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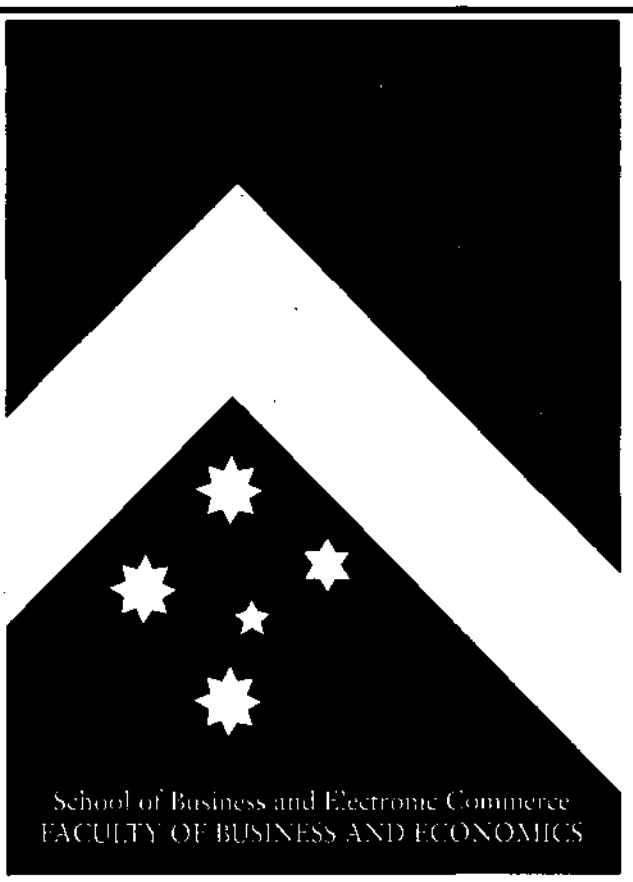
Regional Aspects of Microeconomic Reform in the Electricity Supply Industry of Victoria



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REGIONAL ASPECTS OF MICROECONOMIC REFORM IN THE ELECTRICITY SUPPLY INDUSTRY OF VICTORIA

by

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Abstract

As a result of the microeconomic reform of the electricity generation industry in Victoria, even though the state as a whole, in future, would be able to enjoy the promised benefits of this measure, the main power supplying area of the State - the La Trobe Valley Region - appeared to be the most affected by the recent recession. A few thousand people have been retrenched and considerable migration of population takes place from the region to other areas of Victoria and interstate.

Based on this example the paper examines some theoretical issues of the consequences of microeconomic reforms of a natural monopoly in an area in which the reformed industry is a significant fraction of the local economy. The strategy of deregulation and privatisation of the electricity generation and distribution is discussed from the perspective of the State of Victoria as a whole and from the point of view of the region where the industry is predominantly located. General equilibrium approach to regional economics is used to design a simple model. Substantial deterioration of a regional economy (in terms of the reduction of local employment and purchasing power) is considered as an undesirable result of any reforming policy which is been undertaken on the State or federal level. Therefore, the ultimate goal of this modelling exercise would be to find out the conditions that require to apply temporary governmental regulatory measures to such a disadvantageous region in order to compensate negative consequences of the deregulation of an industry.

September-December 1995

REGIONAL ASPECTS OF MICROECONOMIC REFORM IN THE ELECTRICITY SUPPLY INDUSTRY OF VICTORIA[1]

1. Background

One of the proclaimed intentions of the Liberal Government of the State of Victoria is to make its statutory bodies more commercial in nature and more accountable. In order to achieve this, new laws have been established in the State for the creation, monitoring and control of statutory authorities. These are incorporated in the State Owned Enterprises Act (1992)[2]. The Act defines a number of structures for the "corporatisation" of statutory authorities. The goal of the reform is to improve competitiveness, increase productivity through changed work practices and to

[1] This is a revised version of the paper presented at the 26th Conference of Regional Science Association International (British and Irish Section). The paper represents the starting stage of a bigger research project, which is being funded by the Faculty of Business and Economics of Monash University and the Gippsland Campus Research Fund. The goal of the project is to design a computable multi-sectoral simulation model with application to Gippsland and the La Trobe Valley and to highlight regional consequences of various reforming measures exogenous to the region. Computer simulation based on the approaches presented in this paper and on real primary information is being conducted as a part of inter-disciplinary project "Impact of Industry Restructuring on Population Movement" funded by the Bureau of Immigration, Population and Multicultural Research. The results are supposed to be published after the release of official report.

[2] *State Owned Enterprises Act (1992),* Melbourne, Victoria, 1992

significantly reduce the embedded cost structure of the business together with reduction in the size of the work force.

