THE ECONOMICS OF DIVESTITURE: EX ANTE VALUATION
AND EX POST EVALUATION

by

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Public divestiture is the transfer of enterprises from government to private ownership. This paper studies the divestiture decision by focusing on the various values of the public enterprise. The problem is summed up by the need to identify relationships between, and the determinants of, the sale price and three fundamental values of the enterprise: social value under continued government operation; social value under private operation; and private value under private operation. By focusing on price and value, some light can be shed on the following questions related to privatization: should the enterprise be sold? To whom should it be sold? At what price should it be sold? The study deals with these questions in the context of differing market assumptions, and takes into account a number of factors, such as shadow-pricing, taxes, and synergies. The study comments on the applications of the method for ex post evaluation of divestiture.
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INTRODUCTION/ OVERVIEW

A. Background

In this paper, "divestiture" will refer to the transfer of ownership of enterprises from the government to the private sector. Thus defined, the international record of divestiture may be summarized by the following stylized facts:

1. Many governments have announced privatization policies, particularly in the last five years;
2. Few governments have implemented privatization policies to anywhere near the extent announced;
3. In less-developed countries (LDC's), extensive divestitures have been largely confined to reprivatization of small-scale enterprises which had previously been nationalized or taken over via debt default, and with controlling interests transferred to a single individual, company or group (e.g. Chile, Bangladesh); and,
4. In more-developed countries (MDC's), in contrast, the most important privatizations have been sales of large-scale enterprises on the stock market to a diversified group of investors (e.g. Japan, U.K.).

The validity of these assertions will be readily apparent to the informed observer of the international public enterprise scene and are well documented in a recent World Bank report.¹

¹ Public Sector Management Unit, "Divestiture in Developing Countries", (Washington: World Bank, August 1986).
These stylized facts raise a number of issues, but the most fundamental is: "Why is there such a gap between rhetoric and reality, or between policy and implementation?"

B. The Role of Valuation and Price

As an explanation of the slow pace of privatization policies, the following couplet elicits knowing smiles and nods of agreement around the world:

"If a public enterprise is making money, the government won't sell it; if it's losing money, the private sector won't buy it."

Unfortunately, the widespread initial appeal of this quote can only be attributed to the dominance of political over economic logic, since it represents a fundamental misunderstanding of the economics of divestiture.

If this logic operated in the private sector, then the Wall Street Journal would be considerably thinner than it is. On the one hand, profitable firms are regularly relinquished because the price offered exceeds what the seller expects to earn in future profits. On the other hand, even chronically unprofitable firms can be sold at a positive price if the buyer believes he can accomplish a management turnaround so as to create future profits. In short:

a. assets are sold when buyers and sellers value them differently, thus creating a positive-sum game where both parties can gain; and,
b. the selling price of the asset is the intervening variable which allocates the benefits of the game.

Whether a firm is profitable or unprofitable is secondary, since it is the difference in the valuation which makes a trade possible, not the level of the valuation. On the one hand, there is room for a deal if the seller can run an enterprise to yield 20% (or, \(-20\%\)) while the buyer could run it so as to earn 25% (or, \(-15\%\)).\(^2\) If, on the other hand, buyer and seller value a firm identically, then no deal can be struck, as there is no gain to be had from trading and any transaction costs will create a negative-sum game. In sum, it is divergence of valuation which facilitates sale, and identity of valuation which retards it.

If government preferences and management styles differ considerably from those in the private sector, then differential valuations are likely to be large and hence sale of a public enterprise should be easier than sale of a private enterprise. For example, if—as is commonly held—public enterprises are less cost-efficient than their private brethren, then the magnitude of the positive-sum game should be larger, and sale should be easier, as compared with a private to private transaction where efficiency—and

\(^2\) Divergence in valuation also arises from differences in expectations: the optimistic buyer thinks he can make 15%, and the pessimistic buyer, 5%, when both can really only manage 10%.
hence value—differentials are smaller. Since public to private transactions are in practice notoriously more difficult to consummate, we have a paradox. Resolution is found both in the political and economic spheres.

One political problem follows from point 'b' above. Even if the potential gains are great, how are they to be divided between the two parties? Something in the vicinity of 50/50 might be reasonable in a purely private transaction, but not in the politically charged atmosphere of a public sale where accusations of "giving away the national patrimony", favoritism and corruption are likely. Such political factors can certainly override economic logic and make negotiation of the sale price a difficult exercise at best.

There are, however, economic obstacles as well. Public enterprises typically operate in highly imperfect markets. If the government chooses not to exploit a monopolistic or oligopolistic position, but the private buyer plans to do so, then he will value the enterprise more highly even in the absence of efficiency differentials. The government may nonetheless be reluctant to sell because it is concerned with the welfare of consumers (or workers, or suppliers) after sale. Analytically, the problem is that the government seller cares about the operation of the enterprise after sale and hence we must introduce a third value into the calculation to reflect the social value of the enterprise after privatization. A private seller couldn't care less about the operation of the enterprise after sale, but the government seller, as fiduciary for
all of society's interests, must. The introduction of this third element into the divestiture calculus makes the economics of public divestiture fundamentally different from private divestiture.

There is a good deal more to it than this, of course; witness the heft of this paper. At this point we merely suggest that the economics of public divestiture are rather more complicated than those of private divestiture, and that to our knowledge they have been nowhere spelled out. The purpose of this paper is therefore to identify the relationships between, and the determinants of, the sale price and the three fundamental values of the firm.

More broadly, it is hoped that focusing on price and value will shed some technocratic light on three fundamental privatization questions:

1. Should the public enterprise be sold?
2. To whom should it be sold?
3. At what price should it be sold?

C. Market Failures versus Organizational Failures

Are not the three questions internally inconsistent? Is not the entire goal of privatization to make greater use of decentralized market forces? And, does it not follow that if an

3 After work was well along on this paper, we did discover that elements of the analysis are contained in five paragraphs (pp. 152-154) in: Simon Domberger and John Pigott, "Privatization Policies and Public Enterprise: A Survey", The Economic Record (June 1986, pp.145-162). For a different approach, focusing on the degree of privatization rather than the value of the firm), see the papers by Dieter Bos cited later in the text.
enterprise is to be divested, the price and the buyer should be
determined by impartial market forces, rather than by government
technocrats?

More concretely, should not the institutional model for
divestiture be British Columbia, where: 4

1. Shares in companies to be privatized were consolidated
   into a single company (British Columbia Resources
   Investments Corporation — BCRIC);

2. Some shares in BCRIC were distributed without cost to
   the "public" at the rate of five shares per resident,
   others were sold at the offering rate ($6) and the
   remainder retained by the provincial government and;

3. Thereafter, shares were valued by the stock market.

The purity and sophistication of this model is to be admired, on
both political and economic grounds. On the political side, by
taking seriously the notion that the "public" is the ultimate owner
of a public enterprise, and by distributing shares accordingly,
accusations of favoritism and inequity are neutralized. On the
economic side, creation of a market with large numbers of buyers and
sellers avoids any governmental discretion in deciding buyer or
price.

While commending the British Columbia model for the
consideration of any government structuring a divestiture plan, we

4 T.M. Ohashi and T.P. Roth, Privatization: Theory and Practice (Vancouver:
Fraser Institute, 1980).
suggest that its direct applications will be limited. In the first place, many—if not most—real world divestitures are motivated at least in part by deficit reduction considerations. Thus any political gains from distributing shares are likely to be offset by political losses from raising taxes or reducing critical expenditures. It is therefore not surprising that the British Columbia experiment has not been repeated in other MDC’s, even where sale was to diversified investors via the stock market. Once the government wants the revenue, then the pricing problem returns, since the initial offering price must somehow be set.

In LDC’s, matters are further complicated by the underdevelopment of capital markets in general and of the stock market in particular. Thin capital markets and information imperfections make market valuations an imperfect matter at best, and at worst result in artificial manipulations. Even more critical is the control issue. As we shall emphasize later, there is little to be gained from divestiture unless enterprise behavior changes in the direction of cost efficiency and heightened entrepreneurial initiative. The question is whether in an LDC context, management is likely to alter its conduct significantly when controlled by a large number of diversified shareholders, as opposed to the government shareholder. In short, will an LDC capital market impose financial discipline on the firm? Even if you believe it will, will LDC investors believe this and be willing to bet their savings on it? We suspect that many LDC governments will answer in the
negative and instead rely on selling controlling interests to a single individual, company or group.

Even when selling to a single buyer, however, one could still rely on market mechanisms to set the price, through competitive bidding. Here again, the problem of thin capital markets poses a problem. How many bidders are you likely to get? What is the probability that they will collude? In such an environment it is only prudent for the government to do a bit of homework in setting its own reservation price and in estimating a reasonable offer price for the private sector so as to enhance its own negotiating position.

In sum, we suggest that in the LDC context, the pure market mechanism of divestiture will often fail because divestiture will not generate a large number of informed and competitive bidders. It follows that the government or its representatives will need to take an active role in valuing the assets and setting the price.\(^5\)

Saying the government should undertake a particular task is of course rather different from saying it can do it. The market-failure limitations on market mechanisms are paralleled by the organization-failure limits on government actions. Determining the value of a firm is a complex effort at best, requiring knowledge of

\(^5\) Use of "often" does not signify simple academic wishy-washiness. There are certainly cases where the pure market mechanism might work. For example, in a NIC such as Brazil, Mexico or Korea, the government might first sell only a small fraction of the shares on the open market, and later release more at the price thus determined. Even here, the initial offer price still needs to be set, and there remains the open question of whether or not this gradual process will really alter management conduct.
a host of unknowable future events. Is the government really capable of doing this? Further, even if the technocrats could do it, would the politicians listen? Is it not the case that the three fundamental questions will ultimately be answered on political grounds, with technocratic analysis either being ignored or merely being used as justification for what the powers wanted to do in the first place?

The foregoing class of criticisms can of course be applied to any technocratic approach to public-policy decision-making. Knowing the relevant divestiture values is not going to ensure the right divestiture decision any more than knowing the marginal cost of electricity is going to ensure that such a price is actually charged, or knowing the net present social value of a project is going to ensure that the right investment decision occurs. Furthermore, given measurement problems, we are never going to "know" the relevant technocratic values with great precision. Nonetheless, while giving full recognition to the political element of public policy decisions, the goal of a technocratic approach is to inform the discussion by a careful detailing of the factors to be considered and to reduce the scope for political discretion by quantifying the outer bounds of the costs and benefits.

What distinguishes the divestiture decision from the investment or pricing decision is not the role of politics or the inability to provide a perfect answer. Rather, the difference is that the economics of divestiture have nowhere been systematically worked out. The goal of this paper is therefore to begin to do for the
divestiture decision what the project evaluation literature has done for the investment decision.

E. Approach

In pursuit of this goal, we adopt an approach aimed at the educated practitioner rather than the high theorist on the one hand, or the "who needs a study" man of the world on the other. The aim is to provide a resource for those who actually have to go to the field and propose a selling price for the enterprise or conduct an ex-post evaluation.

As a result, our approach is one of "applied theory", a term best defined by example. We believe that demand curves have some slope, that quantities vary with prices and that therefore the government should be concerned with changes in consumer surplus when evaluating divestiture decisions. This view will be derided as hairy-fairy theorizing by advocates of the "Wall Street" school of divestiture, who view sale of a public enterprise as fundamentally the same as sale of a private enterprise and therefore think that all you need to do is hire a "Big Eight" accounting firm. On the other hand, pure theorists will object that we rely on observed rather than compensated demand curves and therefore miss-state the resulting change in consumer welfare. Our response is that since we can only measure the price elasticity of demand with substantial error, there is no practical gain from fine-tuning second-order effects: e.g. why worry about a 5% adjustment to a variable we know with only +/- 25% accuracy?
A second example of our applied theory approach involves our heavy reliance on $\lambda_g$ — the shadow multiplier for government revenue. Practical men will object to any notion that a dollar is not a dollar, while theorists will object that our $\lambda_g$ is exogenous, rather than being endogenized in a general equilibrium model. Our response to the practical man will be developed as we proceed, but our response to the theorist is that yes, indeed, we would prefer to have a general dis-equilibrium model of the entire economy which generates not only the value of government revenue, but the opportunity cost of capital, value of foreign exchange, price of energy, and so forth, recognizing that many markets are not cleared by prices. We do not however expect the average professional concerned with divestiture to create such a model, let alone believe the results if he did. Instead we adopt a partial equilibrium approach in which values in other markets are exogenous. We show how values such as the government revenue multiplier matter, and provide the basis for a sensitivity analysis, but do not generate such values. This approach is not only practical, but correct so long as the changes generated by divestiture are not large enough to change the value of the exogenous parameter by more than the error in its estimation. In the case of the $\lambda_g$, this means we are safe so long as the revenues from divestiture are small relative to the total government budget. This will generally be the case, but if a country is truly expected to divest much of a large public sector over a short period of time — e.g. as Turkey has announced it will do — then a general dis-equilibrium approach is necessary.
The same argument applies to a host of other national parameters, including the public and private discount rates, opportunity cost of capital, shadow multiplier of foreign exchange, etc. As with the shadow multiplier of government revenue, we take these as given and do not attempt to enter into the debate as to just how such parameters should be estimated. We only attempt to show how such parameters should be incorporated into the divestiture decision.

In general then, we try to take the insights of theory as far as they are likely to be usable in empirical field work, and no further. Further examples will occur throughout the paper.

F. Overview

We begin by laying out the relationships between the various prices and values and the way in which they jointly determine the answers to the fundamental divestiture questions (Section II). Subsequent sections then investigate the determination of the values in increasingly complex environments. Section III deals with the simplest possible case of competitive equilibrium where all prices are "right" and there are no differences between public and private behavior. Here the focus is empirical, and considerable attention is given to extracting relevant data from the accounting records of an actual enterprise. In later sections, we will see how the respective valuations of this same firm change as we introduce additional complexities.
The first complexity involves the fundamental trade-off between increased cost efficiency and possible exercise of market power by the privatized enterprise (Section IV). The second complexity is the presence of price regulation, indirect taxes and other factors creating a gap between market and shadow prices (Section V). The third complexity is the potential positive and negative synergies between the buyer and the acquiring firm (Section VI). To achieve clarity, each of these complexities is introduced on a (largely) ceteris paribus basis. In Section VII, however, all pieces of the methodology are combined in a Lotus 123 template, which allows testing for the sensitivity of the various assumptions, examination of interdependencies, and application to widely differing classes of enterprises. These results are then used to suggest the implications of alternative government policies and strategies which might enhance the outcome of the divestiture effort (Section VIII).

The final section of the paper moves from ex-ante valuation to ex-post evaluation. Here we outline how the methodology developed earlier can be applied to the evaluation of actual historic divestitures, so as to shed light on future decisions.
Section II

BASIC CONCEPTS

A. Overview

In this section we answer the three fundamental questions at the most general level in terms of: three key values of the enterprise—

\[ V_{sg}: \text{social value under continued government operation;} \]
\[ V_{sp}: \text{social value under private operation;} \]
\[ V_{pp}: \text{private value under private operation—} \]

and one inescapable parameter—

\[ \lambda_g: \text{premium on government revenue.} \]

Together, these four values in turn define three alternative sales prices:

\[ Z_g: \text{the minimum price acceptable to the government;} \]
\[ Z_p: \text{the maximum price acceptable to the private buyer;} \]

\[ Z: \text{the actual price at which the sale is executed.} \]

For example: the relationship between \( V_{sg}, V_{sp}, Z \) and \( \lambda_g \) determines whether or not the enterprise should be sold; adding \( V_{pp} \) determines whether or not the enterprise can be sold, and so forth.

A very broad range of divestiture issues are thus encapsulated in a few basic concepts. In this chapter we define these basic concepts and establish the fundamental relationships among them.
Subsequent sections then extend the analysis by specifying the various V's in increasingly complex environments.

B. Private Value (Vpp)

The private value of the company is simply the present discounted value of the stream of expected net benefits accruing to the new owners. By definition, this gives us the maximum willingness to pay of the private buyer:

\[ V_{pp} = Z_p \]  \hspace{1cm} (2.1)

Two variants of Vpp are particularly important, namely:

- **Vppa**: the private value as a stand-alone operation; and,
- **Vppc**: the private value to a larger corporate group.

A corporate group might be willing to pay more than the stand-alone value of the firm for a number of reasons, including the following:

1. economies of scope associated with spreading some overhead over a larger base;
2. reductions in transaction costs and risk associated with traditional horizontal or vertical integration;
3. ability to utilize otherwise unmarketable assets of the firm, such as accrued or expected tax liabilities;
4. higher risk-adjusted return through portfolio diversification; and,
5. exercise of newly created monopoly, oligopoly, or monopsony power.
While some of these private synergies are also socially desirable, others are only transfers and still others are clearly undesirable. We shall elaborate on these distinctions in Section VII.

An understanding of the determinants of \( V_{ppa} \) and \( V_{ppg} \) is thus useful for the government for a number of reasons. First, it is not sufficient merely to know what the private sector is willing to pay; it is also necessary to have some idea why it is willing to pay it. Second, sale should not necessarily go to the highest bidder (in the USA, Norfolk Southern might have been willing to pay more for CONRAIL, simply because of the resulting change in its competitive position). Third, even where noncompetitive practices are precluded, existing private companies will often be willing to pay more than independent individuals, groups of individuals or fiduciaries, and this may conflict with the social goal of diversified ownership. Fourth, understanding private motivations helps structure terms and conditions to facilitate sale. Fifth, as part of the bargaining strategy, it is useful for the government negotiator to have some independent idea of the private sector’s demand price, or the maximum amount it is willing to pay. Finally, it is a precondition to establishing the social value under private operation, which in turn is a precondition to establishing the government’s supply price, or the minimum it is willing to accept.

C. Value to Society Under Private Operation \((V_{sp})\)

The social value under private operation is the present value of expected net benefits accruing to society as a whole from the
private operation of the enterprise. It differs from $V_{pp}$ because social goals differ from private goals, resulting in:

1. different classifications of flows (some private costs—e.g. taxes—are not social costs; some private benefits—e.g. sales gained through predatory pricing or other non-competitive behavior—are not social benefits, etc.); and,

2. different pricing of flows (the private benefits from increasing output or reducing inputs is evaluated at controlled or protected domestic prices, which may differ from the corresponding benefits to society evaluated at international prices).

In sum the private valuation is concerned with returns to the equity shareholder, evaluated at market prices, while the social valuation is concerned with returns to all economic actors evaluated at shadow prices.

D. Value to Society Under Government Operation ($V_{sg}$)

The value to society under public operation is the present value of expected net benefits accruing to society as a whole from the continued public operation of the enterprise. It differs from $V_{sp}$ for two quite distinct sets of reasons:

1. for a given economic environment, private behavior will differ from public behavior, ideally in terms of both static efficiency and dynamic entrepreneurship; and,
2. as part of the terms and conditions of sale, the economic environment will change (e.g. tax rates, tariff protection/exemption, output pricing policies, financial structure and credit availability).

The first set of factors is critical because it constitutes the single most important, though by no means the only, economic motivation for divestiture in the first place. The second set is critical analytically because ignoring it obscures the true benefits of divestiture. For example, in one LDC divestiture, a losing public enterprise was turned into a profitable private enterprise, in part because of increased efficiency, but in part because of a five-year grant of effective prohibition of competing imports. Accordingly, it is useful to distinguish between two alternative values under continued public operation:

- $V_{sga}$: Value under continued operation "as is"; and,
- $V_{sgr}$: Value under restructuring under conditions paralleling those of divestiture.

These distinctions will be the focus of Section VIII.

E. The Premium on Government Revenue ($\lambda_g$)

The parameter $\lambda_g$ summarizes our answer to the question: "Is money in government hands worth more than, less than, or the same as money in private hands? Or, when adding up benefits going to firms or consumers on the one hand, and benefits accruing to the government on the other, should extra weight be given to flows
accruing to one side or the other?" Three stereotypical knee-jerk reactions might be as follows.

Conservative: private funds worth more \((\lambda_g < 1)\)

Liberal: government funds worth more \((\lambda_g > 1)\)

Neutral Neo-classicist: neither, it's just a transfer \((\lambda_g = 1)\)

We believe, however, that there is a strong economic argument for valuing government revenues more highly, and that this is unrelated to any philosophical debate on the correct size of government—in fact it is something on which Presidents Reagan and Mitterrand might agree. Additional revenue of $100 allows the government to reduce taxes elsewhere in the economy by $100, thereby eliminating the inefficiencies and distortions created by that taxation, and hence restoring benefits of more than $100. If the benefits so restored are worth $125 to society, then each dollar of government receipts should be multiplied by a factor of 1.25. Alternatively, $100 of additional revenue allows the government to increase expenditure on worthy causes, creating benefits of more than $100. In general, then, we would expect \(\lambda_g\) to be greater than one. Actually estimating \(\lambda_g\) is beyond the scope of this paper, and in fact is an important area for future research. For the present,
however, we only insist that some such judgment is inescapable in the privatization decision.6

F. The Fundamental Formula of Privatization

We now have the tools which allow us to set forth the fundamental formula of privatization:

\[ \Delta W = V_{sp} - V_{sg} + (\lambda_g - 1)Z \]  (2.2)

where \( \Delta W \) is the change in society's welfare as a result of sale.

Interpretation is straightforward: the first term gives welfare after sale, the second term gives welfare before sale, and the last term gives the welfare effect of the sale transaction itself.7 The government's bottom-line decision-rule is to maximize \( \Delta W \). Answers to the basic questions follow directly.

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6 One question that naturally arises in this context is: can \( \lambda_g \) have more than one value? In fact, the marginal value of a dollar expenditure in each of many different uses is likely to be different, just as the marginal cost of an additional dollar of taxation is likely to be different for each potential source of revenue. These differences, however, are not intrinsic, but rather are imperfections — the result of government's inability to exactly match marginal benefits and marginal costs. A fully optimizing government would want to set the marginal cost of a dollar equal in all channels of expenditure, with these marginal costs and marginal benefits equal to one another. In an ideal world, \( \lambda_g \) is then equal to this common marginal value. In the real world, since this is unlikely to be true, we would want to set \( \lambda_g \) equal to the marginal benefit of the additional expenditures made possible by the expenditure or of the reduced taxation that would occur. As a practical matter, since even this last is unlikely to be known (government funds being quite fungible), considerable judgment is called for in choosing a suitable value for \( \lambda_g \).

7 A complete description of the welfare effect of the transaction requires inclusion of the transaction cost of executing the sale. We treat this as a second-order effect, and for the sake of simplicity, defer its introduction until later.
G. Should the Enterprise be Sold?

To maximize welfare, $\Delta W$ must be positive, otherwise the government should not sell. The selling rule is therefore:

sell if $\Delta W = V_{sp} - V_{sg} + (\lambda_g - 1)Z > 0$. (2.3)

Rearranging yields:

sell if $V_{sp} + (\lambda_g - 1)Z > V_{sg}$. (2.4)

This simply says that the government should sell if welfare under public ownership is less than that under private ownership plus any sale premium.

It might be thought that when $\lambda_g$ is very high, sale is more likely, and that this explains the heightened contemporary interest in divestiture in LDCs, following fiscal and balance of payments crises. However, this conclusion would be premature, since $\lambda_g$ also enters into the calculation of $V_{sp}$ and $V_{sg}$, most prominently as a multiplier for tax revenue and government profits. Until we have specified the $V$'s more fully in later chapters, no such conclusion is warranted.

Assuming that $\lambda_g$ is not equal to one, the sell rule can be rewritten as:

sell if $Z > \frac{V_{sg} - V_{sp}}{\lambda_g - 1}$. (2.5)

The right-hand side of this expression represents the government's supply price or the minimum which it should accept for the enterprise, allowing us to write:
Note that whenever private operation is superior to public operation ($V_{sg} < V_{sp}$), this price will necessarily be negative (except in the unlikely event that $\lambda_g < 1$), meaning that the government should be willing to pay the private sector to take over the enterprise. If the government is neutral between funds in public versus private hands ($\lambda_g = 1$), then it should be willing to pay the private sector any arbitrarily large amount to take over the activity. If $\lambda_g$ exceeds unity, the amount the government should be willing to pay becomes finite, but it should still be willing to pay.

This rather strong result may seem surprising at first, but it is really quite intuitive. If the nation is economically better off with the enterprise in private hands, then the government should be willing to pay something to accomplish this improvement. If it is neutral between funds in private and public hands, then it should be willing to pay anything, since the payment is in this case only a transfer and is welfare neutral. This extreme result is unlikely (and its implausibility is simply one more argument for $\lambda_g > 1$), but the weaker result of a negative supply price remains.

The main result of this section, then, is that if an enterprise is worth selling, then the government should often be willing to pay the private sector to take it over. This minimum supply price is of course not the price at which the sale should actually be executed, a topic to which we now turn.
H. At What Price Should it be Sold?

If the government wishes to maximize $\Delta W$, then, all other things equal, $Z$ should be chosen accordingly. Inspection of (2.2) shows that the optimal sale price depends only on $(\lambda_g - 1)$. Formally:

$$\frac{\partial \Delta W}{\partial Z} = (\lambda_g - 1).$$

(2.7)

This says that if $\lambda_g - 1$ (i.e. there is no premium on government revenues), then $\frac{\partial \Delta W}{\partial Z} = 0$, and the gain in welfare is unaffected by the sale price. This is the usual neo-classical type of result which would treat the price paid as a pure transfer between the purchaser and the government, and therefore would accord no particular value to it. That is, the sale price doesn’t matter and any price (positive or negative) is just as good as any other. Anyone who believes that $\lambda_g = 1$ therefore has a very simple answer to the basic question of what price to charge. Just flip a coin a few times.

However, if—as we have argued—$\lambda_g > 1$, then (2.7) shows that $\frac{\partial \Delta W}{\partial Z} > 0$ and that therefore the government should attempt to obtain the highest possible sale price for the enterprise. This, however, is simply the maximum the private buyer would be willing to pay, so that:

$$Z^* = Z_p = V_{pp},$$

(2.8)

where the $^*$ denotes the optimal value of the variable. It follows that the maximum welfare increment ($\Delta W^*$) is:

$$\Delta W^* = V_{sp} - V_{sg} + (\lambda_g - 1)V_{pp}$$

(2.9)
It is of course exceedingly unlikely that this price will actually be obtained. Recall that $Z_p$ reflects the price at which the buyer is indifferent between buying the enterprise and retaining his existing portfolio; he would simply be trading one asset for another of equal value. The situation is symmetrical, of course, with $Z_g$ representing the price at which society neither wins nor loses from the transaction.

