ON THE PERFORMANCE OF PUBLIC ENTERPRISES: THE CHOICE OF PRICE AND PRODUCTIVE FACTORS

by

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TO

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CHAPTER 1

INTRODUCTION

> (W)hen technical conditions make a monopoly the natural outcome of competitive market forces, there are only three alternatives that seem available: private monopoly, public monopoly, or public regulation. All three are bad so we must choose among evils. Henry Simons, observing public regulation of monopoly in the United States, found the results so distasteful that he concluded public monopoly would be a lesser evil. Walter Eucken, a noted German liberal, observing public monopoly in German railroads, found the results so distasteful that he concluded public regulation would be a lesser evil. Having learned from both, I reluctantly conclude that, if tolerable, private monopoly may be the least of the evils.
>
> Milton Friedman,
> Capitalism and Freedom,
> 1962, P. 28

The role of government in the economy of democratic countries traditionally has been to police the behavior of private enterprises rather than to engage directly in productive activity. Over the past forty years, however, democratic governments have tended to break away from the traditional confines by undertaking directly productive activities which were previously held to be the domain of profit-making private enterprises. The result has been, in many countries, a growing body of governmentally owned and

operated enterprises of a commercial nature such as steel mills, airlines, railroads, and utilities.[1]

Table 1 gives some indication of the relative size of public as compared to private investment in seven countries that were controlled by democratic governments during the period from 1963-1973. Public investment as a percentage of private investment for those countries listed ranges from 19 per cent in the Netherlands to 161 per cent in India.[2] Since these figures do not include public investments resulting from the nationalization of existing industries, they tend to understate the growing importance of public investments in these countries.[3]

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[1]Public (or government) enterprises are defined as "an undertaking that is owned by a national, state (or provincial), or local government, supplies services or goods at a price, and is operated on a more or less self-supporting basis." (Encyclopaedia Britanica, XVIII, 1968 ed.)

[2]The information is not, to my knowledge, available for other countries. However, studies of the public enterprise sector in many other countries lend support to the relationship exhibited in Table 1. For an indication of the size and the growth of public enterprises in various countries see United Nations (1973 and 1974).

[3]There has been an unprecendented growth in the nationalization of private industries since mid 1940s in many countries. For some indication of this growth see, for example, Hanson (1973), Tivey (1960 and 1973), Kelf-Cohen (1973), and Einaudi, Byi and Rossi (1955). However, the literature lacks an acceptable theory of the growth and the emergence of public enterprises. Several hypotheses have been advanced but no attempt has been made to subject these to systematic tests (Pashigian: 1976). The present study also begs the question of the growth and the emergence of public enterprises. We assume that public enterprises are already in existence, regardless of how and why they have come to being.

Table 1

The Relative Increment of Capital Stock in the Private and Public Enterprises: 1963-1973[a]

Country	Gross Capital Accumulation 1963-73*	Depreciation 1963-73*	Net Increment 1963-73*	Public/Private (%)* of col. 3
Australia				
Private	32706	13127	19579	
Public	15100	4222	10878	56%
India				
Private	83	36	47	
Public	108	33	75	161%
Japan				
Private	135455	65280	70175	
Public	21990	6282	15708	22%
Netherland				
Private	136244	46536	89688	
Public	28191	11432	16759	19%
Panama				
Private	975	770	205	
Public	219	28	192	94%
South Africa				
Private	18840	8083	10757	
Public	9108	1192	7916	74%
U.K.				
Private	42976	18739	24236	
Public	17981	12081	5900	24%

[a]Units of Money: Australia---Mil. Aust. $ Panama--------Mil. Balboas
India-------Bil. Rupees South Africa--Mil. Rand
Japan-------Bil. Yen U.K.----------Mil. Pound
Netherland--Mil. Guilders

*Excludes investments resulting from the nationalization of private firms.

SOURCE: The United Nations Statistics 1974 various tables.

As the investment activity undertaken by government becomes larger and more numerous--and subsequently as government competes with the private sector for the limited resources--it becomes paramount to evaluate the differential effects of undertaking the productive activity under public ownership as opposed to private ownership. The study of public enterprises is not a new phenomenon. One set of studies has attempted to indicate contrasts between public versus private enterprises. However, these contributions are greatly unbalanced. The emphasis has been placed primarily on such topics as: (i), which form of ownership should predominate[4] (ii), what price should be charged[5] (iii), how much capital and labor should be employed.[6] Underlying such normative discussions is, of course, a feeling that there are in fact substantial differences in the way enterprises perform under various forms of ownership. However, this feeling has been articulated poorly through most of the literature. For example, Pigou (1920) in his Economics of Welfare devotes a short chapter to the "Public

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[4]For example, Galbraith (1971) in his The Affluent Society devotes one entire chapter discussing the requirement of a balance between outputs provided publicly and privately. Galbraith considers the U.S. economy to characterize an "imbalance" between the amount of output provided publicly and privately and advocates an increase in the size of the public sector.

[5]For an extensive review of normative pricing schemes see, for example, Ruggles (1949-50). See Turvey (1971: Chapter 7) for a more recent account of this literature.

[6]See, for example, Henderson (1965), Dorfman (1965), and Feldstein (1964).

Operation of Industries," where he contends that: a) "the efficiency of management in public and joint stock enterprises . . . is likely to be pretty much the same," (1920: 343); b) "governmental operation of industries will be injurous to productive efficiency," (1920: 348); and c) "public operation . . . might actually foster the growth of the most economical unit of management," (1920: 365). Pigou's discussion suggests serious contradictions as well as lack of a conceptual explanation of the behavior of enterprises under public ownership.

The failure to formulate a coherent conceptual model for evaluating the performance of public enterprises has even been carried through most of the recent literature. For example, in their standard text book treatment of public enterprises Farris and Sampson (1973) contend that: a) "(M)ost people would agree that a publicly owned utility should not use capital in an 'inefficient' manner. However, measuring efficiency without the profit criterion is not easy," (1973: 300); and b) "(M)anagement of capital is always a problem for utilities, it is doubly so for publicly owned utilities," (1973: 300). As regard the choice of price, the authors maintain that: a) "(I)n practice most publicly owned utilities have followed the lead of privately owned utilities," (1973: 301); b) "(S)ome observers feel that public power rates have been unduly low in some categories in order to attract industrial users," (1973: 302); and c) ". . . certainly the tendency to give very low industrial rates

exists" (1973: 302). Finally, Wilcox and Shepherd (1975) in their Public Policies Toward Business contend that "(P)ublic enterprise is not generally inferior to private enterprise by any of the main criteria of economic and social performance. It can be, and is, inferior in some cases, but in others it is superior," (1975: 599). No conceptual framework is provided to support the assertions. The authors admit, however, that "(P)ublic enterprise needs a sophisticated evaluation, which recognizes its variety and complexity" (1975: 598).

A more profound set of studies has attempted to indicate the role of alternative institutional arrangements on the behavior of decision-makers.[7] In particular, there is an increasing theoretical and empirical support for the proposition that differences in the underlying structure of property rights within firms affect systematically the choices of utility maximizing managers.

The studies which have employed this general framework have addressed three broad types of issues with little emphasis on the allocative implications: (i), the impact of institutional arrangements on product quality[8] (ii), the pricing patterns which emerge

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[7] Furubotn and Pejovich (1972) present an extensive review of this literature up to 1971. In addition, see contributions by Alchian (1965a, 1965b, 1959, 1961, 1967), Alchian and Kessel (1962), Demsetz (1964, 1966, 1967), Tullock (1965a), Niskanen (1971), De Alessi (1974a) and Manne (1975).

[8] See, for example, Clarkson (1972), Peltzman (1973), Blair (1975), and Lindsay (1976).

under alternative ownership forms[9] and (iii), input and investment decisions under varying property right structures.[10] While the present study remains within the context of this framework, it examines a somewhat different aspect than has been addressed in previous research. Specifically, this dissertation examines the affects of public ownership of enterprises on the allocation of resources.

For the purposes of our inquiry, the allocative implications of government ownership will be discussed by examining (i), the pricing patterns and (ii), the decisions concerning the employment of productive factors in public enterprises. For simplicity, we assume that the alternative forms of ownership do not affect product quality. This assumption is necessary for our purposes of comparing pricing patterns and input decisions across government and private firms within the same industry.[11]

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[9] See, for example, Peltzman (1971), Mann and Seifried (1972), and De Alessi (1975).

[10] See, for example, Brousalian (1966), Mckean (1972), Pejovich (1972), Crain and Ekelund (1976a), and Holcombe and Zardkoohi (1977).

[11] One obvious set of dimensions through which firms can operate is the selection of product characteristics. The product characteristics might differ across government and private firms within the same industry. For example, Post Office does not accept checks as payment whereas, the UPS does, etc. Since alternative product characteristics can result in different production costs and input ratios, the consideration of the quality dimension would be crucial in the comparison of pricing schemes and input decisions across private and government firms. For analytical simplicity, however, we assume identical product characteristics across all firms within the same industry.

The dissertation is divided into two parts. Part I offers an extension of a model of pricing behavior in public enterprises which was developed initially by Peltzman (1971). Implications concerning allocative efficiency are derived explicitly from a more general formulation of the basic model of pricing in public enterprises. Part II examines the allocative consequences of input and investment decisions under public ownership.

The dissertation is organized in the following sequence. Part I consists of Chapter 2. This chapter critically reviews the recent literature on the pricing behavior of public enterprises and provides a conceptual framework that is aimed to extend this literature. Further, Chapter 2 presents an empirical test of the implications drawn. Part II is divided into 3 chapters. Chapter 3 examines the input utilization in public enterprises. Chapter 4 is devoted to a description of the employment behavior of public enterprises. Finally, Chapter 5 provides some concluding remarks.

The analysis of Part I and II suggests that alternative institutional arrangements underlying public and private enterprises lead to essential differences in performance. In particular, the economic organization of public enterprises is susceptible to political manipulations. Manager-politicians confront a cost-reward structure which can be used as a means to enhance (or buy) political support by manipulating the operation of public

enterprises. These vote buying activities can generate specific price vectors and input combinations that do not agree with the optimal conditions for the economic efficiency.[12]

[12]Wagner (1977) suggests similar phenomenon concerning the political manipulation of the economy though at a somewhat different level. Wagner argues that political policy makers seek to manipulate the macroeconomic variables in the economy to obtain re-election. This vote buying activity generates and amplifies economic fluctuations.

Part I

PUBLIC ENTERPRISE AND THE CHOICE OF PRICES

Part I seeks to examine the impact of institutional arrangements in public (as opposed to private) enterprises on the choice of price. We shall assume, as noted above, identical product characteristics within the same industry across government and private firms. This assumption is made for analytical simplicity. We shall also assume that the responsibility for selecting a pricing scheme in public enterprises lies on managers. Of course, there are cases where public enterprise managers do not assume this responsibility. For instance, the Post Office has no authority to set prices, these are being determined instead by the legislative body. We note, however, that these exceptions also fit our model of pricing for political support, perhaps with some mitigating effects.[1]

The analysis of Chapter 2 will suggest a sharp contrast between pricing practices under various forms of ownership. The

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[1] Political authorities, other than managers (e.g., state legislators), who are responsible to set public enterprise prices have political incentives similar to managers. That is, they also seek political support by manipulating prices. For example, Yoshitake (1973: 136) notes that in Japan ministers have political incentives to manipulate public enterprise prices. We note, however, that since politicians at the state or the national levels are involved in a variety of political activities and are not directly involved in the management of public enterprises, might spend less resources than manager-politicians in manipulating prices.

politically motivated managers manipulate public enterprise prices in achieving political gains. In particular, the manipulation of prices plays an important role to sway voter-taxpayers' support in favor of the public enterprise. The politically determined prices will suggest allocative distortions. An empirical test will be provided in support of the fundamental proposition that public enterprise prices are determined in response to political forces rather than market forces.

CHAPTER 2

PRICING BEHAVIOR AND PUBLIC OWNERSHIP

The literature on the behavior of firms indicates that the pricing practices can depend upon the underlying institutional features confronting the decision-makers involved.[2] In a recent contribution to the literature, Peltzman (1971) formulates a theory of pricing pattern under public ownership and offers some empirical verifications of the theory. The present chapter evaluates the allocative consequences of government ownership by examining the behavior of manager-politicians in selecting a pricing scheme. Though our ultimate objective differs from that of Peltzman, the analysis will be based on a modified version of the Peltzman model. Thus, for purposes of explication it is useful first to examine the Peltzman model.

Section I critically examines the Peltzman model and stresses the conditions to which it is applicable. Specifically, it demonstrates the fundamental implication of this model, that "(G)overnment enterprise prices to different groups will tend to be more highly correlated than private prices" (Peltzman, 1971: 115),

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[2] See, for example, Alchian (1965a), Alchian and Kessel (1962), and De Alessi (1974a).

does not follow in a large number of circumstances. Section II developes a more general formulation of this basic pricing model by introducing costs explicitly into the analysis and an assumption about managerial incentives in public enterprises. This extension is employed to examine the effects on resource allocation when the managers of public enterprises are assumed to forego profits in exchange for political support through the pricing mechanism. Section III offers some empirical verification of the model by examining the pricing behavior of publicly versus privately owned water utilities in the United States. Finally, Section IV offers some concluding remarks.

I. The Peltzman Model: Pricing for Political Support

A distinguishing feature of Peltzman's approach is that the pricing policies in government enterprises reflect efforts by the management to maintain political support for the enterprise and, in particular, the continued job tenure of the managers of such enterprises. (Peltzman, 1971: 112). The management is assumed to manipulate prices so that lower prices are exchanged for political support, which implies that prices are not a profit maximizing levels. However, since any departure from the profit maximizing prices will result in a tax increase, a loss of political support will be generated.[3] Thus, each individual, as a consumer may benefit

[3]Peltzman assumes that the public enterprise seeks to maintain some positive level of profits. Hence, any decrease in prices must be offset by a tax increase.

from a fall in price but, as a taxpayer, may lose from the resultant increase in his tax liabilities. In effect, the management seeks to select an array of prices in a manner such that the number of consumer-taxpayers who are net gainers exceeds the number of net losers.

One implication which follows from the Peltzman model is that since higher than profit maximizing prices will result in losses to voters (as customers as well as taxpayers), there will be a downward bias in public enterprise prices. Further, the distribution of price reductions will depend on the relationship between consumption and tax liability for each voter or group of voters. For example, if the income elasticity for the public enterprise product is very high and tax liabilities are proportional to income, high income customers will receive relatively small price reductions. Large price reductions to these customers, given their proportionally high direct expenditures relative to their tax payments would result in substantial revenue losses to the public enterprise. This would reduce the ability of the public enterprise to subsidize other customers with lower income elasticities. In contrast, customer groups whose tax liabilities are high relative to expenditures on the product would tend to receive relatively larger price reductions.

Peltzman addresses the specific issue of how the structure of prices across various customer groups will differ under public

and private ownership (Peltzman, 1971: 114). His conclusion is that customer groups will be treated more uniformly under public ownership than they would under private ownership. The Peltzman model can be illustrated by a simple example. Suppose that the public enterprise in question serves only two groups of customers, e.g., group 1 and group 2, and individuals within each group are homogeneous. Managers of this enterprise are able to gain votes from individuals within each group by charging less than the profit-maximizing price (Peltzman, 1971: 115). This example can be depicted diagramatically. In Figure 1, the ability of the managers to trade prices for votes is represented by a set of iso-vote curves labeled V_i. Each iso-vote curve represents a locus of price combinations (e.g., P_1 to group 1 and P_2 to group 2) that generates an equal number of votes. In other words, the managers can maintain a given number of votes by charging a higher price to one group and a lower price to the other. However, if the manager charges lower prices to both groups, the number of votes would increase. This would be represented by a movement to a V_i curve which is closer to the origin.[4]

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[4]We note that the set of iso-vote curves are different from the set of what might be called "iso-consumer surplus" curves. If the latter set of curves are drawn in, they will be a set of curves concave from above, where the shape merely reflects a technical relationship between prices. Whereas, the shape of the iso-vote curves are not only convex, but reflect the behavior and the size of each customer groups (as perceived by the manager-politician).