One of the authorities at the forefront of the legislation was the State Electricity Commission of Victoria (SEC). Historically, the electricity supply industry of Victoria was established and developed as a state owned monopoly within the predominantly private Australian economy. It included vertically integrated power generation, transmission and distribution facilities. Over the last few years comprehensive restructuring of the industry has been undertaken by the State Government. The restructuring strategy consists of three stages (Fig 1)[3].

During the first stage (1993), the state monopoly was vertically disintegrated into three new state owned enterprises: power generation; high voltage transmission and retail distribution.

During the second stage (1994), the generation and distribution enterprises were disintegrated into commercially operating but still state owned businesses, including several competing power generation plants and several local geographic distribution and retail monopolies. Each of the new enterprises was required to have its balance sheet, cost and revenue structures appropriate for the commercial sector. Meanwhile, the high voltage transmission (the grid) remained a regulated natural monopoly.

The third stage is currently being implemented and includes the following measures:

- The generation plants are being transformed into private corporations by offering shares in the stock market;
- Distribution and retail sector is being further deregulated;

[3] Reforming Victoria's Electricity Industry; A Competitive Future for Electricity - A Summary of Reforms. Department of Treasury, Melbourne, Victoria, December 1994

- The existing state owned regional companies are being transformed into private corporations; and

Competing private providers will be allowed to enter markets in each of the local geographic areas.

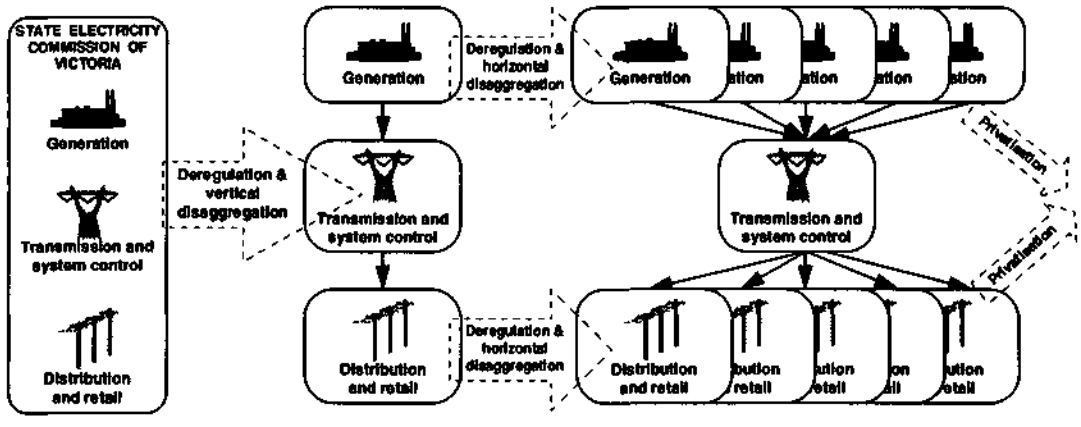

FIGURE 1 THE STAGES OF DEREGULATION AND PRIVATISATION OF POWER INDUSTRY IN VICTORIA

One of the results of the earlier stages of the reforms, can be evaluated, in terms of efficiency, if we compare the recent dynamics of two indicators of the industry activity[4]- a rather stable output and dramatically decreasing employment (Figure 2).

If such an industry development occurs in a competitive economic environment and that industry's spatial location is more or less homogeneous, one could welcome this result as a success if the following conditions are fulfilled:

- retrenched employees of the industry being reformed are equally distributed throughout the State and face the same problems of absorption by other sector

[4]*La Trobe Region Employment & Industry Survey, 1993,* Gippsland Research and Information Bank, Monash University, 1993, pp 137, 149

- the population and production sphere consumers are benefiting from decreasing competitive prices.

1989 - 100%	*1989*	*1990*	*1991*	*1992*	*1993*
Personnel	100.00	84.20	74.77	70.04	56.67
Electricity Generation	100.00	104.27	106.39	106.61	103.71

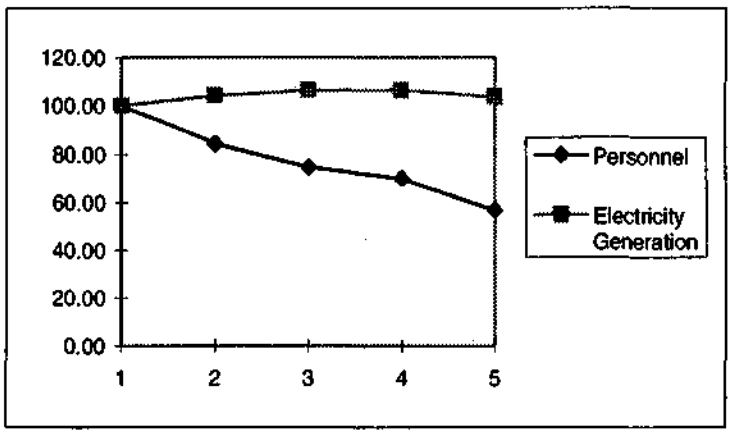

FIGURE 2. EMPLOYMENT AND ELECTRICITY SUPPLY IN THE ELECTRICITY INDUSTRY OF VICTORIA

However, neither of these conditions are fulfilled in the case of the electricity industry in Victoria. The industry is still operating as a natural monopoly. The price of energy for households and the average price for all customers have been increased slightly more rapidly than the rate of inflation[5]. To date price deregulation has not been completed yet. Meanwhile, the spatial location of the industry can be illustrated with the use of data relating to electricity production in Victoria during the first 3 month of 1994:

[5]Ibid, p. 137

The chart (Figure 3) shows that the brunt of immediate disadvantages caused by the microeconomic reforms of the Victorian electricity generation industry is almost fully placed on the economy of the La Trobe Valley.

The electricity generation industry of the State is not only predominantly located in the La Trobe Valley region but is also the major component of the regional economy. Consequently, any reform in this sector causes not only microeconomic effects, but also macroeconomic consequences in the region and, therefore, paradoxically, is comparable with the transitional economies of Eastern Europe, causing similar substantial economic and social effects.

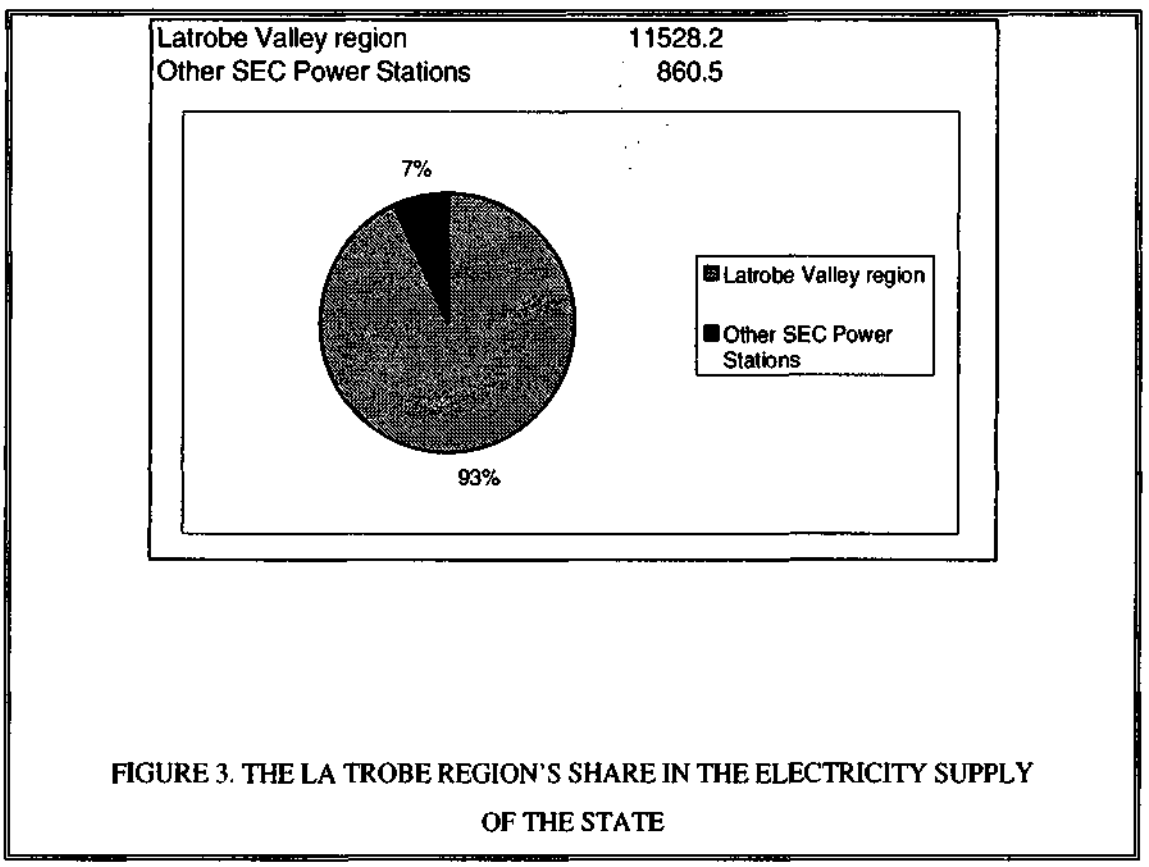

FIGURE 3. THE LA TROBE REGION'S SHARE IN THE ELECTRICITY SUPPLY OF THE STATE

2. Commercialisation of a natural monopoly: regional consequences

In order to theoretically evaluate the possible impact of reform upon the region using the general equilibrium approach, let us consider, how the reform, in terms of production functions, affects production possibilities and factor efficiency of the reformed industry.

