach to regional economics and the MONASH Model instrumentality are used to evaluate the overall impact of the microeconomic reform on the regional economy in terms of the reduction of local employment and purchasing power.

A combination of primary and secondary information is used to implement the model. The multi-regional version of the Monash model and its data are used as an environment for a regional model. The model of the region is based on a comprehensive survey of the La Trobe Valley's economy.

1. Background

Historically, the electricity supply industries in the states of Australia were established and developed as state monopolies. Furthermore, the electricity supply industry in Victoria used to function not as a government-owned commercial entity, but as State Electricity Commission of Victoria (SECV), a statutory authority, which was directly funded from the state budget, with prices rather strictly controlled by the government. The goal of the undertaken by the State Government, starting from 1989, was spelled out as increased competition, increased productivity through changed work practices and significant reduction of the embedded cost structure of the business, together with reduction of the work force.

The first stage of the reform involved transforming the natural monopoly from a public property with statutory functions into an official commercial company. The nature of the electricity generation industry, however, did not economically allow flexible changes in the physical amount of capital employed by the industry, either in terms of time or continuity of changes. Thus, in the short run, rationalisation of the industry does not affect the amount of physical capital. At the same time, a considerable rationalisation of job structure and reduction of employment was undertaken. The quantity of production appeared to be relatively stable and not affected by the reform. On the other hand, in theory, it was obvious, that any attempt to deregulate prices at that stage early stage of the reform would inevitably lead to price increases. Hence, the government left price controls in place until later stages of the reform. The only results of the reform at that stage, therefore, was increased internal efficiency caused by the decrease in

employment. Eventually, that enabled the State Government at least to remove subsidies from the sector, which was previously running at a loss.

At the second stage, the single monopoly was vertically disintegrated into three new state-owned companies. The first of these was in charge of all power plants. It was responsible for power generation and supply to the high voltage transmission network ("the grid"). The second was in charge of high voltage transmission. It was responsible for receiving the energy from the generators and supplying it to the distributor. The third was responsible for the retail distribution of energy.

During the third stage of the reform, the generation and distribution enterprises were disintegrated into commercially operating but still state-owned businesses, including several competing power generation plants and a number of regional distribution and retail monopolies. Meanwhile, the high voltage transmission remains a regulated natural monopoly. The idea was that the generation units competed with one another for shares in the total amount of electricity supplied to the grid and to large consumers. At the same time, large consumers have the choice of either buying energy directly from a generation unit or relying upon the grid price, which is more stable. Consequently, both production and distribution companies were privatised.

Meanwhile, reduction of the workforce in the given industry continues throughout the second and third stages of the reform. Most of all this affected the La Trobe Valley region of Victoria. The production component of the electricity generation industry of the state is not only predominantly located in the La Trobe Valley, but also is one of the major parts of the regional economy. Consequently, any reform in this sector causes not only microeconomic effects, but also consequences for the overall regional economy.

The goal of this paper is to evaluate regional impact of the above-mentioned reform on the economy of the state and the region.

2. Regional consequences of the reform: an illustrative skeleton model.

In order to evaluate the possible impact of reform upon the region and the state as a whole, let us consider first a very simple illustrative general equilibrium model.

At this stage, let us disregard the state structure of the Australian economy and consider an economy of two regions and two homogenous commodities. Commodity X is produced in the first region and Commodity Y in the second one. The commodities are produced both for local consumption and for trade with another region. Each of the regions consumes both commodities. The sector producing the commodity X in the region 1 is considered as the subject of microeconomic reform. Therefore, the model reflects the real fact that the reforming sector is predominantly concentrated in one region and is a substantial part of the regional economy.

Before the reform, the commodity X in the region 1 was produced within a market structure (say, an official monopoly), where the managerial incentives engaging in cost reduction activity were not sufficient. It is a conventional assumption in the theories of deregulation and privatisation, as discussed, for example, in John Vickers and George Yarrow (1988), D. Bös and W. Peters (1986) and D. Bös (1986).

As a direct result of a microeconomic reform, those incentives have been improved so that the unchanged amounts of conventional factors used in production now can produce more output, or the unchanged level of output is achieved by reducing the amount of these factors.

In terms of production functions, it is convenient to represent microeconomic reforms by introducing an additional "reform factor" (R),

which partially substitutes one or more conventional factors. In some models this factor is considered to be a normal factor of production which not only affects the level of output, but also involves a cost (Vickers and Yarrow (1988), pp 35-39.)