Accordingly, $Z_g$ and $Z_p$ only provide boundaries for the actual sale price. If the former exceeds the latter, then no transaction can take place, but given the negative supply price there is likely to be a considerable economic range for bargaining. Within this range, where will the price be set? For a given set of terms and conditions of sale, the answer is indeterminate in a small-number bargaining environment, and depends upon the skill of the two bargaining parties.

In practice, of course, the terms and conditions of sale are anything but predetermined and are in fact the focus of negotiations. If anything, a case can be made that the bargaining sequence be reversed, with the price first determined arbitrarily and the terms and conditions then negotiated so as to make this price acceptable to both parties. That is, while a negative price will generally be economically acceptable, it will never be politically acceptable. Under such circumstances a minimally acceptable political price becomes the starting point and negotiations focus on terms and conditions which make this mutually acceptable. We shall return to this theme in Section VIII.
I. To Whom Should the Enterprise be Sold?

It must be emphasized that the previous section does not say: "sell to the highest bidder." The Conrail example given earlier makes clear why this is nonsensical. Rather, it says, extract the highest possible sale price from the "best" bidder. How then is the "best" bidder to be determined?

Once again, the fundamental equation (2.2) gives the starting point for an answer. Rank bidders according to their $\Delta W$'s and focus on the highest. Unfortunately, this will often only provide a starting point for the selection, because $Z$ will remain subject to negotiation and if some bidders can be induced to raise their final bids (or adjust the terms of conditions of sale more favorably), then the rankings may change. Exactly how this process will work itself out depends on the bargaining/negotiating structure employed. However, equation (2.2) provides the basis for the iterative calculation. Further, as one step in the screening procedure, calculation of $\Delta W^*$ (equation 2.9) allows identification of the bidders with the highest potential for striking the best deal for the country. Finally, note that in the LDC context, having a plethora of qualified bidders should be considered a luxury for which some iterative indeterminacy is a small price to pay.

---

8 Or, given a number of identical bidders, choose the one with the highest bid.
J. The Difference Principle

Note that in answering the basic questions, we have nowhere needed to know $V_{sp}$ or $V_{sg}$, but only their difference $(V_{sp} - V_{sg})$. This turns out to be immensely fortuitous, because otherwise this exercise would be of purely theoretical interest with no practical import whatsoever. Except under the most egregiously simplistic assumptions (e.g. the competitive equilibrium of Section III), the individual values are simply unknowable. We shall argue, however, that analytic tools are available which allow reasonable approximations to the difference. This point will be elaborated upon in concrete terms as we proceed. For the present only note that this difference principle simplifies our task considerably and constitutes our final basic concept.
K. Conclusion

This chapter has shown how the basic privatization questions can all be answered if we can agree on an exogenous national parameter ($\lambda_g$) and can estimate one value ($V_{pp}$), and one difference in values ($V_{sp} - V_{sg}$). Accordingly, subsequent sections focus on methodologies for quantifying these values in increasingly complex environments.
Section III

COMPETITIVE EQUILIBRIUM:

NO SALE

A. Overview

In this section we identify the various values of the firm in the simplest possible environment of stable competitive equilibrium: that is, we assume private operation is identical to public operation, all prices reflect social scarcity, the world does not change, etc. (for details, see Table III-1). This is obviously not a question of direct practical import, but it is nonetheless critical, because if there is no agreement on values in the simplest case, then there is little hope of agreement on more relevant values.

We first establish the general result at the theoretical level (Sub-Section B). This is a relatively easy task under the simple assumptions used here. The bulk of the section however, is devoted to the much more difficult task of converting generic $a$'s and $b$'s into real numbers for real companies in real countries.

We begin the empirical discussion by considering an actual (though slightly disguised) public enterprise case as described by its Profit and Loss Statement and Balance Sheet (see Table III-2 and III-3 in Sub-Section C). Under the simplifying assumptions of Table
Table III-1

ASSUMPTIONS

for 'A' Corporation

I. Conceptual simplifications: (to be relaxed in later sections)

A. Private operation next year will be identical to public operation this year. (Section IV)
B. All prices correctly reflect social scarcity and do not change over time. (Section V)
C. Taxes are neutral (identical rates across income classes — interest, dividends, capital gains, wages, etc — across individuals, across companies, for both positive and negative income, for both public and private enterprises, etc). (Sec. VI)

II. Exogenous Parameters

A. The opportunity cost of capital is 10% (r=.10).
B. The scrap value of the fixed capital at the end of period 'T' is zero.
C. Public goods exist and lump-sum transfers are not feasible so distortion-creating taxes are required, making the shadow price of government revenue greater than 1 (λg = 1.3).
D. The marginal direct tax rate is 33% (t=.3333). There are no indirect taxes.

III. Computational Simplifications

A. Flows occur only once in each period (e.g. in the middle), or, are evenly distributed so as to have the same effect.
B. T = 1. That is, the enterprise will operate for one more year and then die.
C. Scrap value is zero.
D. Physical deterioration follows a one-hoss shay pattern (i.e., zero until scrapped).
III-1, we then ask two bottom-line questions. First, as a private buyer, what is the maximum you would be willing to pay \((Z_p)\) for the enterprise? Second, as the government minister in charge of selling the enterprise, what is the minimum you would be willing to accept \((Z_g)\)? If the reader agrees that the answers are:

\[ Z_g = Z_p = 100; \]

because,

\[ V_{ppa} = V_{ppc} = 100 \]
\[ V_{sg} = 14048, \text{ and} \]
\[ V_{sp} = 14018, \]

then please proceed directly to Section IV. Otherwise, we invite you to consider the process which generated these numbers.

The starting point of our analysis will be the base state of affairs given by the current public operation of the firm as reflected in its financial statements. Valuation proceeds by making a series of adjustments to this base state: the private buyer adjusts for such factors as improved efficiency and synergies, while the public seller adjusts for elements such as controlled prices and the opportunity cost of labor. A systematic quantitative description of existing conditions is thus central to any analysis and this is the second topic of this section. This will be accomplished by converting from the private logic of the profit and loss statement and balance sheet to the economic or public logic of national income and wealth accounting (Sub-Section C).
Sub-Sections D and E then combine the general formulas with the specific data to generate the explicit values which answer the basic questions. The implications are then summarized in Sub-Section F.

B. General Results

1. A Trivial Case (\(\lambda_g = 1\)):

If there is no premium on government revenue, then we have a trivial case because if public behaviour is the same as private behaviour and all prices are the same, then privatization cannot change the wealth of society, but only its distribution. But, if \(\lambda_g = 1\), then distribution doesn't matter either, so the government should be completely indifferent as to whether the enterprise is in public or private hands (i.e. \(V_{sg} = V_{sp}\)). Further, given no change in wealth and distributional neutrality, the government would be happy to accept \(Z_p\) (whatever that might be), for the enterprise. However, it would be equally happy to accept any other price for the enterprise; or, indeed, to pay the private sector any amount of subsidy to take the enterprise. The intuition is obvious and algebra confirms the results:

\[
Z_g = \frac{V_{sg} - V_{sp}}{\lambda_g - 1} = \frac{0}{0} = \text{undefined}
\]  

(3.1)

In summary, if conduct doesn't change, and government revenue doesn't matter, then nothing matters, and we need not bother calculating \(V_{sg}\) and \(V_{sp}\), or anything else.
2. Revenue Motive ($\lambda_g > 1$)

In reality, government revenue does matter, and one of the major motives for privatization is to relax a fiscal constraint. We therefore introduce a revenue concern by assuming public goods exist, lump-sum taxes are not feasible and therefore $\lambda_g > 1$.

Now a bit more calculation is required. We establish the general result under two assumptions: first, that only an operating capital good is being sold (that is, there are no debts, working capital or non-operating assets); and second, that the capital good yields a stable stream of profits (quasi-rents, or $\Pi$) in perpetuity. These assumptions are only made to simplify the initial exposition, and both are relaxed later in this section, with no loss of generality.

Under these assumptions the private calculation is simply:

$$Z_g = \frac{\Pi - \chi^d}{r}$$

where $\chi^d$ is the direct tax paid.\(^9\)

The value to society of this outcome differs only in the positive value attached to $\chi^d$.

$$V_{sp} = \frac{\Pi + (\lambda_g - 1)\chi^d}{r}$$

In the event of continued public operation, the government revenue premium applies to the entire stream of quasi-rents:

\(^9\) We use $\Pi - \chi^d$ rather than $\Pi(1 - \chi^d)$ because the applicable corporate tax rate $\chi^d$ is not charged on quasi-rents but on $\Pi$ less interest, depreciation and a host of other accounting charges. Also note that $\Pi$ is defined as a quasi-rent (see Section III-C-4).
\[ V_{sp} = \frac{\lambda_g \Pi}{r}. \]  

(3.4)

Now, from (2.6):

\[ Z_g = \frac{V_{sg} - V_{sp}}{\lambda_g - 1}. \]

Substituting:

\[ Z_g = \frac{\frac{\lambda_g \Pi}{r} - \frac{\Pi + (\lambda_g - 1) x^d}{r}}{\lambda_g - 1}. \]

(3.5)

Rearranging:

\[ Z_g = \frac{\Pi - x^d}{r}. \]

(3.6)

which is precisely \( V_{pp} \). The general result is therefore that in the absence of behavioural changes or price distortions:

\[ Z_g = Z_p = V_{pp} \]  

(3.7)

That is, the minimum price at which the government is willing to sell is just equal to the maximum which the private sector is willing to pay.

Intuitively, this result may be explained as follows. The government is relinquishing a portion (not all, because of taxes) of its claim on future earnings. To make itself whole, it must receive at least the present value of that claim today. It is important to note that the value of \( \lambda_g \) does not matter (so long as it is not unity), because it enters symmetrically on both the future and
present value sides. Stripped of $\lambda_g$ (which is the only difference between public and private valuations), the resulting public calculation is precisely the same as the private calculation except that benefits and costs are reversed (the buyer gives up cash now for a future claim). The public minimum thus becomes the private maximum.

This equivalence is all that can be established at the general level. To determine actual values requires data, whose extraction from enterprise-level accounts we now consider.

C. Base Flows and Stocks

1. Production and Distribution Flows

The Profit and Loss Statement provides considerable information on the base state of the enterprise. However, the data become more accessible for economic analysis if mapped into a Production and Distribution Table along the lines suggested by national income accounting methodology. No information is lost or added in this conversion,\(^{10}\) it is merely rearranged. Nonetheless, we find it useful to make this rearrangement at the outset for two reasons. First, it is simply handy to have the data directly in the economic categories which we will use for analysis. Second, it increases the accuracy of the results. All too often, when faced with complex

\(^{10}\) Except for indirect taxes and subsidies, which generally do not appear on the P & L and must be obtained exogenously if production at market cost is needed.
Table III-2
'A' Corporation
PROFIT & LOSS STATEMENT
(1/1/86 thru 12/31/86)

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales</td>
<td>17667</td>
</tr>
<tr>
<td>+ Cost of Sales</td>
<td></td>
</tr>
<tr>
<td>Initial Inventory (Finished Products)</td>
<td>147</td>
</tr>
<tr>
<td>Manufacturing Costs</td>
<td>14474</td>
</tr>
<tr>
<td>Wages and Salaries</td>
<td>1294</td>
</tr>
<tr>
<td>Materials</td>
<td>10761</td>
</tr>
<tr>
<td>Depreciation</td>
<td>2419</td>
</tr>
<tr>
<td>Ending Inventory (Finished Products)</td>
<td>671</td>
</tr>
<tr>
<td>- Sales Profit</td>
<td>3717</td>
</tr>
<tr>
<td>- Administrative and Selling Expenses</td>
<td>611</td>
</tr>
<tr>
<td>Wages and Salaries</td>
<td>337</td>
</tr>
<tr>
<td>Purchases of Advertising, etc.</td>
<td>250</td>
</tr>
<tr>
<td>Rent</td>
<td>24</td>
</tr>
<tr>
<td>- Operating Income</td>
<td>3106</td>
</tr>
<tr>
<td>+ Non-Operating Income</td>
<td>272</td>
</tr>
<tr>
<td>Rental Income (from land)</td>
<td>112</td>
</tr>
<tr>
<td>Interest &amp; Dividends Received</td>
<td>160</td>
</tr>
<tr>
<td>- Non-Operating Expenses</td>
<td>1124</td>
</tr>
<tr>
<td>Interest Payment</td>
<td>1029</td>
</tr>
<tr>
<td>Amortization of Start-up Expenses</td>
<td>95</td>
</tr>
<tr>
<td>- Net Profit for the Period</td>
<td>2254</td>
</tr>
<tr>
<td>Income Tax</td>
<td>751</td>
</tr>
<tr>
<td>Dividends</td>
<td>694</td>
</tr>
<tr>
<td>Retained Earnings</td>
<td>809</td>
</tr>
</tbody>
</table>
Table III-3
'A' Corporation

BALANCE SHEET

<table>
<thead>
<tr>
<th></th>
<th>12/31/85</th>
<th>12/31/86</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ASSET SIDE</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current Assets</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cash</td>
<td>58</td>
<td>123</td>
</tr>
<tr>
<td>Demand Deposits</td>
<td>190</td>
<td>380</td>
</tr>
<tr>
<td>Time Deposits</td>
<td>60</td>
<td>40</td>
</tr>
<tr>
<td>Marketable Securities</td>
<td>58</td>
<td>1556</td>
</tr>
<tr>
<td>Inventory: Inputs</td>
<td>1518</td>
<td>1746</td>
</tr>
<tr>
<td>Inventory: Outputs</td>
<td>147</td>
<td>671</td>
</tr>
<tr>
<td>Accounts Receivables</td>
<td>2780</td>
<td>3560</td>
</tr>
<tr>
<td></td>
<td>4811</td>
<td>8076</td>
</tr>
<tr>
<td>Fixed Assets</td>
<td>12865</td>
<td>11279</td>
</tr>
<tr>
<td>Tangible</td>
<td>8786</td>
<td>7292</td>
</tr>
<tr>
<td>Land</td>
<td>709</td>
<td>1121</td>
</tr>
<tr>
<td>Capital Goods</td>
<td>8077</td>
<td>6171</td>
</tr>
<tr>
<td>(Depreciation Reserve)</td>
<td>(7356)</td>
<td>(9775)</td>
</tr>
<tr>
<td>Intangibles</td>
<td>72</td>
<td>75</td>
</tr>
<tr>
<td>Deferred Account</td>
<td>4007</td>
<td>3912</td>
</tr>
<tr>
<td>(Start-up Expenses)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Assets</td>
<td>17676</td>
<td>19355</td>
</tr>
</tbody>
</table>

| **LIABILITY SIDE** |          |          |
| Current Liabilities|          |          |
| Accounts Payable   | 1680     | 1372     |
| Short-Term Debt    | 300      | 393      |
| Fixed Liabilities (Long-Term Debt) | 9893 | 9893 |
| Equity             | 5803     | 7697     |
| Paid-in Capital    | 5122     | 5122     |
| Appropriated Surplus| 69      | 321      |
| Net Profit for the Period | 612 | 2254 |
| Income Tax Reserve | 200      | 751      |
| Dividends Reserve  | 160      | 694      |
| Retained Earnings  | 252      | 809      |
|                  |          |          |
| Total Liabilities & Equity | 17676 | 19355 |
profit and loss statements, economists implicitly make one set of mappings when calculating, say, value-added, another for profit and a third for domestic savings. This problem is avoided by making a single initial mapping under the discipline of the rule: "map all accounting entries into one and only one economic category".

Results for 'A' Corporation are given in Table III-4.

2. Wealth Statement

Unfortunately, the accountant's Balance Sheet is of considerably less use to the economist than its Profit and Loss Statement. Most obviously, the "Net Worth" category is a residual which bears no particular relation to the V_{ppa} which we are looking for. This is because the balance sheet is not intended to show values, but only costs not yet posted to the profit and loss statement:11

<table>
<thead>
<tr>
<th>Table III-4</th>
</tr>
</thead>
<tbody>
<tr>
<td>'A' Corporation</td>
</tr>
</tbody>
</table>

11 "The factors acquired for production which have not yet reached the point of the business process where they may be appropriately treated as 'cost of sales' or 'expenses' are called 'assets' and are presented as such in the balance sheet. It should not be overlooked, however, that those 'assets' are in fact 'revenue charges in suspense' awaiting some future matching with revenue as costs or expenses."

### PRODUCTION & DISTRIBUTION FLOWS

(@ current market prices)

#### Generation of Surplus

<table>
<thead>
<tr>
<th>Description</th>
<th>Notes</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production (@ Market Cost)</td>
<td>2</td>
<td>18191</td>
</tr>
<tr>
<td>Indirect Taxes (plus Subsidies)</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Production (@ Factor Cost)</td>
<td>4</td>
<td>18191</td>
</tr>
<tr>
<td>Intermediate Inputs</td>
<td>5</td>
<td>11011</td>
</tr>
<tr>
<td>Gross Value Added (@ Factor Cost)</td>
<td></td>
<td>7180</td>
</tr>
<tr>
<td>Employee Compensation (Return to Labor)</td>
<td>6</td>
<td>1631</td>
</tr>
<tr>
<td>Rental Expenses (Return to Other Factors)</td>
<td>7</td>
<td>24</td>
</tr>
<tr>
<td>Return to Operating Assets</td>
<td></td>
<td>5525</td>
</tr>
<tr>
<td>Non-Operating Return</td>
<td>8</td>
<td>272</td>
</tr>
<tr>
<td><strong>Total Return to Capital</strong></td>
<td></td>
<td>5797</td>
</tr>
</tbody>
</table>

#### Distribution of Surplus

<table>
<thead>
<tr>
<th>Description</th>
<th>Notes</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Return to Capital</td>
<td>9</td>
<td>5797</td>
</tr>
<tr>
<td>Interest Payments (Return to Debt Holders)</td>
<td>10</td>
<td>1029</td>
</tr>
<tr>
<td>Direct Taxes (Return to Government)</td>
<td></td>
<td>751</td>
</tr>
<tr>
<td>Return to Equity Holders</td>
<td></td>
<td>4017</td>
</tr>
<tr>
<td>Dividends</td>
<td>11</td>
<td>694</td>
</tr>
<tr>
<td>Gross Domestic Savings (by Enterprise)</td>
<td></td>
<td>3323</td>
</tr>
<tr>
<td>Depreciation &amp; Amortization</td>
<td>12</td>
<td>2514</td>
</tr>
<tr>
<td>Retained Earnings</td>
<td>13</td>
<td>809</td>
</tr>
</tbody>
</table>
NOTES TO TABLE III-4

1. This is simply a rearrangement of the Profit and Loss Statement. No information is lost or added. All entries on the P&L are explicitly mapped into some category below. Although we are working with a very simplified P&L in this example, the same exercise can be carried out to reduce the most complex P&L into the basic flows described here.

2. Residual (#4 + #3).

3. Assumed equal to zero.

4. "Sales" + "Ending Inventory" - "Initial Inventory".


7. "Rent".

8. "Rental Income", plus "Interest & Dividends".

9. "Interest Payments".

10. "Income Tax".

11. "Dividends".

12. "Depreciation Allowance" plus "Amortization Allowance".

13. Residual (equals "Retained Earnings").
Nonetheless, the Balance Sheet remains useful for two reasons. First in pursuit of $V_{p\alpha}$, it does provide some entries which are directly relevant (e.g. cash-on-hand on the asset side and long-term debt on the liability side). Second, a time-series of Balance Sheets provides the basis for a meaningful Flow of Funds Statement, which in turn is of central importance in ex-post evaluation.

Accordingly, we first rearrange the Balance Sheet into economically relevant categories in a Wealth Statement at accountants' values in Table III-5. No information is added to, or dropped from, the balance sheet; and valuation remains at book value. The table is therefore of use only as a starting point for Flow of Funds (Table III-5, Column 2) and as one input into a Wealth Statement at economist's values (Table III-6).

On the asset side, a fundamental distinction is made between an operating asset (owned and used by the enterprise to produce something of value) and a non-operating asset (owned by the firm but held for speculative purpose or rented to other firms to produce value through their production processes). Within operating assets, a further distinction is made between fixed and variable assets reflecting those which cannot readily be varied within a single period (e.g. capital goods, land) and those which can (e.g. inventories, cash). On the liabilities side, the fundamental distinction is between equity and debt, with debt further subdivided into interest bearing and non-interest bearing. The latter category (tax and dividend reserves, accounts payable, etc.) is sometimes ignored, but is often significant.
3. Flow of Funds

For ex-post evaluation a time-series of Uses and Sources of Funds is indispensible. We calculate it using a simple and straight-forward methodology based on the following accounting relationship which holds for any line item on the Balance Sheet:  

\[
\text{Beginning Stock} + \text{Real Flows} + \text{Value Adjustments} = \text{Ending Stock}
\]

That is, the Balance Sheet entries change for two quite different reasons. First, there are flows of funds representing real movements of assets or liabilities into and out of the firm. Second, there are value adjustments in which existing assets or liabilities are arbitrarily assigned new values, but nothing actually enters or leaves the firm. For example, the initial book value of capital goods is increased by fixed capital formation (real flow) and reduced by depreciation (a value adjustment) to yield the ending book value. Other value adjustments include amortization, revaluation of fixed assets, adjustments to loans denominated in foreign currencies after a devaluation, etc.

---

12 In practice, things get a little more complicated since transfers from one account to another (e.g. from construction-in-progress to active), disposals (e.g. sales of capital goods and the associated depreciation stock adjustment) and adjustments to previous periods need to be taken into account. However, the basic principle remains applicable.
Table III-5

'A' Corporation

WEALTH STATEMENT & FUND FLOWS
(@ Accountants' Values)

<table>
<thead>
<tr>
<th></th>
<th>Wealth 12/31/85</th>
<th>+ Fund Flows 1-12/86</th>
<th>+ Value Adjustements 1-12/86</th>
<th>- Wealth 12/31/86</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Assets</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fixed Operating Assets</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capital Goods</td>
<td>80778</td>
<td>513</td>
<td>- 24192</td>
<td>61711</td>
</tr>
<tr>
<td>Land</td>
<td>02</td>
<td>0</td>
<td>0</td>
<td>03</td>
</tr>
<tr>
<td>Intangibles</td>
<td>40794</td>
<td>3</td>
<td>- 955</td>
<td>39874</td>
</tr>
<tr>
<td>Variable Operating Assets</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inventories</td>
<td>16651</td>
<td>752</td>
<td>0</td>
<td>24171</td>
</tr>
<tr>
<td>Financial</td>
<td>30286</td>
<td>1035</td>
<td>0</td>
<td>40636</td>
</tr>
<tr>
<td>Non-Operating Assets</td>
<td>8277</td>
<td>1890</td>
<td>0</td>
<td>27177</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>17676</td>
<td>4193</td>
<td>- 2514</td>
<td>19355</td>
</tr>
<tr>
<td><strong>Liabilities</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Debt</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interest Bearing</td>
<td>101938</td>
<td>93</td>
<td>0</td>
<td>102868</td>
</tr>
<tr>
<td>Zero Interest</td>
<td>20409</td>
<td>777</td>
<td>0</td>
<td>28179</td>
</tr>
<tr>
<td>Equity</td>
<td>544310</td>
<td>33232</td>
<td>- 251411</td>
<td>625210</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>17676</td>
<td>4193</td>
<td>- 2514</td>
<td>19355</td>
</tr>
</tbody>
</table>
Table III-5 (continued)

Notes to
WEALTH STATEMENT & FUND FLOWS

1. Directly from Balance Sheet

2. From Profit and Loss; or, in this case from change in depreciation reserve.

3. Land must be split between Operating and Non-Operating. In this case, we have arbitrarily assigned it all to the latter category.

4. "Intangibles" plus "Deferred Account".

5. "Amortization" from Profit and Loss.


8. "Short-term" plus "Long-term".

9. "Accounts Payable" plus "Income Tax Reserve" plus "Dividend Reserve". This category is "zero interest" in the sense that the amount entered on the balance sheet is all that is owed by the firm. This is distinct from the "interest bearing" category where the firm is liable for the balance sheet amount plus interest. There may of course be an implicit interest built into accounts payable. In some tax systems, "income tax reserves" carry an interest charge under certain circumstances, and these would be then listed as interest bearing. We know of no case where corporations pay interest on dividends from the time of declaration to the time of distribution. However, it is common for them to be payable to the holder of record at the time of distribution, rather than at the time of declaration. If so, then they would be part of equity rather than part of debt.


11. From "Total Value Adjustments" on Asset side.

12. This is a residual item in this calculation, but as a check it should be equal to Gross Domestic Savings from the Production & Distribution Flow.

\[
\begin{align*}
\text{Retained Earnings} & \quad 728 \\
\text{Depreciation \& Amortization} & \quad 2514 \\
\hline
- \text{Gross Domestic Savings} & \quad 3242
\end{align*}
\]
Computationally, initial and ending stocks are found on the Balance Sheet (columns 1 + 4 of Table III-5), value-adjustments are identified on the Profit and Loss Statement (Column 3) and Fund Flows are simply the residual (Column 4). Flows on the asset side are deemed Uses, while flows on the liability side are deemed Sources. Note that this procedure means that negative signs will occur: for example, sale of a capital good is a negative use; and repayment of debt, a negative source.

4. Profit

Profit is the "bottom line" of the Profit and Loss Statement but it will vary with where that line is drawn. In this paper our fundamental measure of profit will be as a quasi-rent. That is, the return to fixed factors, or, production revenues less variable costs, or:

\[
\begin{align*}
\text{Return to Operating Assets} & \quad 5525 \\
& \quad \text{(From Production & Distribution Flows)} \\
- \text{Opportunity Cost of Working Capital} & \quad 648 \\
& \quad \text{(exogenous interest rate) x (variable operating assets from the Wealth Statement) =.1 (6359)} \\
= \text{Profit} & \quad 4877
\end{align*}
\]

In terms of supply and demand diagrams, this is given by the (horizontal) quantity times the (vertical) gap between the price and the short-run variable cost curve. When we use "profit" (or "\( \Pi \)" without further modification, it will always be in this sense. Occasionally we will refer to quasi-rent as "public profit" to distinguish it from the traditional private profit.
D. Private Values (Vpp)

1. General

The present value of a net benefit stream is given by the standard relationship:

$$\text{NPV} = \sum_{t=0}^{\infty} \frac{B_t - C_t}{(1+r)^t}$$

The problem is to identify correctly the benefits and costs from the perspectives of different actors. We first illustrate the method with a simple calculation from the private perspective, then generalize the method, and finally apply it from the public perspective.