Let us assume that an official or private monopolist supplies a homogenous commodity or service and that managerial incentives to engage in cost reduction activity are not sufficient[6]. As a direct result of a microeconomic reform, it is expected that those managerial incentives are improved so that the unchanged amounts of conventional factors used in production 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[7]. The grater the anticipated benefits of the reform process, the grate the cost incurred during the process. However, in the model which is being discussed below, the microeconomic reform of an industry is represented as the exogenous change of the factor R with no internal costs.

The general equilibrium approach is suggested to use for analytical evaluation of the effect of the reform in one sector upon the other sectors of the economy, given

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[6]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).

[7]John Vickers and George Yarrow (1988), pp 35-39.

that the reforming sector is concentrated predominantly in one region and is a substantial part of the regional economy. In this paper some theoretical concepts are discussed which are based on a simplified two sector two region model[8]. This model is supposed to be an analytical basis for disaggregated simulation of the consequences of the reform using numerical experiments.

It is assumed that each of two regions produces just one product (X or Y) for local consumption and trade with the other region, but neither produces for export. The industry producing the product X is the only one subject to microeconomic reform, so that the corresponding region is the only one directly affected by that reform. There are only two factors of production: capital (K) and labour (L) with the reform factor R which is involved only in the industry/region X.

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

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

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

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

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

(3) $$X_S = X_S(P_X)$$

[8]An analogous approach is used, for example, in A. Harberger (1962) and R. Cornwall (1984)

(4) $$Y_S = Y_S(P_Y)$$

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:

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

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

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:

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

The consumers maximise a public utility function of two goods:

(8) $$U=U(X,Y)$$

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. General equilibrium models are used to evaluate these

magnitudes at old and new competitive equilibria. In this model, the exogenous variable we are interested in is ***"the reform factor"*** R.

In order to conduct such analysis in terms of small changes, the conventional technique 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 to be of the Cobb-Douglas type and homogenous of degree one, then the model can be rewritten in the following form:

$$\frac{dX}{X} = E_{XK}\frac{dK_X}{L_X} + E_{XL}\frac{dL_X}{L_X} + E_{XR}\frac{dR}{R}, \tag{9}$$

$$\frac{dY}{Y} = E_{YK}\frac{dK_Y}{L_Y} + E_{YL}\frac{dL_Y}{L_Y}, \tag{10}$$

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

$$\left(\frac{dX}{X}\right)_S = E_{PX}\frac{dP_X}{P_X}, \tag{11}$$

$$\left(\frac{dY}{Y}\right)_S = E_{PY}\frac{dP_Y}{P_Y}, \tag{12}$$

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

$$\left(\frac{dX}{X}\right)_D = E_{XX}\frac{dP_X}{P_X} + E_{XY}\frac{dP_Y}{P_Y} + E_{XM}\frac{dM}{M}, \tag{13}$$

(14) $$\left(\frac{dY}{Y}\right)_D = E_{YX}\frac{dP_X}{P_X} + E_{YY}\frac{dP_Y}{P_Y} + E_{YM}\frac{dM}{M},$$

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

(15) $$\frac{dM}{M} = A_X\frac{dL_X}{L_X} + A_Y\frac{dL_Y}{L_Y};$$

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

(16) $$\frac{dU}{U} = E_{UX}\frac{dX}{X} + E_{UY}\frac{dY}{Y}$$

Where $E_{UX}, E_{UX}>0$ are elasticises 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 elasticises, 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 easer 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 appears to be relatively stable compared to the dramatic decrease unemployment. The price is being regulated so far. The structure of the industry remains close to a natural monopoly. Hence, at this stage of the reform the only likely consequence of the reform is the increase in internal efficiency causing the decrease in employment.

Diagrammatically, this sort of reform is reflected in the Figure 4A. The only result of the reform is the increase of profit as the result of savings on costs. Further developments of the reform, if the price is deregulated and the structure of the industry remains monopolistic, is reflected in the Figure 4B. The deregulated price would probably increase, the quantity demanded would decrease; and the consumers would tend to replace electricity with other sources of energy. Alternatively, some customers would opt to purchase electricity at competitive prices elsewhere (as has occurred in the areas of Victoria close to the borders of New South Wales).

Meanwhile, the profitability should be expected to increase. (This is another amazingly analogy to the consequences of reforms in the state owned sector in the East European economies, in which the majority of manufacturing industries had and have monopolistic structures).

Generally, regional models are different to national economy models in their assumptions concerning unemployment. In standard general equilibrium models, where the economy is assumed to be closed with regard to labour. The labour force only moves from one sector to another. In contrast, Keynesian equilibrium allows for

unemployment. In inter-regional models, however, labour is able to move from one region to another.