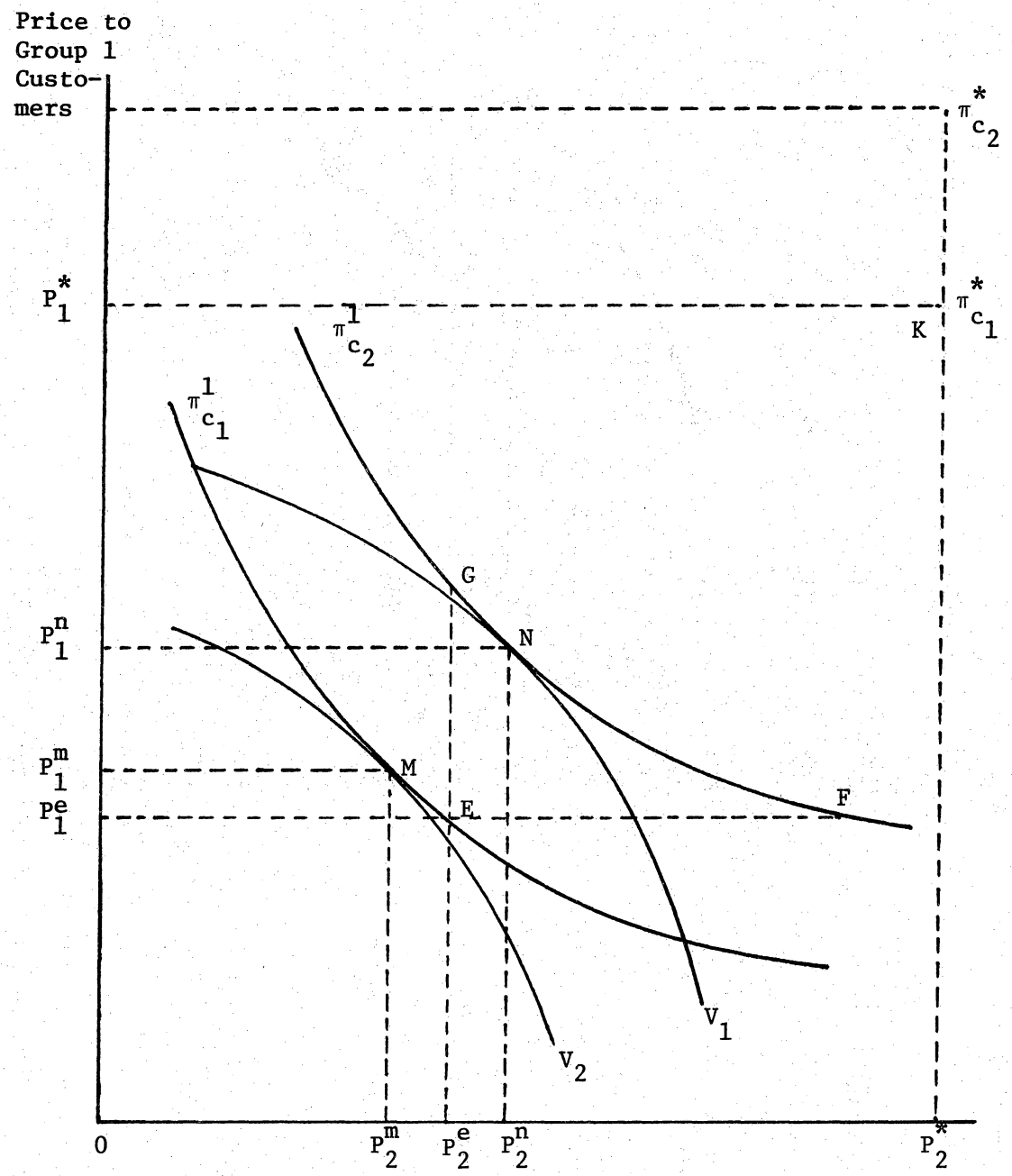

Figure 1

Pricing for Political Support: Differential Cost Adjustments

The shape of the iso-vote curves is affected by two factors: 1) the intensity of the political activity (or sensitivity) of the group and, 2) the relative sizes of the customer groups.[5] Specifically, if the groups have an equal number of customers, the group which is more politically active will be favored over the group exhibiting relatively less political activity. For example, in Figure 1 if group 2 customers are more active politically than group 1, the iso-vote curves would be steeper toward the horizontal axis. That is, a relatively small increase in the price charged to group 2, P_2, will result in a loss of votes from group 2, which can be offset only by a relatively large decrease in the price charged to the relatively less politically active group, P_1. A decrease in P_1 which is equal to the increase in P_2 will be unable to gather enough support from group 1 to offset completely the loss of votes from group 2.[6] The size of a group affects the shape of the iso-vote curves in a similar manner. For example, the larger the relative size of group 2, the steeper the iso-vote curves will be, ceteris paribus.

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[5]The intensity of political activity within a group is defined as the extent to which public enterprise prices affect their overall political participation, (e.g., voting, campaign contributions, organizing citizens complaint groups, etc.).

[6]These assertions about the direction of the effect of the political activity of a group on the shape of the iso-vote curves have received some empirical verification. For example, Mann (1973) finds an inverse relationship between the level of "political activity" of a group and the price charged to the group by a public enterprise.

The $\pi^i_{c_j}$ curves, also depicted in Figure 1, represent sets of price combinations that generate an equal amount of profits, π^i, for any given set of costs, c_j, in serving each customer group. For example, $\pi^1_{c_1}$ shows the combination of prices that generate π^1 level of profits when the cost of serving group 1 and group 2 customers is the set c_1. The profit maximizing price combination (P_1^*, P_2^*) is represented by point K in Figure 1 and $\pi^*_{c_1}$ is the level of maximum profit, given the cost set c_1.

In Figure 1, suppose that the manager of the enterprise is willing to trade profits of an amount $(\pi^*_{c_1} - \pi^1_{c_1})$ for votes through the pricing mechanism. From all the possible price combinations which yield a level of profit $\pi^1_{c_1}$, V_2 represents the largest attainable level of votes. Stated differently, $(\pi^*_{c_1} - \pi^1_{c_1})$ is the smallest reduction in profits which will achieve an expected level of voter support equal to V_2. This implies that the profit constraint is $\pi^1_{c_1}$. Hence, the manager will select the price combination (P_1^m, P_2^m) at point M which maximizes voter support subject to the profit constraint $\pi^1_{c_1}$.

Now consider an increase in the cost of serving group 1 that changes the initial set of cost conditions, c_1, to c_2. Compared with c_1, the set of costs c_2 consists of the original cost of serving group 2 and a higher cost of serving group 1. This change in the cost condition, i.e., from c_1 to c_2, affects the location of each iso-profit curve π^i. For example, the curve which represents π^1 level of profits shifts from $\pi^1_{c_1}$ to $\pi^1_{c_2}$. In other words, both

$\pi^1_{c_1}$ and $\pi^1_{c_2}$ represent the same level of profits, π^1. The shift in the profit curves can be illustrated quite simply. Consider a point on the iso-profit curve $\pi^1_{c_1}$, say, point E. If the price combination (P^e_1, P^e_2) at point E is maintained, given the increased cost of serving group 1, profits would fall below $\pi^1_{c_1}$. To maintain the same level of profits, π^1, while, for instance, holding price to group 1 constant at point E, the price to group 2 would have to be increased by (F-E). The exact amount of (F-E) depends upon the shape and the location of the demand and the cost curves for the two customer groups. Alternatively, if under a similar cost change, price to group 2 is held constant at point E, then price to group 1 must be increased by (G-E) in order to maintain π^1 level of profits. This suggests that points F and G on the profit curve $\pi^1_{c_2}$ reflect an equal amount of profits compared to point E on the iso-profit curve $\pi^1_{c_1}$. Hence, the iso-profit curve, $\pi^1_{c_2}$, will be everywhere above $\pi^1_{c_1}$ though it represents the same amount of profits. In sum, the difference between $\pi^1_{c_2}$ and $\pi^1_{c_1}$ is that the former represents a higher cost of serving group 1.

Given the "new" (after the change in cost) profit curve $\pi^1_{c_2}$, the manager maximizes voter support subject to the π^1 profit constraint by choosing the price combination (P^n_1, P^n_2) at point N. The analysis indicates that when the cost of serving one group rises, the manager of the public enterprise has incentives to allocate the increase in cost over all customer groups. In Figure 1,

P_2^n is greater than P_2^m and P_1^n is greater than P_1^m, even though only the cost of serving group 1 has increased.

Based on this formulation, Peltzman contrasts the pricing structure of enterprises under alternative forms of ownership. As illustrated in Figure 1, managers in public enterprises have incentives to allocate the increment in the service cost of one market across all markets by increasing all prices equi-directionally. That is, in public enterprises, changes in product prices are positively correlated across markets. In effect, this analysis suggests that public enterprises respond to changes in the cost of serving a specific customer group differently than private enterprises. In private enterprises, profit maximizing managers would not allocate changes in the cost of one market over other markets since the marginal costs and marginal revenues in each market are equated independently.[7] Moreover, since the political interest of the manager in a public enterprise tends to prompt correlated prices, discriminatory pricing in the traditional sense would be less serious in this case than in private enterprises. In other words, since changes in prices are more closely tied together in public than in private enterprises, the impact of differentiated demand elasticities on output levels and prices is weakened.

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[7] For a textbook treatment of price discriminating behavior under a profit maximization assumption, see Ferguson (1969) pp. 285-300.

Peltzman uses data from publicly and privately owned electric utilities and state owned liquor stores in the United States to test his fundamental finding. The empirical results that he obtains generally support the assertion that prices to different customer groups in public enterprises tend to be more highly correlated than private enterprise prices. In other words, discriminatory pricing was found to be less serious in the case of public enterprises than private enterprises.

Certainly the fact that a model can be supported on empirical grounds does not necessarily attest to the validity of the model on conceptual grounds. Many factors can be at work which simply comply with the underlying assumptions of the model and, thus, produce the desired results. For example, the implication of the Peltzman model that prices to different groups in government enterprises will tend to be more highly correlated than private enterprise prices, does not hold generally. Its theoretical validity rests upon the assumption that the cost of serving customer groups changes in a particular manner, specifically, if costs change differentially across markets. The implication does not follow, for example, in situations where costs to customer groups change equally. In cases where costs change equally across markets, the effect on price differences in public enterprises may be identical to that in private enterprises. Indeed, it is quite possible for prices across markets in private enterprises to exhibit a higher degree of correlation than those prices in public enterprises.

To illustrate these qualifications, first consider a situation where the costs of serving two customer groups change equally for a public enterprise and compare the price adjustment to that in a private (profit-maximizing) enterprise. The adjustment in the public enterprise is depicted in Figure 2. The assumptions underlying Figure 2 are similar to those in Figure 1, except that in Figure 2 costs change equally for both customer groups. In Figure 2, then, the cost vector, c_3, reflects an equal cost increase to serving both markets. Again, in this case the public enterprise seeks to earn the level of profits π^1. Thus, before the increase in costs, the manager will choose the set of prices (P_1^m, P_2^m) at point M, i.e., at the initial set of costs represented by c_1. After the increase in costs to c_3, the manager will increase both prices equally. The new price combination is (P_1^n, P_2^n) at point N. This result follows from the Peltzman model, where the manager has incentives to allocate any change in the cost of a market over all markets. Since, in this case, costs increase equally in both markets, the cost reallocation would generate equal price changes in the two markets.[8] This result may be identical to the expected change in prices of a private enterprise facing similar cost conditions.

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[8]The effect of an equal increase in the service cost in the two markets on prices can be described by the particular shift which is generated in the profit constraints. An identical increase in the service cost of the two markets will shift the profit curves along a 45° line northeastward. The reason for this shift will be made clear below when we derive the profit functions mathematically. Given the shift in the profit curves and an assumption of homothetic iso-vote curves, prices will change equally in both markets.

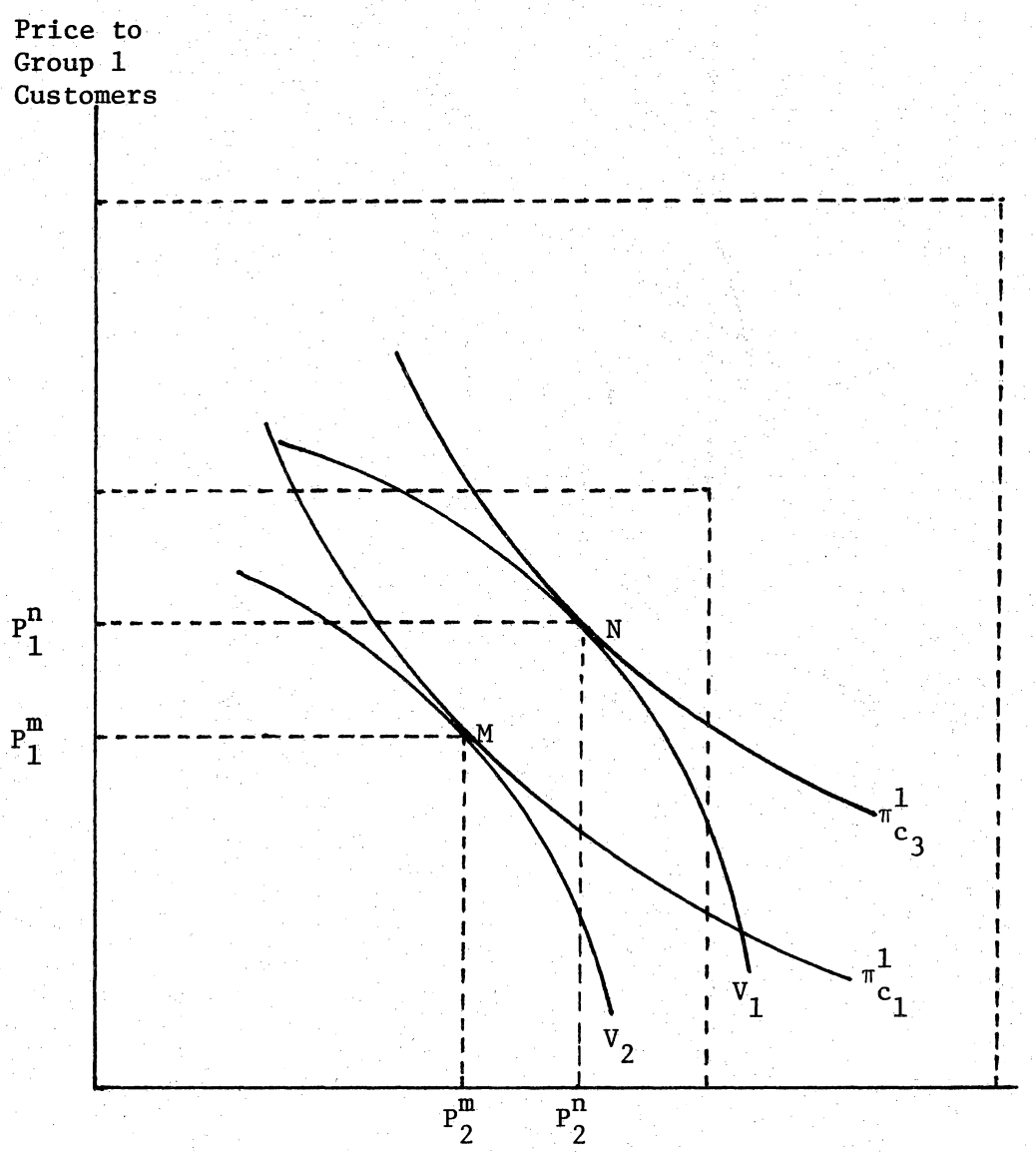

Figure 2

Pricing for Political Support: Identical Cost Adjustments

The effect on prices in private enterprises which result from equal changes in costs across markets can be examined mathematically. First, consider the situation where a private enterprise serves two customer groups, each having a linear demand curve. For simplicity, the marginal cost functions are assumed constant and identical across markets. The following demand and marginal cost functions illustrate such an initial situation:

$$P_1 = a_1 - b_1Q_1, \text{ (market 1)}, \qquad [1]$$

$$P_2 = a_2 - b_2Q_2, \text{ (market 2), and} \qquad [2]$$

$$c_1 = (MC_1, MC_2), \text{ where } MC_1 = MC_2 . \qquad [3]$$

Given profit maximizing behavior in the private enterprise, prices are:

$$P_1 = \frac{1}{2}(a_1 + MC_1) \text{ and} \qquad [4]$$

$$P_2 = \frac{1}{2}(a_2 + MC_2) \qquad [5]$$

in markets 1 and 2, respectively. Hence, the initial difference in market prices is

$$P_2 - P_1 = \frac{1}{2}(a_2 - a_1).^9 \qquad [6]$$

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[9] The result in equation [6] is obtained in the following manner. First, the marginal revenue curves are derived from the market demand curves represented by equations [1] and [2]. These are shown by equations [6a] and [6b] below:

Now consider an equal increase in costs across the two markets by an amount m, so that in the new situation $MC_1 + m = MC_2 + m$. This cost vector is denoted as c_3. Again, given profit maximizing behavior in the private enterprise, the prices in the two markets after the increase in costs will be:

$$P_1 = \frac{a_1}{2} + \frac{1}{2}(MC_1 + m) \text{ and} \qquad [7]$$

$$P_2 = \frac{a_2}{2} + \frac{1}{2}(MC_2 + m). \qquad [8]$$

The difference in the adjusted prices will be

$$P_2 - P_1 = \frac{1}{2}(a_2 - a_1). \qquad [9]$$

$$MR_1 = a_1 - 2b_1Q_1 \text{ (market 1) and} \qquad [6a]$$

$$MR_2 = a_2 - 2b_2Q_2 \text{ (market 2).} \qquad [6b]$$

Second, assuming zero marginal costs initially, we substitute $MC_i = 0$ for MR_1 and MR_2 in equations [6a] and [6b] and obtain the corresponding profit maximizing output levels. Thus,

$$Q_1 = \frac{a_1}{2b_1} \text{ and} \qquad [6c]$$

$$Q_2 = \frac{a_2}{2b_2} \qquad [6d]$$

are the output levels in markets 1 and 2, respectively. By substituting the output levels in equations [6c] and [6d] into the demand equations [1] and [2], the profit maximizing price levels are

$$P_1 = \frac{a_1}{2} \text{ and} \qquad [6e]$$

$$P_2 = \frac{a_2}{2} \; . \qquad [6f]$$

Hence, equation [6] in the text is obtained by taking the difference between equations [6e] and [6f].

Hence, a comparison between the set of prices before the change in costs (i.e., equation [6]) and after the change in cost (i.e., equation [9]) indicates that private enterprise prices increase equally for an equal increase in costs across the markets. This result is identical to the finding for price changes in public enterprises which result from an equal change in costs across markets.

A second situation which contradicts the prediction of the Peltzman model arises when the assumption of linear demand curves is relaxed. For example, consider a private enterprise which faces a linear demand curve in market 1 and a non-linear demand curve in market 2. These can be represented as in equations [10] and [11].

$$P_1 = a - bQ \text{ (linear)} \qquad [10]$$

$$P_2 = a - bQ^2 \text{ (concave from below)} \qquad [11]$$

In this case, an equal change in the cost of serving the two markets will result in prices that show a higher correlation in the private enterprise than in the analogous public enterprise. We again assume an initial situation where marginal cost in each market is zero. Given the demand curves represented by equations [10] and [11] and zero marginal costs, the private enterprise will choose the prices $P_1 = \frac{a}{2}$ and $P_2 = \frac{2}{3}a$, and the difference between prices is

$$P_2 - P_1 = \frac{a}{6} .^{10} \qquad [12]$$

Now assume that marginal costs in the two markets increase equally, by an amount m. The private enterprise will, in this situation, adjust to the prices $P_1 = \frac{1}{2}(a + m)$ and $P_2 = \frac{1}{3}(2a + m)$. The difference between the adjusted prices in the two markets is

$$P_2 - P_1 = \frac{a}{6} - \frac{m}{6} . \qquad [13]$$

Thus, a comparison of the price differences before and after the equal cost increases, i.e., equations [12] and [13], illustrates that prices in the private enterprise become more highly correlated since $\frac{a}{6} > \frac{a}{6} - \frac{m}{6}$.[11]

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[10] This result is obtained by following the procedure shown in Note 9.

[11] There are a range of additional theoretically plausible circumstances in which private enterprise prices would exhibit a higher correlation than prices in public enterprises. The exact relationship between the extent to which prices are correlated in public and private enterprises depends upon the relative degree of curvature of the market demand curves. For example, if the demand curves in the two sectors are linear, the difference between prices will stay the same for any given change in costs across all markets. However, in cases where the stronger demand curve is concave and exhibits a greater curvature (i.e., a larger second derivative) than the weaker demand curve, the difference between prices will get smaller for a given increase in costs across all markets. In general, if we denote the second derivative of the stronger demand curve by d''_s and that for the weaker demand curve by d''_w, the following conditions hold for a given increase in costs across markets in private enterprises:

If $|-d''_s| > |\pm d''_w|$ prices become more correlated.

If $|-d''_s| < |\pm d''_w|$ prices become less correlated.

In contrast, a public enterprise facing this latter set of demand and cost conditions would adjust price equally. The differences in the market prices would remain unaltered and, hence, would not become more correlated.[12] We stress that while private enterprises would not reallocate costs across the markets, profit maximizing behavior can still result in prices that are more highly correlated than prices in public enterprises.

In sum, the essential conclusion reached by Peltzman that prices will be more highly correlated in public than in private enterprises does not follow under a variety of conditions. Hence, in its present form the basic model is somewhat limited in its predictive ability and in its analytical scope. In Section II we turn to an extension of this model which (i) addresses these limitations and (ii) explicates the allocative implications of public enterprise pricing.

II. Some Modifications in the Model

This section offers an extension of the Peltzman model which will enable us to evaluate a consequence of undertaking production activity in the public sector. We note that this extended model has

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If $|+d''_S| > |\pm d''_W|$ prices become less correlated.
If $|+d''_S| < |\pm d''_W|$ prices become more correlated.
A negative second derivative implies a demand curve which is concave from below.

[12] Note that this result follows because an equal increase in costs across markets will shift the profit constraint (which is derived on page 33 below) northeastward along a 45° line.

a different underlying objective than that of Peltzman. The primary objective here is to draw some inferences concerning the allocative consequences of pricing behavior in public enterprises. Further, some implications will be drawn as to the relative pricing practices in public versus private enterprises.

The approach in this section differs from that of Peltzman in two fundamental respects. First, cost functions will be introduced explicitly into the model. This facilitates the evaluation of the effect on resource allocation which arises in publicly owned enterprises. Second, it will be assumed that managers of public enterprises have no incentive to maintain positive profit levels. This assumption conforms specifically to much of the literature on bureaucratic behavior. We note that Peltzman's assumption about profits implies a continuous substitutability between political support (e.g., votes) and profits in the preference function of manager-politicians. That is, in the Peltzman view managers of public enterprises exhibit a reluctance to forgo profits in exchange for political support, which suggests that their wealth is positively related to the profitability of the enterprise. This view does not agree with numerous theoretical and empirical studies.[13] Each of these two modifications and their importance will be discussed in turn.

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[13]For example, see Niskanen (1971), Tullock (1965a), Alchian (1965a), Alchian and Kessel (1962), De Alessi (1974b), Crain and Tollison (1976).

The affect of introducing costs explicitly into the model is depicted in Figure 3. The vertical axis measures price to group 1 customers and the horizontal axis measures price to group 2 customers. The MC_1 and MC_2 lines show the marginal cost of providing service to group 1 and group 2 customers, respectively. For simplicity, the marginal costs are assumed constant. Point Z, which occurs at the intersection of the marginal costs, represents the optimal, (i.e., marginal cost) pricing solution. In addition, it satisfies the zero profit constraint. Another desirable characteristic of point Z is that it indicates the combination of prices (P_1^z, p_2^z) which maximizes the sum of consumer surplus under a zero-profit rule. In sum, the introduction of the cost functions into the model generates an optimal pricing point as a benchmark for comparing and evaluating the effects of public enterprise pricing behavior.

The second modification in the model concerns the underlying incentives of managers in public enterprises. Unlike their counterparts in private enterprises, we assume that decision-makers in public enterprises are not residual claimants to profits and, thus, have incentives to forego these entirely in order to gain political support. One obvious implication which follows--and this can be observed in almost all public enterprises in the world--is that public enterprises would be characterized by zero profit levels.[14]

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[14]One reason which is commonly advanced for the case of public enterprises is to regulate their operation such that they "behave

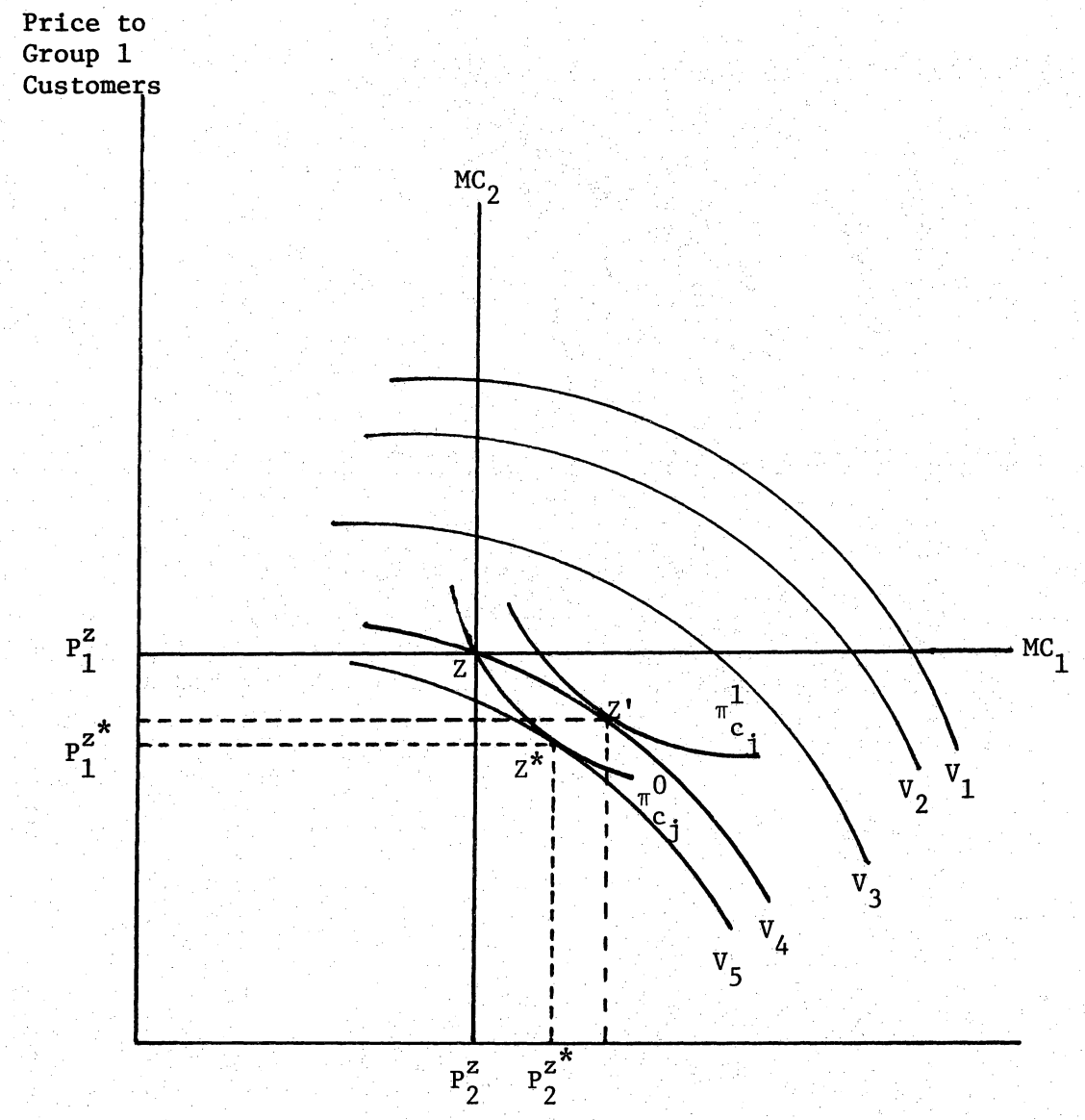

Figure 3

Pricing for Political Support: Allocative Implications

In effect, since foregone profits do not represent any reduction in the wealth of managers in public enterprises, they can buy votes at zero cost. This contrasts sharply with the approach taken by Peltzman, where managers of public enterprises are assumed to maintain some positive amount of profits. Peltzman's view perhaps corresponds more closely to the analytical treatment of private corporations which are characterized by a separation of ownership and control.[15]

The affect of these two fundamental departures from the Peltzman approach for the analysis of public enterprise pricing can be illustrated in Figure 3. $\pi^0_{c_j}$ in Figure 3 corresponds to a zero profit level while $\pi^1_{c_j}$ reflects some positive rate of return. The

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competitively," e.g., make zero profits. While the zero profit constraint does not necessarily make an enterprise competitive, it is one of the primary objectives of many public enterprises. For example, Yoshitake (1973) maintains that in Britain "it is commonly admitted that the price is in principle a matter which should be entrusted to the boards of nationalized industries so that the break-even principle could be maintained" (1973: 136). In Japan the break-even principle is also a primary principle for local public enterprises. The Law of Local Public Enterprises Article 21 says "the rate of local public enterprise must be fair and reasonable. In determining the rate, due consideration must be paid for maintaining the balance of financial account" (Yoshitake 1973: 7). Mallya maintains that in India "(T)he principle motive in public enterprises is not maximization of profits as there are other motives like public interest, national planning for economic development, and other national policy considerations" (1971: 46).

[15]Numerous empirical studies have found a positive relationship between the profitability of a private enterprise and the salary of its managers. In situations where the enterprise is not managed by its owners, this relationship may be somewhat mitigated, yet the positive relationship would still continue to exist. For an example of this type of study, see Williamson (1964).

zero-profit constraint can be derived as follows. Assume that the customer groups in Figure 3, i.e., group 1 and group 2, have the following respective demand curves:

$$P_1 = a_1 - Q_1 \qquad [14]$$

$$P_2 = a_2 - Q_2 \qquad [15]$$

The zero-profit constraint implies

$$TR = TC \qquad [16]$$

Substituting the demand equations [14] and [15] into [16] the constraint becomes

$$P_1(a_1 - P_1) + P_2(a_2 - P_2) = MC_1(a_1 - P_1) + MC_2(a_2 - P_2), \qquad [17]$$

if we retain the constant cost assumption. The constraint can be simplified to

$$[P_1 - \tfrac{1}{2}(a_1 + MC_1)]^2 + [P_2 - \tfrac{1}{2}(a_2 + MC_2)]^2 = K, \quad \text{where,} \qquad [18]$$

$$K = \tfrac{1}{4}(a_1 + MC_1)^2 + \tfrac{1}{4}(a_2 + MC_2)^2 - a_1MC_1 - a_2MC_2 \; . \qquad [19]$$

Hence, the zero-profit constraint is a circle whose radius is $\sqrt{K}$ and whose center is located at the point $[\frac{1}{2}(a_1 + MC_1), \frac{1}{2}(a_2 + MC_2)]$ in Figure 3. The circle will pass through point Z which reflects

the marginal cost pricing condition, as this point satisfies the zero-profit constraint.[16]

In Figure 3, the public enterprise manager can be viewed as having three relevant pricing alternatives. The choice of point Z represents a marginal cost pricing solution and a level of political support described by V_4. Point Z' depicts the choice of the "Peltzman" manager who seeks a positive rate of return for the public enterprise while maintaining the level of political support, V_4. Finally, the pricing alternative represented by Z^* will secure the maximum attainable level of political support for the manager, V_5, given a break-even limitation, $\pi^0_{c_j}$. The model predicts that point Z^* will be chosen since the modifications introduced above suggest that the additional political support, i.e., the difference between V_4 and V_5, imposes no opportunity cost on the manager.