The greater the anticipated benefits of the reform, the greater the cost incurred during the process of reform. However, for simplicity, the microeconomic reform is represented in this model as the exogenous change of the factor R with no internal costs.

There are only two factors of production: capital (K) and labour (L) with the reform factor R involved only in the industry X of the region 1/

The following equations represent a general equilibrium model with two products and two regions.

The production functions for each of two sectors/regions are:

$$X = X(K_X, L_X, R) \quad (1)$$

$$Y = Y(K_Y, L_Y) \quad (2)$$

Supply of both commodities is represented as increasing functions of prices P_X and P_Y :

$$X_S = X_S(P_X) \quad (3)$$

$$Y_S = Y_S(P_Y) \quad (4)$$

The quantity demanded for the product of both sectors/regions X_D and Y_D depends upon prices for both products P_X and P_Y as well as upon the level of income of the aggregate consumer:

$$X_D = f^X(P_X, P_Y, M) \quad (5)$$

$$Y_D = f^Y(P_X, P_Y, M) \quad (6)$$

It is assumed that there is no income apart from the wages of employees L_X and L_Y in both sectors, and that the wage rates w_X and w_Y are constant:

$$M = w_X L_X + w_Y L_Y. \quad (7)$$

The consumers maximise in each of the regions are maximising a similar public utility function of two goods:

$$U=U(X,Y). \quad (8)$$

The conventional use of the general equilibrium approach is to carry out comparative static analysis. In particular, such an analysis answers the question, how changes in some exogenous variables lead to changes in output, relative prices, income distribution and welfare In this model, such an exogenous variable is "*the reform factor*" R .

In order to conduct such analysis in terms of small changes, one of the conventional techniques is to firstly rewrite the model (1)-(8) in terms of log-derivatives representing small relative changes. If the production, supply, demand and utility functions involved in the model (1)-(8) are assumed homogenous of degree one, then the model can be rewritten in the following form:

$$d \log x = E_{xK} d \log K_X + E_{xL} d \log L_X + E_{xR} d \log R, \quad (9)$$

$$d \log y = E_{yK} d \log K_Y + E_{yL} d \log L_Y, \quad (10)$$

where $E_{XK}, E_{XL}, E_{XR}, E_{YK}, E_{YL} > 0$ are constant factor elasticities of outputs X and Y;

$$(d \log X)_S = E_{PX} d \log P_X, \quad (11)$$

$$(d \log X)_S = E_{PY} d \log P_Y, \quad (12)$$

where $E_{PX}, E_{PY} > 0$ are price elasticity of supply;

$$(d \log X)_D = E_{XX} d \log P_X + E_{XY} d \log P_Y + E_{XM} d \log M, \quad (13)$$

$$(d \log Y)_D = E_{YX} d \log P_X + E_{YY} d \log P_Y + E_{YM} d \log M, \quad (14)$$

where $E_{XX}, E_{YY} < 0$ are price elasticities of demand, $E_{XY}, E_{YX} > 0$ are cross price elasticities of demand, and $E_{XM}, E_{YM} > 0$ are income elasticities of demand;

$$d \log M = A_X d \log X + A_Y d \log L, \quad (15)$$

where

$$A_X = \frac{w_X L_X}{M} > 0 \quad \text{and} \quad A_Y = \frac{w_Y L_Y}{M} > 0,$$

and

$$d \log U = E_{UX} d \log X + E_{UY} d \log Y \quad (16)$$

where $E_{UX}, E_{UY} > 0$ are elasticities reflecting the effect of the change in consumption of each good upon the change in public utility.

The analytical solution of this model with respect to the relative change in the exogenous “reform factor” is rather complicated to interpret in the general case, when all parameters are different from zero. Considering the signs of the parameters of elasticities, the relative change of R affects public welfare in opposite directions in both sectors/regions. Roughly, the reduction of costs in the sector/region X, reduces the price of X and, therefore,

increases welfare because of the increasing affordability of this product, but decreases demand for factors. Subsequently, income decreases that is the reason of the decrease in welfare.

Meanwhile, the introduction of some additional assumptions would more realistically reflect the peculiarities of the reform of the Victorian electricity generation industry and simplify the analytical problem.