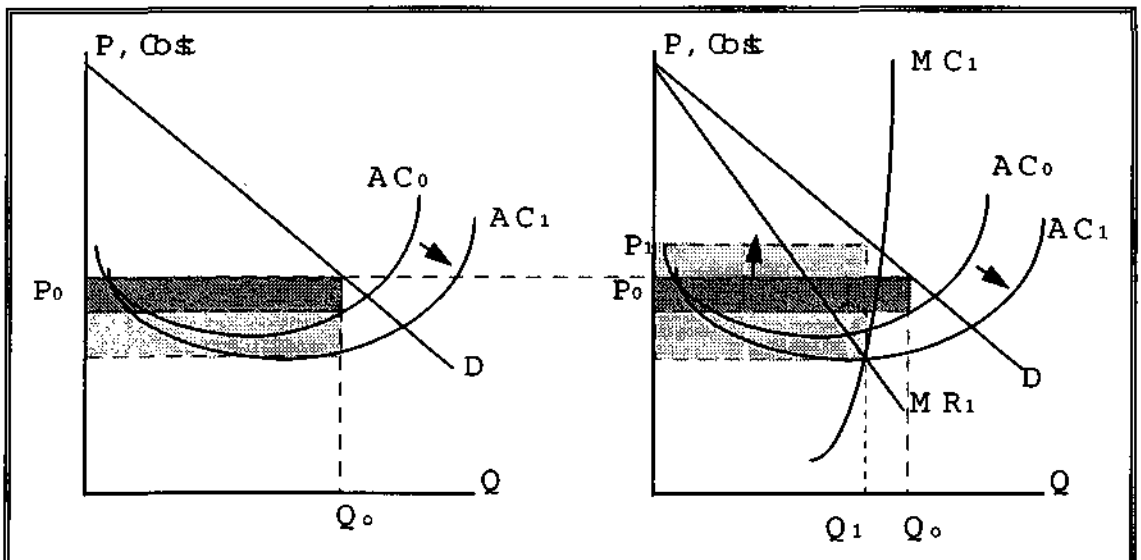


FIGURE 4. MICROECONOMIC REFORM OF NATURAL MONOPOLY

A. The aim and the result of reform is increasing incentive to improve internal efficiency. The price is still controlled by the government. As the result of decreasing average cost (shifting from AC0 to AC1), the revenue is increasing, whereas the output (Q0) remains unchanged

B. The aim and the result of reform is increasing incentive to improve internal efficiency and the deregulation of price. The structure of the industry remains monopolistic. However, a profit maximising decision is made. The revenue of the firm is affected by increasing price (from, P0 to P1), decreasing average cost (from AC0 to AC1) and decreasing output (from, Q0 to Q1).

On the one hand, in this model, it is realistic to assume, that the labour retrenched from the electricity generation industry is not able to find stable employment in their region. Therefore, in the ideal case, move not only from the La Trobe Region 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, we can neglect this factor with regard to the whole State, but treat it as significant with regard to the region.

On the other hand, there is evidence that a considerable part of retrenched people, at least in the short run, have chosen not to migrate. The underlying reasons

for this are a subject for a separate sociological study. Some of these reasons could be:

- 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, etc[9].

In both cases the discussed reform reduces incomes and purchasing power in the region affected by the reform.

The additional assumptions discussed above 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*":

$$\frac{dL_X}{L_X} = -\frac{E_{XR}}{E_{XL}}\frac{dR}{R} \tag{17}$$

[9]The listed hypothetical reasons for unemployed people in the La Trobe region choose not to migrate has been discussed with Bettyann Foster (School of Business, Monash University). Those reasons are one of the issues of the above-mentioned inter-disciplinary project "Impact of Industry Restructuring on Population Movement".

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

$$\frac{dY}{Y} = E_{YL}\frac{dL_Y}{L_Y} \tag{18}$$

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:

$$\frac{dY}{Y} = E_{YY}\frac{dP_Y}{P_Y} + E_{YM}\frac{dM}{M}, \tag{19}$$

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

$$\frac{dU}{U} = E_{UY}\frac{dY}{Y}. \tag{20}$$

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):

$$\frac{dY}{Y} = -\left(\frac{A_X E_{XR} E_{YM}}{E_{XL}}\right) \Big/ \left(1 - \frac{E_{YY}}{E_{PY}} - \frac{A_Y E_{YM}}{E_{YL}}\right)\frac{dR}{R}, \tag{21}$$

and the demand for the same product in the region affected by the reform:

$$\left(\frac{dY}{Y}\right)_X = -\left(\frac{A_X E_{XR} E_{YM}}{E_{XL}}\right) \Big/ \left(1 - \frac{E_{YY}}{E_{PY}}\right) \frac{dR}{R}, \tag{22}$$

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.

This is one more similarity with the East European nations which are experiencing considerable decrease in their GDP. However, compared to the East European economies, the negative changes in such a regional economy as La Trobe Valley, may appear to be not as reversible as they promise to be in Eastern Europe. The reason for that is absolute openness, of the region in the long run, to migration out of the La Trobe region to the other regions of Victoria and interstate.