These simple modifications broaden considerably the analytical scope of the underlying model. For example, some specific inferences may be drawn concerning the effects of the institutional structure in public enterprises on managerial conduct and allocative performance. This can be illustrated in Figure 3 by comparing the politically appealing pricing alternative, point Z^*, with the marginal cost pricing benchmark, point Z. At point Z^*, the manager has increased the probability of re-election (i.e., a movement from the

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[16] Referring to notes 8 and 12 above, an equal increase in the marginal service cost will move the center of the circle along a 45° line. This type of shift in the constraint is apparent from equation [18].

iso-vote curve V_4 to V_5) by charging prices (P_1^{Z*}, P_2^{Z*}) that deviate from the marginal cost pricing vector (P_1^Z, P_2^Z). This comparison illustrates the resource misallocation in public enterprises that are implied by the model. In this specific example, price exceeds the marginal service cost in market 2 and falls below marginal service cost in market 1, which implies that quantity is restricted to customers in the former market and expanded to customers in the latter. The quantity restriction in market 2, in effect, generates a profit which can be redistributed to the more politically active customers (i.e., market 1) in the form of a per unit subsidy. More importantly, this transfer will cause allocative inefficiency if the output expansion in the subsidized market does not exactly offset the quantity restriction. These offsetting quantity adjustments will net out (i.e., create no allocative distortions) only under a quite special condition. This condition can be derived explicitly. Equation [20] expresses the condition where the increase in the output in market 1 is exactly equal to the decrease in the output in market 2.

$$\Delta Q_1 = \Delta Q_2 \qquad [20]$$

We retain the set of demand functions expressed in equation [1] and [2] and denote a cost function in equation [21],

$$MC_i = d_i + e_i X_i \qquad [21]$$

The price adjustment which will occur in both markets are denoted in equation [22].

$$\Delta P_i = \left(\frac{b_i}{b_i + e_i}\right) \frac{\pi}{Q_i} \quad , \qquad [22]$$

where i identifies the specific market, i = 1 for market 1 and i = 2 for market 2, and π is the amount of profit which is employed as the per unit subsidy.[17] The elasticity relationship in

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[17] Equation [22] can be derived quite simply. We first solve for the initial equilibrium output level in market 1 and in market 2 by setting equation [1] and equation [2] equal to equation [21].

$$a_i - b_i Q_i^0 = d_i + e_i Q_i^0 \quad , \qquad [22a]$$

where i = 1 denotes market 1 and i = 2 denotes market 2. By solving for Q_1^0 and Q_2^0 and substituting back into equation [1] and [2], we obtain the initial set of prices as in equation [22b].

$$P_i^0 = a_i - b_i \frac{a_i - d_i}{b_i + e_i} \qquad [22b]$$

After the unit "tax" (i.e., the price increase resulting from the quantity restriction) is imposed on customers in market 2 and the equivalent subsidy is given to customers in market 1, the effective <u>net</u> average revenue schedules become

$$AR_i^{Net} = a_i - b_i Q_i + \frac{\pi}{Q_i}^{(-)} \quad , \qquad [22c]$$

where $\frac{\pi}{Q_2}$ is the unit "tax" in market 2 (with the negative sign) and $\frac{\pi}{Q_1}$ is the unit subsidy in market 1 (with the positive sign), Q_2 is the new (post-"tax") output level in market 2 and Q_1 is the new (post-subsidy) output level in market 1. The new equilibrium output level in market 1 and in market 2 are given by

$$a_i - b_i Q_i + \frac{\pi}{Q_i} = d_i + e_i Q_i \qquad [22d]$$

Solving for the Q_i's, we obtain the adjusted output levels. Substituting Q_1 and Q_2 into demand equations [1] and [2] respectively, we obtain the post-transfer set of prices, P_i, as in equation [22e].

equation [23] is substituted into equation [20] to obtain equation [24].

$$\eta_i = \frac{\Delta Q_i}{\Delta P_i} \cdot \frac{P_i}{Q_i} \qquad [23]$$

$$\eta_1 \Delta P_1 \frac{Q_1}{P_1} = \eta_2 \Delta P_2 \frac{Q_2}{P_2} \qquad [24]$$

Finally, we substitute the expression for price changes stated in equation [22] to obtain the special condition denoted in equation [25] under which no allocative inefficiency exists.

$$\frac{\eta_1 \left(\frac{b_1}{b_1 + e_1}\right)}{\eta_2 \left(\frac{b_2}{b_2 + e_2}\right)} = \frac{P_1}{P_2} \qquad [25]$$

We note that the condition stated in equation [25] is necessary and sufficient for allocation efficiency. Thus, it follows that under <u>all</u> other conditions the pricing behavior of public enterprises suggested by our model of public enterprise pricing pattern will imply <u>allocative inefficiencies</u>. In other words, the vote buying

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$$P_i = a_i - b_i \frac{a_i - d_i + \frac{\pi}{Q_i}}{b_i + e_i} \qquad [22e]$$

Finally, the changes in prices, ΔP_i, are derived by subtracting equation [22b] from equation [22e].

$$\Delta P_i = P_i - P_i^0 = \left(\frac{b_i}{e_i + b_i}\right) \frac{\pi}{Q_i} \qquad [22f]$$

activities of manager-politicians which are financed by means of a wealth redistribution from one customer group to the other are likely to bring about allocative distortions.

The condition stated in equation (25) implies further that the allocative distortions that can emerge may take two directions. First, if

$$\frac{\eta_1\left(\frac{b_1}{b_1 + e_1}\right)}{\eta_2\left(\frac{b_1}{b_1 + e_1}\right)} < \frac{P_1}{P_2}, \qquad [26]$$

the increase in output in market 1 will be less than the decrease in output in market 2. In this case net output in the public enterprise will be below the competitive benchmark level. Second, if

$$\frac{\eta_1\left(\frac{b_1}{b_1 + e_1}\right)}{\eta_2\left(\frac{b_2}{b_2 + e_2}\right)} > \frac{P_1}{P_2}, \qquad [27]$$

the increase in output in market 1 will be more than offset the quantity restriction in market 2 and hence the public enterprise will produce more than the optimal amount.

We note that both types of inefficiency in public enterprises (i.e., "inadequate" or "excessive" output) have been argued by several earlier writers, though on totally different grounds. For

example, West (1965), Wallis (1968) and Peltzman (1973) suggest that government involvement in the provision of services is likely to result in less than optimal output. On the other hand, Tullock (1965a) and Niskanen (1971) argue that government ownership of enterprises will result in excessive levels of provision. The relationships depicted in equations [26] and [27] above offer an alternative explanation for the ambiguous nature of allocative distortions under public ownership.

Public Enterprise Pricing and Monopolistic Behavior

The model of Figure 3 can be employed further to exhibit the pricing behavior in public versus private enterprises when the former serves politically passive markets, i.e., markets where customers do not possess the relevant voting rights. The lack of opportunities to reap political gains in these markets implies monopolistic behavior on the part of the public enterprise. This is depicted diagramatically in Figures 4(a) and 4(b). Figure 4(a) depicts the interaction of the public enterprise under consideration with group 1 and group 2 customers. Group 1 customers are assumed to possess no voting rights to elect managers of the public enterprise. Group 2 customers possess such rights. The specific set of demand and marginal cost curves underlying Figure 4(a) are

$$(P_1 = 10 - Q_1 \ , \ MC_1 = 4) \text{ for group 1 and,} \qquad [28]$$

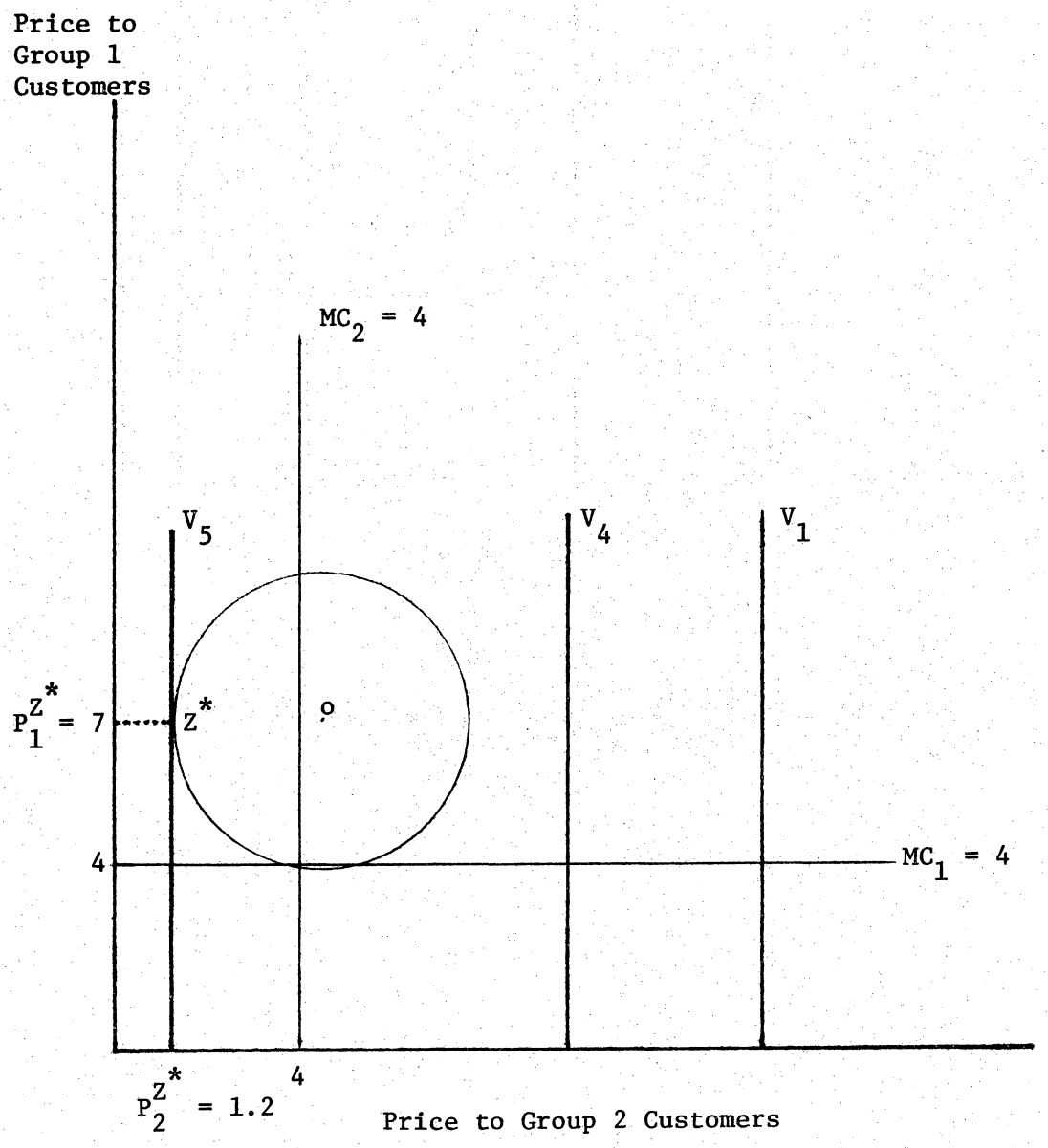

Figure 4(a)

Public Enterprise and Monopolistic Behavior in the Politically Passive Market

$$(P_2 = 5 - Q_2 \ , \ MC_2 = 4) \text{ for group 2,} \qquad [29]$$

respectively. The construction of Figure 4(a) is similar to Figure 3, except that in Figure 4(a) the marginal service costs are identical across both customer groups, and that group 1 customers are devoid of the relevant voting rights. This latter assumption implies a set of iso-vote curves which are perpendicular. That is, no votes will be lost for a given increase in the price charged to group 1 customers while keeping price to group 2 customers unaltered. Similarly, no additional votes will be secured from group 1 customers by lowering the price charged to them. In Figure 4(a), given the demand and marginal cost functions denoted by equations [28] and [29], the constraint circle is drawn in with the center coordinates (7, 4.5) and radius 3.04.[18] Managers of the public enterprise maximize the probability of re-election by selecting the combination of prices ($P_1^{Z^*}$, $P_2^{Z^*}$) at point Z^*. The choice of prices ($P_1^{Z^*}$, $P_2^{Z^*}$) implies that the public enterprise charges a price exceeding marginal cost in the non-voting market and a price below marginal cost in the voting market. As Figure 4(a) exhibits, the price charged to group 1 customers, i.e., the non-voting market, is \$7 which exceeds the marginal service cost. The price charged to group 2 customers, i.e., the voting market, is \$1.2 which falls below the marginal service cost.

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[18]The results are obtained using equation [18].

We note that a private (profit-maximizing) enterprise facing the demand and cost functions as in equations [28] and [29] will charge the same monopoly price in market 1 as charged by the public enterprise. This relationship can be illustrated diagramatically. Figure 4(b) depicts the pricing pattern of the private enterprise which faces similar cost and demand conditions described by equations [28] and [29]. The private enterprise, of course, charges a price to achieve that output which equates marginal revenue and marginal cost independently in each market. In this specific case, given the particular demand and cost functions, the price which satisfies the profit maximizing condition is \$7 in market 1 (and \$4.5 in market 2). We note that the monopoly price (i.e., \$7) is the same price level which is charged in market 1 by the public enterprise. In other words, the analysis suggests that the public enterprise behaves monopolistically in the market where there exists no opportunity to secure political support.