2. Vppa: Obvious Method

What would a private buyer offer on a stand-alone basis for the enterprise described in Tables III-1 and III-2, under the simplifying assumptions of Table III-3?

One obvious method of calculation would proceed as follows:

1. 1987 current receipts:

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dividends</td>
<td>694</td>
</tr>
<tr>
<td>Retained Earnings</td>
<td>809</td>
</tr>
<tr>
<td>Amortization Allowance</td>
<td>95</td>
</tr>
<tr>
<td>Depreciation Allowance</td>
<td>2419</td>
</tr>
</tbody>
</table>

   1.987 current receipts: \+4017

2. Plus liquidation of assets in 1987:13

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current assets</td>
<td>8076</td>
</tr>
</tbody>
</table>

   2. Plus liquidation of assets in 1987: \+9197

---

13 Capital goods and intangibles have no liquidation value in this case by assumption; deferred accounts have no liquidation value by definition.
3. Less outstanding obligations in 1987:

<table>
<thead>
<tr>
<th>Land</th>
<th>1121</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current liabilities</td>
<td>1765</td>
</tr>
<tr>
<td>Fixed liabilities</td>
<td>9883</td>
</tr>
<tr>
<td>Tax Reserve$^{14}$</td>
<td>751</td>
</tr>
<tr>
<td>Dividend Reserve$^{15}$</td>
<td>694</td>
</tr>
</tbody>
</table>

4. Equals Net 1987 Cash Flow

Discounting to 1986, we have:

$$V_{ppa} = \frac{110}{1.1} = 100 - Z_p$$

That is, the owner of the enterprise will receive a net cash flow of 110 in 1987, equivalent to 100 today, which is therefore the maximum a private buyer would be willing to pay on a stand-alone basis.

3. Synergies: Taxes

In general, $V_{ppa}$ would not be the final willingness-to-pay because interdependence with pre-existing operations must also be taken into account. Under present assumptions, the only such consideration is taxation. Since the buyer would be paying with after-tax dollars but receiving pre-tax dollars, it might be thought that because he would actually be netting considerably less than 100, he would be willing to pay considerably less than 100. In fact, given our assumption of tax neutrality, $V_{ppc} = V_{ppa} = 100$,

---

$^{14}$ These obligations would normally be due early in 1987 and thus subject to a lower discount rate. We ignore this for computational simplicity (see Table III-1, assumption III-A).

$^{15}$ We assume these were declared prior to sale and thus are the property of the previous owners. Also, the earlier footnote on timing applies here as well.
because both numerator and denominator must be adjusted symmetrically. More precisely, for the single-period case above:

\[
V_{ppc} = \frac{(B_t-C_t) - D_t x^{dd} - (B_t - C_t - D_t - V_{ppc}) x^{dc}}{1+r(1-x^{dr})}
\]

(3.8)

where 'D' is dividends and new superscripts reflect different tax rates on different forms of income. That is, net benefits next year are reduced by taxes on dividends and again by taxes on capital gains\(^\text{16}\) while the opportunity cost is also reduced by taxation. If tax rates are neutral, then \(x^{dd} = x^{dc} = x^{dr} = x\) and we have:

\[
V_{ppc} = \frac{(B_t-C_t) - (B_t-C_t-V_{ppc})}{1+r(1-x)}
\]

(3.9)

which says that it doesn't matter whether quasi-rents are arbitrarily classified as depreciation, dividends or retained earnings. Further rearrangement yields:

\[
V_{ppc} = \frac{(B_t-C_t)(1-x)}{(1+r)(1-t)} = \frac{B_t-C_t}{1+r}
\]

(3.10)

which says that if taxes are truly neutral, they can be ignored.

Taxes, of course, are not neutral. If dividends and interest are taxed at 33\%, but capital gains at half that, then:

\[
V_{ppc} = \frac{110 - 694(.3333) - (110-694 - V_{ppc}) .1667}{1 + .1 (1-.3333)}
\]

\[
V_{ppc} = -26.7
\]

which says that a buyer would have to be paid to take over the company, because taxes on (positive) retained earnings are only half

\(^\text{16}\) Where capital gains equal the net benefits, reduced by dividends and by the original purchase price (which is just \(V_{ppc}\)).
compensated for by tax rebates on (negative) capital gains. Of course, direct tax rebates are uncommon, but the same thing is accomplished if the buyer's positive capital gains are set against the negative capital gains of the enterprise being sold, and this is the implicit assumption above.

The validity of the foregoing assumption will of course vary with the level and composition of the buyer's profit. This means that the effective marginal tax rates will vary with the buyer (requiring buyer subscripts in the notation). Further, even the original corporate tax rate included in $V_{ppa}$ may change (e.g. if the buyer can revalue assets at the sale price) and thus increase the depreciation allowance.

In summary, in this case $V_{ppa} = V_{ppc}$, but only because taxes are neutral. Assymmetric taxes on income create synergies which alter willingness-to-pay relative to the stand-alone value. That is, an enterprise will throw off a stream of earnings whose present value ($V_{ppa}$) is to a considerable extent (though by no means entirely) independent of the buyer; but, the value of that stream will vary with the circumstances of the individual buyer ($V_{ppc}$). This will be covered in detail in Section VI.

4. Depreciation and Amortization

In the foregoing calculation, one item requires elaboration, namely the treatment of depreciation and amortization allowances as benefits rather than costs. After all, is it not the case that depreciation is a real cost, and that public enterprise profits are
overstated because insufficient depreciation is deducted, rather than that they are understated because any depreciation is deducted?

The answer lies in the distinction between single and multiple period analyses. Capital is a cost which must be charged once in each analysis, but not twice. In accountants' profit and loss analysis, or economists' production function analysis, or any other single period analysis, depreciation is charged to reflect the cost of holding assets. In project evaluation, on the other hand, the cost of capital is charged as the initial investment in period 0, and depreciation is not charged in subsequent periods, because to do so would be double counting capital costs and rejection of profitable projects. The same is true of divestiture valuation. The present value reflects our willingness to pay for the assets, or the cost of capital; charging again for this cost via depreciation is double counting.

Consider a company with one year left to run, zero expected profits after a depreciation charge of 110, and no residual breakup value. If depreciation were a real cost, then this company would be worthless on a stand-alone basis. In fact, it is worth 110/1.1 - 100. Note that the problem is not the use of accountants' historically-based depreciation instead of economists' future-oriented depreciation based on the change in value. In the foregoing example the value of the company is 100 at the beginning of the period and 0 at the end, making economists' depreciation 100. Deducting this as a cost again yields the incorrect answer of zero present value for an enterprise worth 100. Deducting either form
of depreciation is thus simply wrong in multi-period analysis, however valid it may be in single-period calculations.

The foregoing assumes that the enterprise has a discrete and known remaining life-span 'T'. In fact, one cannot know in advance when an enterprise will become obsolete and be shut-down, or indeed whether it will be shut down at all. In such circumstances, a prudent investor will set aside a certain sum each year to replace the existing assets when they do become obsolete. If the funds thus accumulated are just sufficient to replace the obsolete assets with new ones yielding the same amount, and if this process continues indefinitely, then the firm lives forever, creating a perpetuity. The present value of such a firm is simply the net annual benefits after depreciation, over the interest rate. Treating depreciation as a cost in this sense of a replacement reserve can thus be defended as a practical alternative to the unknowable 'T' and a realistic reflection of an enterprise as an ongoing entity.

Two objections may be raised to this approach. The first is quantitative. The correct annual replacement reserve contribution will bear no necessary relationship to either the economists' or the accountants' notion of depreciation. Instead it will depend upon the period 'T' until replacement, the interest rate earned in the meantime, and the acquisition cost of assets yielding an equivalent stream. It is therefore far more uncertain than the earlier method since it implicitly requires knowing not only 'T' but other unknowables as well. The second assumption is that the funds can
and should be reinvested in the present activity, instead of elsewhere.

Nonetheless, in a perfect world, the two methods are equivalent if handled correctly. Consider the firm at the beginning of this subsection with a present worth of 100. Treating depreciation allowance directly as a benefit says simply I’m going to get 110 back next year; and, at 10%, that’s worth 100 today. On the other hand, treating it as a cost says I’m going to have 110 of surplus next year, but I’m going to reinvest some of it to yield a perpetual income stream. If capital yields 10% and lasts forever, then buying 100 of capital goods next year would yield a perpetual stream of 10. Alternatively, if capital lasts four years but still yields 10%, then the return stream would be 31.548. These three alternative and equivalent ways of treating depreciation are summarized below:

<table>
<thead>
<tr>
<th>Period</th>
<th>NPV</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct Credit Method</td>
<td>100</td>
<td>110</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0   ...</td>
</tr>
<tr>
<td>Indirect Credit #1</td>
<td>100</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10  ...</td>
</tr>
<tr>
<td>Indirect Credit #2</td>
<td>100</td>
<td>10</td>
<td>31.55</td>
<td>31.55</td>
<td>31.55</td>
<td>31.55</td>
<td>31.55</td>
</tr>
</tbody>
</table>

All three streams have the same net present value of 100. The essential point is that the depreciation allowance confers a net benefit. This benefit can be credited in a number of different ways, but it must be credited. In this paper we will follow the simplest method of crediting it when earned. The alternative, of
crediting it in terms of reinvestment returns, is equivalent, but much more cumbersome.

One final argument for not crediting depreciation is that capital goods do not wear out all at one time 'T', but sporadically. Some capital goods with a short life span must be replaced well before period 'T' if the enterprise is to be kept running. It can be argued that the depreciation allowance covers these costs, but conveys no further benefits after time 'T', but only ensuring that returns continue until 'T'. If so, then we must not credit depreciation at all.

What this argument really says is that we have some current return on past investment (the depreciation allowance), but we will use it to cover future investment costs. Since the current benefit and the future cost more or less cancel one another, we will ignore both. While this is not an unreasonable argument, in this paper we prefer to explicitly enter both current depreciation benefits and future replacement costs. If, in some particular case, it makes sense to assume that the present values of the two streams happen to be precisely equivalent, fine, but we prefer not to prejudge the issue.

5. Vpp: Standard Method

We have just seen that there are many equivalent ways of dealing with depreciation, and the same is true of any other element of the calculation. In this subsection we propose a standardized
method and use it to generate the same result as in Sub-Section 2 above.

Three distinctions are fundamental. First, we wish to distinguish between net returns to fixed capital (\(\Pi\)) and returns to other assets and liabilities in the portfolio which constitutes the firm. We will refer to these latter flows as financial (\(B^F-C^F\)) to stress their portfolio choices nature and distinguish them from the production flows summarized in \(\Pi\). This will be a central distinction both for shadow pricing purposes, and also for reasons of calculation methodology. Accordingly, we will make use of the following (and similar) bifurcations:

\[ V_{pp} = V_{\Pi pp} + V_{F pp} \]

where the superscripts refer to the respective valuations of the returns to fixed capital on the one hand, and to the financial portfolio on the other.

Secondly, within the return to fixed capital, we wish to distinguish between those accruing between now and some arbitrary time ‘\(r\)’, and those accruing from ‘\(r\)’ to the expected end of the project’s life ‘\(T\)’. Year ‘\(T\)’ thus corresponds to the standard project evaluation terminal year. Year ‘\(r\)’, however, represents some arbitrary time horizon, beyond which our estimation procedures change. These procedures become cruder and more arbitrary after time ‘\(r\)’ both because the future is less knowable, and because — given the discount rate — it is much less important to know it.

Third, we want to specifically identify any fixed capital formation (\(F_C\)) required to maintain the flows of quasi-rents specified
previously (including a negative scrap value). Our standard present
value formula then becomes:

\[
\text{NPV} = \sum_{t=0}^{\tau} \frac{\Pi_t}{(1+r)^t} + \sum_{t=r+1}^{T} \frac{\Pi_t}{(1+r)^t} - \sum_{t=0}^{T} \frac{F_t}{(1+r)^t} + \sum_{t=0}^{T} \frac{Cf-Cf}{(1+r)^t}
\]  

(3.11)

The first three terms of the equation constitute \(V_{pp}\), while the
last two represents \(V_{dp}\). Using data from the earlier example, the
four terms are evaluated as follows:

1. Calculate the return to fixed capital in each period from now
to \(r\). This is simply quasi-rents after taxes for 1987, or:

   Operating Surplus 5525
   - Opportunity Cost of Working Capital .10 (6480)
   - Total Return to Fixed Capital 4877
   - Taxes on Operations\(^{17}\) 1094
   - After-tax Return 3783

2. Calculate the return to fixed capital in years following year
   \(r\). In this case, zero.

3. Calculate additional fixed capital formation requirements and
   scrap value. In this case, zero.

4. Calculate the net value of all other enterprise assets and
   liabilities. In 1986 values, this is:\(^{18}\)

   Working Capital 6480
   + Non-Operating Assets 2717
   - Total Assets +9197

\(^{17}\) Net taxes are only 751, but the tax effect of the interest deduction
(312) is treated as reducing the cost of debt. It is therefore entered as
part of term 4 below.

\(^{18}\) See notes to Table III-6 for details.
Debt: Interest Bearing    - 9974
+ Debt: Zero Interest    - 2561

- Total Liabilities    - 12535

Net   - 3339

Substituting these values into (3.11) and assuming \( r = 10\% \):

\[
V_{ppa} = \frac{3783}{1.1} + 0 - 0 - 3339 = 100 - Z_p.
\]

as before. Or:

\[
V_{ppa} = V^{\pi}_{pp} + V^f_{pp} - 3439 - 3339 = 100.
\]

6. Private Wealth Statement (at economists' values)

One advantage of the standard method is its straight-forward interpretation in terms of the Private Wealth Statement at economists' values (Table III-6). The correct valuation of fixed assets is given by \( V^{\pi}_{pp} \), while \( V_{ppa} \) gives the net worth.

Under present assumptions, working capital and non-operating assets can be read directly from Table III-5, but the debt entries differ. The accountant enters the non-interest-bearing debt at its face value, a practice which would be correct only if payment were made immediately. In the present instance, these are not due until next year, allowing the company to earn a return in the meantime (or avoid borrowing), making their economic value equal to the accountants' cost discounted by one plus the interest rate. This particular example is in part a contrived result of our assumptions (on the timing of dividend and tax reserve payouts), but it will generally hold for accounts payable.
Table III-6

PRIVATE WEALTH STATEMENT
(@ Economists’ Values)

‘A’ Corporation: 12/31/86

<table>
<thead>
<tr>
<th>Assets</th>
<th>Notes</th>
<th>12.635</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed Operating</td>
<td>1</td>
<td>3439</td>
</tr>
<tr>
<td>Working Capital</td>
<td>2</td>
<td>6480</td>
</tr>
<tr>
<td>Non-Operating</td>
<td>2</td>
<td>2717</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Liabilities &amp; Net Worth</th>
<th></th>
<th>12.635</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net Worth</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>Debt: Interest Bearing</td>
<td>4</td>
<td>9,974</td>
</tr>
<tr>
<td>Debt: Zero Interest</td>
<td>5</td>
<td>2,561</td>
</tr>
</tbody>
</table>

Notes

1. Net present value of future quasi-rents, less taxes, from text ($V_{pp}$).

2. Unchanged from accountants’ values in Table III-5.

3. Residual; but equal to $V_{ppa}$ from text.

4. Equals the face value from Table III-5 (10,286) less the tax savings which follow from interest deductability. $[(.33)(1028.6)/1.1 - 312]$. The real cost of the debt is therefore only 9,974.

5. Differs from Table III-5 in that real economic cost of zero interest debt is not its face value, (since it does not have to be repaid until next year), but that amount discounted by the opportunity cost. The present value of this debt is therefore not 2817 as at accountants’ values, but only $2817/1.1 = 2561$. 

Turning to interest-bearing debt, first consider a debt of 100 at a non-concessionary rate of 10%. What must be paid back next year is 110, and discounting yields a net present value of 100. Compounding and discounting cancel, so the face value is correct. On the other hand, consider a loan at a concessionary interest rate of 5% when the market rate is 10%. This is valued by the accountant at 100, but by the economist at $100 \times 1.05 / 1.1 = 95.5$. In the present example, the loan is not at a concessionary rate, but it is subsidized by the standard tax deduction allowed for interest payments. Accordingly, the accountants' value must be modified as follows:

$$\text{Econ. Value} = (\text{Acct. Value}) \left(1 - \frac{r_x}{1+r}\right)$$

$$= 10,286 \left(1 - \frac{0.0333}{1.1}\right) = 9974.$$  

In sum, accountants' values are generally not equal to economists' values, even as we move beyond fixed capital and net worth.

E. Sale Prices & Public Values

We now calculate $V_{sg}$ and $V_{sp}$ and it is convenient to proceed in two steps, treating the productive and financial elements of (3.11) separately. First, consider only the return to fixed capital component. We have already seen that:
\[ Z_p^\pi = V_{pp}^\pi = \frac{\Pi - xd}{1 + r} = \frac{4877 - 1094}{1.1} = 3439 \]

\[ V_{sp}^\pi \text{ will differ in two ways: first, because taxes are not a public cost, but a distribution; and second, because of the extra weight attached to revenue flowing to the government, making:} \]

\[ V_{sp}^\pi = \frac{\Pi + (\lambda_g - 1)xd}{1 + r} = \frac{4877 + .3(1084)}{1.1} = 4732.0 \]

If, on the other hand, the enterprise is government-owned, then the entire surplus accrues to the government, making:

\[ V_{sg}^\pi = \frac{\lambda_g \Pi}{1 + r} = \frac{1.3(4877)}{1.1} = 5763.7 \]

The minimum government sales price is then:

\[ Z_g^\pi = \frac{V_{sg}^\pi - V_{sp}^\pi}{\lambda_g - 1} = \frac{5763.7 - 4732.0}{.3} = 3439 \]

This confirms the general result of (3.7) that under current assumptions, the government's minimum price for the fixed capital equals the private maximum:

\[ Z_g^\pi = Z_p^\pi = 3439. \]

Before commenting on this result, it remains to show that it continues to hold as we take other assets and liabilities into account. We have already seen that for the firm as a whole:

\[ V_{pp} = 100 \]

This is the value to the equity share-holder, but \( V_{sp} \) will be considerably larger, since it includes returns to all economic actors. It thus amounts to the total public wealth represented by the firm.
As with $V_{sp}^n$, this differs from the private wealth in treating taxes as benefits and in the distributional adjustment for government revenue. The details are given in Table III-7, with the major changes summarized as follows:

| Private Wealth | 12,635 |
| + Operating Taxes (discounted) | 995 |
| = Public Wealth @ Market Prices | 13,630 |
| + Distributional Effect $(\Lambda_g - 1) \times \frac{(T_r/(1 + r))^7}{(1/1.1)}$ |
| 1986 Tax reserve | .3(711/1.1) | 194 |
| 1987 Tax flow | .3(711/1.1) | 194 |
| Public Wealth @ Shadow Prices ($V_{sp}$) | 14,018 |

Note that the distributional effects are contributions to the creation of wealth elsewhere (externalities, or, general equilibrium effects). For example, as a result of government tax revenues here, taxes will be reduced (or not imposed) elsewhere, increasing the wealth of participants in that other market by 388. They therefore are entered as an external effect on the production (asset) side of the Public Wealth Statement, and as a distribution to society on the liability side.

If the enterprise were to remain in government hands under current assumptions, the value to society would differ in only one respect, namely that the equity share would also accrue to government:
Table III-7

PUBLIC WEALTH STATEMENT
(@ Shadow Values)

‘A’ Corporation: 12/31/86

<table>
<thead>
<tr>
<th>Assets (NPV of Benefits)</th>
<th>$V_{sp}$</th>
<th>$V_{sg}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed Operating</td>
<td>4434(^1)</td>
<td>4434</td>
</tr>
<tr>
<td>Working Capital</td>
<td>6480(^2)</td>
<td>6480</td>
</tr>
<tr>
<td>Non Operating</td>
<td>2717(^2)</td>
<td>2717</td>
</tr>
<tr>
<td>External Effects</td>
<td>388(^5)</td>
<td>418(^7)</td>
</tr>
<tr>
<td>Total</td>
<td>14018</td>
<td>14048</td>
</tr>
</tbody>
</table>

Liabilities & Net Worth (Distribution of Benefits)

<table>
<thead>
<tr>
<th>Debt-Holders</th>
<th>$V_{sp}$</th>
<th>$V_{sg}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interest Bearing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paid by Firm</td>
<td>9974(^2)</td>
<td>9974</td>
</tr>
<tr>
<td>Gov't Subsidy</td>
<td>312(^3)</td>
<td>312</td>
</tr>
<tr>
<td>Non Interest Bearing</td>
<td>2561(^2)</td>
<td>2561</td>
</tr>
<tr>
<td>Private Equity-Holders</td>
<td>100(^2)</td>
<td>0</td>
</tr>
<tr>
<td>Government</td>
<td>683(^4)</td>
<td>783</td>
</tr>
<tr>
<td>Society</td>
<td>388(^5)</td>
<td>418</td>
</tr>
<tr>
<td>Total</td>
<td>14018</td>
<td>14048</td>
</tr>
</tbody>
</table>
Notes to Table III-7

1. Quasi-rents, discounted: 4877/1.1.

2. Unchanged from private wealth @ economists values, under current assumptions.

3. Subsidy due to interest deductability (10286/3)/1.1.

4. Taxes less subsidies (1094-343)/1.1.

5. Distributional Effects (see text)
   \[ .3(711)/1.1 + .3(711)/1.1. \]

6. V_{sp} value plus return to equity holder.

7. V_{sp} value plus (\lambda_g-1) times return to equity holder.
Calculation of \( Z_g \) follows directly:

\[
Z_g = \frac{14,048 - 14,018}{0.3} = 100.
\]

And, once again, we have the important results that under the assumptions of this chapter:

\[
Z_g = Z_p - V_{pp} = 100.
\]

F. Implications

This section has several important implications. First, at the technical level, note that under present assumptions \( Z_g \) can be set without calculating \( V_{sg} \), \( V_{sp} \), or even \( \lambda_g \), but only knowing \( V_{pp} \). In later chapters matters will not be so simple, but it will remain true that quantification requirements are less onerous than they appear initially because what matters is the difference \( (V_{sp} - V_{sg}) \). Since many variables enter \( V_{sp} \) and \( V_{sg} \) symmetrically, they will cancel and can be ignored. This is the first example of the difference principle enunciated in Section II.

At a more policy-oriented level, a second implication is that there can be no pure revenue motive for the sale of public enterprises. With behavioural changes or price distortions, revenue effects occur as second order effects, but without them the government and private sector can only exchange streams of equal value. The pattern of revenue can be altered (liquidity effect) but its level (wealth effect) is unchanged.

The third implication is that under these conditions, no sale is likely to occur. If there are any transaction costs (e.g. the
cost of typing up a contract and walking across the street to sign it), then $Z_p$ will fall and $Z_g$ will rise, leaving no mutually acceptable $Z$.

The fourth and final implication is that sale is socially desirable only if the maximum willingness-to-pay is extracted from the private sector. If there is some uncertainty as to just what this number is (as there always will be), and if the bidding process is less than perfectly competitive (as it generally will be), then the chances of extracting this maximum are substantially less than 100%. It follows that a prudent minister will never sell, because he has nothing to gain. The best he can do is break even (if $Z-Z_p-Z_g$), while there is a serious possibility both of making the country worse off (if $Z < Z_p$) and of opening himself to political charges of giving away the national patrimony.

In short, in this section a zero-sum game is being played which, given information asymmetries, the government is likely to lose. No sale is likely to transpire under these conditions. If, however, enterprise conduct changes and/or there are price distortions, then there is potential for a positive-sum game. To this possibility we now turn.
Section IV

ALLOCATIVE VS COST EFFICIENCY:
THE FUNDAMENTAL TRADE-OFF

A. Overview

The economics of divestiture become interesting only when enterprise conduct is altered as a result of sale. On this, opponents and proponents can agree. On the one hand, private management is said to improve static operating efficiency and dynamic entrepreneurial innovation. On the other hand, private motivation is said to lead to exploitation of consumers, workers and/or the environment. In short, there is a trade-off between the possibility that private objectives are less desirable socially, and the possibility that the private sector will pursue these objectives more efficiently. This is the fundamental trade-off of divestiture.

In this chapter we focus on one common manifestation of the trade-off, namely the possibility that divestiture increases cost-efficiency through better management, but reduces allocative
efficiency through exploitation of market power.\textsuperscript{19} We begin by extending our simple model of Section II, and proceed to apply it to different market structures. In competitive output markets, (Sub-Section C), there is no trade-off because market power cannot be exercised, privatization is unambiguously desirable socially, and the only interesting question is how the fruits of this positive sum game are to be divided. In monopolistic and oligopolistic markets (Sub-Sections D, E and F), the trade-offs are fundamental and the focus is on quantification.

B. The basic methodology

Our task is to develop quantitative measures of the various variables we discussed in Section II. In order to do so, it is useful to introduce some notation and then to present our analytic framework.

Notation:

$q_p, q_g$ : levels of output under private and government operation

$P_p, P_g$ : corresponding output prices

$c_p, c_g$ : average costs of production

\textsuperscript{19} An alternative formulation of the trade-off is due to Bos, who assumes (among other things) no government (so $\lambda_g$ is irrelevant), and perfect capital markets (so $Z = Z_p$). Private shareholders vote to maximize profits while public shareholders vote to maximize welfare. The optimal balance between allocative and cost efficiency is then obtained by divesting an optimal number of shares. Dieter Bos: "A Theory of the Privatization of Public Enterprises", \textit{Journal of Economics} (Suppl. 5, 1986, pp. 17-40).
\( \Pi_p, \Pi_g : \) annual profits of the firm

\( S_p, S_g : \) annual consumer surplus accruing to domestic consumers

\( X \) : annual corporate tax payments after privatization.

We may now write down some key relationships. Firstly, firm profits (before taxes) may be written as quantity produced times the difference between price and average cost:

\[
\Pi_g = (P_g - c_g)q_g \\
\Pi_p = (P_p - c_p)q_p
\]

(4.1) and (4.2) should, in principle, be computed for each year in the future. If we index by \( t \) the value of a variable in year \( t \), then we can represent the private value of the enterprise as

\[
V_{pp} = \sum_{t=0}^{\infty} \rho^t \left( \Pi_p(t) - s(t) \right)
\]

(4.3)

where \( \rho \) represents the discount factor.\(^{20}\)

Note that this relationship is true for the enterprise as an independent firm; we are ignoring here in this simple version any synergies that the acquiring private firm may have with this enterprise\(^{21}\). Under this assumption, (4.3) represents the maximum willingness to pay for the enterprise, which may be denoted \( Z_p \).\(^{22}\)

\(^{20}\) If \( r \) is the discount rate and is constant over time, then \( \rho = 1/(1+r) \)

\(^{21}\) Synergies will be discussed in Section VI.