Therefore, the government should consider at least temporary compensatory measures if it is concerned not only with the increase of the internal efficiency of the (former) public sector enterprises, but also with the protection of those regional

economies affected by externally injected development and, consequently, externally designed and implemented reforms.

3. Horizontal disintegration and privatisation

The latest stages of the reform, horizontal disintegration, and especially privatisation have catalysed enormous discussions among politicians, academics and the broader community about who will gain and who will loose as a result of privatisation. Those opposing privatisation appeal to the public who are accustomed to more or less stable prices and concessions provided by the government to pensioners and unemployed. Those defending reforms claim that the state monopoly caused excess costs and that as a result of privatisation and the initiation of competition, an increase in efficiency and a decrease in costs and prices should occur.

In the view of the above considerations (equations (20) and (21)), from the public interest perspective (in terms of public utility in the State as a whole and in the reforming region), even though horizontal disintegration and privatisation would not cause a further decrease in the number of jobs, only a decrease in costs and in the price for electricity would make the reforms acceptable to the broader community. The question is if there is a ground for lower price expectations, considering the scheme of reforms being implemented.

On the one hand deregulation really should cause higher efficiency and lower costs. However, the cost minimisation goal had been already considerably achieved at the earlier stages of the reform, when the number of jobs provided by the State Electricity Commission of Victoria almost halved, whilst the statistics of electricity sales remained stable.

On the other hand one can assume, that even though the generation facilities being privatised, the generation costs cannot decrease below a certain "technologically predetermined" level. That is especially true in Victorian, where the main generation

plants are based on their own brown coal deposits. Therefore, competition does not result in pressure on the input market. The "technological" level of costs is structurally predetermined in the very expensive constructions and equipment installed in each of the generation plants. Meanwhile, basic technologies and levels of efficiency vary in each of the plants, mainly because of their different vintage. Each of them was built in a different period of time and embodied corresponding contemporary (of that time) engineering solutions.

Let us assume, that either the government owned utility, or independent private providers are just break even. Thus, cut, before disintegration, the wholesale price was supposed to be set to cover aggregated costs of all generation plants. This kind of cross-subsidisation is not possible when all plants begin to function independently.

However, the fact that the wholesale market of energy is still a state monopoly creates only two opportunities. Either the transmission authority differentiates wholesale prices through individual contracts with each of the suppliers, or the price would be established, as a result of bidding, at a level satisfying all supplies. The first option would dramatically restrict the degrees of freedom for competition. The second option would establish one of the known forms of oligopolistic competition. Therefore, depending upon different factors the price would appear at a level either higher or lower than before disaggregation, considering that the "technological" level of efficiency was achieved during the earlier stages of the reform.

Generally, due to difficulty of formal analysis and uncertainty, the price formation as a result of disintegration, would be another subject of numerical simulation. However, let us consider just one of the options using a simple model of oligopolistic market.

The following assumptions are being made:

- There are n generating units which, after horizontal disintegration, are starting to operate independently;

- Each unit is characterised by increasing cost functions

(23) $$c_i = c_i(q_i), \quad c_i'(q_i) > 0;$$

- Demand for electricity (q) is variable, however, it is fluctuating within the range required facilities of all generators; though, generally, they operate below capacity:

(24) $$q = \sum_{i=1}^{n} q_i; \quad q_i > 0;$$

- The cost function of the grid ($c(q)$) is determined only by the contract price (prices) of the generators;
- The wholesale price is established at a level not lower than the cost

(25) $$c(q) \leq p;$$

- the grid, at least, breaks even but does not function according to the profit maximisation criteria;
- The retail market of electricity is, to some extent, elastic and can be characterised by a conventional decreasing function:

(26) $$p=D(q);$$

- The grid is aware about the conditions of the retail market and translate those conditions to the generators, through contracts, by determining price and quantity schedules.

Prior to the reform, when the industry functioned as a state authority, it was supposed to break even at a (periodically reconsidered) regulated price P^*. Otherwise, the industry might be subsidised. Thus, the average cost of the industry could be determined as one of possible combinations of the average costs of the generators (Fig.5A):

(27)
$$c(q) = \sum_{i=1}^{n} c_i(q_i)$$

$$q = \sum_{i=1}^{n} q_i$$

As a result of the first stage of the reform, vertical disintegration and commercialisation of the state authority, the choice of production schedule q_i was restricted by the condition of, at least, breaking even (Fig. 5B):

(27)
$$\sum_{i=1}^{n} c_i(q_i) \le P^* q ,$$

Therefore, the most inefficient production schedules, at each given price, were supposed to be eliminated.

Disintegration generation facilities in a few independent businesses, even though not private yet, has created a market with oligopolistic characteristics. The consequences of this stage of the reform for price formation depend upon the type of

the market conduct of newly established firms and their interaction with the state wholesale establishment.