Public Enterprise and Price Uniformity: A Supplement

Returning once again to the issue of price uniformity, the analysis of Figures 4(a) and 4(b) indicate that the divergence between the selected prices (P_1^{Z*} , P_1^{Z*}) in the public enterprise is greater than the divergence between prices charged by the private enterprise. The difference between the prices charged by the public enterprise is \$6.8(=7-1.2) whereas, the difference between the prices charged by the private enterprise is \$2.5(=7-4.5). In effect, the

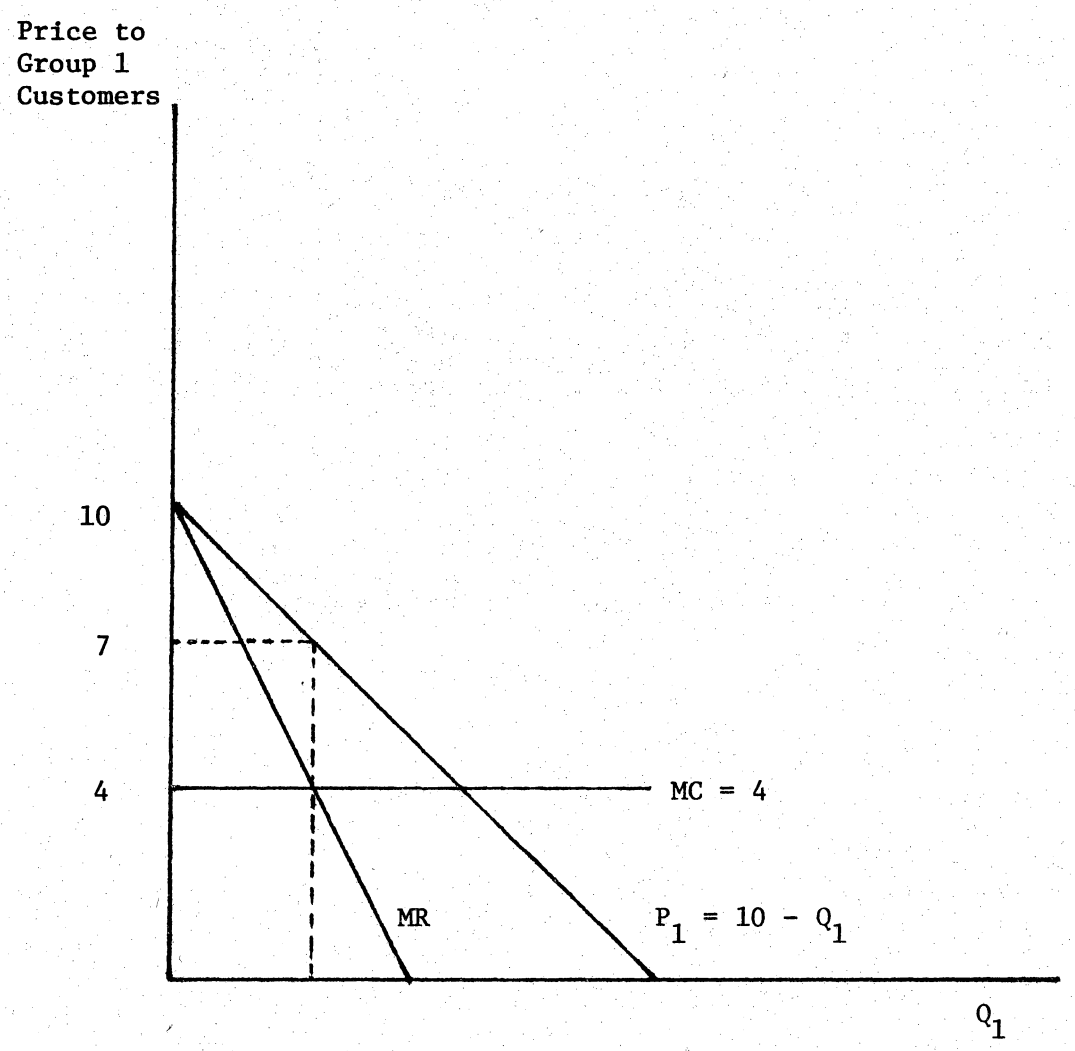

Figure 4(b)

Private Firms and Monopoly Pricing

manager of the public enterprise charges prices across markets which exhibit less uniformity than the prices charged by the private enterprise. This additional conclusion indicates that in static conditions, i.e., when costs remain unchanged, different customer groups served by private enterprises may receive a more uniform treatment than if they were served by a public enterprise.

This assertion adds a wide range of circumstances to the conditions noted previously which contradicts the fundamental implication obtained by Peltzman that public enterprise prices exhibit greater correlation than private enterprise prices. The recognition that the price uniformity can take different directions (under various conditions) suggests that the employment of this criterion as a conceptual framework to predict prices in public versus private enterprises can become misleading. An alternative predictive criterion in distinguishing between the pricing behavior of public versus private enterprises is implied by the model. Namely, public enterprise prices are determined in response to political forces rather than market forces. In effect, the resultant degree of price uniformity across markets in public versus private enterprises can prove trivial.

III. Some Empirical Evidence: The Case of Water Utilities in the U.S.

The models of the preceding section indicate the fundamental proposition that public enterprise prices are formulated in response to political forces rather than market forces. This section seeks

to examine this implication of the model empirically by using data from water utilities in the United States. The selection of this industry proves fruitful for several reasons. First, utilities within the industry can be categorized into the two alternative ownership forms, private versus public, with a sufficient number of observations falling into each category. Second, publicly owned water utilities generally are either a direct branch of local government or they are an independent political authority. In the former case, the utility is simply one of many departments within the local government and decision-making responsibility rests, for example, with mayors or city councilmen. In the latter case, the utility is controlled by a local board or commission whose ad hoc members typically are appointed by locally elected political officials.[19] Under both of these particular control structures, the ultimate decision-makers in public utilities are elected officials and, hence, fit quite accurately the organizational condition described in the analytical model of public enterprises. A third characteristic of water utilities in the U.S. that is relevant for the empirical purposes is that they frequently serve customer groups whose political activities are readily distinguishable. That is, we can

[19] See Keig, Fristoe, and Goddard (1970) for a thorough description of the institutional framework in publicly-owned water utilities in the U.S.. For an additional source see Staff Report (1966).

distinguish a clear difference in the extent of political activity across groups because some markets consist of customers who reside outside of the city limits and, hence, are devoid of the relevant voting rights.

These institutional arrangements of water utilities enable us to examine the fundamental implication of the model. Namely, if the primary objective of public enterprise pricing is to secure political support, then we would expect to observe a significantly different pricing pattern between public and private utilities for politically passive customers (i.e., outside city residents) and politically active customers (i.e., city residents). Stated in the context of a testable null hypothesis, we should not be able to detect any significant difference between public and private water utilities in their pricing treatment of these two types of customer groups.

This null hypothesis is tested by comparing the price differential between politically passive and politically active markets served by publicly owned water utilities with the price differential observed across these markets for privately owned utilities. In other words, we like to see whether there is any difference between the pricing practices in public and private utilities with regard to the two distinguishable customer groups: (i), politically active and (ii), politically passive customers. Thus, for purposes of comparison, we calculate the mean prices charged to the alternative

customer groups by the public and the private water utilities in our sample. We use the Student-t to test the null hypothesis that the difference between the mean prices charged to the two customer groups is equal across the public and the private water utilities. The results of this test for 1970 and 1965 are presented in Table 2. The firms included in the data sample and the selection method are present in the Appendix. The sample consists of 55 firms in each ownership category for 1970 and 51 for 1965.

Column 1 in Table 2 presents the mean price charged in politically passive markets, $\overline{P}_P$, for publicly and privately owned water utilities. Column 2 presents this information on mean prices for markets which are politically active, $\overline{P}_A$. In Column 3, the mean of the price differentials within each firm, $\overline{D}$, is provided. The standard deviations of the respective mean values are listed in parentheses. For the 1970 sample, the probability that the mean of the price differentials in public enterprises, \$1.08, is equal to that in private enterprises, \$0.04, is 0.001. For 1965, the probability that the null hypothesis is correct is also 0.001. Hence, these results provide a strong basis for rejecting the null hypothesis in favor of the alternative hypothesis that pricing behavior differs under the two ownership forms.[20] Moreover, the

[20]The appropriate formula for the t-statistic which is used in these and the subsequent mean comparison was taken from Steel and Torrie (1960: 73-83). We note that in each case the hypothesis of equal variances was tested by calculating an F-statistic.

Table 2

Prices in Politically Distinct Markets[a,b]
(1970)

Ownership	1. Mean Price in the Politically Passive Market, $(\bar{P}_P)$	2. Mean Price in the Politically Active Market, $(\bar{P}_A)$	3. Mean of the Price Differentials $\bar{D} = \frac{\sum_{i=1}^{55} P_P^i - P_A^i}{55}$
Public	3.58 (1.59)	2.50 (0.87)	1.08 (1.15)
Private	4.04 (2.70)	4.00 (2.69)	0.04 (0.41)

(1965)

Ownership	1. $(\bar{P}_P)$	2. $(\bar{P}_A)$	3. $\bar{D} = \frac{\sum_{i=1}^{51} P_P^i - P_A^i}{51}$
Public	3.18 (1.40)	2.18 (0.89)	1.00 (0.89)
Private	2.76 (0.82)	2.62 (0.79)	0.14 (0.51)

[a]Prices are for 500 cubic feet water.

[b]The standard deviations of the respective mean values are listed in parentheses.

SOURCE: American Water Works Association, AWWA Statistical Report, Operating Data for Water Utilities 1970 and 1965, AWWA No. 20112.

prices across these two particular customer groups exhibit relatively less uniformity in the case of public enterprises.

The result in Table 2 for 1970 data support the implication that public enterprises are expected to treat politically passive customers monopolistically. This is apparent from the mean prices presented in Column 1. A comparison between the mean prices in politically passive markets charged by the public utilities (i.e., $3.58) and the private utilities (i.e., $4.04) indicates no statistically significant difference. In other words, the public utilities in the sample charge monopoly prices to non-voting markets. Whereas, as Column 2 indicates the public utilities in the sample charge a price to politically active customers which is significantly below the monopoly price. We note that the mean price charged to politically active markets by the public utilities (i.e., $2.50) is significantly less than the mean price charged by the private utilities to this same market category (i.e., $4.00).

In sum, the particular relationships that are observed between the pricing patterns in the two types of utilities is consistent with the proposition underlying the theoretical framework. Decision-makers in publicly owned water utilities appear to treat customer groups which are politically distinguishable differently from decision-makers in the privately owned water utilities.

Our finding that public enterprise prices are determined in response to political forces rather than market forces is not unique

to water utilities. Similar pricing behavior is also observed in other public enterprises not only in the United States but also in other countries. For instance, Yoshitake finds that "the political interference into the settlement of prices of public services is widespread and far-reaching still in Japan . . . the ministers being in most cases party-politicians it is inevitable that the price of public enterprise is influenced by the interest of party politics" (1973: 136). Meek (1968: 111) notes that in Britain public enterprise prices were kept so low that most nationalized industries were unable to keep the "break-even principle." Meek contends that the reason for this policy was primarily political.

IV. Concluding Remarks

This chapter has attempted to expand the analytical and empirical scope of a model of public enterprise behavior. Our analyses suggest that when prices are formulated in response to political forces, resource allocation is likely to be distorted. Moreover, the model sheds considerable light on the ambiguous nature of such resource misallocations and provides an explicit analytical means to predict the direction of the consequent output effects. The empirical results for water utilities in the U.S. provide some additional evidence that pricing behavior differs under alternative ownership forms. The findings support quite well the fundamental proposition that publicly owned enterprises seek political support through the pricing mechanism. Moreover, there is at least some

evidence that decision-makers in public enterprises are successful in achieving this end. The findings of De Alessi (1974a), for example, are indicative of systematic differences in the tenure patterns among executives in privately versus publicly owned firms. In De Alessi's sample of two hundred electric utilities, top level decision-makers in the public firms exhibited significantly less turnover than their counterparts in private firms. The analytical model discussed in the present chapter suggests that the pricing mechanism may well be a means for achieving this observed pattern of longer job tenure.

APPENDIX

The data were obtained from Operating Data for Water Utilities 1970 and 1965 (AWWA No. 20112) published by the American Water Works Association. A random number table provided in Steel and Torrie (1960:430) was used to select 51 public water utilities for the year 1965 and 55 for the year 1970. The number of public utilities selected in each of the years correspond to the maximum number of private utilities for which all data are available. For example, in year 1970 there are 96 private water utilities listed, for which data is available for 55.

The method of sample selection was to choose the public water utilities from an alphabetical listing of the firms based on a random number table in Steel and Torrie (1960: 430). When a firm was selected for which some of the data was missing, the next utility on the list that provided such data was selected. The names of the utilities selected for 1965 and 1970 are provided below.

Public Utilities (1965)

Anaheim
San Bernadino
Lakeland
Bensenville
Winnetka
Bowling Green
Latrobe
New Orleans
Mt. Pleasant
Clarksdale
Fremont
Corte Madera
Lompol
Bradenton
Park Forest
Liberal
Alexandria - Rapids Parish
Adrian
St. Cloud
Virginia
Kansas City
Southington
Thomasville
Charleston
Fort Dodge
Frankfort
Holand
Troy
East Orange
Hamburg

Mamaroneck - Westchester
Mobile
Salisbury
Oklahoma City
Eugune
Hanover
Dallas
Vylie - N Tex Mun. WTR
Syosset - Jericho Wtr. Dist.
Zanesville
Watertown
Parkersburg
Two Rivers
Florence
Los Angeles
Beaumont
Albany
San Antonio
Kaukana
Glendale
San Diego

Public Utilities (1970)

Bartow
Fort Lauderdale
Macon
Peru
Hutchinson
Fort Madison
St. Joseph
Marshall
Asheville
Akron
Greenville
Houston
San Antonio
Bedford
Kaukauna
Fresno
Ventura
Lakeland
Appleton
Shreveport
Canton
Bozeman
Phoenix
Pasadena
Portsmouth
Norwich
St. Petersburg
Rock Island
Coffeyville
Port Huron
Roswell
Johnson City
Burlington
Chilicoth
New Philadelphia
Salem
Mineral Wells
Arlington
Milwaukee
Hawthorne
Santa Monica
Westminster
Clearwater - Pine Uas Cty
Miami
Jasper
Lawrence
Ypsilanti
Rochester
Binghampton
Poughkeepsie
Oakmont
Waynesboro
Riverside - Jurupa Com Svcs
Bellflower - S Dmerset Water

Private Utilities (1965)

Altadena - Lincoln Wtr.
Campbell
Compton
Merced
Modesto-Del Este
Palm Spring
San Jose
Santa Paula
Tustin
Valinda - 5
Hazardville
New Haven
Plainville
Rockville
Boise
Coeur D'Alene
Champaign - NO ILL. Wtr.
Kanakee
Lincoln-Central El.
Pekin
Streator - NO ILL. Wtr.
Gary-Gary Hobart Wtr.

Indianapolis
Muncie
Seymour
Terre Haute
Green River
West Lafayette
Baton Rouge
Crowley-Central
New Iberia-Central
Biddeford-Saco. Wtr.
Rockland & Camden
Milford
Cape Girardequ
Independence
St. Joseph
University City - St. Louis
Jamaica
Sea Cliff
Massilon - Ohio
Wtr. Serv.
Struthers
Klamath Falls - Ore. Wtr.
Roseburg
Richland Twp.
Sayre
Wilkes Barre-pa
York
Clarkson-Wash. Wtr. & Pwr.
Spokane
Bluefield - W. Va. Wtr.

Private Utilities (1970)

Anchorage-Cent. Alaska
Apple Valley Rancho's Wtr.
Campbell Wtr. Co.
El Monte-Garvey
Laguna Hills-Rossmoor
Marysville - Cal. Wtr.
Merced
Modesto-Dell Este Wtr.
Oildale Mutual Wtr.
San Dismas-Cal. Cities Wtr.
San Francisco - Cal. Pac Co.
San Jose Waterworks
Santa Maria - Cal. Consol.
Santa Paula
So Lake Tahoe - Tahoe
Colorado Springs - Widefld.
Bridgeport Hydraulic Co.
New Haven
Rockland & Camden
Joppa
Cape Girardeau
Missoula
Phillipsburg
Lynbrook - Long Island
Struthers - Ohio Wtr. Serv.
McDonald - West Penn.
Uniontown - Uniontown Wtr.
York
Plainville
Cape Coral - Gac. Utils.
Champaign - No. Ill. Wtr.
Danville
Kankakee
Pekin
Peoria
Pontiac
Sterling - No Ill. Wtr.
Steator - No. Ill. Wtr.
Gary Hobart Wtr.
Greenwood - Indiana Cities
Hoosier Wtr. - Indianapolis
Indianapolis
Seymour
West Lafayette
Lousiville
Anderson
Spokane - Washington Wtr.
St. Joseph
St. Louis County
Nashua - Pennichuch Wtr.
Las Vegas
Massilon - Ohio Wtr. Serv.
Hershey
Pittsburgh - SO Pgh. Wtr.
Washington - West Pa. Wtr.