The nature of electricity generation does not allow flexible changes in the physical amount of capital employed by the industry, either in terms of time or in terms of the continuity of changes. That is why, it is easier to consider the short run-effect of the reform, excluding changes in the factor capital.

The quantity of the product of the electricity generation industry has been relatively stable compared to the dramatic decrease unemployment.

The prices for electricity have been relatively stable too. At the initial stages of the reform, both the wholesale and retail prices were regulated. At the later stages, however, the wholesale price became established as a result of competition, among independent production units, for sales both to the grid and to the bulk industrial consumers. Eventually, the wholesale price has become relatively lower in Victoria compared to the other states of Australia, where analogous reforms have not happened yet. Meanwhile, the retail suppliers remain regional monopolies facing virtually no competitors and, therefore, no initiative to decrease their price.

The behaviour of employees retrenched from the electricity supply industry appeared to be different to what is normally assumed with regard to regional labour markets from the neoclassical perspective. In conventional inter-regional general equilibrium models, labour is able to move from one region to another. Similarly, one would expect, the labour retrenched from

the electricity generation industry would not be able to find stable employment in their region and would move from the La Trobe Region not only to the other regions of Victoria, but also interstate. Considering that the population of La Trobe Valley is much smaller than in the State of Victoria as a whole, it is possible to neglect the impact of such a movement on the State as a whole, but treat it as significant concerning the region.

Meanwhile, there is an evidence, that a considerable part of retrenched people, at least in the short run, have chosen not to migrate. There are the following underlying reasons for that:

- The retrenched people are specialists in their field, and there is no comparable employment elsewhere;
- High cost of migration is not affordable, especially for low income workers;
- The depressed real estate market in the La Trobe Valley has created a situation where they are not able to sell their home, and/or are not able to obtain sufficient finance to buy a home elsewhere;
- The age of retrenchees is a factor of their mobility; the less working period left, the less likely they are to migrate;
- Cultural reasons: people are attached to their community and to their extended family links;
- People are concerned with children changing schools;
- Their marital and family status;
- Their spouse's employment opportunities elsewhere, etc¹.

Both migration out of the region and reduction in regional employment reduce income and purchasing power in the region affected by the reform.

¹The listed hypothetical reasons for unemployed people in the La Trobe region choose not to migrate have been considered in Kazakevitch, Foster and Stone (1997)

The above-mentioned additional considerations allow for the reduction in the number of variables and equations in the system (9)-(16).

The output of the industry X remains unchanged. Therefore, in the short run the demand for labour in this industry decreases with the increase of the “reform factor”:

$$d \log L_X = -\frac{E_{XR}}{E_{XL}} d \log R \quad (17)$$

In the short run, the production function of the industry Y determines only the demand for labour:

$$d \log Y = E_{YL} d \log L_Y \quad (18)$$

The supply function (12) of this industry and the function (15) for the change in income remain the same as in the general model (9) - (16).

The demand for the product Y now does not depend upon changes in the price for the product X :

$$d \log Y = E_{YY} d \log P_Y + E_{YM} d \log M , \quad (19)$$

And change in the public utility now is determined only by changes in the consumption of Y :

$$d \log U = E_{UY} d \log Y . \quad (20)$$

The solution of the system (12), (15), (17)-(19), gives the following relationship between the “reform factor” and the demand for the product of the industry Y in the whole economy (the only one affecting public utility):

$$d \log Y = - \left(\frac{A_X E_{XR} E_{YM}}{E_{XL}} \right) \Bigg/ \left(1 - \frac{E_{YY}}{E_{PY}} - \frac{A_Y E_{YM}}{E_{YL}} \right) d \log R, \quad (21)$$

In addition, the demand for the same product in the region affected by the reform will be changed by:

$$(d \log Y)_X = - \left(\frac{A_X E_{XR} E_{YM}}{E_{XL}} \right) \Bigg/ \left(1 - \frac{E_{YY}}{E_{PY}} \right) d \log R, \quad (22)$$

The determination of the direction of changes in the demand for Y and, therefore, in the public utility of the whole economy is not straight forward, as the sign of the expression (21) depends upon the relationship between positive and negative components. However, it is clear that even the negative direction of changes in those regions of the state which are not affected by the reform are determined only by the change in demand in the region affected by the reform. Therefore, the smaller the population residing in the area affected by the reform as a fraction of the population of the State, the lower is the overall effect.