Considering the "official past" of the newly established oligopolistic market, it would be realistic to assume collusion as one of the possible kinds of market conduct.

According to the well known concept of collusive market[10], the participants avoid rivalry and tend to maximise the total industry profit:

(28) $$\max \pi$$

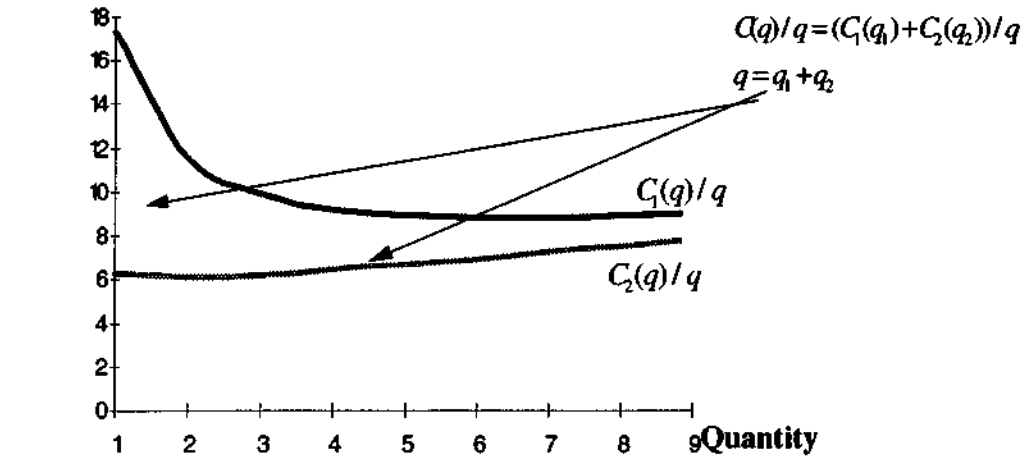
$$\pi = \sum_{i=1}^{n} \pi_i = \left(\sum_{i=1}^{n} q_i \right) \times D\left(\sum_{i=1}^{n} q_i \right) - \sum_{i=1}^{n} c_i(q_i)$$

The maximisation conditions for the function (28) are:

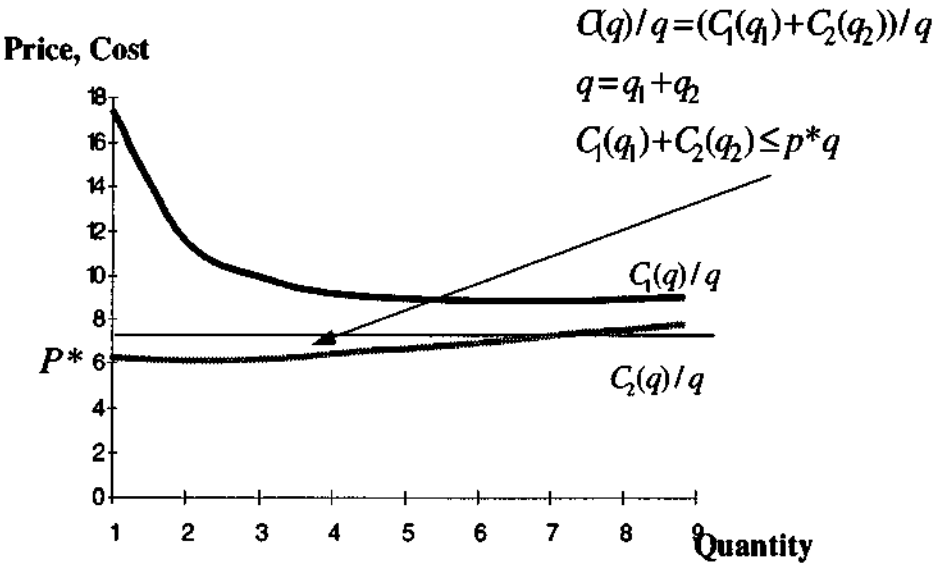
(29) $$\frac{\partial \pi}{\partial q_i} = \left(\sum_{i=1}^{n} q_i \right) D' + D - \frac{\partial c_i(q_i)}{\partial q_i} = 0$$

$$i = 1,..n$$

[10] K. C. Kogiku, *Microeconomic Models*, Harper & Row Publishes, 1971



A. The average cost of the official monopoly is one of possible combinations of the average costs corresponding to each of the units



B. The average cost of breaking even combinations of the units' outputs at a given price.

FIGURE 5.THE AVERAGE COST OF OFFICIAL MONOPOLY IN THE CASE OF TWO PRODUCTION UNITS

Equations (29) mean, that the optimal solution corresponds to the market shares (or production quotas(?)) q_i^e of the generation businesses at a point where their marginal costs ($\frac{\partial c_i(q_i)}{\partial q_i}$) ares equal to each other and to the marginal revenue of the industry ($\left(\sum_{i=1}^{n} q_i\right) D' + D$).