\(^{22}\) In fact, (4.3) needs to be modified by the value of non-operating assets of the enterprise. We ignore this for purpose of our analytical exposition since it is something that simply needs to be added in the final calculation.
Next consider the \textit{social} value of the enterprise under the alternative regimes of government and private ownership. The essential point here is that, in our measure of social value, we must include not only the returns to the enterprise, but also those to other agents in the economy. These could include consumers, other firms, owners of factors of production (including labor) and government. Properly speaking, all these elements should be included in our welfare measure. In order to keep matters as simple as possible, let us concentrate at this time on the consideration of only three agents — the enterprise, consumers and the government. In Sub-Section E we will extend the analysis to include owners of factors of production, and in Sub-Section F to include other firms.

With this simplification, the social value of the enterprise can be taken to be the sum of producer and consumer surplus plus government revenue receipts, with the last being valued at the shadow value $\lambda_g$. In principle, weights could be attached to the other components of welfare also, and we will in fact consider this in detail when we discuss the use of shadow prices in Section V.

Keeping our various simplifications in mind, we may write the social values for any given year (say year $t$) as

\begin{align}
V_{sg}(t) &= S_g(t) + \lambda_g \Pi_g(t) \quad (4.4) \\
V_{sp}(t) &= S_p(t) + (\Pi_p(t) - X(t)) + \lambda_g X(t) \quad (4.5)
\end{align}

(4.4) is straightforward. It sets the level of welfare under public operation equal to the sum of consumer surplus and enterprise profits, with the latter evaluated at $\lambda_g$. (4.5) shows the social value under private operation as the sum of consumer surplus plus...
the net profits of the firm, plus government tax revenues, valued at $\lambda_g$. Note that in (4.4) we did not make any separate allowance for the tax payments of the enterprise, since the profits accrue to the government (including the public enterprise) anyway.

In fact, $V_{sg}(t)$ and $V_{sp}(t)$ are only flows for year $t$. The true social values are the present discounted value of the stream of these flows. Thus we may write

$$V_{sg} = \sum_{t=0}^{\infty} \rho^t (S_g(t) + \lambda_g \Pi_g(t))$$

(4.6) and (4.7) may be used to find the change in welfare as a result of privatization, defined in (2.3) as

$$\Delta W = V_{sp} - V_{sg} + (\lambda_g - 1)Z.$$ Substituting (4.6) and (4.7) in this equation we can write, after some manipulation,

$$\Delta W = \sum_{t=0}^{\infty} \rho^t (S_p(t) - S_g(t) + \lambda_g [\Pi_p(t) - \Pi_g(t)])
- (\lambda_g - 1) \left( \sum_{t=0}^{\infty} \rho^t [\Pi_p(t) - X(t)] - Z \right)$$

(4.8)

But, from (4.3) we know that

$$V_{pp} = \sum_{t=0}^{\infty} \rho^t (\Pi_p(t) - X(t))$$

and we also know that $V_{pp} = Z_p$, the maximum willingness to pay of the buyer. Thus (4.8) can be written as
\[ \Delta W = \sum_{t=0}^{\infty} \rho^t \left( \Delta S(t) + \lambda_g \Delta \Pi(t) \right) - (\lambda_g - 1)(Z_p - Z) \quad (4.9) \]

where \( \Delta S(t) \) and \( \Delta \Pi(t) \) represent the change for year \( t \) in consumer surplus and in net pre-tax profits respectively.

(4.3) and (4.9) are the basic analytic equations for the divestiture decision. (4.3) provides the simplest estimate of the willingness to pay of a potential buyer. Although we will examine in succeeding sections various needed adjustments to (4.3), such as adjustments for asset values and for synergies of the enterprise with the buyer's other operations, (4.3) provides the basic framework for estimating \( V_{pp} \). (4.9) provides an estimate of how much society will gain from selling the enterprise to a particular buyer. Again, complications will be added later, but (4.9) illustrates the virtue of our differencing procedure. The gain in welfare will be much easier to estimate than the levels of welfare. For example, as we shall see in our illustrative numerical examples, the gain in consumer surplus \( (S_p - S_g) \) is quite easy to estimate, even though the individual elements of this difference are well-nigh unknowable. And (4.9) provides us the key information for the divestiture decision. We need \( \Delta W > 0 \) to consider divestiture, and we can choose among alternative bids by choosing the one that yields the highest \( \Delta W \).

Finally, let us note here a simplification of (4.9) that is of some interest. As we argued in section II, government ought to attempt to maximize the sale price \( Z \) as long as \( \lambda_g > 1 \). Thus,
government's target price is \( Z = Z_p \). If indeed government did receive this price, then (4.9) simplifies to

\[
\Delta W^* = \sum_{t=0}^{\infty} \rho^t (\Delta S(t) + \lambda g \Delta \Pi(t)) \]

(4.10)

(4.10) is quite a remarkable result. It says that, as long as government obtains the maximum price the buyer is willing to pay, the gain in welfare from divestiture can be written as the present value of the sum of the change in consumer surplus plus the change in company profits, with the latter evaluated at \( \lambda g \). Thus we get quite a simple formula for the net gain from privatization. Of course, estimation of future variables is always problematic, and some simplifying assumptions will be necessary. For example, if we assumed \( \Delta S(t) \) and \( \Delta \Pi(t) \) were constant over time and accrued in perpetuity, then (4.10) would reduce to

\[
\Delta W = \frac{1}{r} (\Delta S + \lambda g \Delta \Pi)
\]

where \( r \) is the discount rate. Alternatively, if we assumed that \( \Delta S \) and \( \Delta \Pi \) will grow at a constant rate \( g \), then (4.10) would become

\[
\Delta W = \frac{1}{r-g} (\Delta S(0) + \lambda g \Delta \Pi(0))
\]

Obviously some judgement in the face of an uncertain future is necessary here, and will at least partially depend upon the particular circumstances under consideration.

We will illustrate the use of our methodology by taking the data for the illustrative company of section III and then calculating the values of \( Z_p \) and \( \Delta W \) under different scenarios of
behavioral changes and market structure. This process will reveal exactly what information is needed to make the best divestiture decision.

C. Perfect competition.

The simplest case to analyse is where the enterprise operates in a perfectly competitive market. The price at which the output is sold is fixed by the market, so there is no effect on consumer surplus. One special case of this is where the sales are exports, so that the consumer surplus doesn't even enter into the measure of aggregate domestic welfare. Assume that \( Z = Z_p \) (since adjustments can always be made later according to (4.9)). Then (4.10) gives us our measure of \( \Delta W \). For this case then, since \( \Delta S = 0 \), and suppressing the time index for simplicity,

\[
\Delta W = \sum_{t=0}^{\infty} \rho^t \lambda_g (\Pi_p - \Pi_g)
\]  

(4.11)

Using (4.1) and (4.2), we may write

\[
\Delta W = \sum_{t=0}^{\infty} \rho^t \left[ \lambda_g ((P_p - c_p)q_p - (P_g - c_g)q_g) \right]
\]

(4.12)

Let \( P-P_g=P_p \) be the given market price. Then it is possible to write

\[
\Delta W = \sum_{t=0}^{\infty} \rho^t \left( \lambda_g \left[ (c_g-c_p)q_g + (P-c_p)(q_p-q_g) \right] \right)
\]

(4.12) may be readily interpreted as follows. The first term within the brackets represents the cost saving in producing the original quantity \( q_g \); the second term gives the net value of any increase in production.
The simplest way to picture this is shown in Fig. IV.1. Here the public enterprise produces at a constant average cost of $c_g$ up to some level of "capacity" $q_g$. When the firm is privatized, average cost falls to $c_p$ and the firm also manages to increase capacity utilization, so that output rises to $q_p$. The shaded area then represents the net gain, to be valued at $\lambda_g$. The identical net result is obtained in the somewhat more complicated picture in Fig. IV.2, where the cost curves are U-shaped. Here, divestiture has the effect of causing the firm's average and marginal cost curves to shift downward, raising the optimal level of output from $q_g$ to $q_p$. The net result is the same however, with the shaded area representing the net gain. Note that in this case, if our behavioural assumption is correct, i.e. that divestiture will lead to improved efficiency, then $\Delta W$ is always positive. Thus divestiture will always be desirable. To determine the best sale price, we must return to (4.3) and note that

$$Z_p = \sum_{t=0}^{\infty} \rho^t (\Pi_p - X) = \sum_{t=0}^{\infty} \rho^t ((p-C_p)q_p - X)$$  \hspace{1cm} (4.13)

Thus in this case, in order to find $Z_p$, we need estimates of the extent to which cost will be reduced and output increased.

**An Example**

As an example, consider 'A' Corporation, the enterprise whose data was presented in Section III. Suppose that, once it is privatized, the enterprise could raise its output by 10 per cent while using the same level of intermediate inputs and labor. That
Figure IV-1
Increase in Profits Under Competition: Constant Cost Case
Figure IV-2
Increase in Profits Under Competition:
U-Shaped Cost Case
is, assume there is an all-around 10 percent improvement in efficiency. The production and distribution flows now look like Figure IV-3. In this case, the willingness to pay calculation will go as follows:

Willingness to pay with perfect competition and efficiency gains:

<table>
<thead>
<tr>
<th>1987 Operating Surplus</th>
<th>7,344</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Opportunity Cost of Working Capital</td>
<td>(618)</td>
</tr>
<tr>
<td>- Total Return to Fixed Capital</td>
<td>6,726</td>
</tr>
<tr>
<td>- Taxes on Operating Return</td>
<td>1,710</td>
</tr>
<tr>
<td>- After Tax Return</td>
<td>5,016</td>
</tr>
<tr>
<td>Discounted to 1986</td>
<td>4,560</td>
</tr>
<tr>
<td>+ Financial Value (from Section III)</td>
<td>-3,338</td>
</tr>
<tr>
<td>- Maximum Willingness to Pay</td>
<td>1,221</td>
</tr>
</tbody>
</table>

Thus the amount a private buyer is willing to pay for an enterprise is higher if this buyer feels that efficiency gains in the enterprise are feasible.\(^{23}\) In fact, if bidding were competitive, the amount a potential buyer bids for the enterprise may be an

\(^{23}\) Note that, in our calculation, the value of "other" net assets, i.e. assets other than fixed capital, has been unaltered as a result of privatization.
Figure IV-3

'A' Corporation

PRODUCTION & DISTRIBUTION FLOWS\(^1\)
(@ current market prices)

COMPETITIVE CASE

<table>
<thead>
<tr>
<th>Generation of Surplus</th>
<th>Before</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production (@ Market Cost)</td>
<td>18,191</td>
<td>20,010</td>
</tr>
<tr>
<td>- Indirect Taxes (plus Subsidies)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Production (@ Factor Cost)</td>
<td>18,191</td>
<td>20,010</td>
</tr>
<tr>
<td>- Intermediate Inputs</td>
<td>11,011</td>
<td>11,011</td>
</tr>
<tr>
<td>- Gross Value Added (@ Factor Cost)</td>
<td>7,180</td>
<td>8,999</td>
</tr>
<tr>
<td>- Employee Compensation (Return to Labor)</td>
<td>1,631</td>
<td>1,631</td>
</tr>
<tr>
<td>- Rental Expenses (Return to Other Factors)</td>
<td>24</td>
<td>24</td>
</tr>
<tr>
<td>- Return to Operating Assets</td>
<td>5,525</td>
<td>7,344</td>
</tr>
<tr>
<td>+ Non-Operating Return</td>
<td>272</td>
<td>272</td>
</tr>
<tr>
<td>- Total Return to Capital</td>
<td>5,797</td>
<td>7,616</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Distribution of Surplus</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Return to Capital</td>
<td>5,797</td>
<td>7,616</td>
</tr>
<tr>
<td>- Interest Payments (Return to Debt Holders)</td>
<td>1,029</td>
<td>1,029</td>
</tr>
<tr>
<td>- Direct Taxes (Return to Government)</td>
<td>751</td>
<td>1,358</td>
</tr>
<tr>
<td>- Return to Equity Holders</td>
<td>4,017</td>
<td>5,229</td>
</tr>
<tr>
<td>- Dividends</td>
<td>694</td>
<td>694</td>
</tr>
<tr>
<td>- Gross Domestic Savings (by Enterprise)</td>
<td>3,323</td>
<td>4,535</td>
</tr>
<tr>
<td>- Depreciation &amp; Amortization</td>
<td>2,514</td>
<td>2,514</td>
</tr>
<tr>
<td>- Retained Earnings</td>
<td>809</td>
<td>2,021</td>
</tr>
</tbody>
</table>
indication of just how much of an efficiency improvement the buyer expects to be able to effect. Unfortunately, the bid is also affected by synergies the enterprise may have with the buyer's other activities, and so it is impossible to choose a bid on grounds of its size alone.

How much better off is society as a result of privatization and the realization of efficiency gains? The answer was provided in (4.10): It is the change in pre-tax profits multiplied by the shadow value of government revenue. The pre-tax profits are given by production minus costs (intermediate inputs, labor, rentals and the opportunity cost of working capital). We therefore have the following calculation:

<table>
<thead>
<tr>
<th></th>
<th>Before privatization</th>
<th>After privatization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production</td>
<td>18,191</td>
<td>20,010</td>
</tr>
<tr>
<td>Intermediate inputs</td>
<td>11,011</td>
<td>11,011</td>
</tr>
<tr>
<td>Labor costs</td>
<td>1,631</td>
<td>1,631</td>
</tr>
<tr>
<td>Rentals</td>
<td>24</td>
<td>24</td>
</tr>
<tr>
<td>Opp. cost of working capital</td>
<td>648</td>
<td>618</td>
</tr>
<tr>
<td>Gross pre-tax profits</td>
<td>4,877</td>
<td>6,726</td>
</tr>
</tbody>
</table>

The change in gross profits is therefore \(6,726 - 4,877\) = $1,849. If \(\lambda_g\), the shadow value of government revenue, is 1.3, then

\[\Delta W = (1.3 \times 1,849)/1.1\]

\[= 2,185.\]
If government were evaluating more than one bid, this figure would be the point of comparison to determine the selected one — the one yielding the highest gain in social welfare.

D. Monopoly:

If the enterprise occupies a monopoly position, the divestiture decision is not as easy. There is now the possibility that the divested firm will attempt to exploit its monopoly position. Government may consider the imposition of regulation, but this will lower the willingness to pay of private buyers. We will consider this problem in some greater detail in Section VIII ignoring the possibility of regulation for the time being. In that case, it may well be that, in (4.12), there will be a welfare loss for consumers against which may be weighed the gain in profits from increased efficiency and altered profit-maximizing behaviour. The possible tradeoff can be seen easily in Figure IV-4. For simplicity in the diagram, it is assumed that the public enterprise sets $P_g = c_g$ (which is regarded as welfare-maximizing pricing) and therefore $P_g > 0$. The private enterprise is more efficient ($c_p < c_g$) but it curtails output ($q_p < q_g$) in order to raise prices ($P_p > P_g$). Then the area $P_pABP_g$ represents the loss to consumers ($S_p - S_g$) in (4.9), while the area $P_pACc_p$ represents the gain in profits. In this example, if the privatized enterprise is expected to curtail output and raise price considerably, it may be in the social interest not to

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24. This assumption is, of course, not necessary, and we do not make it in our example below.
privatize, or to introduce regulation. If however, the enterprise cuts costs and lowers prices, then this divestiture will be unambiguously desirable from the social point of view.

With regard to the sale price of the enterprise, (4.13) can again be applied to determine this. Once again, therefore, we need estimates of the cost savings and of the new price and quantity figures. In order to derive these last estimates, it is possible to use the standard formulae for monopoly behaviour.

An illustration may give us some greater insight into the relative importance of the different variables. Suppose that, initially, the public enterprise is setting price equal to the (constant) marginal cost. Without loss of generality, normalize this initial price to unity. Suppose also that a point estimate of the elasticity of demand at the initial quantity is given by $\varepsilon$. Then a linear approximation of the demand curve, of the form

$$ p = \alpha - \beta q $$

must satisfy, because of the price normalization,

$$ 1 = \alpha - \beta q_g $$

and $\varepsilon = 1/\beta q_g$. 

Figure IV-4
Change in Profits and Social Welfare
Under Monopoly
where $q_g$ is the initial level of production. Thus the parameters of the linear approximation to demand will be given by

$$\alpha = 1 + 1/e \quad \text{and} \quad \beta = 1/e q_g. \quad \text{(4.14)}$$

Now suppose that, if the enterprise is privatized, the (constant) average cost will be given by $c$. If there is an improvement in efficiency, we must have $c < 1$. Then, for a linear demand curve, it is straightforward to find the price and quantity that would be set by a profit-maximizing monopolist. We would have

$$P_p = (\alpha + c)/2 \quad \text{(4.15)}$$

and

$$q_p = (\alpha - c)/2\beta. \quad \text{(4.16)}$$

Since $\alpha$ and $\beta$ can be estimated from initial conditions according to (4.14), an estimate of the cost improvement that is likely to be effected by the buyer is all that is needed to estimate the new price and quantity.

It remains to calculate the willingness to pay of the buyer and the welfare gain from privatization. The profits for the monopolist would be given by

$$\Pi_p = (\alpha - c)^2/4\beta$$

and so $\nabla_{pp}$ may easily be calculated. The welfare gain has two components. The change in gross pre-tax profits is given by $(\Pi_p - \Pi_g)$, where $\Pi_g$ represents the public enterprise's initial level of profits. For the change in consumer surplus, it can be seen from Figure IV-4 that this will be given by

$$\Delta S = \Delta P \left[ q_p + (q_g - q_p)/2 \right] \quad \text{(4.17)}$$

Since $q_p$ and $P_p$ can be estimated, so can $\Delta S$. Note that our assumption of a linear demand curve is less restrictive than it may
seem, since all we are really interested in is $\Delta S$. As long as the demand curve is approximately linear in this region, our calculation will be reasonably accurate. We do not need the demand curve to be linear at prices higher than $P_p$.

Finally, it is possible to calculate the improvement in social welfare as a consequence of privatization. Once again, this will depend upon the sale price. (4.9) remains the general formula for $\Delta W$. If government receives the maximum willingness to pay, this reduces as before to

$$
\Delta W = \sum_{t=0}^{\infty} \rho^t (\lambda_g (\Pi_p - \Pi_g) + \Delta S)
$$

Whether or not the enterprise should be privatized depends upon whether or not $\Delta W > 0$. The way we have outlined the model here, we would expect that the first term in (4.18) would be positive, but the second term would be negative, that is, firm profits would rise, but consumers could well be made worse off if the enterprise behaves as a profit-maximizing monopolist. The relative magnitude of the two effects will determine which way the tradeoff pushes the decision. For example, in the simplest case, with $c = 1$ (no cost reduction) and $\lambda_g = 1$, it may be shown that

$$\Pi_p = q_g/4e \quad \text{and} \quad \Delta S = -3q_g/8e.$$

Thus, as we would expect in the linear case, the fall in consumer welfare is one-and-one-half times the rise in profits. In this case, the enterprise should not be privatized. If $\lambda_g = 1.5$, however, $\Delta W$ would become zero, and for $\lambda_g > 1.5$, $\Delta W > 0$, and the enterprise should be privatized. Thus if government revenues are
needed badly enough (i.e., if \( \lambda_g \) is high enough), privatization may be justified even if no cost reductions are expected to result.

If \( c \) is indeed less than 1, i.e., there is a cost reduction from privatization, then \( \lambda_g \) need not be that high to provide a justification for privatization. In fact, it is entirely possible for \( \Delta W > 0 \) even with \( \lambda_g = 1 \) if \( c \) is sufficiently low.

**An Example**

To flesh out the argument, consider again the example of the previous section, i.e., 'A' Corporation with the same efficiency gain parameters as in our analysis of the competitive case. The difference here will be that the firm may exploit its monopoly position, and may in fact curtail output in order to raise the price. In order to predict what the firm might do, we must have some information on demand conditions. One simple piece of information that may be available or may be estimated is the elasticity of demand for the product. Suppose for the commodity in question, that \( e = 1.1 \). Then, using (4.14), it is possible to make an estimate of a linear approximation to demand. In the case of our example, given \( q_g = 18,191 \), we have the demand curve given by

\[
p = 1.909 - \frac{q}{20,010}.
\]

That is, we estimate \( \alpha = 1.909 \) and \( \beta = 1/20,010 \).

Next, in order to use this demand curve to predict what the firm is likely to do, we need an estimate of the per unit cost. We make the following estimates for the components of unit cost:
Intermediate inputs: 0.5503
Labor: 0.0815
Rental: 0.0012
Opp. cost of working capital: 0.0309
Total per unit cost: 0.6639.

This is our estimate of c.

Thus we have estimates of all the key parameters, a, b and c.

Using these in equations (4.15) and (4.16), we can estimate the price and quantity that the monopolist will set:

\[ P_p = 1.2865 \]
\[ q_p = 12,458 \]

so that the value of total production is given by

\[ P_p q_p = 16,028. \]

It is now possible to construct the table of production and distribution flows for the enterprise. This is presented in Figure IV-5. Next, it is then possible to estimate the maximum willingness to pay of the buyer:

25 Previously, we used 11,011 of inputs to produce 18,191 of output, i.e., 0.6053 per unit. Since there is a 10% increase in output per intermediate input, the per unit requirement now is 0.6053/1.1 = 0.5503.

26 Previously we needed 1631/18191 = 0.0897 labor per unit output. Again, divide by 1.1 to get the new per unit requirement.

27 (24/18191)/1.1.

28 Working capital includes input and output inventories, cash, demand deposits and accounts receivable. We assume that input inventories are proportional to the level of intermediate input use, output inventories are proportional to the level of output, and financial working capital is proportional to the intermediate inputs and output. Allowing for the reduced use of inputs per unit output yields the figure of 0.0309 for the working capital requirement.
Willingness to pay with monopoly and efficiency gains:

1987 Operating Surplus: 8,142
- Opportunity Cost of Working Capital: (385)
- Total Return to Fixed Capital: 7,757
- Taxes on Operations: 2,054
- After Tax Return: 5,703
Discounted to 1986: 5,184
+ Net Assets (except fixed capital): (3,338)
- Maximum Willingness to Pay: 1,846

The last number gives the government a target price that they should attempt to achieve in negotiations with the buyer. Note that the maximum willingness to pay calculated here (1,846) is higher than the figure we calculated in the previous section (competitive case), where the number was 1,221. Suppose in fact that the government is attempting to divest this enterprise and has received two proposals.
Figure IV-5
'A' Corporation

PRODUCTION & DISTRIBUTION FLOWS\(^1\)
(@ current market prices)

MONOPOLY CASE

<table>
<thead>
<tr>
<th>Generation of Surplus</th>
<th>Before</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production (@ Market Cost)</td>
<td>18,191</td>
<td>16,028</td>
</tr>
<tr>
<td>- Indirect Taxes (plus Subsidies)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Production (@ Factor Cost)</td>
<td>18,191</td>
<td>16,028</td>
</tr>
<tr>
<td>- Intermediate Inputs</td>
<td>11,011</td>
<td>6,856</td>
</tr>
<tr>
<td>- Gross Value Added (@ Factor Cost)</td>
<td>7,180</td>
<td>9,172</td>
</tr>
<tr>
<td>- Employee Compensation (Return to Labor)</td>
<td>1,631</td>
<td>1,015</td>
</tr>
<tr>
<td>- Rental Expenses (Return to Other Factors)</td>
<td>24</td>
<td>15</td>
</tr>
<tr>
<td>- Return to Operating Assets</td>
<td>5,525</td>
<td>8,414</td>
</tr>
<tr>
<td>+ Non-Operating Return</td>
<td>272</td>
<td>272</td>
</tr>
<tr>
<td>- Total Return to Capital</td>
<td>5,797</td>
<td>8,414</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Distribution of Surplus</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Return to Capital</td>
<td>5,797</td>
<td>8,414</td>
</tr>
<tr>
<td>- Interest Payments (Return to Debt Holders)</td>
<td>1,029</td>
<td>1,029</td>
</tr>
<tr>
<td>- Direct Taxes (Return to Government)</td>
<td>751</td>
<td>1,624</td>
</tr>
<tr>
<td>- Return to Equity Holders</td>
<td>4,017</td>
<td>5,761</td>
</tr>
<tr>
<td>- Dividends</td>
<td>694</td>
<td>694</td>
</tr>
<tr>
<td>- Gross Domestic Savings (by Enterprise)</td>
<td>3,323</td>
<td>5,067</td>
</tr>
<tr>
<td>- Depreciation &amp; Amortization</td>
<td>2,514</td>
<td>2,514</td>
</tr>
<tr>
<td>- Retained Earnings</td>
<td>809</td>
<td>2,553</td>
</tr>
</tbody>
</table>
One bidder plans to export the entire output on the competitive international market. The other plans to enjoy the benefits of a domestic monopoly. As we can see, the monopolist has a higher profit potential. Let us suppose each firm bids its maximum. Which proposal should the government accept?

To answer this question, we must complete our calculations for the monopoly case. Specifically, we must estimate how much better off society is under the monopoly divestiture. If government receives the full price for the enterprise, we know \( \Delta W \) is given by (4.10):

\[
\Delta W = \sum_{t=0}^{\infty} \rho^t (\Delta S + \lambda_g (\Pi_p - \Pi_g))
\]

To estimate \( \Delta S \), we use the usual measure of consumer surplus to estimate the shaded area of Figure IV-4. This is found to be

\[
\Delta S = \left[ 0.2865 \times (12,450 + 0.5(12,191 - 12,458)) \right]
\]

\( = -4390.\)

This is an estimate of how much worse off consumers are under the monopoly regime.

Against this loss to society must be weighed the gain in efficiency and profits. We may perform the following calculation:

<table>
<thead>
<tr>
<th></th>
<th>Before privatization</th>
<th>After privatization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production:</td>
<td>18,191</td>
<td>16,028</td>
</tr>
<tr>
<td>- Intermediate inputs:</td>
<td>11,011</td>
<td>6,856</td>
</tr>
<tr>
<td>- Labor costs:</td>
<td>1,631</td>
<td>1,015</td>
</tr>
<tr>
<td>- Rentals</td>
<td>24</td>
<td>15</td>
</tr>
</tbody>
</table>
- Opp. cost of working capital: 648 385
- Gross pre-tax profits: 4,877 7,757

Thus the gain in profits is 7,757 - 4,877 = 2,880. If λ_g = 1.3, we may write our estimate of the net gain in social welfare as
\[ \Delta W = [-4,390 + 1.3 \times (2,880)] \]
\[ = -588. \]

In this case, therefore, society is actually worse off under divestiture than under continued public operation. If government were considering divestiture in this case, it would be unadvisable. If there were a choice between this option and the competitive one, it is clear that the competitive option should be exercised. One final point is that there may be yet another option: Divest the enterprise to the monopolist but also introduce regulation. We will consider this option in Section V.