Part II

PUBLIC ENTERPRISE AND THE CHOICE OF PRODUCTIVE FACTORS

The preceding chapter analysed the "demand-side" effects of institutional arrangements in public enterprises. Namely, the choice of a pricing scheme was analysed with respect to politically distinguished customer-demanders. Part II examines the "supply-side" effects of the property rights structure associated with public enterprises. In particular, Part II examines the effects of the institutional arrangements in public enterprises on the choice of productive factors. We shall conjecture that the same underlying proposition applies to the choice of productive factors, namely, politically motivated managers will seek to select a specific input combination which generates additional amounts of political support for the public enterprise. This vote generating process will result in allocative distortions.

Part II is divided into 3 chapters. Chapter 3 examines the choice of productive factors in public enterprises. Chapter 4 is devoted to a description of the employment behavior of public enterprises in a few countries. Finally, Chapter 5 presents some concluding remarks.

CHAPTER 3

THE CHOICE OF PRODUCTIVE FACTORS AND PUBLIC OWNERSHIP

In a contribution to the literature on the behavior of the firm, Averch and Johnson (1962) formulate a theory of input utilization under regulatory constraint. The authors suggest that the rate of return regulatory constraints tend to bias upward the capital employment of firms. This result follows from the assumption that regulated firms seek to maximize profits.[1] In the absence of regulation, however, the theory of the firm predicts that firms will combine inputs in a manner which exhibits a cost-minimizing production process.

In contrast, public enterprises are expected to behave differently under similar circumstances, namely, their behavior will differ from private enterprises under regulatory or non-regulatory conditions. The present chapter seeks to examine the effects on the investment behavior of public enterprises which are attributable solely to the institutional peculiarities of public (as opposed to private) ownership.

Section I examines the impact of the institution of public ownership on the investment decision of managers of public enterprises. Section II developes a conceptual model which relies on the effects

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[1] See Keating and Keating (1975) for an examination of the effect of regulation in nonprofit firms.

of property rights structure associated with public enterprises on the investment decision of owner-taxpayers. The identification of the behavior of managers and owner-taxpayers, will allow us to draw some specific observable implications regarding the investment decision in publicly owned enterprises. Finally, Section III offers some concluding remarks.

I. Investment Decision and the Institutional Setting of Public Enterprise Operation

This section attempts to develop conceptually a model which aids in identifying the relevant incentives on the part of managers of public enterprises which influence the resulting choice of productive factors. The identification of such incentives stresses the belief that public enterprises tend to be biased away from long-term capital investment, and towards the excessive utilization of existing facilities.

Our inquiry concerning the investment behavior of public enterprise managers begins with examining the problem of natural monopoly. This problem has been viewed as one which can be resolved by allowing competition among the potential contractors for the field. Tullock (1965b) argues, in effect, that one alternative solution to the problem posed by natural monopoly is for the public to buy or build the necessary operating facilities and periodically put its operation up to auction. Demsetz (1968) suggests a quite similar scheme which relies on the rivalry among potential suppliers to obtain the operating contract to eliminate monopoly power.

These views are important for our present purposes in that they stress the role of competition at the bidding or contractual state vis-a-vis during the actual production or service period. In the former stage, given an elastic supply of bidders and prohibitive collusion costs, bids would approach the competitive or zero profit levels. In other words, the incentives present in competing for the field are important to the resulting performance aspects of the enterprise.

The rivalary process for the field can be employed as a framework to shed light on the behavior of the successful politician who wins the contract to produce the public output temporarily by using the community-owned facilities. An implication concerning the expected behavior of the elected official (i.e., the supplier of the public output) is suggested by this type of contractual arrangement. The fact that the elected official, e.g. the manager of the public enterprise, has incentives to participate again in the bidding process for the subsequent term (i.e., seeks re-election), will prompt him to select a specific production process which will increase the probability of his re-election. This production process will exhibit an excessive utilization of existing facilities which is viewed as an appealing alternative to investment projects which require long-term financial commitments.

Consider, for example, a contractual arrangement in which community-owned facilities are let out for limited production intervals. The individual who wins the bid will be the one who convincingly

promises to undertake production at the "cheapest" cost during the term of the contract. Under such contractual arrangements the production process would correspond roughly to conditions characterizing short-run optimality. In particular, the contractor's decision concerning the relative employments of capital and labor--given a specified output--would minimize production costs only over the period guaranteed by contract. If long-run cost minimization requires an adjustment in the quantity of capital, a disparity would arise between the production costs obtained under the contract renewal objective and the minimum cost possible to society.[2]

A simple numerical example can make the point clearer. Suppose it requires $100 to make an optimal long-run adjustment in the community-owned physical facilities. The additional facilities would then produce 20 units of the public output per year for five years before it is fully depreciated. Under these circumstances the long-run average capital cost will be $1. Alternatively, assume that it will cost $50 in minor repairs to employ excessively the existing facilities and produce 20 units of the public output per year for two years. Under this alternative situation, the short-run average capital cost will be $1.25. A comparison between the short-run and the long-run

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[2]Crain and Ekelund (1976a) suggest the long-run adjustment problems associated with the contractual scheme envisaged by Densetz (1968). For a similar argument concerning the effects of contractual arrangements between politicians and vote-taxpayers on the tendency to favor deficit financing of public expenditures, see Crain and Ekelund (1976b).

alternatives would indicate that the average capital cost is 25 per cent greater under the former arrangement than under the latter. Yet, it is most likely that the production process that will be selected would correspond to the short-run adjustment alternative. The underlying incentive for this selection stems from the temporary nature of political contracts. Political entrepreneurs would tend to evaluate the costs from long-run capital investments only over the period of time designated by the contract. For example, if the term of the contract is two years, the cost of the $100 capital investment which could produce 100 units of the public output over five years will be evaluated only over the production of 40 units--20 units per year for two years. In effect, since the cost of the long-run alternative adjustment is $100, the average capital cost will be viewed as $2.50 (= $100/40) instead of $1 (= $100/100). A comparison between the short-run average capital cost (i.e., $1.25) and the politician's view of the long-run average capital cost (i.e., $2.50) would indicate that the "cost" is smaller under the short-run alternative than under the long-run adjustment. Hence, given that the manager-politician seeks re-election and, therefore, attempts to appear thrifty he has incentives to take the short-run course of action. In sum, the limited production horizon prompts the elected officials, i.e., managers of public enterprises, to be biased away from long-run capital investments and towards the utilization of factors not requiring financial commitments beyond the period designated by the contract. Beyond this guaranteed production

period, a discontinuity in the discount rate exists because of the uncertainty of contract renewal.

The contrast between the choice of inputs in public enterprises and private enterprises is depicted in Figure 5. The horizontal axis measures the labor input and the vertical axis measures the capital input. Each isoquant, Q_i, represents a locus of input combinations (i.e., labor and capital) that generates an equal amount of output. The slope and the position of line MN represents the relative market prices of the inputs and the size of budget, respectively. Given the relative input prices, the size of budget, and the technological know-how, point A reflects the long-run cost-minimizing input combination which will be selected by managers in a (non-regulated) profit maximizing private enterprise.

Our conceptual model of a public enterprise facing similar conditions suggests that managers in this case will select a quite different input combination. In particular, if manager-politicians have a limited production horizon, the cost of capital per unit of output will be considered cheaper under the short-run alternative than under the long-run alternative. Hence, the relative price of employing factors will be perceived differently by decision-makers in public enterprises. The perceived price for using excessively the existing capital facilities is lower than the market price for new capital investment.[3] In Figure 5, the line NN' depicts the politician's

[3]Averch and Johnson (1962) find a divergence between the market price of capital and that which is perceived by managers of firms which are subject to rate of return regulatory constraints. We note that the

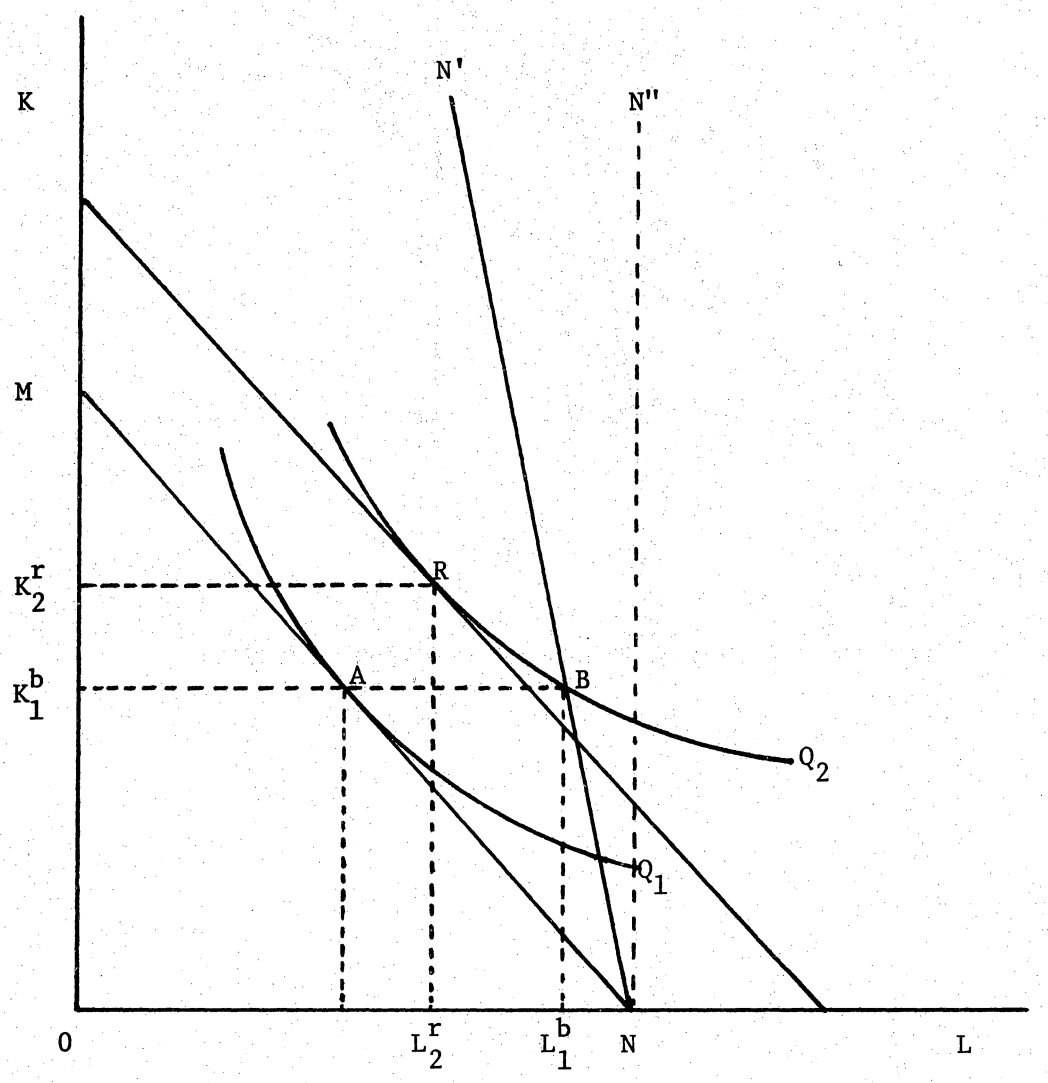

Figure 5

Public Enterprises and the Choice of Productive Factors

perception of relative input prices. The exact position of NN' relative to MN depends upon the short-run cost of continued utilization of the existing facilities. For example, if this cost (i.e., maintenance cost) is close to zero, the line NN' will approach the vertical line depicted by NN". In the specific case exhibited in Figure 5, a positive maintenance cost is required to utilize the existing capital stock in the production of the output Q_2. However, this maintenance cost is not sufficient to replenish the stock over-time. In other words, the depreciation period of the capital facilities is affected by the production horizon which is relevant to the political entrepreneur. In this example, the politician's choice of an input combination, given the slope of NN' and a stock of existing capital K_1, will be (K_1^b, L_1^b) at point B. The quantity of the public output produced at point B is depicted by isoquant Q_2 which exceeds the isoquant chosen by the analogous private enterprise, Q_1.

The difference in these factor choices follows from the contrast between the underlying objectives of managers under these two forms of ownership. In the case of private enterprises, managers have incentives to make decisions which maximize the present value of the firm by combining inputs in an efficient long-run manner. This result follows

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A-J effect results in a quite different input combination than the combination in public enterprises which is suggested by the model of this chapter. The similarity between the two approaches, however, is that managers in both models face relative input prices which differ from relative market prices. However, while the A-J effect tends to bias private firms towards additional capital investment, the effect implied by our model tends to bias public enterprises away from capital investment.

from the underlying institution in private firms where ownership rights are transferable. The ability to transfer ownership rights creates a market whereby the intertemporal profitability of private firms is capitalized into the value of current ownership shares. The greater the present value of the firm, the higher is the marginal product of managers. Empirical studies have found a positive relationship between the market value of ownership shares and salary of managers in private firms.[4] The positive relationship between the present value of firms and the salary of managers illustrates the incentive on the part of managers to combine inputs optimally. In the case of public enterprises, however, the institutional arrangements imply a quite different set of incentives. In particular, managers are expected to behave in a manner which will increase the probability of re-election. This vote generating behavior will lead to the input combination represented at point B in Figure 5. Insufficient units of capital facilities and an excess of laborers are employed to produce the output level represented by the isoquant Q_2. We note that the cost-minimizing input combination which produces this same amount of output occurs at point R, where it requires K_2^r units of capital and L_2^r laborers.

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[4]Numerous studies have found a positive relationship between the profitability of private enterprises (regulated and non-regulated) and salary of managers. For recent findings on this relationship see Crain and Tollison (1976).

In sum, a comparison between the production process adopted by the public enterprise (i.e., represented by point B) and that adopted by the private enterprise (i.e., represented by point A) indicates that manager-politicians have a tendency to over utilize the existing capital facilities by adding labor input beyond the optimal level and expanding output. This political maneuver essentially lowers per unit cost over the limited production horizon established in the political contract. Of course, the effect of such a vote-seeking tactic is increased operating expenses in the long-run. The temporary supplier, however, would not be liable personally for such cost overruns other than his minimal pro rata share as a future consumer and taxpayer.

II. Owner-Taxpayers and the Public Investments

The effect examined in the preceding section of the institution of public ownership on managerial behavior in public enterprises poses an interesting problem. The additional cost of the non-optimal operation will be borne eventually by owners of public enterprises, i.e., citizen-taxpayers. The recognition of this cost would appear contradictory as to its effect on the voting outcome desired by politicians. Presumably, politicians have incentives to behave in manners which correspond roughly to the interest of a majority of voters, and the additional cost of inefficient operations would appear to be contrary to voter-taxpayer interests. Hence, it is important to examine these seemingly

contradictory effects on the voting outcome by identifying the cost-reward structure facing voter-taxpayers with regard to investment decisions in projects undertaken by publicly owned enterprises.

Consider a situation where an investment proposal in a public enterprise must be supported by a simple majority of voter-taxpayers. The decision of the median voter, then, will determine if the projected investment by the enterprise will be undertaken. Thus, it is only necessary for our purposes to examine the preference of the median voter regarding to behavior of the public enterprise. In effect, this section seeks to ascertain the compatability between the preferred outcome of the median voter with that of the manager-politicians in public enterprises.

The analysis will take a public choice approach to examine public investment decisions that are made in a democracy. We first consider simple cases and, then, proceed to examine more general conditions. By making explicit recognition of the institutional structure within which public investment decisions are made, the actual level of investment will be compared to the norm of economic efficiency in order to evaluate the ability of the institution of public ownership to produce efficient outcomes.