The answer on the question, whether the equilibrium price p^e would be higher or lower than the price p^* before the price deregulation, depends upon several factors at least including:

- The parameters of the demand function;
- The level of price and production quotas before deregulation; and
- The cost functions of independent generators after deregulation.

The following numerical example has been designed to illustrate possible consequences of horizontal disintegration and deregulation of price in the short run (Figure 6, based on the example in the Appendix).

It is assumed that excess capacity still exists and the clearance of factors has occurred during the previous stages of the reform. The level of production before the disintegration q^* corresponds to the point on the demand curve at a regulated price p^*. In addition, it is assumed (just for more convenient diagrammatic representation), that there only two firms with different fixed and similar variable costs. The later assumption immediately implies the similarity of the both firms' and the industry's marginal cost functions. This also means, that for the cost functions used in the example, the firms would be allowed equal quotas at any level of industy's output.

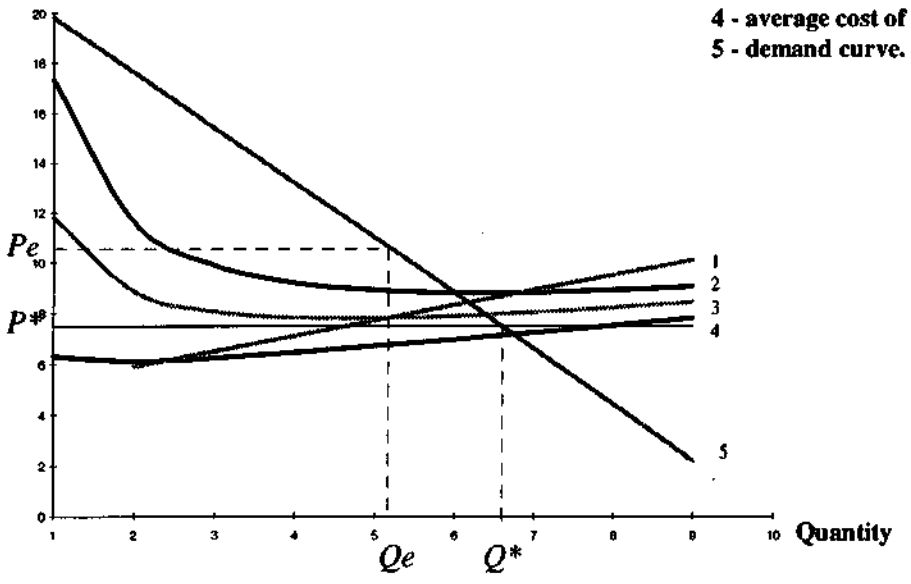


FIGURE 6. A POSSIBLE RESULT OF TRANSITION FROM A BREAKING EVEN MONOPOLY TO AN OLIGOPOLISTIC MARKET

As a result of deregulation, the profit maximising industry's output, in the sense of conditions (29), appears at a lower level and the price at a higher level than before deregulation.

The diagrams reflects a particular case, where the price before deregulation appears below the average cost of the oligopolistic competitive industry. As it can be seen on the diagram, the consequence of the deregulation might be similar, if the regulated price was above the industry's average cost curve , but still between firms' average cost curves.

The above example shows, that generally, expectations of a decrease in prices and increase in the welfare at a given cost structure do not have any ground. Those expectations would be reasonable only if, as the result of privatisation and emerging competition, in the long run, investments in equipment cause improvement in the

"technological" level of efficiency and, therefore, decrease in the costs of independent commercial firms.

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APPENDIX

A Numerical Example Used for Diagrams (Figures 5 and 6)

$C_1(q) = 0.3q^2 + 5q + 12$

$C_2(q) = 0.3q^2 + 5q + 1$

$C_1(q) / q = 0.3q + 1 / q + 5$

$C_2(q) / q = 0.3q + 12 / q + 5$

$P=D(q)=22 - 2.2q$

q	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00
$C_1(q)$	17.30	23.20	29.70	36.80	44.50	52.80	61.70	71.20	81.30
$C_2(q)$	6.30	12.20	18.70	25.80	33.50	41.80	50.70	60.20	70.30
$C(q)$	18.80	17.70	24.20	31.30	39.00	47.30	56.20	65.70	75.80
$C_1(q) / q$	17.30	11.60	9.90	9.20	8.90	8.80	8.81	8.90	9.03
$C_2(q) / q$	6.30	6.10	6.23	6.45	6.70	6.97	7.24	7.53	7.81
$C(q) / q$	11.80	8.85	8.07	7.83	7.80	7.88	8.03	8.21	8.42
$\Delta C(q) / \Delta q$		5.90	6.50	7.10	7.70	8.30	8.90	9.50	10.10
$P=D(q)$	19.80	17.60	15.40	13.20	11.00	8.80	6.60	4.40	2.20
P^*	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50