E. Monopsony and returns to owners of inputs

Thus far, our analysis of privatization has ignored its impact on the owners of inputs. This neglect is justifiable if the enterprise is "small" relative to the input markets, that is, if it does not influence input prices in any substantive way and if the enterprise is truly paying the competitive market price. In fact, however, public enterprises are frequently likely to be "large" in input markets. This may be true in a local labor market, and may be even more significant in cases where the enterprise is the only
buyer of particular inputs; cases could include raw materials, such as tobacco in a cigarette monopoly, ginseng, sugar, etc. If this is true, and if the enterprise consequently faces an upward-sloping supply curve of the particular input, input-owners will be earning some rents from the enterprise. The impact of privatization on these input-owners must then be considered.

In addition to the case of upward-sloping input supply curves, we may also find situations where the public enterprise simply pays more than the market price. This may happen for political reasons, and is most likely to happen for labor, but could well also happen for, say, an agricultural raw material. In either event, if the enterprise pays more than the market price, the owners of inputs will once again enjoy rents. This situation is unlikely to continue after privatization. It is frequently argued that one of the main benefits of privatization is the greater efficiency of resource use that results. Particularly with respect to labor, private owners will find ways to trim down the labor force and cut wages if at all possible. Workers as a class are likely to be worse off. Similarly, for other inputs, the private owners of the enterprise will attempt to use any available monopsony power by curtailing use and cutting the price they pay. The consequences for input owners must be then considered.

To be more precise, let us examine our basic model of Sub-Section B and see what modifications are necessary. The calculation of \( V_{pp} \), the private value of the enterprise, is unaltered. Thus (4.3) stands unchanged. The calculations for \( V_{sp} \) and \( V_{sg} \), however,
need to be adjusted. Let us represent by $M$ the net welfare (or rents) of input-owners. $M$ is equal to the total revenues of input-owners minus their opportunity cost, and may be represented in a diagram (see Figure IV-6) as the area above the input supply curve $L_s$ and below the price, upto the level of input use. This is the shaded area in Figure IV-6. In panel (a) we show a case with a rising input supply curve, and in panel (b) a case where the public enterprise is simply paying a price $w_g$ higher than the market price $w_p$, but limiting use to $L_g$. The key point here is that, if the enterprise were small in the input market, (thereby facing a perfectly elastic supply curve at the market price), and if it paid this price, then no rents would be enjoyed by input-owners.

In the event that the input-owners do enjoy rents the definitions of $V_{sg}$ and $V_{sp}$ in (4.6) and (4.7) will be modified by the addition of a term in the welfare of input-owners, $M$:

$$V_{sg} = \sum_{t=0}^{\infty} \rho^t \left( S_g(t) + \lambda_g \Pi_g(t) + M_g(t) \right)$$  (4.19)

$$V_{sp} = \sum_{t=0}^{\infty} \rho^t \left( S_p(t) + \Pi_p(t) - X(t) + \lambda_g X(t) + M_p(t) \right)$$  (4.20)

Thus, after simplification, the modified version of (4.9) will be

$$\Delta W = \sum_{t=0}^{\infty} \rho^t (\Delta S(t) + \lambda_g \Delta \Pi(t) + \Delta M(t)) - (\lambda_g - 1)(Z_p - Z)$$  (4.21)

The only change is the introduction of the term $\Delta M(t)$, the change in the rents enjoyed by input-owners.

Actually estimating $\Delta M$ involves a process similar to the estimation of $\Delta S$ in the monopoly case. We may write
Figure IV-6
Rents to Owners of Inputs

(a)

(b)
\[ M_g = w_g L_g - \int_{0}^{L_g} L_s \, dL \]  
(4.22)

and
\[ M_p = w_p L_p - \int_{0}^{L_p} L_s \, dL \]  
(4.23)

Once again, differencing simplifies the calculations, so that
\[ \Delta M = w_p L_p - w_g L_g - \int_{L_g}^{L_p} L_s \, dL \]  
(4.24)

This is the shaded area in Figure IV-7. The measure of \( \Delta M \) is then analogous to the estimation of \( \Delta S \) in (4.17):
\[ \Delta M = \Delta w \left[ L_p + (L_g - L_p)/2 \right] \]  
(4.25)

Thus estimation of \( \Delta M \) would require information on the elasticity of input supply, in order to generate estimates of \( w_p \) and \( L_p \).

However, because there is something of a presumption that the public enterprise was initially not optimizing its choice of inputs, there is some question whether the initial input price-quantity combination even lies on the supply curve. For example, in the case of labor, the enterprise may set the wage too high and then ration jobs. Although we consider rationing situations in the next chapter, it is worth noting here a way of crudely approximating (4.24) that would apply in a wide variety of situations (including rationing) and that is considerably less demanding in terms of information requirements. This approximation involves approximating the integral in (4.24) as
\[ \int_{L_g}^{L_p} L_s \, dL = w_p (L_p - L_g) \]
Figure IV-7
Change in Input Rents:
Case (a)

Figure IV-8
Change in Input Rents
Case (b)
In that case, (4.24) becomes

$$\Delta M = (w_p - w_g) L_g$$  \hspace{1cm} (4.26)

This approximation would measure $\Delta M$ in Figure IV-7 as the shaded area plus the small triangle enclosed in the dotted line. Thus it would overstate the loss by approximately $(\Delta w L / 2)$. This is obviously a second-order, and hence relatively small, error. If $L_g$ were less than $L_p$, (4.26) would understate the true loss by a similar small magnitude. Note from Figure IV-6(b) that (4.26) is exact in the case where the enterprise has no monopsony power, but simply sets $w_g$ too high. Also, in Figure IV-8, we consider the case where the initial price-quantity combination is off the input supply curve. Once again, the true $\Delta M$, the second shaded area, is overestimated by the small triangle enclosed in the dotted lines.

To see how easy it would be to apply (4.26), let us assume the input in which we are interested is labor, and then we consider our previous numerical example of the competitive case. The reader will recall that, in that example, the enterprise increased output by 10 per cent while holding labor costs constant. If this was achieved simply by using the existing labor more efficiently, then no further adjustment in our measure of $\Delta W$ is necessary, since $(w_p - w_g)$ in (4.26) is zero. If, however, this was achieved by increasing employment by 10 per cent while cutting wages by the same proportion, then workers are worse off. Here $w_p = 0.9 w_g$, and so

$$\Delta M = -0.1 w_g L_g.$$

Since we know $w_g L_g$ is the total wage bill prior to privatization, we know $w_g L_g = 11,011$ and so $\Delta M = -1,101$. This figure would then be
used to modify the estimate of $\Delta W$. We had previously calculated this for the competitive case, under the assumption of $\lambda_g = 1.3$, to be 2,391. Thus the new estimate would be $\Delta W = 2,391 - 1,101 - 1,290$.29

F. Oligopoly and returns to other firms:

If the enterprise operates in an oligopolistic market, it becomes necessary to consider the impact of divestiture not only on consumers, the enterprise, and government, but also on other firms in the industry. Let a prime (') indicate the value of a variable for other firms in the industry. Thus $\Pi'$ would represent the profits of other firms, with subscripts $g$ and $p$ indicating the value of the variable before and after divestiture. Then, suppressing time subscripts on the right-hand side for simplicity, the welfare levels before and after divestiture may be written30:

$$W_{sg} = \sum_{t=0}^{\infty} \rho^t (S_g + \lambda_g (\Pi_g + X'_g) + (\Pi'_g - X'_g))$$

(4.27)

$$W_{sp} = \sum_{t=0}^{\infty} \rho^t (S_p + (\Pi_p - X) + (\Pi'_p - X'_p) + \lambda_g (X + X'_p))$$

(4.28)

29 The case where the enterprise has monopoly power in the output market and monopsony power in the input market is considerably more complicated. In this case, the marginal cost curve of the enterprise will almost certainly be upward-sloping and this makes estimation of the new output and input quantities considerably more problematic; in particular, we have greater optional requirements. If the enterprise has monopoly power in the output market, and no monopsony power, but simply sets input price too high, then the approximation (4.26) may be used without difficulty.

30 Note that in the ensuing analysis, the consumer' surplus measures $S_g$, $S_p$ and $\Delta S$ are defined over the output of all firms, that is, including the enterprise and the other firms in the industry.
Taking the difference between (4.28) and (4.27), we get, after some manipulation and using the definition of $\Delta W$ given in (2.3), the net benefit from divestiture:

$$\Delta W = \sum_{t=0}^{\infty} \rho^t [\Delta S + \lambda_g \Delta \Pi + \Delta \Pi' + (\lambda_g - 1) \Delta X'] - (\lambda_g - 1) (Z_p - Z)$$

(4.29) replaces (4.9) in the case of oligopoly. Note that it differs from (4.9) only in the last two terms within the square brackets, which may be interpreted as adjustments to the basic equation to allow for oligopoly. They say that, if the industry is oligopolistic, we need to add two terms to our measure of the change in welfare. The first represents the change in the profits of the rest of the industry, while the second is the change in tax collections from the rest of the industry, with this change being weighted by the term $(\lambda_g - 1)$, the excess of the shadow value of government revenue over unity. As can be seen from this expression, the analysis of the oligopoly case is considerably more complicated; however, it is also clear that a systematic application of our valuation procedure will still yield the required estimates of willingness to pay and net social gain.

The major problem is to decide on a model of oligopoly that would be appropriate for the particular industry that is under consideration, because predictions of the outcome of privatization will depend very much on the behavioural assumptions that are made. We will not attempt here to choose the "best" model since there is no single best model. Rather, the appropriate model depends upon the particular circumstances, including the institutional
environment and the degree of competition. In general, however, we
would expect that the equilibrium outcome in any oligopoly will tend
to lie in between the competitive and monopoly cases; thus it is
generally possible to set bounds on the likely outcomes. This would
be particularly true for estimates of the private value of the
enterprise, \( V_{pp} \). Since we can compute the value of \( V_{pp} \) to lie
somewhere between them. In other words, if \( V_{pp}^c \), \( V_{pp}^m \) and \( V_{pp}^o \)
represent the private value of the enterprise under competition,
monopoly and oligopoly respectively, we may write

\[
V_{pp}^o = \mu V_{pp}^c + (1-\mu)V_{pp}^m
\]

where \( \mu \) is the degree of competition, in the industry (for perfect
competition, \( \mu=1 \) and for monopoly, \( \mu=0 \)).

It is the calculation of \( \Delta W \) that is considerably more
problematic. What happens to the profits of other firms depends
very much on the nature of competition that emerges in the industry.
And a wide range of types of competition is possible. For example,
in a privatization involving, say, a large telecommunications
enterprise, the dominant firm model may be the most useful if the
public enterprise that is being privatized is initially in a near-
monopoly situation. It is interesting to note that public enterprises that are in a dominant position have been known to
behave in quite a opposite ways. In general, we would want a public
enterprise to use its dominant position to force the industry close
to the competitive situation. If this were done, privatization
would have the undesirable effect of moving us away from this
relatively good situation. Whether public enterprises actually do
this in practice, however, is another matter. While some examples of the appropriate behaviour can be found, public enterprises are on occasion observed using their dominant position to actually enforce a cartel.31 (Example). In this case, privatization is likely to encourage rivalry and a market outcome closer to the competitive one.

One particularly interesting case would be one where the public enterprise being privatized is a large multi-plant monopoly that could be split up into several smaller firms that would then compete with each other. This case is likely to arise particularly in situations where the privatization basically involves the divestiture of previously private but nationalized firms, such as the jute and textile industries in Bangladesh. But there may well be other situations where the enterprise is simply large enough to be broken into several smaller firms. This would be true of large holding-company type enterprises such as India’s steel and fertilizer companies. Britain’s National Bus is currently being sold off in about 70 different pieces. In cases such as these, the industry structure may be endogenous to the privatization decision, and so the government may the optimal level of competition for the industry. Thus a market structure that optimizes the tradeoff between competition and scale economies may be achievable.

A. Overview

So far we have assumed that prices paid by the enterprise for its inputs and prices paid by the public for the outputs are market clearing, further that the private evaluation of these prices by the input suppliers respectively output purchasers coincide with the social evaluation. These assumptions generally do not hold in reality. So the question arises how our framework has to be modified to incorporate rationing and differences between private and social evaluation of prices.

In this section we deal with three related issues. In subsection A nonprice rationing of inputs and outputs is analysed quite thoroughly. Then in subsection B we include indirect taxes into our framework. Last in subsection C we turn to shadow prices proper. All these issues have in common that the public enterprise and/or privatized firm operate(s) off the relevant demand or supply curves. In the case of rationing all actors perceive the correct curves, but they cannot reach points on these curves. In the case of indirect taxes the government drives a wedge between curves as perceived by buyers and by sellers. In the case of shadow prices proper the actors optimize along curves that, from a social

32 The only exception is $\lambda_g$, the shadow multiplier of public funds, which we introduced in Section II.
perspective, are incorrect. Thus, in the last case, buyers are on their private demand curves, and sellers are on their private supply curves. However, they are off the social demand respectively supply curves.

B. Nonprice Rationing

1. Direct Welfare Costs of Rationing

Public enterprises often pay higher wages than their counterparts in the private sector. Or they offer more job security and less job pressure than private firms. These advantages lead to a labor supply for the public enterprise that is larger than its labor demand. In such cases it has to use nonprice rationing for jobs. On the output side for political reasons, public firms often set artificially low prices for their products. At the same time they face capacity constraints, or the government wants to place a cap on public enterprise deficits. Again, the firm has to use nonprice rationing methods.

a. Rationing of Outputs

In case of nonprice rationing of outputs the consumer surplus measure $S(p)$ no longer gives a proper description of consumer benefits because the consumers can no longer buy all quantities they want at price $p$. Rather, consumer benefits are now determined by the price, by the quantity available, $q$, and by the rationing method, $R^0$, where superscript 'o' indicates output rationing. For simplicity we only consider the monopoly case. If we designate $S(p)$ as consumer surplus under pure price rationing and $S(p,q,R^0)$ as
consumer surplus under mixed price-quantity rationing, then it is well known that \( S(p_0) \geq S(p_0, q, R^0) \) for all mixed rationing schemes and all prices \( p_0 \). This says that under consumer sovereignty price is the ideal rationing device. Each consumer is assumed to know best which quantity to buy at a given price. Any outside restriction on quantity and any additional nonprice rationing mechanism can only make the consumer worse off. This holds for each individual and therefore in the aggregate. Normally we can assume that unconstrained private enterprises depend on price rationing, whereas public enterprise often resort to some nonprice rationing.\(^{33}\)

Rationing methods can vary substantially. For example, the enterprise can designate priority groups that are served first; or it can establish maximum consumption levels per customer; or it can make customers wait in line, etc.. In terms of their effects on consumer surplus the extreme cases are rationing in the order of willingness to pay and rationing in the reverse order of willingness to pay.

In the first extreme case, if the public enterprise rations consumers according to their willingness to pay, then

\[
S(p_g, q_g, R^0_g) = S(p(q_g)) + q_g[p(q_g) - p_g] \tag{5.1}
\]

where subscript \( g \) indicates that rationing is done by the public enterprise and \( p(q) \) is the demand function.\(^{34}\) Equation 5.1 says

\(^{33}\) Cases of nonprice rationing by private enterprises are not so exceptional, though. They include most service industries, where waiting is frequently involved, such as restaurants, movie houses, or airlines, and some manufactured products with order backlogs.

\(^{34}\) Strictly speaking, it is the inverse demand function.
that total consumer surplus will then be equal to the consumer surplus at the price $p(q_g)$ that would have rationed the available supply $q_g$, plus the money saved by the consumers due to the actual lower price $p_g$. \( S(p_g,q_g,R_0^g) \) is given by the sum of the two shaded areas in Figure V-1.

In the other extreme, if the enterprise rations consumers in reverse order of their willingness to pay, then

\[ S(p_g,q_g,R_0^g) = S(p_g) - S(p(q_\alpha)) - [p(q_\alpha) - p_g]q_\alpha, \quad (5.2) \]

where $q_\alpha = q(p_g) - q_g$. $q_\alpha$ therefore is the difference between the quantity demanded at $p_g$ and the quantity supplied by the enterprise. As can be seen in Figure V-2, the first difference in equation 5.2, \( S(p_g) - S(p(q_\alpha)) \), is the area ACDE. From this we subtract the rectangle ABDE to arrive at a remaining consumer surplus of area BCD. This is quite small compared to the whole area between line AF and the demand curve that would have resulted as consumer surplus under ordering according to willingness to pay.

Another way of looking at the difference between the two types of rationing is in terms of consumer surplus lost compared to the full supply of the quantity demanded at price $p_g$. In case of rationing in the order of willingness to pay this surplus loss is equal to the small triangle GFC in Figure V-2. However, with rationing contrary to willingness to pay the consumer surplus loss becomes the large unshaded area below the demand curve and above the line segment AB.
Equation 5.2 is not very intuitive. Hence it is good to know that for a linear demand curve equation 5.2 becomes

$$S(p_g, q_g, R^0_g) = S(p(q_g)). \quad (5.2.a)$$

In this case consumers in total do not benefit from the lower price at all. Then total consumer surplus is simply equal to the upper shaded area in Figure V-1. Note that the lower shaded area in this case would present a deadweight welfare loss because the enterprise does not get this amount either. Also note that low-demand (and often low-income) customers would benefit from this approach, while high-demand (and often high-income) customers would suffer.

Perverse as the second extreme type of rationing may look, it is not totally unrealistic. For example, rationing through queues may correspond to this type if low-demand customers have a low value of leisure time and high-demand customers value their time considerably more highly.

Any real rationing scheme will lie somewhere between the two extremes. Using the linear demand function as a first-order approximation to an arbitrary demand curve, one can then write

$$S(p_g, q_g, R^0_g) = S(p(q_g)) - \mu^0_g[p_g - p(q_g)], \quad (5.3)$$

where $0 \leq \mu^0 \leq 1$ is a function of the rationing rule. In particular we

---

35 This is true regardless of whether $q_A \leq q_g$

36 In case of a convex demand curve total consumer surplus would even go down.
Figure V-1
Consumer Surplus Under Alternative Rationing Schemes
The Linear Case

Figure V-2
Consumer Surplus Under Alternative Rationing Schemes
The Non-Linear Case
have \( \mu^0_o = 0 \) for rationing contrary to willingness to pay and \( \mu^0_g = 1 \) for rationing according to willingness to pay. Normally we can expect that the public enterprise will use different rationing methods than the privatized firm. Hence we have to differentiate between \( \mu^0_g \) for the publicly held firm and \( \mu^0_p \) for the divested firm.

Now we can apply 5.3 to our divestiture valuation. In order to keep the formulas simple, in this section we look at the one-period case only and thus leave out the discounting and summation over time. We further assume that the price \( Z \) paid for the enterprise equals \( V_{pp} \), the private willingness to pay. To denote these simplifications we write \( \Delta W^* \) instead of \( \Delta W \). Considering 5.3 and with nonprice rationing even after privatization we get

\[
\Delta W^* = \lambda_g \Delta \Pi + \Delta S(p(q)) + \mu^0_g q_g [p_g - p(q_g)] - \mu^0_p q_p [p_p - p(q_p)]
\]

(5.4)

As can be seen from the differences between surplus under rationing for the linear and nonlinear cases it may be worth approximating consumer surplus changes by simpler formulas. One such approach is given by Turvey (1974). The Turvey approximation to a consumer surplus change \( \Delta S \) resulting from a price change \( \Delta p \) is \( \Delta S = \Delta p(q + \Delta q/2) \). This approximation is exact for linear demand curves. It overestimates a surplus increase (decrease) for a convex (concave) demand curve, and it underestimates a surplus increase (decrease) for a concave (convex) demand curve.37 Approximations

---

37 Another approximation to the surplus change suggested by Finsinger and Vogelsang (F-V, 1981) is simply \( \Delta S = \Delta p \cdot q_0 \), where \( q_0 \) is the quantity demanded at the original price \( p_0 \). This approximation usually underestimates surplus increases and overestimates surplus decreases.
are usually defined for changes that occur on the demand curve, whereas rationing occurs off the demand curve. Hence, we have to assume to know the approximate amount of rationing. Then we can apply the Turvey approximations to expression 5.4 resulting in

\[
\Delta W^* = \lambda_g \Delta \Pi + (1/2)[p(q_g) - p(q_p)][q_g + q_p] + \\
\mu^0q_g[p_g - p(q_g)] - \mu^0p_q[p_p - p(q_p)]
\] (5.5).

Assuming rationing according to willingness to pay under both regimes, then

\[
\Delta W^* = \lambda_g \Delta \Pi + (1/2)[q_p - q_g][(p(q_g) + p(q_p)] + q_g p_g - q_p p_p
\] (5.5.a).\(^{38}\)

Figure V-3 illustrates equation 5.5.a. Here we assume an average cost reduction from \(c_g\) to \(c_p\), while price remains unchanged at \(p = p_g = p_p\) and output is increased from \(q_g\) to \(q_p\). For the case of \(\lambda_g = 1\) the approximate welfare change is exact and is given by the shaded area ABCGEF.

For rationing contrary to willingness to pay 5.5. becomes

\[
\Delta W^* = \lambda_g \Delta \Pi + (1/2)[q_g + q_p][p(q_g) - p(q_p)]
\] (5.5.b).\(^{39}\)

Compared to equation 5.5.a we are thus adding a rectangle that is given by GHIK in Figure V-3.

Now we are in a position to calculate the change in welfare for our numerical example. To concentrate on the rationing aspect let

38 The corresponding result for the F-V approximation is
\[
\Delta W^* = \lambda_g \Delta \Pi + [p(q_p) - p][q_p - q_g].
\] This differs from 5.5.b by subtracting the area of triangle CGD in Figure V-3. Note that the F-V formula is different if the private firm contracts output instead of expanding it.

39 The corresponding formula under the F-V approximation is
\[
\Delta W = \lambda_g \Delta \Pi - q_g[p(q_p) - p(q_g)].
\]
us assume that through privatization the price remains unchanged, for instance, because it is regulated. However, as in our numerical example on the competitive case in Section IV, output goes up and thus nonprice rationing is reduced. Then in equation 5.4 we have \( p_p - p_g = p \). We are now in a position to use the same flows as in the competitive case of Section IV. The relevant numbers are provided by Table IV.3. All that changes is the story behind the numbers.

We assume that the output is sold domestically at a regulated price that remains unchanged under privatization. As before, privatization is taken to lead to an improvement of total factor productivity and to an increase in output of 10%. This output can easily be accommodated in the market because at the regulated price there is excess demand. The reason for the unwillingness to supply more lies in the capacity constraint of the plant that has been privatized. Like in the monopoly example of Section IV we assume a downward sloping demand curve with an estimated elasticity of \( \epsilon = 1.1 \) at the price \( p \). Demand \( q(p) \) at that price is estimated to be 20% larger than the firm's supply \( q_g \). In this case the linear approximation to the demand curve is \( p = \alpha - \beta q(p) \). As in Section IV the assumption \( p = 1 \) leads to estimates for the parameters \( \alpha \) and
Figure V-3
Approximation to Welfare Change Under Rationing
\[ \beta \text{ of} \]
\[ \alpha = 1 + 1/\epsilon \quad \text{and} \quad \beta = 1/\epsilon q(1). \]

Since \( q(1) = 18,191 \times 1.20 = 21,829 \), we get

\[ p = 1.91 - q/21,829 \times 1.1 = 1.909 - q/24,012, \]

and \( p(q_g) = 1.1514. \)

Since we know output after privatization to be \( q_p = 20,010 \) we can now calculate the market clearing price after privatization, \( p(q_p) \), as \( p(q_p) = 1.909 - 20,010/24,012 = 1.0767. \)

As before the change in profits is given by

\[ \Delta \Pi = \Pi_p - \Pi_g = 6,726 - 4,877 = 1,849. \]

With \( \lambda_g = 1.3 \) we get \( \lambda_g \Delta \Pi = 2,404. \)

If we have rationing in the order of willingness to pay we can use approximation (5.5.a) which gives us

\[ \Delta W = 2,404 + (20.010 - 18,191)(1.0767 + 1.1514)/2 - 1 \]
\[ = 2,404 + 207 = 2,611. \]

Under this approximation the annual improvement due to the reduction in rationing is thus estimated to be 207 monetary units.40

Let us now turn to rationing in the reverse order of willingness to pay. For this case approximation (5.5.b) becomes

40 The corresponding numbers for the F-V approximation are
\[ \Delta W = 2,404 + (1.0767 - 1)(20,010 - 18,191) = 2,404 + 140 = 2,544. \]
Under this approximation the annual improvement due to the reduction in rationing is estimated to be 140 monetary units.
\[ \Delta W = 2,404 \cdot (18,191 + 20,010)(20,010 - 18,191)/2 \cdot 24,012 \]
\[ = 2,404 + 1,447 - 3,851.41 \]

Note that the type of rationing makes an enormous difference in our example. The welfare improvement due to a reduction in rationing increases by a factor of 7 when comparing rationing in reverse order of willingness to pay with rationing in the right order.

b. Rationing of Inputs

The case where the public enterprise pays an above market wage but only employs a limited amount of labor is quite symmetric in terms of welfare effects to the case where it charges a low price and applies nonprice rationing methods for its output. This symmetry between outputs and inputs has already appeared in Section IV, where we introduced input rents into our welfare calculation. Thus with labor queuing for attractive jobs the rents \( M \) will depend on the wage rate, \( w \), on the amount of labor hired, \( L \), and on the input rationing method, \( R^i \): \( M = M(w, L, R^i) \). Now formulas symmetric to the case of output rationing can be developed. If the public enterprise awards labor contracts in the order of the reservation wages of workers, then

\[ M(w_g, L_g, R^i_g) = M(w(L_g)) + L_g[w_g - w(L_g)] \]  

(5.6).

The labor rents from 5.6 are given by the two shaded areas in Figure V-4.