Public Enterprise and Majority Voting

The decision calculus of the median voter (as well as other voters) in considering the investment behavior of public enterprises can be characterized as weighing the cost of projects, in terms of the relevant tax liabilities and user fees, against the benefits of projects

appropriately discounted over his lifetime. Of course, this decision calculus could apply as well to individuals facing alternative investments in the private sector. The important distinction between the two settings, however, is the form of ownership or the structure of property rights.[5] We examine this distinction by providing a numerical example.

Consider Table 3, where in each period there are three individuals living in a society. In year 1, the society consists of an old person (A), a middle-aged person (B), and a young person (C). At the end of each year, the old person dies, the middle-aged becomes old and a new young person is born. Thus, in year 2 individual B will be the old person, C will be the middle-aged and D will be the young person. The figure listed besides each person's name reflects his income, excluding taxes and benefits associated with the public enterprise in question. For simplicity it is assumed that all persons have an equal income of $100 in all periods; thus, there is no economic growth. The appropriate discount rate is assumed to be 5 per cent.

Suppose that in year 1 no taxes are collected, and no investments are made in the public enterprise. In year 2, there is a proposal to undertake a $30 investment financed by a 10 per cent income tax per person, so that the physical capital of the public enterprise can be maintained. The $30 investment is assumed to yield an annual return of $18 for two consecutive years, beginning with year 3. The returns

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[5] Holcombe and Zardkoohi (1977) employ a similar analytical framework to explain the pattern of public and private enterprises which emerges in a democracy.

Table 3

Investment Decision and Majority Voting:
One Period Tax

Tax Rate	0	.10[a]	0	0
Year	1	2	3	4
Young	C 100	D 100[b] $\begin{bmatrix} 10^{d} \\ 0^{e} \end{bmatrix}$ -10[c]	E 100 $\begin{bmatrix} 0 \\ 6 \end{bmatrix}$ 6	F 100 $\begin{bmatrix} 0 \\ 6 \end{bmatrix}$ 6
Middle-aged	B 100	C 100 $\begin{bmatrix} 10 \\ 0 \end{bmatrix}$ -10	D 100 $\begin{bmatrix} 0 \\ 6 \end{bmatrix}$ -4.5	E 100 $\begin{bmatrix} 0 \\ 6 \end{bmatrix}$ 12.3
Old	A 100	B 100 $\begin{bmatrix} 10 \\ 0 \end{bmatrix}$ -10	C 100 $\begin{bmatrix} 0 \\ 6 \end{bmatrix}$ -4.5	D 100 $\begin{bmatrix} 0 \\ 6 \end{bmatrix}$ 1.275

[a]Tax rate.

[b]Income.

[c]The present value of returns net of taxes.

[d]The amount of tax paid by each individual.

[e]The amount of returns received by each individual.

will then be divided among citizens proportional to the tax shares. That is, each individual in year 3 and 4 will receive $6 per year.

In Table 3, the top figure in each bracket lists the amount of taxes paid, and the bottom figure lists the amount of returns received. In year 2, each person pays $10 tax and receives no benefits. In the next two years, no taxes are paid but $6 benefit is received by each citizen. The figure below each person's income states in present value the return net of taxes. For example, in year 2 the return net of taxes is (-$10) for each individual, i.e., no return is received while $10 tax is paid. In year 3, individuals D and C will each "receive" a net return of (-$4.5). The reason is that D and C each paid $10 tax in year 2. The present value, in year 3, of the $10 tax paid in year 2 is (-$10.5). Further, since the two individuals receive $6 returns in year 3, the net return for each person is (-$4.5), etc.[6]

A cost-benefit analysis of the additional investment would suggest that the project is cost-effective, since the present value of the taxes (in year 2) is $30, but the present value of the benefits is $33.6. Despite the fact that the project would be cost-effective, a majority of the citizens will vote against it. Individual B will die

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[6]Looking at the accrued value or the present value will not alter the results of the model. The accrued value is simply the present value at some time in the future. To find the present value at the present time, the present value of that accrued value could be calculated. Since whenever the accrued value in the future is positive, the present value at the present time would be positive, the voter will make the same decision using either criterion.

before receiving any benefits from the project, and individual C will die with a negative accrued value associated with the project. Only individual D will find that his benefits exceed his cost, and will vote in favor. Despite the cost-effectiveness of the investment project a majority will be against it.

Now consider similar proposal, but this time assume that the enterprise is owned privately by individuals B, C, and D. The proposal, as before, requires a $30 investment which will be financed by the private owners on equal terms. Since the present value of the stream of returns on the $30 investment is $33.6, each private owner will receive a net gain equal to $1.2 and, thus, the project will be unanimously approved.

Any time that the benefits of a project exceed the costs, there is some possible way to distribute the costs so that the undertaking of the project could be unanimously approved. The reason why that will not happen in this instance of the public enterprise is that certain trades cannot take place. In public enterprise, unlike private enterprise, owners are not allowed to sell their shares in order to consume the present value of their investment. In this example, with an investment that has a long stream of benefits over time, the contract for maintaining the capital facilities of the public enterprise that would receive unanimous consent would require unborn people to bear part of the cost. Private capital markets can take care of this problem, since stock in private enterprises that now exist can be sold to people in the future who are not yet alive. In public enterprise,

where the purchase and sale of shares does not occur, another method of transferring some of the cost to future generations would have to be found in order for the investment in the public enterprise to be undertaken.

In the example described in Table 3, individual C would be indifferent to the investment proposal if, instead of returning $6 in year 3, the project returned $10.5. A return of $10.5 in year 3 would exactly offset the present value, in year 3, of the $10 tax paid in year 2. Thus, if the returns were greater than $10.5, say, $11 per year, the majority would favor the project. However, changes in tax rates are not typically enacted for a period of only one year, as assumed in Table 3. Usually, the increase in tax is enacted for the current and all the subsequent periods, so that the public expenditure can continue.

Table 4 illustrates this more general situation. The underlying assumptions in Table 4 are similar with those in Table 3, except that taxes and benefits from the public enterprise are assumed to continue indefinitely. Further, the return to each individual from a $10 tax paid for the public enterprise is assumed to be $11 in each of the two years after the tax is paid. This latter assumption facilitates a comparison between the decision outcome on the one period tax proposal, noted above, and that on an infinite period tax proposal.

A cost-benefit analysis would indicate that the continual re-investment proposal has a higher net present value than the proposal to merely undertake the investment for only one period. However, if

Table 4

Investment Decision and Majority Voting:
All Periods Tax

Tax Rate	0	.10[a]	.10	.10	.10
Year	1	2	3	4	5
Young	C 100	D 100[b] -10[c]	[10[d] 0[e]] E 100 1	[10 11] F 100 12	[10 22] G 100 12	[10 22]
Middle-aged	B 100	C 100 -10	[10 0] D 100 -9.5	[10 11] E 100 13.05	[10 22] F 100 24.6	[10 22]
Old	A 100	B 100 -10	[10 0] C 100 -9.5	[10 11] D 100 2.025	[10 22] E 100 25.7	[10 22]

[a]Tax rate.

[b]Income.

[c]The present value of the amount of returns net of taxes.

[d]The amount of tax paid by each individual.

[e]The amount of returns received by each individual.

an election is held on whether to increase the tax rate in order to undertake the reinvestment continually, Table 4 indicates that the proposal will not receive a majority of the votes. The reason why a majority will not favor the proposal, even though the proposal would receive a majority approval if it required only one year tax, is that the median voter will be paying taxes towards the end of his life for which he will not live to receive the entire benefits. In other words, a relatively larger proportion of the tax that the median voter pays towards the end of his life will be used to produce benefits that will be realized only after he is dead.

This principle applies any time the benefits from the tax investment is expected to last beyond the time at which the taxpayer incurred the cost. If taxes are collected continually in order to maintain the physical capital of the public enterprise, the median voter will have to pay taxes towards the end of his life for which he will not receive full benefits.

In sum, the interest of a majority of voters can be characterized by a reluctance to undertake investment activities in any public enterprise which requires continual or long-term financial commitments. This result is reconcilable with the implication obtained in the preceding section. In other words, manager-politicians as well as voter-taxpayers have incentives to bias away from undertaking long-run investment projects in public enterprises. In contrast, when resources are employed in the private sector managers as well as private owners have incentives to undertake cost-effective projects because ownership

shares are transferable. The ability to transfer shares creates a market which allows the intertemporal profitability of cost-effective projects to be fully capitalized into the current stock prices.

A Favorable Condition for an Inefficient Operation

The principle which was examined above can be employed to formulate a condition under which the median voter would favor an inefficient operation of public enterprises. In particular, we wish to derive the rate of return on a public (as opposed to a private) project which is necessary to sway the median voter's decision in favor of the public project. The identification of this rate of return corroborates our fundamental proposition that manager-politicians in public enterprises have incentives to "finance" the production of the public output by an excessive depreciation of existing facilities.

Consider a situation where political managers are proposing to invest in a public enterprise which will yield a stream of benefits over time. If the proposal is approved, it would obligate the median voter to invest Z dollars in the enterprise plus a continual re-investment which will maintain the amount of investment at the initial level, Z. In calculating whether he will favor the proposal, the median voter will recognize that one alternative to public sector investment is an investment in the private sector. Thus, in order to favor the public sector investment, it will have to be at least as attractive as its private sector alternative. One difference between the two alternatives is that if the investment were undertaken privately, the median voter has the option of selling his share in the

enterprise. He does not possess this option, however, in the case of public enterprises. In the latter case, he is only able to consume the return on the investment, and cannot liquidate his investment should he desire to consume the initial investment. This difference in the transferability of ownership share suggests that the return on investment in public enterprises would have to be higher than the return in analogous private enterprises in order to make the investor (e.g., the median voter) indifferent between the public versus private alternatives.

The differential between rates of return associated with private versus public investment could be quite substantial. In a private investment, where the median voter who expects to live t more years invest Z dollars at the market rate of interest i, the present value of the investment will be the annual return plus the present value of the initial amount in t years, as shown in equation [1].

$$PV_{Priv} = \sum_{j=1}^{t} \frac{z \cdot i}{(1+i)^j} + \frac{z}{(1+i)^t} \qquad [1]$$

If the same Z dollars were invested in a public enterprise, the median voter would receive an annual return at the public sector rate of return r, but would lose the initial amount of the investment since he would be unable to withdraw the investment for consumption (or bequest to the heir of his choice). Thus, the public sector investment would be worth only the present value of annual returns, as shown in equation [2].

$$PV_{Pub} = \sum_{j=1}^{t} \frac{z \cdot r}{(1+i)^j} \quad . \qquad [2]$$

The median voter will be indifferent between the public and the private investment alternatives only if the present value of his investment is the same in each case. This condition is depicted in equation [3].

$$\sum_{j=1}^{t} \frac{z \cdot r}{(1+i)^j} = \sum_{j=1}^{t} \frac{z \cdot i}{(1+i)^j} + \frac{z}{(1+i)^t} \quad . \qquad [3]$$

Equation 3 can be simplified to yield equation [4].

$$r = i + \sum_{j=1}^{t} \frac{1}{(1+i)^{j-1} + 1} \quad . \qquad [4]$$

Equation [4] indicates that the rate of return on public investment, r, will have to exceed the rate of return on private investment, i, in order for the median voter to be indifferent between the investment projects in the two sectors.

This requirement has an important implication regarding the decision of a voter (e.g., the median voter) when facing a proposal to undertake an investment by a publicly owned enterprise. Equation [4] indicates that public projects which are discounted at the same rate as alternative private projects will result in a reluctance on the part of the median voter to favor the public alternative in the absence of an equalizing effect in the latter form of enterprise. Stated differently, to obtain the support of the median voter on the investment proposal, the political managers would have to bring about

a compensatory adjustment by the difference between r and i rates of return in equation [4]. This differential between the rates of return can be achieved in a public enterprise through a higher depreciation rate relative to the analogous private enterprise alternative. As noted in Section I (Figure 4), this compensatory (or equalizing effect) is offered by political managers in public enterprises to voter-taxpayers in terms of a higher than cost minimizing output rate per dollar of tax investment in the short-run. That is, political managers depreciate the net capital value of public enterprises at a higher than optimal rate in order to increase the short-run rate of return to voter-taxpayers. In this production process, the political managers employ additional labor input in order to facilitate the excessive utilization of the existing capital of the enterprise.

In sum, the input combination which will receive the support of voter-taxpayers, according to this model, is that which requires the least amount of additional capital and a higher than optimal rate of depreciation since these tend to equalize the return on investment between the public and private enterprises. A comparison between the input combination preferred by political decision-makers and that preferred by voter-taxpayers suggests an equi-directional force which tends to bias downward the capital investment in publicly owned enterprises, indicating an inverse Averch-Johnson effect.

III. Concluding Summary

The conceptual model developed in this chapter stresses the effects of institutional arrangements in public enterprises on the

incentives and behavior of political entrepreneurs and voter-taxpayers. We have identified incentives on the part of these two groups. These incentives tend to affect the choice of productive factors in publicly owned enterprises. The limited production horizon of political entrepreneur tends to bias downward the long-term capital investments in favor of the employment of variable factors, e.g., labor. Moreover, the inability to transfer ownership shares in public enterprises tends to discourage owner-taxpayers to favor public products which require long-term financial commitments. These equi-directional tendencies which rely on the institution of public ownership are likely to bring about allocative distortions.

CHAPTER 4

OVEREMPLOYMENT: SOME OBSERVATIONS

The analysis of the preceding chapter suggests that the institution of public ownership tends to bias upward the amount of labor employed in public enterprises. Several previous studies corroborate this implication. The literature on the bureaucratic behavior suggests that public bureaus have incentives to employ an excess of labor-input. For example, the salaries of bureaucrats may be tied to an institutional scale. That is, the greater the number of people in the hierarchy, the greater the opportunity for promotion to higher paying positions by bureaucrats. For instance, "(E)xpanding the number G.S. 12's leads to more positions at the G.S. 13 level" (Orzechowski 1973: 123). Moreover, overemployment can muster additional political support in favor of the public bureau. In other words, the greater the number of employee-voters, the larger the political power of the public bureau. Finally, Alchian (1965a) argues, on a different ground, that the high cost of transferring the ownership shares in public enterprises inhibits the capitalization of future consequences into current transfer prices and, thus, reduces incentives on the part of managers to detect and police employees' behavior. Being left undetected, employees in public enterprises are likely to seek leisure while on the job. In effect, too many employees will be hired per unit of the public output produced.

The present chapter provides some additional evidences in support of the fundamental proposition concerning the employment pattern in public enterprises. This will be achieved by examining the size of labor input in public enterprises in several countries. The emphasis will be placed, however, on the employment practice of the Australian publicly owned airline. The selection of this airline proves fruitful for several reasons. First, there exists a benchmark in the private sector with sufficient information which is necessary to compare and evaluate the employment behavior of the publicly owned airline. Second, the public and the private airlines are subject to a quite similar set of regulatory constraints. In particular, the airlines are restricted to commission into service new aircraft of similar attributes (e.g., number of seats and brand of aircraft) at the same time. The resultant equality in the number of aircraft (i.e., size of capital) across the public and private airlines is important for comparing the employment pattern in the two airlines.

The Australian Case

In a recent contribution Davies (1971) examines the institutional arrangements of the Australian airline industry. A unique feature of the Australian airline industry is that government uses the same blueprint of regulation in operating its own airline as it does in operating the private airline.[1] For example, the Australian government has:

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[1] See Davies (1971).

a) required the two airlines to acquire the same type of aircraft, and to commission the new aircraft into service at the same time,

b) set practically the same routes for the two airlines,

c) allocated equal plane capacity for both passengers and freight,[2]

d) controlled time schedules, specific ports of call and frequencies of visits to various stopping places,

e) created equal prices for the airlines' services,

f) prohibited a third airline from entering the industry, and

g) set rules to help assure that each airline possesses a comparable cost structure.