The signs of the parameters of the expression (22) determine the expected negative relationship between the change in the “reform factor” and consumer demand in the region affected by the microeconomic reform and, therefore, characterise the economy of that region as a shrinking one.

3. An empirical model and some numerical results

Three kinds of primary information were explored.

The first source involved a detailed review of the ESI’s financial statements for the year ended June 30 1990 prior to reform, and the base year ended June 30 1995 post reform. The review of the financial statements was essential to enable identification of how much money was injected into the regional economy by the ESI both prior to, and during the reforms. Due to

the disaggregation of the SECV as part of the reform process, the research had to incorporate not only the Business Units but also all Contractors who provide services in areas outsourced by the SECV.

Each Business Unit supplied a list of Contractors who had taken over previous SECV activities which had been outsourced. It was evident that the success of the data collection stage rested upon the establishment of a good relationship with the representatives of the ESI. Bearing this in mind, it was decided that the best way of approaching the industry was to write a formal letter requesting the cooperation of each organisation. It was further decided to arrange meetings with each of the representatives to deliver the letter in person.

The second source of data was a survey directed towards the expenditure patterns of current ESI employees. The objective of the survey was to determine the spending patterns of these employees in the regional economy. The survey participants were a random sample of industry employees representative of the general population.

The third source was relevant secondary information from the Australian Bureau of Statistics (ABS).

The following approaches to data collection within the ESI were employed.

A survey was distributed to a random sample of current employees working within the generating sector of the industry. The objective of the survey was to collect data on employee expenditure patterns in the region. The data was then used to analyse what effect the downsizing of electricity industry employee numbers had on the La Trobe region economy.

The cooperation of the electricity industry was sought to assess how the level of expenditure by the industry in La Trobe region has altered as a direct result of the reform process. It was proposed that each organisation's expenditure in the region would be aggregated with all other entities to provide a basis for comparison between industry expenditure subsequent to,

and following from the microeconomic reforms. To ensure the change in regional expenditure was recorded accurately, organisations that hold outsourcing contracts with the Business Units were included in the data collection stage.

An additional request from the industry, related to the collection of demographic information on past and present employees to be used for statistical analysis. The Integrated Systems Solution Corporation (ISSC) is a private organisation who manage some aspects of the SECV's, and now the Business Units', computer data. A database known as HUMINS is maintained by ISSC on behalf of the electricity industry. HUMINS contains demographic information relating to every employee including gender, date of birth, weekly income, and country of birth. Access to variables within the Business Units' employee database enabled analytical comparisons between current employees and VDP recipients to be made. The data was used to calculate how many Business Unit employees were in each income bracket as per the survey. The main data essential to the project at this stage was the weekly income of each employee. Spreadsheet techniques were used to analyse and organise the data. For each Business Unit, information relating to both current and past employees was analysed separately.

As a result of the reforms the industry has reduced its employee numbers. Figure 1 illustrates the significant reduction in the ESI employee numbers between the base years - 1989/1990 prior to the beginning of the reform, and 1994/1995 post reform. The number of employees with the ESI has decreased from 8,481 to 3,661. (See Table 1)

As most of these employees reside in the region this has impacted negatively upon the regional economy. However, the focus on contracting work outside the Business Units has softened the negative impact. The Contractors have employed many VDP recipients and injected substantial sums of money back into the local economy. The results would have been significantly different if the project had failed to take into account the number of people who took

VDP's and were subsequently re-employed in the industry with one of the contracting firms

Many employees were paid a substantial sum for resigning voluntarily from the SECV and then continued to receive weekly income payments from their new employer. For those who gained employment back in the industry, the question of how they spent their package becomes an issue. For many, the package acts as a large bonus or as security for the future. If the VDP recipients who gained re-employment continued to spend the same amount of money as when they were employed with the ESI, the immediate impact of the reform would be lessened.

Overall, expenditure in the region by industry employees has declined substantially, offsetting the increase in expenditure by the industry. This conclusion is seemingly logical as the reduction in employment within the industry has in turn reduced the expenditure injected into the region by employees on the whole.