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41 Similarly, the result for the F-V approximation is
\[ \Delta W = 2,404 + 18,191(20,010 - 18,191)/24,012 = 2,404 + 1,378 = 3,782. \]
42 The less drastic rationing is, the more important is the relative difference between the two rationing schemes.
If the public enterprise awards labor contracts in the reverse order of reservation wages, then

\[ M(w_g, L_g, R^i_g) = M(w_g) = M(w(L^\Lambda)) - [w_g - w(L^\Lambda)]L^\Lambda \](5.7),

where \( L^\Lambda = L(w_g) - L_g \). In this case the labor rents are given by the shaded area in Figure V-5. Again, we can see the difference in the surplus loss due to rationing of jobs. In case of rationing in the order of reservation wages the surplus loss is given by the unshaded area ABC in Figure V-4, while for rationing in the reverse order the surplus loss is given by the unshaded area ABCD in Figure V-5.

For a linear supply curve equation (5.7) becomes

\[ M(w_g, L_g, R^i_g) = M(w(L_g)) \quad \text{(5.7.a)} \]

Hence, by characterizing queuing methods along a scale \( 0 \leq \gamma^i \leq 1 \) we can write

\[ M(w_g, L_g, R^i_g) = M(w(L_g)) + \gamma^i L_g[w_g - w(L_g)] \quad \text{(5.8)} \]

Noting that a public enterprise will use different methods of hiring than a private firm, we differentiate between \( \gamma^i_g \) and \( \gamma^i_p \). Corresponding to (5.4) we then arrive at

\[ \Delta w^* = \lambda_g \Delta \Pi + \Delta S(p(q)) + \Delta M(w(L)) + \gamma^i_p L_p[w_p - w(L_p)] - \gamma^i_g L_g[w_g - w(L_g)] \quad \text{(5.9)} \]
Figure U-4
Job Rationing in the Order of Reservation Wages

Figure U-5
Job Rationing in Reverse Order of Reservation Wages
The Turvey approximation to this expression is

\[ \Delta W^* = \lambda_g \Delta \Pi + \Delta S(p(q)) + (1/2)[L_g + L_p][w(L_p) - w(L_g)] \\
+ \gamma_p L_p[w_p - w(L_p)] - \gamma_g L_g[w_g - w(L_g)] \quad (5.10). \]

If labor hiring only occurs in the order of reservation wages this becomes

\[ \Delta W^* = \lambda_g \Delta \Pi + \Delta S(p(q)) + (1/2)[L_g + L_p][w(L_p) - w(L_g)] \\
+ L_p w_p - L_g w_g \quad (5.10.a). \]

Corresponding to (5.5.b), if we have only hiring in the reverse order of reservation wages, then

\[ \Delta W^* = \lambda_g \Delta \Pi + \Delta S(p(q)) + (1/2)[L_g + L_p][w(L_p) - w(L_g)] \]

(5.10.b).

2. Indirect and Rent-Seeking Costs of Rationing

There could be other costs associated with rationing besides those measured by \( S(p_g, q_g, R^o_g) \) and \( M(w_g, L_g, R^i_g) \). For example, the enterprise may have to print and issue rationing coupons and the consumers may have to queue or incur costs for alternative supplies. For example, electricity consumers in many countries have auxiliary power generators for the many times that their electricity is turned off.

As long as these other costs are borne by the enterprise they are correctly captured in profits and therefore pose no new problems. Rationing costs borne by consumers and input suppliers are often of a rent seeking nature. They may have to be considered separately. These costs will, in particular, be substantial for inputs like labor. If the public enterprise hires labor at above market wages but only employs a limited amount, then workers will
acquire additional credentials, queue as unemployed, bribe officials, etc., all in an effect to employed by the public enterprise.

The rent-seeking literature contains fruitful discussions on the size of these costs\textsuperscript{43}. The simplest assumption on an upper bound for these costs is that they equal the rents that can be generated by the rationing. Thus, under a nonprice rationing scheme for an output the excluded customers get no consumer surplus. Such customers would be willing to pay up to the amount of surplus available to them if they could get the commodity at price $p$, while those happy customers that get the right to buy the commodity are willing to pay up to their surplus to be able to keep this right. If consumers correctly weigh their chances of ultimately getting the commodity and if they are risk neutral, then the total rent seeking expenses will not exceed the additional consumer surplus at price $p$ that is potentially generated by the nonprice rationing scheme. This is the lower shaded area in Figure V-1.

As a consequence, under "efficient" rent seeking we can expect that the commodity will end up with those consumers that value the commodity most. Also jobs will be given to those who are willing to sacrifice most to get them. Assuming that rent-seeking costs are not just transfers but require real resources we would then simply deduct rent-seeking cost from the consumer surplus levels under

\textsuperscript{43} See, for example, the contributions in J. Buchanan, R. Tollison and G. Tullock (eds.), \textit{Toward a Theory of the Rent-seeking Society}, College Station, Texas A&M University Press, 1980.
rationing in the order of willingness to pay respectively from the rent levels under queuing in order of reservation wages. This would mean that under output rationing we always end up with an additional welfare loss that is approximately equal to the lower shaded area in figure V-1. The welfare change due to privatization would then be given by (5.5.b) respectively (5.10.b).

C. Indirect Taxes

So far we have assumed away indirect taxes. This led to two simplifications. First, producer price was always equal to consumer price. That facilitated calculation of profits and consumer surpluses. Second, we did not have to consider the tax consequences of price and quantity changes. Due to our assumption that \( \lambda_g > 1 \), however, these tax consequences matter.

Two simple types of indirect taxes allow us to make this case. We denote indirect taxes by \( x^i \). Ad valorem taxes at a rate \( x^i_v \) would be relevant as tariffs or general sales taxes. Unit taxes at a rate \( x^i_u \) would be relevant for particular commodities like gasoline or cigarettes.

First, assume the indirect tax rate is \( x^i_v \) on the value of output. If therefore the firm receives a price \( p \), the consumers have to pay \( p(1+x^i_v) \). This means that the demand curve faced by the firm is proportionately lower by \( 1/(1+x^i_v) \) than the demand curve of consumers. In the following we assume that consumer surplus is measured on the true demand curve of consumers, while firm profits
are calculated using the shifted demand curve and the net prices received by the firm. For simplicity we omit time subscripts. Then

$$V_{sg} = \sum_{t=0}^{T} \rho^t \{ S(p_g[1+x_{iv}]) + \Pi_g(p_g) + \lambda_g x_d + \lambda_g x_{iv} p_g q(p_g[1+x_{iv}]) \}$$

(5.11),

$$V_{pp} = \sum_{t=0}^{T} \rho^t (\Pi_p(p_p) - x_d p)$$

(5.12)

and

$$V_{sp} = \sum_{t=0}^{T} \rho^t \{ S(p_p[1+x_{iv}]) + \Pi_p(p_p) + [\lambda_g - 1] x_d p + \lambda_g x_{iv} p_p q(p_p[1+x_{iv}]) + \lambda_g Z \}$$

(5.13).

Assuming that the public enterprise is sold at the private reservation price $Z = V_{pp}$ we can write

$$\Delta \hat{W}^* = \sum_{t=0}^{T} \rho^t \{ \Delta S(p[1+x_{iv}]) + \lambda_g \Delta \Pi(p) + \lambda_g x_{iv} p_p q(p_p[1+x_{iv}]) - p_g q(p_g[1+x_{iv}]) \}$$

(5.14).

Note that the last two terms in equation 5.14 give the change in firm revenues due to privatization multiplied by the tax rate $x_{iv}$ and the government multiplier $\lambda_g$. The main feature of this result then is that the change in firm revenues due to privatization directly affects the valuation.

Second, let us consider the case of a unit tax $x_{iu}$. In this case consumers pay $p+x_{iu}$ if the firm receives a price $p$. For the firm this means a parallel downward shift of the demand curve by $x_{iu}$. Corresponding to equations 5.11 to 5.14 this leads to the following equations 5.11.a to 5.14.a:
\[ V_{sg} = \sum_{t=0}^{T} \rho^t (S(p_g + x^i u) + \Pi_g(p_g) + \lambda_g X^d + \lambda_g x^i u q(p_g + x^i u)) \] (5.11.a)

\[ V_{pp} = \sum_{t=0}^{T} \rho^t (\Pi_p(p_p) - X^d_p) \] (5.12.a)

and

\[ V_{sp} = \sum_{t=0}^{T} \rho^t (S(p_p + x^i u) + \Pi_p(p_p) + [\lambda_g - 1] X^d_p + \lambda_g x^i u q(p_p + x^i u) + \lambda_g Z) \] (5.13.a).

Assuming that the public enterprise is sold at the private reservation price \( Z = V_{pp} \) we can write

\[ \Delta W^* = \sum_{t=0}^{T} \rho^t (\Delta S(p + x^i u) + \lambda_g \Delta \Pi(p) + \lambda_g x^i u [q(p_p + x^i u) - q(p_g + x^i u)]) \] (5.14.a).

The main feature of equation 5.14.a is that the valuation is directly affected by a change in output due to privatization. Again this change is multiplied by the tax rate \( x^i u \) and by the government multiplier \( \lambda_g \).

In the above formulas we have only considered taxes on outputs. Taxes and tariffs on inputs obviously carry just as much importance. They can be treated in a symmetric fashion.

D. Shadow Prices Proper

Differences between private and social evaluation of inputs and outputs can be the result of constraints (policy or otherwise) or externalities/linkages. Typically the shadow prices corresponding to social evaluation would be derived from a model outside our
framework, but we would like to apply the results to our partial equilibrium setting.

Clearly, differences between the prices applied by the enterprises and the corresponding shadow prices affect welfare. How then do differences in social evaluation affect our formulae? First, let us consider shadow pricing of outputs only. This corresponds mainly to cases like externalities, linkages or exports at distorted exchange rates. In exact terms, for the case where only the output price is different from its shadow value, we get

$$\Delta w^* = (\lambda_g - 1)\Delta \Pi_m + \Delta S_s(p_s)$$

(5.15),

where subscripts m and s indicate that the respective variables are calculated at market prices or shadow prices. The formula says that all changes have to be valuated at shadow prices. Profits at market prices only appear in this formula because the government as shareholder or as seller of the public enterprise receives these profits in nominal terms and evaluates them with $\lambda_g$ in the form of cash.

Now we may want to divide equation 5.15 up into two changes. One is the change as before in Section IV, that is only expressed in market prices, $\Delta \Pi_m$. We have the familiar $\Delta \Pi_m^* = \lambda_g \Delta \Pi_m + \Delta S_m(p_m)$. The other is the adjustment necessary for shadow pricing, $\Delta S_s$.

Thus, $\Delta \Pi = \Delta \Pi_m + \Delta S_s$ and therefore

$$\Delta S_s^* = \Delta \Pi^* - \Delta \Pi_m^* = [\Delta \Pi_s - \Delta \Pi_m] + [\Delta S_s(p_s) - \Delta S_m(p_m)]$$

(5.16).

Note that $\lambda_g$ is irrelevant for the adjustment $\Delta S_s$ because no payments enter the calculation of $\Delta S_s$. 
Equation 5.15 says that one would have to know the shadow demand and supply schedules in addition to mere shadow prices in order to derive the exact welfare effects. Requiring such knowledge would be highly demanding. However, as long as we are content with a good approximation, the introduction of shadow values requires only a very simple change over our previous results in Section IV. This can be seen from Figure V-6.

In this figure we assume constant average and marginal cost $c_g$ and $c_p$ for the public enterprise respectively the privatized firm. Private and social prices are denoted by the first price subscript, while the second subscript refers to ownership. The market demand curve is $D_p$ and the shadow demand curve $D_s$.

$\Delta W_m$ is given by the difference between the two lightly shaded areas. There is a welfare increase from privatization due to the cost decrease from $c_g$ to $c_p$. On the other hand there is a welfare decrease due to the reduction in quantity from $q_g$ to $q_p$. By construction, the net result is a slight welfare gain in nominal prices.

The change resulting from shadow evaluation is

$$\Delta W_s = (\Delta H_s + \Delta S_s(p_S)) - (\Delta H_m + \Delta S(p_m)). \quad (5.17)$$

This is given by the heavily cross-shaded area between the two demand curves, which shows a substantial welfare decrease. This just wipes out the slight welfare increase $\Delta W_m$. In our illustration $\Delta W_s$ turns out to be approximately equal to the difference between the shadow price and the market price charged (paid) by the public
Figure V-6
Welfare Adjustment for Shadow Pricing
enterprise times the quantity increase (decrease) effected by privatization.

Therefore

\[ \Delta W_s = (q_p - q_g)(P_s - P_g) \]  \hspace{1cm} (5.18).

One can argue that shadow pricing for inputs is more important than for outputs because input prices are often more distorted. For example, firms often receive credit at rates that have little to do with the social cost of providing capital. The same can be true for imports for which a firm may collect quota rents on import licences. It is good to know then that a symmetric argument to the one for outputs holds for inputs. Again, we can get a similar approximation and therefore we only have to know the shadow prices of inputs, not the shadow demand schedules. We indicate the variety of inputs that may be shadow priced by using a summation sign. Adding shadow prices for inputs to equation 5.18, we get

\[ \Delta W_s = (q_p - q_g)(P_s - P_g) - \Sigma (L_p - L_g)(w_s - w_g) \]  \hspace{1cm} (5.19)\hspace{1cm} 44

The simplicity of 5.18 and 5.19 derives from the fact that we are only looking at the effect of a change in quantity on the difference in evaluations. The difference in slope between the private and public evaluation of surplus then becomes a second-order effect. This will be quite negligible as long as the quantity change due to privatization is small and/or the slopes of the

44 In a sense the different shadow prices act like different weights given to consumer surplus and wages.
private and social demand (supply) curves are similar.\footnote{There also exists a subtle issue of rationing under shadow pricing. Assume that the shadow price of an output is above the market price. Then some consumers, whose social evaluation is above the market price, will be excluded. It is not clear that this rationing occurs according to social willingness to pay.} The simplest case of such a similar slope is a unit tax on inputs or outputs in which case the slopes are in fact equal. There are definitely cases, however, where the slopes are not similar. For example, the pay schedule of a public enterprise may be independent of the scarcity of labor in the geographic or skill area in which it operates. If it hires more workers the nominal wage therefore will not change. However, the shadow wage could rise if it is not a labor surplus economy. Still, the effect of this change is only second order as long as the change in employment is not enormous. Hence, we usually will only have to know shadow prices, not shadow schedules. If quantity changes are large, however, some information on shadow schedules may help. In particular, many shadow schedules are proportional to the nominal schedules. This is not only true for ad valorem taxes but also for other items, that depend on revenues rather than on quantities, for instance scarce foreign exchange. If one is confident about proportionality a Turvey-type approximation can be used.

It is now easy to construct a numerical example. To do so we take the flows from the monopoly case in Section IV, in particular Table IV.5. This provides us with the market price data, and therefore with
\[ \Delta W_m = 1.3(2,915) - 4,407 = -618. \]

Now, this firm could be a public utility producing a nontradeable service with positive linkage effects. Or it could be the domestic monopoly for a protected import competing good. In either case the shadow value of its output is assumed to be above the sales price \( p \). In particular, at \( q_g \) we assume \( p_s = 1.25 \), meaning that the shadow price is 25% above the price charged by the PE. We know that due to the privatization output has been reduced from 18,191 units to 16,027 units. Then equation (5.8) implies that

\[ \Delta W_s = .25(16,027 - 18,191) = -541. \]

Therefore, under shadow pricing of the output the welfare loss from privatization in this case would be increased from 618 to 1,159 monetary units. Now assume further that the wage paid by the public enterprise is 25% above the opportunity cost of labor. The savings in the wage bill by the privatized firm have occurred only by laying off employees and workers, not by reducing wages. Then (5.9) gives us the total adjustment necessary for shadow pricing of the output and labor,

\[ \Delta W_s = .2(1,631 - 1.014) - 541 = -664. \]

As we can see, laying off workers further increases the welfare loss because these workers lose their producer rents.
Section VI

SYNERGIES

1. Definitions

We have already noted that different private buyers will value the public enterprise differently. Aside from different preferences, risk attitudes and states of information, such different private evaluations could derive from synergies that a private buyer would hope to realize by acquiring the public enterprise and merging with it. A celebrated example for this phenomenon in the U.S. is the recent sale of Conrail. This cargo railroad company had quite a different value if sold to the general public or to another railroad, in particular to Norfolk Southern. In the first case Conrail would be valued on a stand-alone basis, while in the second case its value depended on the substitutabilities and complementarities it would have had with the operations of Norfolk Southern. The combined Conrail/Norfolk Southern could have saved real resources by producing essentially the same transportation output as the sum of the two separate systems, at considerably lower cost. Parallel tracks could, for example, have been closed down; the turnover of railroad cars could
have been increased; duplicative overhead costs for scheduling, systems expansion planning, etc. could have been eliminated. On the other hand, the combined system would probably have gained market power because the number of competing suppliers along parallel tracks would have been reduced by one. In many cases this could have led to monopoly supply. Also, the combined system could have saved on taxes by shifting old Conrail losses over to the profitable Norfolk Southern.

This combination of advantages would increase the value of Conrail to a company such as Norfolk Southern compared to unaffiliated buyers. They also affect social valuation. In general, real resource savings would increase the social value of the combination while increases in market power would tend to have the opposite effect. Thus, we can speak of private and public synergies in connection with privatization.

We define an economic synergy of a merger

(a) as positive if $V_{A+B} > V_A + V_B$ for two companies $A$ and $B$ that have merged into company $A+B$.

(b) as negative if $V_{A+B} < V_A + V_B$.

Now we can apply the same subscripts to the various valuations as defined in Section II. Therefore a (positive) private synergy is defined by $V_{pp}^{A+B} > V_{pp}^A + V_{pp}^B$ and a (positive) public synergy by

$$V_{sp}^{A+B} > V_{sp}^A + V_{sp}^B.$$ 

Note that in the case of the sale of a public enterprise, it may also happen that some positive synergies are lost as a result of
this divestiture. This would be particularly important for partial privatization. In this case A would stand for the privatized part and B for the part that remains in the public domain. As an example, postal and telephone services are often organized jointly in a PTT ("Postal, Telegraph and Telephones" entity). Privatization here usually is considered only for the telephone services (and here often only for the part involving the sale and servicing of terminal equipment). Then the question arises whether synergies between postal and telecommunication services influence the social evaluation of the enterprise division that is privatized.

2. A Classification of Synergies

Given that synergies occur whenever the value of the combination of two companies is different from the sum of the values of the two companies as separate entities, the questions arises: what are the sources of synergies? And when do the private and social valuations of synergies coincide?

We propose a classification based on the private valuation of synergies and suggest that all private synergies may be classified into one of the following three categories:

(1) synergies that operate through costs of production,
(2) synergies that operate through changes in market power, or
(3) financial synergies that only affect distribution of social surplus.

This classification is analytically convenient in that it categorizes different synergies according to their source in an
economically meaningful way. In particular, we may think of the
different components of a firm's profits in the following way:

\[ \Pi = R - C - X \]

That is, net profits are equal to total revenues minus costs minus
taxes. Then, say, positive private synergies arise if

\[ \Pi^{A+B} > \Pi^A + \Pi^B \]

that is, if

\[ TR^{A+B} - C^{A+B} - X^{A+B} > (TR^A + TR^B) - (C^A + C^B) - (X^A + X^B) \]

A simple way to classify synergies would be to say: positive
synergies exist if, ceteris paribus,

\[ C^{A+B} < C^A + C^B \]
\[ TR^{A+B} > TR^A + TR^B \]
\[ X^{A+B} < X^A + X^B \]

(category 1)

(category 2)

(category 3)\(^{46}\)

Negative synergies would simply require reversal of each of the
inequalities above. Of course actual cases will not be so simple,
since there may be simultaneous effects on all three components of
revenue. The classification would be based on what is the primary
or most important source of the synergy.

In addition to providing an economically intuitive set of
categories, our classification also yields categories that differ
according to whether the social value of such (positive) private

\(^{46}\) Tax effects are not the only kind of category 3 synergy. There may be
other purely financial synergies. One could imagine, say, that the debt
rating of a company changes after it buys a public enterprise, thereby
influencing the cost of borrowing. The debt rating may improve if it is
felt the company now has greater assets; it may deteriorate if the company
has borrowed heavily to finance the acquisition. In either event, we feel
such effects are likely to be small.
synergies is positive, negative or neutral respectively. Our argument can be illustrated by use of the Conrail example, where all these types of synergies can be seen.

In category 1, we would place a wide range of possible synergies, including economies of scale, economies of scope, benefits from horizontal or vertical integration and so on. The key aspect of such synergies is that total costs of production are lower in the combined firm than in the separate firms. If Norfolk Southern had bought Conrail, for example, the cost of transport between, say, Florida and New England would have been lowered because freight would stay on one railroad throughout the journey. This could be seen as a case of vertical integration, where the "upstream" firm provides transport from Florida to Washington, and the "downstream" firm transports the goods from Washington to New England. Other cases of cost-reducing synergies may well have arisen if the combined firm had benefited by scale economies or by economies of scope. Closing down parallel tracks is an example of enjoying scale economies. In general, cost reductions are, of course, socially desirable, and so this category of private synergies would have the same sign in the social evaluation. That is, when synergies are due to cost-reductions (or increases) then positive private synergies will result in positive social synergies, while negative private synergies will likewise be undesirable socially.

Category 2 synergies depend upon profitability rising because the combined firm has increased market power. The most obvious,
simple example is that of a duopoly that becomes a monopoly through merger. In the Conrail example, if Conrail and Norfolk Southern were the only two railroads providing services in a particular sector, the combined firm would have been a monopoly and would likely have ahd profits in that sector higher than the sum of the two separate firms' profits. To the extent that this rise in profits stems from scale economies (such as the closing down of parallel tracks mentioned earlier), they are socially desirable at the same time that they are privately profitable. The more important source of synergy, however, is likely to be the greater ability of the combined firm to exploit its market power. It is well known that monopolies do better than the sum of any number of rivals, since a monopoly will essentially enforce the cartel solution. This kind of positive private synergy then has a decidedly negative impact socially, because of the increased deadweight losses that enhanced market power causes. The issue of market power was central in the discussion of the Conrail sale. In fact, it may safely be assumed that the main reason the U.S. government decided not to sell Conrail to Norfolk Southern was precisely the fear of the effects of reduced competition in the railroad industry.

The third category of synergies are purely financial. The most important examples are situations where the tax liabilities of the acquiring firm can be reduced considerably through merger. In the Conrail case, Norfolk Southern stood to gain tremendously by acquiring Conrail since Conrail had large amounts of accumulated
losses carried over along with the possibility of sizable depreciation allowances. Norfolk Southern could in principle have offset its own profits against Conrail’s losses and depreciation. Note that, in general, such synergies are not specific to a particular acquiring firm; rather any profitable firm could take advantage of most of the available deductions.

In any case, from the social point of view, such synergies are basically neutral\(^47\) since they represent a redistribution. To the extent that an acquiring firm reduces its tax liability by buying the public enterprise it will be willing to pay more for the enterprise. Thus government should, in principle, receive the “future tax payments” up front in the form of the sale price of the enterprise.

3. The Measurement of Synergies

How can we incorporate synergies in our measurement system? Conceptually, this is quite straightforward. We simply have to add in the valuation of the other affected firms, both ex ante (before the privatization action) and ex post. Thus, including synergies at the public enterprise stage we would include those parts of the public (and private?) sector that have particularly strong linkages with it. Similarly, for the acquirer we have to include its other operations in our valuation exercise. This means that generally we

\(^{47}\) An exception would occur if the presence of such redistributive synergies results in rent-seeking behaviour that dissipates some of the private benefits. Such rent-seeking would be a net loss socially.
have to look at both the public enterprise and the acquirer in a multiplant/multiproduct setting. The change in welfare resulting from the privatization decision would then become

\[ \Delta W = V_{sp} A + B + V_{sg} C - V_{sg} A + C - V_{sp} B = \lambda_g (\Pi_p A + B + \Pi_g C - \Pi_p B - \Pi_g A + C) + S_p A + B + S_g C - S_p B - S_g A + C, \]

where A is the privatized part of the enterprise. This assumes that all private synergies are fully reflected in the bid price offered for it. Also the summation of consumer surpluses over potentially many products requires that demands for these products are independent of each other.\(^{48}\)

The problem is that the quantity of information needed to calculate \( \Delta W \) with synergies can easily be a multiple of the information needed for a calculation without synergies. In addition the information on synergies will be especially vague and hard to come by. However, it appears that by and large the synergies that are the most difficult to estimate are also likely to be the least important, while the largest synergies may be relatively easy to estimate.

Consider, for example, category 1 (cost-reducing) synergies. How can one know the extent to which cost savings will be realized from a private merger? In particular, this specifically requires speculation on future events. There is considerable discussion of this in the U.S. antitrust literature on mergers. The empirical consensus is that such cost reductions are notoriously hard to

---

\(^{48}\) Our approach will work in a modified form if cross effects exist, but are symmetric.
predict and that predicted cost savings rarely occur. That is, acquiring firms seldom do actually enjoy the cost-savings that they had expected; rather, the realized cost savings are mostly of second-order magnitude. It therefore appears to us that we can ignore this category of synergy in most if not all cases, particularly since we are already taking account of cost reductions due to privatization.

With regard to category 2 synergies, which relate to market power, we would expect that if there is a potentially serious problem of monopoly-creation through divestiture, government is unlikely to be willing to make such a sale. We acknowledge that there is some circularity in this statement. It says: we don’t have to worry about measuring the losses from monopoly-creation since they are likely to be so large that government won’t sell the enterprise in the first place. If in fact the potential losses are small, so that government may be willing to sell the enterprise, then we can ignore the losses since they are small!

Although there is something tautological in this argument, we do believe that the basic thrust of privatization efforts is to increase competition, so that category 2 synergies are unlikely to arise to any significant extent.

Finally, category 3 synergies could well be quite large and important in privatization decisions. These are, however, quite easy to calculate. The loss carryover and depreciation situation of the public enterprise are available in the company’s books, and tax benefits that might then accrue to any acquiring firm. These
benefits can thus easily be calculated and added in as an element of
the buyer's willingness to pay.
Section VII

VALUATION ALGORITHM AND SENSITIVITY ANALYSIS

A. Overview

Thus far, our numerical examples have been limited to a single company and to changing one or two variables at a time. While fine for expository purposes, this has obvious practical limitations. In this section, we therefore generalize the empirical portion of our approach by outlining a valuation algorithm (Sub-Section B). The procedures are computerized (as a Lotus-123 Template) allowing application to various data sets under various sets of assumptions. The template is developed only to illustrate fundamental issues and would have to be extended to deal with real cases. For example, the template accepts only a single output and only a single efficiency shift parameter, whereas field-work would require dealing with multiple products and differential efficiency shifts by year and by input.