This regulatory policy has been successful. As one observer notes, the airline industry in Australia is synonymous to

> a monopoly of air transport divided between two massive organizations whose development is rigidly controlled by Acts of Parliament to the point where competition in the generally accepted sense of the word, is restricted to the peripheral comforts and minor variations in time-tabling, (Davies 1972: 154).

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[2]Moreover, "(I)n order to help assure that one of the airlines does not cause economic harm to the other, the Commonwealth not only controls the routes, ports of call, and frequencies of stops, but also the maximum aircraft fleet capacity permitted on a given competitive route over a specified period of time. For each forthcoming six month period government officials calculate a predicted required industry capacity in units of ton-miles for all competitive trunk routes. This determination is then allocated to TAA and Ansett ANA, each receiving exactly one-half of the total allowable predicted capacity." (Davies 1971: 155).

Prima facie, one would expect that the imposed similarities of the two airlines would lead each to function similarily. However, they do not. Identical regulations have not generated identical results due to the difference in the internal makeup of the airlines. Despite the important similarities between the two airlines, the private airline under investigation still has private ownership shares outstanding. The private owners can transfer shares and to a degree have control on the internal operation of the firm (Alchian 1965a). In other words, private managers confront a cost-reward structure which will pay them to be more efficient than the public managers. While the regulated private airline is not as efficient as a non-regulated airline, differences between the regulated public and private airlines still remain.

Davies' analysis indicates that the output per unit of labor in the public airline is far less than in the private airline. Table 5 illustrates the absolute amount of service (i.e., number of passengers, tons of freight and mail), and the number of employees in the public and the private airline. A comparison between the labor productivity in the two airlines is illustrated in Tables 6 and 7. Table 6 lists output per unit of labor in each airline. Under these conditions, output is larger for the private airline than for the public airline. Table 7 lists similar productivity results in terms of percentages. For example, for the year 1958-59 the ratio of the tons of freight and mail per unit of labor in the private airline to that in the public airline is 242 per cent. Stated differently, the productivity of the

Table 5

Statistics on Airline Operations

Year	Freight and Mail (tons)	Passengers 000's	Employees
	The Public Airline: TAA		
1958-59	17696	871	4007
1959-60	19058	1080	4168
1960-61	21939	1106	4848
1961-62	21669	1147	4665
1962-63	22706	1236	4845
1963-64	25198	1431	5219
1964-65	29334	1679	5848
1965-66	30572	1841	6263
1966-67	32995	2041	6453
1967-68	34834	2170	6440
1968-69	35506	2365	6650
	The Private Airline: Ansett Transport Industries, Air Group		
1958-59	42401	1118	3965
1959-60	45043	1292	4182
1960-61	47574	1463	4342
1961-62	48797	1492	4503
1962-63	55395	1578	4996
1963-64	61079	1788	5521
1964-65	75900	2200	6253
1965-66	76370	2442	6894
1966-67	72933	2455	7062
1967-68	68964	2614	7205
1968-69	70314	2890	7369

SOURCE: Davies (1971). Original Source: Stanley Brogden, Australia's Two-Airline Policy 214 (1968); Trans Australian Airlines Ann. Rep. (1958-1969); Ansett Transport Industries Ltd. Ann. Rep. (1958-1969).

Table 6

Productivity Measures

Year	Tons of Freight and Mail Carried Per Employee	Passengers Carried per Employee
	The Public Airline: TAA	
1958-59	4.42	217
1959-60	4.57	259
1960-61	4.52	228
1961-62	4.64	246
1962-63	4.69	255
1963-64	4.83	274
1964-65	5.02	287
1965-66	4.88	294
1966-67	5.11	316
1967-68	5.41	337
1968-69	5.34	356
Mean	4.86	279
	The Private Airline: Ansett Transport Industries, Air Group	
1958-59	10.69	282
1959-60	10.77	309
1960-61	10.96	337
1961-62	10.84	331
1962-63	11.09	316
1963-64	11.06	324
1964-65	12.14	352
1965-66	11.08	354
1966-67	10.34	348
1967-68	9.57	363
1968-69	9.54	392
Mean	10.73	337

SOURCE: Table 5.

Table 7

Ansett Productivity Measures Divided by TAA Productivity Measures[a]

Year	Ansett (Freight and Mail)/(Employees) / TAA (Freight and Mail)/(Employees)	Ansett (Passengers)/(Employees) / TAA (Passengers)/(Employees)
1958-59	242	130
1959-60	236	119
1960-61	242	148
1961-62	234	135
1962-63	236	124
1963-64	229	118
1964-65	242	123
1965-66	227	120
1966-67	202	110
1967-68	177	108
1968-69	179	110
Mean	204	122

[a]Ansett and TAA denote the Private Airline and the Public Airline, respectively.

SOURCE: Table 6.

private airline in handling freight and mail is 2.4 times that of the public airline during 1958-59 period. In the case of passenger service, the productivity of the private airline is 1.33 times that of the public airline for the same period. Similar productivity comparisons are listed in Table 7 for the remaining years.

The data in Table 5 can be employed further to estimate roughly the relevant degree of overemployment in the public airline as compared to the private airline. Given the institutional arrangements described above, the two airlines must be able to employ an equal number of employees per unit of output. For example, if the private airline employs X number of laborers per passenger-mile, the public airline must be able to do the same.

One problem with making the estimate, however, is that the airlines produced the two services in different ratios during 1958-59, (see Table 5). During this period, the passenger-freight ratio was greater in the public airline than in the private airline. This implies that an estimate of the relative sizes of employment in the two airlines which is based upon the data in Table 5 could create a bias against the productive efficiency of one or the other airline. In other words, as long as one output is relatively more labor intensive than the other, the difference between the output ratios across the airlines would naturally bring about a difference between the number of laborers necessary in the production process. One way to account for the labor intensity of each service is to use information

on the relative marginal products of labor across the airlines. Unfortunately, this information is not available.

An alternative way to estimate the overemployment in the public airline is to make an adjustment in figures listed in Table 5 in a manner that would reflect on equality between the output ratios in the two airlines. Accordingly, if one service requires more labor to produce than the other service, the relative output distribution will be similar across the airlines. Moreover, in order to prevent any bias against the public airline, adjustments will be made in a manner that would indicate more output for the public airline than the airline actually produced.

Table 8 lists the adjusted figures. The method used to make the adjustment is first to determine the output ratio in the private airline. Then, the absolute amount of the service in the public airline is adjusted upward such that the ratio of the amount of services produced in the public airline is equal to that in the private airline. For example, during the 1958-59 period the ratio of the amount of freight per passenger in the private airline is 0.038 (=42401/1118000). The same ratio for the public airline is 0.02 (=17696/871000). In order to make the ratios equal, the amount of freight in the public airline (i.e., 17696) is adjusted upward such that the new output ratio in the public airline is also 0.038. Similar calculations are performed for the remaining periods as listed in Table 8.

The information in Table 8 can be used to estimate roughly the relative size of overemployment in the public airline. We first

Table 8

Statistics on Airline Operations: Adjusted Values

Year	Freight and Mail (Tons) Adjusted	Passengers 000's	Employees
	The Public Airline: TAA		
1958-59	33033	871	4007
1959-60	37652	1080	4168
1960-61	35965	1106	4848
1961-62	37514	1147	4665
1962-63	43389	1236	4845
1963-64	48876	1431	5219
1964-65	57926	1679	5848
1965-66	57575	1841	6263
1966-67	60634	2041	6453
1967-68	57250	2170	6440
1968-69	57541	2365	6650
	The Private Airline: Ansett Transport Industries, Air Group		
1958-59	42401	1118	3965
1959-60	45043	1292	4182
1960-61	47574	1463	4342
1961-62	48797	1492	4503
1962-63	55395	1578	4996
1963-64	61070	1788	5521
1964-65	75900	2200	6253
1965-66	76370	2442	6894
1966-67	72933	2455	7062
1967-68	68964	2614	7205
1968-69	70314	2890	7369

SOURCE: Table 5.

determine the number of labor per unit of each service in the private airline. Then, using this figure, we determine the maximum number of laborers in the public airline required to make this airline as efficient as its private counterpart. Finally, we make a comparison between the number of laborers employed in the public airline and the maximum number of laborers necessary to make the public and the private airlines equally efficient. The absolute and the percentage differences between these two sets of figures are listed in Table 9 for the period 1958-69. The figures listed in Table 9 indicate that the public airline employed more laborers than it needed to make the airline as efficient as the private airline. In particular, the public airline employed from 10 to 48 per cent more than the "required maximum" during the 1958-1969 period.[3]

Overemployment: The Case of Other Countries

The overemployment examined above is not unique to the publicly owned Australian airline. Observations show that many other countries confront similar problems in their public enterprise sector. For instance, a study by the United Nations Department of Economic Affairs indicates that "(P)ublic enterprises in many

[3]The degrees of overemployment in the public airline which are listed in Table 9 are underestimated. The underestimation is resulted because the actual figures for the production of the public airline are adjusted upward in order to account for the difference between the output ratios, (see Table 8).

Table 9

The Actual and the Required Maximum Manpower in the Australian Public Airline

Year	Actual Employment	"Maximum Requirement"	Excessive Employment	% Excessive Employment
1958-59	4007	3103	904	29%
1959-60	4168	3489	679	19%
1960-61	4848	3274	1574	48%
1961-62	4665	3451	1214	35%
1962-63	4845	3898	947	24%
1963-64	5219	4395	824	19%
1964-65	5848	4648	1200	26%
1965-66	6263	5192	1071	21%
1966-67	6453	5888	565	10%
1967-68	6440	5745	695	12%
1968-69	6650	5786	864	15%

SOURCE: Table 8.

developing countries have tended to become islands of surplus labor and consequently low productivity" (United Nations 1974: 7).

In India, a country whose government possesses most of the industries, overemployment is a problem. Particular instances can be cited. For example, in the case of the Bhilai Steel Plant the detailed project report estimated about 7300 laborers required for the plant, Mallya (1971). In 1970, however, there were over 26,800 people working on the same plant size: about 270 per cent above the proposed "maximum" required. Numerous studies indicate that the Indian public enterprises justify additional employment by creating many unnecessary positions. For example, Mallya maintains that

> (I)t is sad to reflect that every skilled worker whether a fitter, artisan, mason, machine attendant or a person who uses a set of tools, must have a helper. The helper, who actually carries the tool kit, is almost a status symbol today, (Mallya 1971: 67).

Overemployment in the Iranian public enterprises is similarly serious. For example, it was once suggested that in order to absorb the excessive manpower of a textile industry in Iran, the government should construct additional plants and extend the existing ones.[4] A group of experts who visited the publicly owned textile companies of Iran noted that

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[4]See George Fry and Associates: Management Consultants (1957).

> (T)o achieve a more efficient organization, improvement or correction must be attained in (the area of) excess manpower employed and duplication of work procedures, (George Fry and Associates: 121).

In a different instance it was reported that

> (T)he problem of surplus labor employed in the Behshahr and Shahi (two of the largest textile plants in Iran) is an old one, a solution to which had not been found .... A careful study of the entire economic and social aspects of this problem was conducted.... The result...was an agreement that the best solution was to expand the Shahi Mill substantially, thus creating additional jobs (to absorb the overemployment), (George Fry and Associates: 134).

Similar problems are noticed in Britain. For example, Kelf-Cohen (1973: 87) maintains that the British Rail is "very labour intensive as staff expenses are more than 60 per cent of total costs of operation." In general, as for all nationalized industries in Britain, Kelf-Cohen (1973: 267) maintains that they are operated with "less and less attention to financial and economic criteria; concentration is now on 'social considerations' . . ., keeping plants going however unremunerative and above all doing everything possible to maintain the volume of employment in the industries."

Orzechowski (1973) performs an empirical test of the proposition that public enterprises employ a smaller capital-labor ratio than their private counterparts by determining the capital-labor ratio in the private versus public colleges and universities in the United States. He finds that "public colleges in a state

would be expected to employ roughly forty per cent more labor than private colleges for the same size capital stock," (Orzechowski 1973: 134).

CHAPTER 5

CONCLUDING REMARKS

Some investments, of course, are better undertaken in the public sector than the private sector. Public goods problems and the attendant free rider problem will render the private sector supply of some goods too costly to be feasible.[1] This dissertation, however, has attempted to identify the incentives relevant to the production and sales of public outputs. In particular, the conceptual models developed in this dissertation stress the effects of institutional arrangements in public enterprises on incentives and behavior of manager-politicians and voter-taxpayers. The identification of incentives on the part of these two groups suggests implications regarding the choice of a price vector and input combinations in publicly owned enterprises.

The models of Part I suggest that when a disparity exists between political activities of customer groups, managers in public enterprises are likely to engage in a wealth redistribution between politically distinct markets in order to secure additional political support. In this setting, the resultant political support is brought about through political manipulation of prices. In particular, prices

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[1] For an excellent discussion of public goods problems and the free rider problem see Buchanan (1968).

in the more politically active markets are set below marginal service costs whereas, prices in the less politically active markets are set above marginal service costs. The politically determined prices are likely to distort allocative efficiency.

The analysis of Part II suggest that the allocative distortion in publicly owned enterprises can be magnified further by the political manipulation of the productive process. Limitations on the productive horizon of political decision-makers and the inability to transfer ownership shares tend to bias downward long-term capital investments in favor of a higher employment of variable factors, e.g., labor. This tendency runs directly opposite to the capital bias in private regulated firms which was postulated by Averch and Johnson.

The empirical results in Part I and II provide supporting evidence for the fundamental proposition that the institutional structure of public enterprises makes them susceptible to various sorts of political manipulations. In Part I, we examined the assertion that prices in publicly owned enterprises are formulated in response to political forces rather than market forces. The empirical investigation used data from water utilities in the United States. The results of the tests significantly support the implication derived in Part I that political forces underly price formation in public enterprises. Further, the discussion in Chapter 4 concerning the employment practices of public enterprises

in several countries corroborates the underlying proposition in Part II that publicly owned enterprises employ relatively more labor than their privately owned counterparts.

In sum, the lack of an enforceable specification in the manager-voter contract regarding the performance of public enterprises may lead to political manipulations of these enterprises which, in turn, can retard economic efficiency. On the one hand, political entrepreneurs can simply transfer wealth from one customer group to the other and, in the process, generate additional political support. On the other hand, they can depreciate the capital value of public enterprises by hiring additional units of variable factors and expanding output. This political tactic lowers per unit costs over the limited production horizon designated by the contractual arrangements. In the long-run, however, the political manipulation of the economic decisions made in public enterprises are likely to lead to allocative distortions.

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ON THE PERFORMANCE OF PUBLIC ENTERPRISES: THE CHOICE OF PRICE AND PRODUCTIVE FACTORS

by

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(ABSTRACT)

The public enterprise sector has shown an increasing trend in many countries. As the public enterprise sector competes with the private sector for the limited resources, it becomes paramount to evaluate the effects of undertaking the productive activity under public ownership as opposed to private ownership. The scope of this dissertation is the economic efficiency of public enterprises.

The analyses attempt to identify the role of alternative institutional arrangements on the behavior of decision-makers. This attempt is based upon the proposition that differences in the underlying structure of property rights within firms affect systematically the choices of utility maximizing managers.

The economic efficiency of public enterprises is viewed from two perspectives. On the "demand-side" the pricing behavior of public enterprises is analysed by examining the impacts of public ownership on manager-politicians. On the "supply-side," the choice concerning the employment of productive factors is analysed by examining the impacts of alternative forms of property rights on the decision-makers involved. In both cases the analyses imply that the lack of an

enforceable specification in the manager-voter contract regarding the performance of public enterprises can lead to political manipulations of these enterprises which, in turn, can retard economic efficiency.