Some numerical calculations were conducted to estimate the impact of the above-mentioned reforms upon the region of La Trobr Valley. An attempt was made to empirically implement some assumptions, considered in the previous section, using the MONASH-MRF computable general equilibrium (CGE) regional model of the Australian economy (Meagher and Parmenter, 1993). The original version of the model recognised eight regions, including the six states and two Territories. This model is used as a national economy environment for a specially designed block, in which the state of Victoria is divided in two blocks: the La Trobe Region and the rest of the Economy.

The core model consists of the equations and variables of the original ORANI model with a regional subscript added. The equations of the model determine consumer demands; producer and consumer prices; and market clearing conditions; income and expenditure of each region. The labour market and regional migration block defines equations determining regional

population based on natural growth; inter-regional migration and foreign migration.

In the original model, each region exports independently to the rest of the world. This assumption, however is simplified for the modified two-region block of the state of Victoria. For the purpose of foreign trade, the state is represented as a whole.

The simulation was conducted on the assumption that structure of household expenditure within the region, which was obtained as a result of the employee survey, was applied to the absolute value of the decrease in payments to the core industry's and contractor's employees spent in the region. As a result, the sectoral structure of the absolute decrease in demand within the region was calculated.

The production function and input-output coefficients for the region were taken similar to the state as a whole.

A comparative static simulation was conducted. The base variant included the pre-reform employment in the electricity supply industry (ESI) of 1989, which was compared with the after-reform level of employment in this industry in 1995.

Overall the aggregate results indicate insensitivity of the state of Victoria as a whole to the results of the reform. In contrary, the regional economy has experienced negative economic repercussions due to the reform in the ESI. The results also indicate, however, that the impact is not as severe as many observers have suggested.

Table 1

The impact of the ESI on the Regional Economy before and after the Microeconomic Reform

	1989/1990	1994/1995	Change	Change
	'000	'000		(% to 1989/90)
Employment				
Number of Employees in the ESI Core Industry	8,481	2,004	-6,477	-76.37
Number of Employees/Self-employed in		1,657	1,657	

Contracted Firms				
Total Impact on the Region	8,481	3,661	-4,820	-56.83
Expenditure within the Region (\$ '000)				
Non-salary/wages Expenditure by the ESI Core Industry	78,909	44,956	-33,953	-43.03
Non-salary/wages Expenditure by Contracted Firms		38,673	38,673	
Subtotal Expenditure Effect	78,909	83,629	4,720	5.98
Employment Multiplier Effect			38	
Expenditure Injection in the Region by Business Unit Employees	124,051	29,569	-94,482	
Expenditure Injection in the Region by Contractors' Employees		24,448	24,448	
Subtotal Expenditure Effect	124,051	54,017	-70,034	-56.46
Employment Multiplier Effect			-367	
Total Expenditure Effect	202,960	137,646	-65,314	-32.18
Total Employment Effect			-329	

The aggregate both data exogenous data and the total expenditure and employment effect obtained as the result of simulation are represented in the Table 1.

The methodology of the project enables an analysis of the change in expenditure injections by both the industry and its employees. Expenditure by the core industry into the region has decreased by almost \$34 million, over the period of reform. Taken in isolation this result suggests a significant leakage, but it fails to indicate the true picture. Total expenditure injected by the ESI, when taking Business Units and Contractors into account, has in fact increased by \$4 million.

If we look at the structure of the SECV prior to the implementation of the reforms, the Production Group used to operate the majority of its activities 'in house'. The SECV had the infrastructure and personnel to ensure that it was virtually self-sufficient in terms of producing electricity. Payments to Contractors were very low at \$44 million in 1989/1990 (SECV, Production Group, Financial and Statistical Report, 1989/1990)

The reform process saw the outsourcing of many departments which had previously been 'in house'. Expenditure on contracts increased

dramatically with the majority of Contractors establishing offices in the region due to the enormous financial investment made by the Business Units.

Whereas the SECV used to buy the majority of its heavy machinery from regions other than the La Trobe Valley and employed their own staff to operate the machinery, they now pay Contractors to perform the same functions. The benefit of contracting out such work is that the Business Units do not have to incur the high finance charges associated with the purchase of expensive machinery, nor do they have to pay staff members who may have only been required occasionally. In terms of expenditure in the region, when the SECV purchased an asset it would be recorded in the Balance Sheet of their financial records and would not be included as part of expenditure. The reforms have resulted in the Business Units injecting more money into as they hire the same assets from the Contractors that they would have purchased in the past.

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