The algorithm is then used to conduct a sensitivity analysis to identify just which variables are critical in the valuation process (Sub-Section C). Finally, the algorithm is used to illustrate alternative sets of assumptions; e.g. a losing company which nonetheless has a positive sales value (Sub-Section D).
B. Valuation Algorithm

1. Assumptions

The valuation algorithm is simply a cook-book summary of the text thus far, specifying the ingredients (data requirements) and the processing procedures (formulas), necessary to produce a particular set of outputs (the various values and prices of the enterprise).

For present purposes we need only be concerned with the front-end of the template, as illustrated in Table VII-1 (which mimics the competitive equilibrium of Section III). The company and run are identified first, followed by a statement of the principal assumptions. On the left are "dynamic assumptions" which cover efficiency and demand shifts persisting for more than one period. For example, an entry of

<table>
<thead>
<tr>
<th>Yr Mult</th>
<th>r</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.10</td>
<td>3</td>
</tr>
<tr>
<td>1.05</td>
<td>5</td>
</tr>
</tbody>
</table>

says that under private operation efficiency will increase 10% annually for 3 years while demand will expand 5% a year for 5 years. On the right of the table, "static assumptions" give important parameters which are assumed not to change in this version. At the lower left the critical elements of market structure are entered. The specifics of the cryptic notation will become clear as we move along. Here only note that any or all of the assumptions can be modified so as to explore a wide variety of circumstances.
### DIVESTITURE ALGORITHM: COMPETITIVE EQUILIBRIUM

#### 1. BASIC INFORMATION

<table>
<thead>
<tr>
<th>Company Name</th>
<th>'A' Corporation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base Year</td>
<td>1986</td>
</tr>
</tbody>
</table>

| Run Name         | S3-2: COMPETITIVE EQUILIBRIUM: LAMg>1 |

#### 2. BASIC ASSUMPTIONS

<table>
<thead>
<tr>
<th>Indicator</th>
<th>YR MLT</th>
<th>TAU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private Efficiency Multi</td>
<td>1.000</td>
<td>1</td>
</tr>
<tr>
<td>Govrnmnt Efficiency Multi</td>
<td>1.000</td>
<td>1</td>
</tr>
<tr>
<td>Private Anual Dmdn Shift</td>
<td>1.000</td>
<td>1</td>
</tr>
<tr>
<td>Govrnmnt Anual Dmdn Shift</td>
<td>1.000</td>
<td>1</td>
</tr>
</tbody>
</table>

#### MARKET STRUCTURE

<table>
<thead>
<tr>
<th>Indicator</th>
<th>VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gov Rev Mult</td>
<td>1.30</td>
</tr>
<tr>
<td>D Elasticity</td>
<td>4E+49</td>
</tr>
<tr>
<td>Life (max=25)</td>
<td>1.00</td>
</tr>
<tr>
<td>G Corp Tax</td>
<td>0.33</td>
</tr>
<tr>
<td>P Corp Tax</td>
<td>0.33</td>
</tr>
<tr>
<td>G Indirect Tx</td>
<td>0.00</td>
</tr>
<tr>
<td>P Indirect Tx</td>
<td>0.00</td>
</tr>
<tr>
<td>G OpCst Capital</td>
<td>0.10</td>
</tr>
<tr>
<td>P OpCst Capital</td>
<td>0.10</td>
</tr>
<tr>
<td>G Discount Rate</td>
<td>0.10</td>
</tr>
<tr>
<td>P Discount Rate</td>
<td>0.10</td>
</tr>
<tr>
<td>G Loan Rate</td>
<td>0.10</td>
</tr>
<tr>
<td>P Loan Rate</td>
<td>0.10</td>
</tr>
<tr>
<td>NonOp Ast Adj Fc</td>
<td>1.00</td>
</tr>
<tr>
<td>Wrk Asset Adj Fc</td>
<td>1.00</td>
</tr>
<tr>
<td>Shd Mlt: Output</td>
<td>1.00</td>
</tr>
<tr>
<td>Shd Mlt: Labor</td>
<td>1.00</td>
</tr>
<tr>
<td>Shd Mlt: ...E. Cpt</td>
<td>0.00</td>
</tr>
</tbody>
</table>

#### 3. SUMMARY OF RESULTS

<table>
<thead>
<tr>
<th>VALUES</th>
<th>TOTAL</th>
<th>PRDCTN</th>
<th>FNCNL</th>
</tr>
</thead>
<tbody>
<tr>
<td>TO PRIVATE OF PRIVATE</td>
<td>Vpp</td>
<td>101</td>
<td>3439</td>
</tr>
<tr>
<td>(TO SC OF PVT)-(TO SC OF GVT)</td>
<td>Vsp-Vsg</td>
<td>-30</td>
<td>-1032</td>
</tr>
<tr>
<td>PRICES</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PRIVATE MAXIMUM (= OPTIMAL)</td>
<td>Zp</td>
<td>101</td>
<td>3439</td>
</tr>
<tr>
<td>GOVERNMENT MINIMUM</td>
<td>Zg</td>
<td>101</td>
<td>3439</td>
</tr>
<tr>
<td>CHANGE IN WELFARE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MAXIMUM (@ Zp)</td>
<td>dw*</td>
<td>0</td>
<td>-0</td>
</tr>
<tr>
<td>MINIMUM (@ Zg)</td>
<td>-0</td>
<td>-0</td>
<td>-0</td>
</tr>
</tbody>
</table>
2. Results Using Text Examples

Next consider the interpretation of the result at the bottom of the figure. The first line \((V_{pp})\) says that the company would be valued by the private sector at 101 with a positive value on the production side (3439) nearly offset by a negative value on the financial side (-3338), where debts exceed assets other than fixed capital. The second line \((V_{sp}-V_{sg})\) says that society is worse off after privatization \((V_{sp}-V_{sg}\) is negative). Although there is a gain in welfare from the financial transfer (-1002), this is more than offset on the production side (+1032).

The prices for the firm then follow directly from the relationships spelled out in Section II. The private maximum willingness to pay \((Z_p)\) is identical to \(V_{pp}\), but the government's reservation price is \(V_{sp}-V_{sg}/(\lambda_g-1)\); or, in this case, 101.

The last two lines show the maximum and minimum welfare changes. In this case both are zero because we have a zero-sum game resulting from the fact that both parties value the asset equally.

Now assume that the private sector is more efficient. Simply go to the "assumption" section, and change the Private Efficiency Multiplier to 1.1 to reflect an annual efficiency increment of 10% for one year. New results (production side only) are given in line

---

49 The Section III result was reported as 100 (rounded from 100.42) whereas the 101 result here is rounded from 100.58. The difference is due in part to rounding and in part to the fact that our template does not deal very well with infinite elasticities and we have to settle for 9 as the highest approximation.

50 In fact, the last line \((\Delta W)\) will always be zero, since that is the welfare change associated with \(Z_g\) by construction.
3 of Table VII-2. Now we have a positive sum game with a maximum welfare gain of 2185. Because it is more efficient, the private buyer's willingness-to-pay has gone up (from 3439 to 4560). Society values the efficiency increment even more highly (because of taxes) and so \( V_{sp} \) rises even more than \( V_{pp} \). With \( V_{sg} \) unchanged, \( V_{sp} - V_{sg} \) rises to a positive value (to 817 from -1032), meaning society is better off as a result of the transfer of ownership. Accordingly, the government minimum sale price is negative 2724. The negative sign tells us that the government should be willing to pay the private sector to take the company. Since society is better off after privatization, it should be willing to pay something to achieve that state. How much? Well, with a government revenue multiplier of 1.3, every dollar paid to the private sector results in a social loss of 30 cents. If, therefore, we pay \( 1817 / .30 = 2724 \) to the private sector to take the company, then society's gains from the asset transfer (+817) will be precisely balanced by the loss from the sale subsidy (.30 * 2724). This point where gains just equal losses is precisely the minimum price (\( z^*_g \)). At any higher price, society is better off from the sale, and at any lower price, worse off. The maximum gain to society (\( \Delta W^* = 2185 \)) occurs if the private maximum price is extracted.

In sum, the result here illustrates a positive sum game in which the price can fall anywhere in the wide range from -2724 to 4560 and still make privatization socially desirable.
Table VII-2
SUMMARY OF TEXT EXAMPLES
(PRODUCTION ONLY)

<table>
<thead>
<tr>
<th>Assumptions Changed (from previous Run)</th>
<th>$v_1^{pp}$</th>
<th>$v_1^{sp}$</th>
<th>$z_1^p$</th>
<th>$z_1^g$</th>
<th>$\Delta W^*$</th>
<th>$\Delta W^-$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Base (Competitive Equilibrium)</td>
<td>3439</td>
<td>0</td>
<td>3439</td>
<td>Err</td>
<td>0</td>
<td>Err</td>
</tr>
<tr>
<td>2. Government Revenue Multiplier = 1.3</td>
<td>3439</td>
<td>-1032</td>
<td>3439</td>
<td>3439</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>3. Private Efficiency Shift = 1.1</td>
<td>4560</td>
<td>817</td>
<td>4560</td>
<td>-2724</td>
<td>2185</td>
<td>0</td>
</tr>
<tr>
<td>4. Private Market Structure = Monopoly; Elasticity = 1.1</td>
<td>5184</td>
<td>-2143</td>
<td>5184</td>
<td>7144</td>
<td>-588</td>
<td>0</td>
</tr>
<tr>
<td>5. Regulated Price @ 1.0 Rationing by willing to pay</td>
<td>4189</td>
<td>206</td>
<td>4189</td>
<td>-686</td>
<td>1462</td>
<td>0</td>
</tr>
<tr>
<td>6. Base Excess Demand = 3638</td>
<td>4560</td>
<td>1005</td>
<td>4560</td>
<td>-3350</td>
<td>2373</td>
<td>0</td>
</tr>
<tr>
<td>7. Rationing by inverse of willingness to pay</td>
<td>4560</td>
<td>2137</td>
<td>4560</td>
<td>-7109</td>
<td>3501</td>
<td>0</td>
</tr>
<tr>
<td>8. Private Competition (as in #3) Shadow Output Mult = 1.25 Shadow Wage Mult = 0.75</td>
<td>4560</td>
<td>1231</td>
<td>4560</td>
<td>-4102</td>
<td>2598</td>
<td>0</td>
</tr>
<tr>
<td>9. Private Monopoly (as in #4)</td>
<td>5184</td>
<td>-3772</td>
<td>5184</td>
<td>12575</td>
<td>-2217</td>
<td>0</td>
</tr>
<tr>
<td>10. Indirect Tax after privatization (otherwise, competition as in #3)</td>
<td>3347</td>
<td>1181</td>
<td>3347</td>
<td>-3937</td>
<td>2185</td>
<td>0</td>
</tr>
</tbody>
</table>

Note: runs correspond to text examples as follows:

1. Section III-B-1
2. Section III-E
3. Section IV-C
4. Section IV-D
5. Section VIII
6. Section V-B
7. Section V-B
8. None
9. Section V-D
10. Section V-C
If, on the other hand, we maintain the efficiency differential but convert private market structure to monopoly ("If Mkt Mnp = 1 with a demand elasticity of 1.1), then privatization is no longer desirable (line 4 of Table VII-2). This is reflected in a negative value for $\Delta W^* (-588)$ which says the enterprise shouldn’t be sold (at any price a rational buyer would be willing to pay). Equivalently, it can’t be sold, because the private maximum (5184) exceeds the government’s minimum (7144).

The reasonable response to this situation is to exploit the private efficiency differential but control the monopoly exploitation through price regulation (at, say, the old level of 1). Assuming this can be accomplished without eroding the efficiency differential (a very strong assumption), results are given on line 5 of Table VII-2. As expected, privatization now has considerable potential ($\Delta W^* = 1462$) and there is considerable range for negotiation ($Z_p = 3439 > Z_g = -686$). Note, however, that the gains are less than in the competitive case (line 3) because the private sector’s ability to produce more cannot be exploited given the fixed price and non-infinite demand elasticity. This emphasizes the point that demand conditions do affect both the private sector’s willingness to pay and the public sector’s reservation price.

So far we have assumed that the base price and quantity were set by market forces, but that need not be the case. What if the base state was also the result of price regulation at 1.0 and that there was underutilized capacity of, say, 20%? This is not
unrealistic since a fair number of public enterprises apply average cost pricing in a misguided attempt to cover fixed costs even in the presence of excess capacity. If so, then privatization under the previous assumptions has an additional advantage of expanding production, making privatization still more desirable, as shown in line 6.

Thus far we have assumed rationing via willingness to pay. In the extreme case of perfect inverse rationing we get the results of line 7 of Table VII-2. The private valuation is unchanged since the private shareholder doesn’t care from whom he gets his dollar. From the public enterprise perspective, however, privatization is even more desirable than in the previous case because the incremental output is valued more highly.

The rationing story need be neither symmetric nor extreme. For example, what if a portion of public output is distributed to the politically favored, while the private sector sells largely to those with the highest willingness to pay? The impact can be determined by setting \( \mu^0_g = .25 \) and \( \mu^0_p = .75 \). Note that all of these non-price-rationing stories are unrealistic in ignoring both the transfer and transaction effects of rent-seeking. How does the private sector accomplish rationing via willingness to pay? Presumably, by actually charging it and capturing the increment off the books. This would raise \( V_{pp} \) and \( \Delta W^* \) above the levels specified. On the other hand, deadweight loss associated with real resources expended in rent-seeking would lower \( V_{sp} \), \( Z_g \) and \( \Delta W^* \).
Now consider the impact of shadow pricing, returning to the competitive environment of line 3, but with output undervalued by 33% and workers overpaid by 25%. As shown on line 8 of Table VII-2, private willingness to pay is unaffected by shadow pricing, since only the market prices affect the private decision. The public numbers change considerably, however. Market price underestimates benefits and overestimates costs, so shadow pricing increases the gains from the output expansion effect while somewhat reducing the credit for cost reduction. On balance, $V_{sp} - V_{sg}$ rises from 817 to 1231 making privatization even more desirable than appears to be the case at market prices. If, on the other hand, the private sector behaves as a monopolist (line 4), then shadow pricing increases the loss due to reduced output, making privatization even less desirable than at market prices (line 9).

Finally, consider the impact of an indirect tax imposed in conjunction with divestiture. In the competitive case (which is supply constrained), $V_{pp}$ falls without altering $\Delta W^*$ (line 10). The government has simply taken some of the gains as taxes, reducing $Z_p$ by an equivalent amount.

C. Sensitivity Analysis

1. Overview

What is the relative importance of the various variables involved in the privatization calculation? This question is of obvious practical importance, since—given scarce analytical resources—we need to know just where to focus our efforts. It
makes little sense to waste time perfecting our estimate of a variable which doesn't really make much difference to the bottom-line. Accordingly, in this section we conduct a sensitivity analysis to get a feel for the relative impact of various variables on $\Delta w^*$. Specifically, we calculate the percentage change in $\Delta w^*$ resulting from a 1% change in each variable and report the result as an arc elasticity.

Use of the phrase "get a feel for" is purposeful because there can be no general result independent of the specific context. Sensitivity of $\Delta w^*$ to a particular variable is calculated holding all other variables constant; if the other variables were different, then sensitivity would generally be different. This is of course a source of concern in any sensitivity analysis, but it is particularly important in the present context because of the critical role of discontinuous market structure variables. For example, in a competitive environment with excess profit, indirect taxes make little difference because quantity is not affected and all that changes is that the government gets more in future taxes but less in present sale prices. In a non-competitive market, on the other hand, quantity also changes, with a significant welfare impact. In the first case, sensitivity to indirect taxation is low, but this result cannot be extrapolated to a different market structure where it could be extremely high.

51 There will be some effect if discount rates differ, because the two transactors differ in their relative valuation of money now and money later. If the private discount rate is higher, as we would expect it to be, then imposing an indirect tax on future output reduces current return to the government but increases future returns.
In sum, the detailed results of this subsection should not be taken as definitive, but rather as indicative of general orders of magnitude and illustrative of an approach that could and should be used in any particular context.

2. Basic Assumptions

As the starting point for our sensitivity analysis we once again use 'A' Corporation, but with a life expectancy of 25 years. The assumption section of Table VII-3 reflects a not uncommon view of the public/private environment in LDC's.

Reforms can improve efficiency in the public sector (Gvrmnt Efficiency Multi = 1.025), but to a lesser extent than under private operation (Private Efficiency Multi = 1.1). Demand will expand with national income under both public and private operation (Gvrmnt & Private Annual Dmnd Shifts = 1.02).

Since divestiture is not very controversial in a competitive setting, we use a non-competitive environment (D elasticity = 1.1), with price formation via the market (Market = 0). Market power, however, is only partially exercised (If Mkt = 0.1) either because there are several producers or because of fear of government regulation. We also assume that in the original base state output was supply constrained rather than demand constrained (Base Excess Demand = 1909).

Turning to the static indicators, we assume the effective corporate tax rate is lower under private ownership (G Corp Tax = .33;
Table VII-3
BASE FOR SENSITIVITY ANALYSIS

1. BASIC INFORMATION

<table>
<thead>
<tr>
<th>Company Name</th>
<th>'A' Corporation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base Year</td>
<td>1986</td>
</tr>
</tbody>
</table>

2. BASIC ASSUMPTIONS

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>P Corp Tax</td>
<td>0.25</td>
</tr>
<tr>
<td>G Corp Tax</td>
<td>0.33</td>
</tr>
<tr>
<td>Indirect Tx</td>
<td>0.10</td>
</tr>
<tr>
<td>Discount Rate</td>
<td>0.20</td>
</tr>
<tr>
<td>Loan Rate</td>
<td>0.10</td>
</tr>
<tr>
<td>OpCost Capital</td>
<td>0.10</td>
</tr>
<tr>
<td>Discount Rate</td>
<td>0.20</td>
</tr>
<tr>
<td>Loan Rate</td>
<td>0.10</td>
</tr>
<tr>
<td>OpCost Capital</td>
<td>0.10</td>
</tr>
</tbody>
</table>

3. SUMMARY OF RESULTS

<table>
<thead>
<tr>
<th>Values</th>
<th>Total</th>
<th>Prodctn</th>
<th>Fncnl</th>
</tr>
</thead>
<tbody>
<tr>
<td>TO PRIVATE OF PRIVATE Vpp</td>
<td>28369</td>
<td>21741</td>
<td>6628</td>
</tr>
<tr>
<td>(TO SC OF PVT)-(TO SC OF GVT) Vsp-Vsg</td>
<td>4398</td>
<td>2391</td>
<td>2007</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Prices</th>
<th>Total</th>
<th>Prodctn</th>
<th>Fncnl</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRIVATE MAXIMUM (= OPTIMAL) Zp</td>
<td>28369</td>
<td>21741</td>
<td>6628</td>
</tr>
<tr>
<td>GOVERNMENT MINIMUM Zg</td>
<td>-14659</td>
<td>-7970</td>
<td>-6689</td>
</tr>
</tbody>
</table>

| Change in Welfare Maximum (@ Zp) dW* | 12908  | 8913    | 3995   |
| MINIMUM (@ Zg) | 0     | 0       | 0      |
P Corp Tax = .25) reflecting the view that private owners are somewhat more creative in utilizing accounting practices which avoid taxes. Indirect taxes, on the other hand are the same in both environments (G Indirect Tax = P Indirect Tax = 0.1). The government discount rate (and opportunity cost of capital) is lower than in the private sector, reflecting both the Arrow & Lind normative view and the positive statement that private investors in LDCs expect to get their money back in three years, given uncertainty. A differential loan rate (G loan rate = .1; P loan rate = .05) is included to suggest that as part of the negotiating process, the government may offer to refinance the original loan at a lower subsidized rate. The book value of non-operating assets is below its market rate (NonOp Ast Adj Fc = 2), reflecting inflation. However, the market value on working capital is lower (Wrk Asst Adj Fc = .5) because of over-optimistic estimates of receivables. The real scarcity value of output is above its market value (Shd Mlt: Output = 1.5), but this is partly offset by the enterprise receiving subsidized inputs, especially energy (Shd Mlt: Intrmdt = 1.25). Labor is overpaid (Shd Mlt: Labor = .75) and we have no priors on working capital (Shd Mlt: Wrk Cpt = 1.00).

3. Sensitivity Results

For the basic assumptions just described, sensitivity results are given in Table VII-4. Interpretation is straightforward: a sensitivity of +5.0 says that a 1% rise in the variable increases
\( \Delta W^* \) by 5\%, while a sensitivity of -0.50 says that a 1\% rise in the variable reduces \( \Delta W^* \) by 0.5\%. Results are easily summarized: efficiency and demand variables matter a lot (absolute sensitivities in the two to five range). The government revenue multiplier, private discount rate and shadow multiplier for output are moderately important (absolute sensitivities about unity). Results are much less sensitive to other variables (absolute sensitivities generally well below one).

The critical importance of efficiency and demand parameters will come as no surprise to those familiar with the ex-post project evaluation literature. When the actual project outcome has differed considerably from that projected, it is far more commonly due to errors in forecasting demand, costs and gestation periods than to whether the shadow multiplier of labor was 0.2 rather than 0.8.

Signs on the efficiency shift elasticities are readily interpreted: the more efficiency improves under private operation, the greater the potential gains from privatization; but, the more efficiency improves under public operation, the less the potential gains from privatization. The sign on the demand shift parameter is harder to interpret as it is the net result of many offsetting effects. Under private management, greater demand means fuller utilization of the expanded capacity, increasing both \( V_{pp} \) and \( V_{sp} \), and therefore raising \( \Delta W^* \). However, under government operation, greater demand also raises \( V_{sg} \) and this lowers \( \Delta W^* \). In the current example, the latter effect dominates the former, largely because of the market power exercised by the privitized firm.
Table VII-4

Sensitivity Analysis

<table>
<thead>
<tr>
<th>Variable</th>
<th>Sensitivity*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Efficiency Shifts</td>
<td></td>
</tr>
<tr>
<td>Private</td>
<td>5.56</td>
</tr>
<tr>
<td>Government</td>
<td>-2.24</td>
</tr>
<tr>
<td>Demand Shifts</td>
<td>-3.03</td>
</tr>
<tr>
<td>Market Structure</td>
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</tr>
<tr>
<td>Monop/Comp (μ)</td>
<td>-0.19</td>
</tr>
<tr>
<td>Base Excess D</td>
<td>0.54</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td></td>
</tr>
<tr>
<td>Gov't Rev Mul</td>
<td>-1.20</td>
</tr>
<tr>
<td>Demand Elasticity</td>
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</tr>
<tr>
<td>Direct Taxes</td>
<td></td>
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<tr>
<td>Private</td>
<td>0.10</td>
</tr>
<tr>
<td>Government</td>
<td>0.00</td>
</tr>
<tr>
<td>Indirect Taxes</td>
<td></td>
</tr>
<tr>
<td>Private</td>
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<tr>
<td>Government</td>
<td>0.00</td>
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<tr>
<td>Discount Rates</td>
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</tr>
<tr>
<td>Private</td>
<td>-1.10</td>
</tr>
<tr>
<td>Government</td>
<td>0.03</td>
</tr>
<tr>
<td>Loan Rate</td>
<td></td>
</tr>
<tr>
<td>Private</td>
<td>0.20</td>
</tr>
<tr>
<td>Government</td>
<td>0.00</td>
</tr>
<tr>
<td>Asset Adjustors</td>
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<tr>
<td>Non-Operating</td>
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</tr>
<tr>
<td>Working Capital</td>
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<td>Shadow Multipliers</td>
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<td>Output</td>
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</tr>
<tr>
<td>Intermediates</td>
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</tr>
<tr>
<td>Wages</td>
<td>0.02</td>
</tr>
<tr>
<td>Working Capital</td>
<td>-0.06</td>
</tr>
</tbody>
</table>

Elasticity of $\Delta W^*$ with respect to a 1% change in the indicated variables. Note that it makes a great deal of difference whether the original variable is listed as a multiplier (1.10) or as an equivalent increment (0.10). To increase comparability, the 1% increase was therefore calculated on the basis of the value minus one for all multiplier type variables.
Section VIII:

EFFECTS OF GOVERNMENT ACTIONS

A. The Nature of the Problem

There are three major reasons why we have to consider government policy measures besides the divestiture decision itself. First, public enterprise policies less drastic than divestiture, like reorganization, worker layoffs, wage reductions, etc., that hitherto were prevented by political constraints, suddenly might become feasible once divestiture is considered as an option.

The second reason is that there may be a politically motivated minimum constraint on the selling price $Z$. That is, even with a positive net benefit of divestiture the resulting $Z$ may be too low. Then the government will have to find ways to increase $Z$ without making $\Delta W$ nonpositive.

The third reason is that there may exist policies to improve the net social benefit of divestiture for a given $V_{sg}$. This would be in line with our stipulation (in equation 2.2) that the government's goal for privatization is:

$$\max \Delta W = V_{sp} - V_{sg} + (\lambda - 1)Z$$

(8.1).

Thus far we have assumed that the government takes the right-hand side variables of equation (8.1) as exogenous. We now
endogenize them and ask how $V_{sp}$, $V_{sg}$ and $Z$ can be altered by governmental policy decisions.

$V_{sg}$ is influenced by the counterfactual policies taken instead of divestiture. $V_{sp}$ is influenced by the policies affecting the period after divestiture, while $Z$ is influenced by both of these plus by sale-related policies for the time before divestiture.

As noted in Section II, $V_{sg}$ differs from $V_{sp}$ for two quite distinct sets of reasons:

1. for a given economic environment, private behavior will differ from public behavior, and,
2. as part of the terms and conditions of sale, the economic environment will change.

The objective of the private negotiator trying to buy the public enterprise will be to maximize $V_{pp}-Z$. Once $V_{sg}$ is fixed, analysis focuses on raising $V_{sp}$ as a way to increase social welfare, and on raising $V_{pp}$ as a way of making the transaction politically acceptable and increasing $Z$.

We have to interpret $Z$ as the net sale price of the public enterprise, that is, net of transaction costs. Optimizing the divestiture decision with respect to $Z$ then means two different things. It means first to increase $V_{pp}$ to improve the private willingness to pay. Second, it means for the government to expend resources in the selling process in order to reduce the difference between $Z$ and $V_{pp}$. For example, making more potential buyers line up will increase the expected sale price, but at the same time the
search for additional buyers increases the transaction cost of the sale.

Regarding the value after privatization there are then five broad classes of policies to be considered:

1. Policies that raise both $V_{sp}$ and $V_{pp}$.
2. Policies that raise $V_{sp}$, but lower $V_{pp}$.
3. Policies that lower $V_{sp}$, but raise $V_{pp}$.
4. Policies that lower both $V_{sp}$ and $V_{pp}$.
5. Policies that raise $Z$ for given $V_{pp}$.

The fourth category is of course of interest only in identifying policies which should always be avoided.

Government policy instruments for the situation after divestiture can be categorized into one of the first three classes above. For example, there are policies that unambiguously increase efficiency, thereby raising both $V_{sp}$ and $V_{pp}$. Under certain market conditions, reductions in regulation may be of this kind, especially because rent-seeking activity would be reduced. Devices that shift risk to the government may frequently be of this nature also, as is discussed in greater detail below. A third, somewhat more subtle, example is the creation of favorable expectations. If government can assure the potential buyers of stability in future policy, particularly regarding the possibility of re-nationalization, estimates of $V_{pp}$, and implicitly $V_{sp}$, will be higher.
For the second class of policies, there exist many situations where government intervention in markets is desirable from the social point of view. Regulation may be desirable if the privatized enterprise will be a monopoly, such as British Telecom. In this kind of situation, regulation raises $V_{sp}$ at the cost of lowering $V_{pp}$. Policies that increase the net inflow into (or reduce the outflow from) the treasury without creating too much distortion also fall in this category.

A wide range of policies fall in class three. For example, the provision of import protection (either tariffs or quotas), exclusive licensing arrangements, or established price floors, all tend to raise $V_{pp}$ at the expense of $V_{sp}$. Of course, this may be true only in the short run. In the long run, such policies may be justified if they increase the dynamic capability of the economy.

Because policies in class five contain two elusive elements, benefits in terms of a higher sale price and transactions costs, they are hard to exemplify. Two interesting features immediately emerge from our framework, though.

First, to the extent that transaction costs require real resources on the part of the government they receive a weight of $\lambda_g$, while the increase in the sale price only receives a weight of $\lambda_g-1$. For the private negotiator transactions costs get the same weight as reductions in $Z$. Also, the government values private transactions
costs negatively. Thus, we would expect the private negotiator to negotiate harder than the government.\textsuperscript{52}

Second, bargaining often results in some focal point formula like 50/50 splitting of the difference between $Z_g$ and $Z_p$. In this case any policies that increase either of these two variables will lead to an increase in $Z$ that is only 50\% of the increase of the variable (as long as $V_{pp} > Z_g$).

The effects of all policies described above can in principle be simulated by extending the model of Section VII. Each policy set, however, consists of a myriad of options, which can be combined in innumerable ways and which therefore ultimately have to be considered on a case-by-case basis. These options will depend on variables like market structure, size of firm, type of product (e.g. tradeable vs. non-tradeable), financial situation, etc.. In this section we therefore only raise the major issues for each of the policy steps and show the applicability of our framework via example.\textsuperscript{53}

We categorize these issues by the three sets of policies mentioned at the beginning of this section. The first set consists

\textsuperscript{52} The government may have to negotiate many cases, though. There may then be economies of scale in establishing a reputation of being a tough negotiator. Still, the above principle will have to hold.

\textsuperscript{53} As in all our analysis so far we do not specifically deal with incomplete information and uncertainty faced by the agents and by the evaluator. Explicitly introducing these kinds of imperfections will have to be the topic of future research. For the time being we rely instead on sensitivity analysis to simulate the effects of alternative scenarios.
of policies as alternatives to divestiture. The second set consists of policies to overcome political constraints to divestiture. And the third set consists of policies that improve the net benefits of divestiture. Of course, the last two sets may overlap because improvements in net benefits may increase feasibility of divestiture.

B. Lifting Constraints on Public Enterprise Behavior

In this subsection we assume that some of the political constraints on Public Enterprise behavior have been lifted. It is then useful to distinguish between two alternative values under continued public operation:

- $V_{sga}$: Value under continued operation "as is"; and,
- $V_{sgr}$: Value following restructuring under conditions paralleling those of divestiture.

Such restrictions should be undertaken instead of divestiture if $V_{sgr} > V_{sga}$ and if $Z_{gr} > Z$, where $Z_{gr}$ is the minimum acceptable sale price after restructuring. This restructuring could be internal or external to the firm. First, consider an example of internal restructuring.

Effect of a change in Hiring Policy on $V_{sg}$: There is a widespread feeling that cost inefficiency is the major problem of public enterprises. Constraints on input prices and input quantities, in particular for labor, may well be responsible for this cost inefficiency. Without the threat of privatization these constraints are politically well established. Public enterprise
employees in many countries cannot be fired, and their pay (especially in lower ranks) is above that in comparable private industry jobs. Under the threat of privatization employees may then accede to some reduction in pay and in job security. How would this affect Vsg? Assuming that workers in the reference situation (denoted by superscript '0') were paid above their social opportunity wage, we have w_s < w^0_g. Now, in the counterfactual scenario their wage is reduced. In this new situation (denoted by superscript '1') w^1_g < w^0_g. At the same time the work force is reduced. Assuming that the alternative wage for laid-off workers is w, the resulting change in ΔW* (assuming that output price and quantity does not change) can be expressed as

\[
ΔW* = -ΔV_{sg} = (1 - λ_g)(w^0_g L^0_g - w^1_g L^1_g) + w(L^0_g - L^1_g)
\]

Equation 8.2 says the following: The change in the public enterprise wage bill is a saving to the treasury weighted by λ_g and a loss to the workers weighted by one. The loss to workers, however, is reduced because those laid off receive the alternative wage w.

How does this counterfactual policy compare to the divestiture option? Clearly, if divestiture would only result in the same layoff as is now being considered by the public enterprise and if there are no behavioural changes, then Z_{gr} = Z_{p}. Therefore, if the cost saving achieved through the layoff were not fully reflected in Z, then ΔW < 0 as a result of the layoff policy.
Next, consider two examples of external policy changes. The first one concerns a change in the regulated price of the output, the second one consists of a reduction in tariff protection for the public enterprise.

**Effect of a change in p on V_{sg}:** In Section IV we assumed that after privatization the monopoly firm would raise the price for the output. What if the firm under continued government operation were allowed to do the same? Assume the simple one-period case without discounting and without adjustment for shadow prices. In this case the effect of a price change for the public enterprise can be expressed as the derivative

$$\frac{\partial V_{sg}}{\partial p} = -\theta + \lambda g \frac{\partial \pi_g}{\partial p} + \frac{\partial S}{\partial p} =$$

$$(\lambda g - 1)q + \lambda g \left( \frac{\partial q}{\partial p} \right) (p - \frac{\partial C}{\partial q})$$

(8.3).

Equation (8.3) is quite familiar from the literature on optimal public enterprise pricing. In case of \( \lambda g = 1 \) it would simply say that the effect of a price change on \( V_{sg} \) is proportional to the difference between price and marginal cost. This would lead to marginal cost pricing as the optimal government policy. With \( \lambda g > 1 \) optimal price is above marginal cost.

This can be seen by looking at case 4 in Table VII-2. Here the government is assumed to charge a price of \( p_g = 1.00 \) while marginal cost is \( MC = 0.73 \). In this case \( \Delta W^* \) through divestiture is -588. Had the government enterprise charged a marginal cost price of \( p_g = 0.73 \), and had there been no binding capacity constraint, then privatization would have resulted in a positive net benefit \( \Delta W^* = 1507 \). Thus, charging a price of \( p_g = 1.00 \) turns out to be better.
than privatization (without price regulation). In fact, the optimal price for the public enterprise to charge is \( p_p = 0.93 \). In this case privatization would reduce welfare by \( \Delta W^* = -613 \).

Another way of describing the effect of these different prices is in terms of \( Z_g \). Under \( p_g = MC = 0.73 \) we get \( Z_g = -3176 \). That is, government would be willing to pay to divest the enterprise. Under \( p_g = 1.00 \) \( Z_g \) is increased to \( Z_g = 3805 \), while \( Z_g = 3889 \) at the optimal \( p_g = 0.93 \). Obviously, the type of price regulation makes quite a difference here.

**Effect of Reduced Tariff Protection on \( V_{sg} \):** In a developing country one of the most powerful policy tools applied by governments is tariff protection. Usually, a public enterprise, as the only domestic producer of a tradeable homogeneous commodity, will enjoy some tariff protection. Let us assume that this currently is enough to keep imports out, and let us assume that domestic price equals the world market price plus tariff and that the shadow price of foreign currency is the exchange rate. Domestic price is above marginal cost. The country is small in the world market and local average production costs of the public enterprise are above the world market price. Now assume that the tariff is reduced. What are the likely effects?

First, the price of the commodity will go down and the total quantity consumed will go up. This will increase consumer surplus.

Second, at the old cost level, the profit of the public enterprise is likely to go down. This will hold whether imports actually occur or not. If no imports occur, it will hold because
otherwise the old price would have been above the profit maximizing level. This is entirely possible but unlikely because it would make sense neither for the firm nor for the government. If imports occur, the public enterprise will lose output and thus profit is likely to be reduced further. However, tariff revenues may actually lead to a net financial gain for government.

Third, a reduction in tariff protection may actually affect the public enterprise's cost level. Empirical comparisons of public versus private enterprise cost levels indicate that the amount of competition in a market may have more influence on productive efficiency than ownership per se. Reduced tariff protection increases competition and puts pressure on the public enterprise management to increase X-efficiency. It could therefore lead to a more diligent resource use by the public enterprise. Such a cost reduction will be smaller than the tariff reduction, but could still be substantial. There could also be an increase in effective capacity of the public enterprise.

C. Coping with Political Constraints on Divestiture

The Effects of a Change in Firm Debt on Z: Why is it that a major issue in privatization negotiations is whether or not the government should take over the debt of the enterprise? In

principle, this should make no difference, because the sale price of the enterprise should adjust to reflect the debt situation. Further, the public and private valuations of this adjustment would be similar, if not identical. There are, however, a host of subtle points that do not permit this simple principle to work in practice.

First, as we mentioned earlier, there is frequently a fixation on book value as the appropriate price; if the price is fixed in this way a priori, there would naturally be a reluctance on the part of the government to assume any debt. In such cases, the need is to get away from this rigid notion of price.

Second, there may be political advantages to the assumption of debt. Having assumed the debt, government can raise the apparent sale price of the enterprise, thereby making the sale more acceptable politically. For example, when Britain privatized the National Freight Company, the government assumed a L47 million pension fund liability (by actually pumping this amount of money into the pension fund). The company was then sold for L51 million. It is doubtful if it would have been politically feasible to simply sell the company for L4 million.

Third, one could argue that there may be some pure gain to government assuming the debt of a company. Government can borrow more cheaply than private firms can. More significantly, an improvement of the company's balance sheet in this way will lower the future cost of borrowing, at little or no cost to the government, since the cost of assuming the debt would be reflected in the sale price. Thus the assumption of debt can be seen as a
device for shifting risk from the company to the government — a desirable policy that can raise both the social and private payoffs. There are several problems with this argument, though. First, if government is so good at borrowing money, then it should profitably become a lender to all private firms. Second, if the government pays off the debt of the enterprise, it must receive compensation in the form of a higher sale price. If the sale price doesn't rise by the full amount of the debt paid off, it is not an adequate compensation. If it does rise by the full amount, then the enterprise cannot enjoy any benefits of the debt payoff that it couldn't have otherwise. Specifically, if the buyer finances the purchase of the enterprise by issuing debt, then one form of debt has simply been replaced by another. If the purchase is financed by equity, then the buyer could have paid off the debt anyway. Third, if the government only guarantees the debt, or replaces the debt by obligations to itself, there are likely to be adverse incentive effects on the firm. For example, the threat of bankruptcy becomes simply the threat of renationalization. Clearly, these are issues worth pursuing. However, we cannot really analyse these effects without explicitly introducing uncertainty.

We have simulated the effects of two policies to cope with the political constraint that Z be positive. One is a change in p after 'divestiture. The other is a change in the enterprises's debt/equity

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55 In fact this argument underlies the debate on whether or not government should subsidize private investment generally. See Mayshar (1977) and Stewart (1979).
ratio before divestiture. The main assumptions we use for our simulations are those of the base case of Section VII with two qualifications: first the public enterprise charges the marginal cost price \( p = .73 \) and this has to be maintained after privatization. There is no effective capacity constraint. Second, through privatization costs are decreased by 10%. Divestiture in this case would result in a net benefit of \( \Delta W^* = 1961 \). However, the minimum willingness to pay by the buyer would be \( Z_p - V_{pp} - 1884 \).

As a first policy option we allow the firm a price increase after divestiture to \( p_p = 1.1 \). This will lead to a private willingness to pay of \( Z_p - V_{pp} = 1424 \). However, the net benefit of privatization is reduced by 199 to \( \Delta W^* = 1762 \). As an alternative, consider that the government increases the equity and reduces the debt of the firm by 4311. Our simulation shows that this will lead to the same private willingness to pay of \( Z_p - V_{pp} = 1424 \). However, this will leave the net benefit of \( \Delta W^* = 1961 \) unchanged. The reason is clear: the increase in equity does not cost the government anything because it is fully reflected in an increase of the sale price \( Z \).

The Effects of Trade Protection on \( V_{sp} \) and \( V_{pp} \): As mentioned before, another way of bringing up \( Z \) to politically feasible levels may be through some additional tariff protection that is granted to the privatized firm. Such trade protection can have various effects not all of which we are able to trace here. For simplicity we make the following assumptions: The public enterprise is divested as a monopoly producer. The country is small in the world market.
Before divestiture there is a unit tariff $x_{t_u}$. Thus, the domestic monopoly firm faces a kinked demand curve with a horizontal section at $p = p_w + x_{t_u}$. We assume that before and after divestiture the firm produces in this horizontal range of its demand curve. Profit maximization after divestiture demands that either the firm chooses an output such that $p_w + x_{t_u} = MC$, or there will be no imports. For simplicity we assume that the firm has limited capacity so that there will always be some imports. Average and marginal cost up to the capacity limit are constant, $AC = MC = c$. Then the effect of a tariff increase will be an increase in the firm's profit, a decrease in consumer surplus and an uncertain change in government tariff revenues. We look at the one-period case without discounting.

Under our assumptions

$$V_{pp} = (p_w + x_{t_u})q - cq$$

(8.4),

where $q$ is the capacity limit for output.

For small changes in $x_{t_u}$ we get

$$\frac{\partial V_{pp}}{\partial x_{t_u}} = q$$

(8.5).

Equation (8.5) says that an increase in the tariff rate by one unit leads to an increase in profit of the firm by $q$ units. This is due to our assumption that firm output is unaffected by the tariff.

In terms of social valuation

$$V_{sp} = \Pi_p + S_p + \lambda g x_{t_u} [q_D - q]$$

(8.6),

where $q_D = q(p_w + x_{t_u})$ is the total quantity traded in the market. For small changes in $x_{t_u}$ this leads to

$$\frac{\partial V_{sp}}{\partial x_{t_u}} = q - q_D + \lambda g [q_D - q] + \lambda g x_{t_u} \frac{\partial q_D}{\partial x_{t_u}} =$$

$$[\lambda g - 1][q_D - q] + \lambda g x_{t_u} \frac{\partial q_D}{\partial x_{t_u}}.$$
The first part of equation (8.7) gives the government revenue increase on the imported quantity. This is borne by consumers, hence the weight \( \lambda_g - 1 \). The second part of (8.7) gives the revenue reduction due the reduction in imports. The net effect could go in either direction.

We now come to the effect of a small change in \( x^*_u \) on the divestiture decision. For simplification we only look at the case where \( Z = V_{pp} \). Then

\[
\frac{\partial \Delta W^*_u}{\partial x^*_u} = \frac{\partial V_{sp}}{\partial x^*_u} + (\lambda_g - 1) \frac{\partial V_{pp}}{\partial x^*_u} = (\lambda_g - 1) q_D + \lambda_g x^*_u \frac{\partial q_D}{\partial x^*_u}
\]  

(8.8).

Thus, the effect of a tariff increase on the divestiture decision could well be positive. Obviously, this would not hold if the tariff had been optimally set in the first place and if \( q \) was not influenced by divestiture. Also note that it would generally not be optimal to increase the tariff up to a level where it no longer constrains the price setting by the domestic firm.

D. Improving the Net Benefit of Divestiture

The Effects of Price Regulation After Divestiture: The monopoly case is the obvious one where the government would not want the firm after divestiture to choose the unconstrained profit maximizing price. The question then arises of what is the effect on the privatization decision of regulating price after divestiture. For the moment, let us assume that price regulation has no effect on the X-efficiency of the firm. While the U.S. literature on rate-of-
return regulation\textsuperscript{56} suggests that price regulation increases costs relative to unregulated firms, there may also be the opposite effect due to additional pressure on the firm to survive. Also, there may exist less distorting forms of price regulation than experienced in the U.S.. One such example could prove to be the RPI-X formula developed by Littlechild for the privatization of British Telecom.

For the one-period case with a proportional corporate income tax we find that a marginal change in $p$ results in

\[
\frac{\partial V_{sp}}{\partial p} = \frac{\partial \Pi_{p}}{\partial p} + (\lambda_g - 1)\frac{\partial x^{d}}{\partial p} + \frac{\partial S}{\partial p} - \frac{q + (\partial q/\partial p)(p - \partial C/\partial q)}{1 + (\lambda_g - 1)x^{d}} - q \quad (8.9).
\]

\[
\frac{\partial V_{pp}}{\partial p} = \frac{\partial \Pi_{p}}{\partial p} - \frac{\partial x^{d}}{\partial p} - \frac{q + (\partial q/\partial p)(p - \partial C/\partial q)}{1 - x^{d}} \quad (8.10).
\]

We know that $\partial W/\partial p = \partial W/\partial p = \partial V_{sp}/\partial p + \lambda_g \partial Z/\partial p$. Assuming that $Z = V_{pp}$ we then get

\[
\frac{\partial W^{*}}{\partial p} = (\lambda_g - 1)q + \lambda_g (\partial q/\partial p)(p - \partial C/\partial q) \quad (8.11).
\]

Thus a price change after divestiture has the opposite effect of a price change under continued public operation (equation 8.3). A welfare enhancing price change under continued public operation makes divestiture less attractive while the same type of price change for the privatized firm would make divestiture more attractive. Aside from the sign the difference between equations 8.3 and 8.11 is only that the effects might have to be evaluated at different levels for the price and cost variables.

\textsuperscript{56} See, for example, L. Weiss and M. Klass (Eds.), \textit{Case Studies in Regulation}. Boston/Toronto: Little, Brown & Co., 1981.
A simulation of price regulation after divestiture is provided by case #5 of Table VII-2 and has been discussed in Section VII.

**The Effects of a Foreign Buyer for the Public Enterprise:**

Should the public enterprise be sold to a foreign buyer or not? If the public enterprise is acquired by a foreign buyer, then profits no longer accrue to the domestic economy. This could change our calculations. It is therefore important to know the effects of buyer nationality in order to assess whether the government should establish a policy of favoring domestic acquirers.

The main effect of foreignness is that the social value of the firm after divestiture no longer includes profits going to the foreign owner. Thus, in the one-period framework without discounting

\[ V_{pp} = \Pi_p - X_d. \]
\[ V_{sp} = S_p + M_p + \lambda_g X_d. \]

Thus, under foreign ownership, denoted by subscript F,

\[ \Delta W_F = V_{sp} - V_{sg} + \lambda_g Z. \] (8.12)

This differs from our previous formula, because the sale price Z is not paid by domestic agents; thus Z gets the full weight \( \lambda_g \) rather than \( (\lambda_g-1) \). Similarly, for the case of \( Z = V_{pp} \) we get a different formula. However, in this case the net result stays unchanged:

\[ \Delta W_F^* = V_{sp} - V_{sg} + \lambda_g V_{pp} = \lambda_g \Delta \Pi + \Delta S + \Delta M. \] (8.13)

The difference arises only if government cannot capture all the rents of the purchaser in the sales price. Thus, if government can
only capture a fraction \( \theta \), \( 0 \leq \theta \leq 1 \) of the firm's rent, \( V_{pp} \), in the purchasing price, then

\[
\Delta W_F = \Delta S + \Delta M + \lambda_g (1 - x^d)(\theta \Pi_p - \Pi_g) + \lambda_g x^d \Delta \Pi. \tag{8.14}
\]

Compared to this the welfare change from selling to a domestic buyer would be

\[
\Delta W = \Delta S + \Delta M + [1 - x^d]((\theta \Pi_p - \Pi_g)\lambda_g + (1-\theta)\Pi_p] + \lambda_g x^d \Delta \Pi
\]

\[
= \Delta W_F + (1 - x^d)(1-\theta)\Pi_p. \tag{8.15}
\]

Without synergies and with the shadow price of foreign currency being the exchange rate government would therefore always do worse by selling to a foreigner, as long as the price is the same. The difference in net benefit from selling to a foreigner is directly proportional to the selling price for the firm.
Section IX

EX-POST EVALUATION
(and other extensions)

A. Overview

In this section we consider two types of extensions to the body of this paper. The first extension involves shifting from the prescriptive task of suggesting what should be done in future divestitures, to the descriptive task of ascertaining what actually happened in past divestitures: that is, from ex-ante valuation to ex-post evaluation. The second set of extensions is methodological, involving a deepening of the analytics by introducing additional complications. These two types of extension are considered in turn.

B. Ex-Post Evaluation: Goals

At present, divestiture can only be supported or opposed on the basis of ideology, theory or politics, since there is only the most limited empirical support for either position. Nowhere in the world are we able to find even a single serious and balanced study of what actually happened in the wake of divestiture. Instead, what one finds is little more than elaboration on one side or the other of the following anecdotes. Visit a country and be taken to see a "success story" of divestiture, where profits have risen dramatically thanks to both lower costs (attributed to more
efficient use of all inputs) and higher sales (attributed to improved product quality and marketing). Then visit the opposition and be informed that: of course sales rose, because as a side-condition of sale, a high tariff was imposed on competing imports; and of course, costs fell, because the sale contract included the government's taking over some debt and refinancing the balance at a lower rate. Alternatively, visit a country where profitability has deteriorated in the wake of divestiture. Proponents attribute this to mismanagement of the economy by the government, making it impossible for even the most efficient businessman to turn a profit. Opponents charge that the enterprises were sold at 10 cents on the dollar and that 9 cents of that was funded by a government subsidized loan. As a result, purchasers were speculators who could turn a tidy profit by simply selling off liquid assets at a market price (e.g. head-office real estate in the capital) and not worrying about the operations of the firm.

There is presumably some truth to both sides of both stories, but how much? More precisely, for any given divestiture, one would like to know:

1. What is the bottom line: was the nation better off or worse off following the divestiture, and by how much?

2. How were the benefits and costs of divestiture distributed? Who was better off, who worse off, and by how much?

3. What variables actually changed: prices or quantities? exports or import substitution? lower inputs or
higher output? explicit or implicit subsidies, or real changes in efficiency? lower inventories or improved tax-avoidance accounting? greater adaptability to a changing environment, or a more efficient response to the existing environment? etc;

4. To what extent were the foregoing changes attributable to:

a. divestiture itself, through improved management and motivation by the private sector;

b. discretionary changes in the economic environment (prices, financing, etc.) which accompanied divestiture, but which could in principle have been accomplished under public operation:

c. exogenous changes in the economic environment which occurred independently of divestiture;

and,

d. the cross-product interaction of the foregoing independent effects?

5. How do actual results compare with those envisioned at the time of the original divestiture decision? To what extent are any divergences explained by unexpected events, and to what extent by failures in the bargaining process?

6. Given the actual distribution of benefits, could/should the actual sales price have been set higher or lower?
7. What do the achievements under private ownership tell us about priorities for reforming management practices in remaining public enterprises, and about the potential gains from such changes?

Ex-post divestiture evaluation attempts to provide answers to such questions. The goal is to improve future divestitures by understanding historical divestitures.

C. Ex-Post Evaluation: Methodology

The analytics of ex-post evaluation are a mirror image of those of ex-ante valuation: annual flows are compounded forward in the one case, but discounted backward in the other. The relevant single-period flows themselves, however, are identical in the two cases. This will therefore be a very short sub-section.

The only thing distinguishing the two approaches is empirical detail. Ex-ante, we necessarily rely heavily on assumption, whereas ex-post we rely more heavily on facts. Given the room for error in our ex-ante assumptions, it makes no sense to fine-tune them through great detail. This is equally true of divestiture valuation and project evaluation. Ex-ante, we therefore assume a single set of shadow multipliers which do not change over time, and one (or a very limited number) of price indices which do not vary over commodities. Ex-post, this is ridiculous, since relative prices vary dramatically over commodities and economic distortions vary substantially over time. To incorporate these differences, ex-post evaluation requires much finer detail in commodity categories, dynamic rather than
static shadow prices and much greater attention to empirical methodology (e.g. Divisia versus Laspeyres indexing procedures). These problems parallel those dealt with in ex-post performance evaluation and the interested reader can find guidance there.

The distinctions between the two approaches therefore involve mechanics rather than fundamental principles. Important though such issues, may be, they are better treated by example in the context of an actual study.

D. Extensions

Three further classes of extensions can be considered: theoretical, computational and empirical. Theoretical extensions can be further subdivided into partial and general equilibrium. At the partial equilibrium level, the following elements could be incorporated into the analysis:

1. uncertainty,
2. income distribution, and,
3. foreign ownership.

Some issues can be handled within the existing framework by subdividing or adding multipliers (e.g. income distribution and foreign ownership) or by modifying or redefining parameters (e.g. the public and private discount rates to deal with exogenous uncertainty. Others will be considered more complicated (e.g. dealing with endogenous uncertainty in the future of the enterprise and its market).
A further extension to general equilibrium is essential to deal with large scale divestitures, and desirable in any event. Two varieties need to be distinguished. The first is the small journal-level model designed to rigorously identify marginal conditions under restrictive assumptions. The other is the larger-scale CGE model designed to generate numerical estimates for particular national economies.

Absent a complete CGE model, computational extensions refer to modifications of the algorithm of Section VII. The current model is merely illustrative and needs to be extended both to incorporate certain material from the text (e.g.) and to allow for greater empirical detail (e.g. multiple products).

Empirical extensions refer to applications to actual cases of ex-post evaluation or ex-ante valuation. In our opinion this is by far the most important next step. Confronting actual problems is the most productive way of motivating and assigning priorities to the various theoretical and computational extensions.

E. Conclusion

In sum, although much remains to be done, we hope we have achieved our goal of beginning to do for the divestiture decision what the project evaluation literature has done for the investment decision. That is, move towards adding at least a pinch of analytically-based empiricism to what has to date been primarily an ideological or political decision.
APPENDIX

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