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Measuring Industrial
Subsidies: Some
Conceptual Issues

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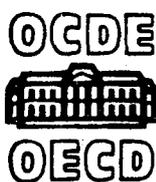
WORKING PAPERS

No. 75: MEASURING INDUSTRIAL SUBSIDIES: SOME CONCEPTUAL ISSUES

by

Professor Neil Bruce

February 1990



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Industrial subsidies should ideally be measured in ways that permit comparisons across subsidy instruments and countries, and that facilitate subsequent economic analysis of the effects of subsidisation. This paper deals with a number of conceptual issues that arise from these requirements. It first covers some definitional issues, concluding that subsidies should be measured broadly to include a wide range of instruments and both direct and indirect subsidy schemes. The paper then discusses measurement concepts for a range of instruments available to governments.

* * *

Idéalement, les subventions industrielles devraient être mesurées de manière à permettre des comparaisons entre pays et types de subvention et à faciliter l'analyse économique de leurs effets. Cet article traite d'un certain nombre de problèmes conceptuels que pose ce double objectif. Il examine en premier lieu quelques questions de définition, en concluant que la mesure des subventions devrait inclure une large gamme d'instruments et prendre en compte aussi bien les programmes de subvention directe qu'indirecte. Le papier analyse ensuite les problèmes de mesure pour un ensemble d'instruments dont disposent les gouvernements.

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by

Professor Neil Bruce

February 1990

The author is Professor of Economics at Queen's University, Kingston, Canada. He wrote this paper as Consultant to the Economics and Statistics Department. The views expressed are not necessarily those of the OECD or of the governments of its Member countries. He is grateful for comments on an earlier draft from Bob Ford, John Martin and Jeff Shafer.

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MEASURING INDUSTRIAL SUBSIDIES: SOME CONCEPTUAL ISSUES

I. EXECUTIVE SUMMARY

In this paper I examine some conceptual issues surrounding the appropriate measurement of industrial subsidies. By "appropriate" I mean the objective is to measure industrial subsidies consistently and comprehensively across industries and countries, bearing in mind the important consideration of data availability.

It is necessary to distinguish between the total subsidy, which measures the total amount of aid given to an industry, the average subsidy rate, which measures the relative amount of aid given to an industry controlling for its size, and the marginal subsidy rate, which measures the incremental subsidy to an activity conducted by a firm and, hence, the effect of the subsidy on economic incentives. An effective subsidy rate is an all-in measure that aggregates the impact of all subsidy programmes on an industry.

An important question is how broadly to define the term "industrial subsidy". If the definition is too narrow, there is a risk that reported subsidy levels across industries and countries will not be comparable. On the other hand, a definition which is too broad may be impractical. There is no conceptual answer to this question and the breadth of subsidy measurement must depend on practical criteria such as data availability and computational feasibility. In particular, I argue that the issue of which subsidies to measure should be determined independently of the question of whether particular programmes are desirable.

I proceed from the most easily measured subsidies, direct cash disbursements to firms, for which data are readily available in the national accounts, to tax expenditures, and finally to the more difficult-to-measure implicit subsidies found in government loan guarantees and government procurement practices. The general approach recommended for the latter category is to construct and evaluate a hypothetical direct cash subsidy which is equivalent to the particular implicit subsidy provision under consideration. While this procedure makes the subsidy component of a programme clear, there are difficult valuation problems to overcome. An "alternative price" at which an item would have been traded in a purely commercial transaction must be established, and it is often difficult to do this with a high degree of confidence.

Some particular measurement problems associated with various subsidy programmes are identified. The budgetary cost of direct subsidies, while readily available from the national accounts, is a gross-of-tax amount. Because these transfers are often taxable when received, the net cost is a more appropriate indicator of the cost in public funds and of the incentives provided. To measure the incentive effect, it is also necessary to examine descriptive data on each programme for caps, incremental provisions, etc., to determine whether the average subsidy rate conforms to the marginal rate.

Also, capital grants, while recorded in the national accounts, are not found in IO tables and are not readily available by industry.

Tax expenditures are reported in a way that makes them approximately comparable to budgetary amounts, but they are reported on a net revenue loss basis in many countries. As such, they are not directly comparable to the gross-of-tax amounts reported for budgetary subsidies. Also, the methodology for calculating tax expenditures differs across countries, and in all countries is subject to serious reservations. The calculation of the marginal and effective subsidy rates is complicated for some types of tax expenditures and requires a methodology similar to that followed in the effective tax rate literature.

Implicit subsidies occur when a government programme or agency provides a subsidy in-kind: when, for example, a benefit is made available to a firm with no (or only a partial) user charge. In some cases, subsidies take the form of below-market input prices or above-market output prices. They may also take the form of "offsets" in government procurement.

Evaluating implicit subsidies is very difficult in practice. In principle, one evaluates an equivalent policy for which the benefit actually received in-kind is, instead, sold to the recipient firm at a fair market value. In compensation the firm is given a cash subsidy of equivalent value. Evaluating such a hypothetical programme requires imputing the fair market price. This is sometimes possible when the in-kind benefit consists of a standardised good or service for which market prices can be observed. In other cases, a hedonic price must be calculated.

Several examples of evaluation of implicit subsidies are found in the literature. The implicit value of a loan guarantee can be evaluated using the observed default rate of the loan granting agencies. Other financing subsidies can be evaluated by comparing the private borrowing rate of the recipient firms to the subsidised rate. Special subsidies such as equity infusions and soft loans can be evaluated as a combination of an unconditional grant, interest rate subsidy and/or loan guarantee.

Implicit subsidies such as special government procurement practices, are the most difficult to evaluate. The value of offsets in military procurement practices may be obtained from an examination of the contracts (if they are not classified), but determining the subsidy component of the offset is more difficult. To do so, it is necessary to estimate the cost of the procured items in the absence of the offset. This is difficult to do unless the items are sufficiently standardised. The only feasible large-scale procedure is to apply subsidy rates obtained from a separate study of a representative sample of contracts to the total value of government procurements in each country.

II. CONCEPTUAL ISSUES IN DEFINING INDUSTRIAL SUBSIDIES

In this section, I address some conceptual issues associated with defining and measuring industrial subsidies. First, I discuss why it is

desirable to measure subsidies comprehensively across countries. Second, I examine the different ways of measuring the value of a subsidy. These provide different information about the subsidy programme being evaluated, so the values that should be reported depend on the purposes for which the information is to be used. Third, given that one is going to measure industrial subsidies, it is necessary to decide how broadly the class of "subsidies" should be defined. That is, where does one draw the line between all the rest? I argue that there is no a priori answer to this question and that the decision of how broadly to measure subsidies must be based on practical criteria.

A. Why measure industrial subsidies?

Obviously, there are numerous reasons why an individual country might want to monitor its own subsidy programmes and report summary measures of the costs involved. First, there is the budgetary and foregone revenue costs of such programmes, which represent funds that the government could have used for other public purposes, or returned to the private sector in different (non-subsidy) ways. Second, there is the domestic economic efficiency cost of subsidy programmes, which occurs because resources are allocated so as to take advantage of subsidies rather than market profitability. In some cases, the domestic efficiency cost is negative, such as when a subsidy corrects a market failure or when it permits the domestic country to capture economic rents from abroad. Third, there is the equity cost of subsidy programmes. Subsidies alter the distribution of real income in the economy, perhaps to the detriment of horizontal (the equal treatment of equals) and vertical (the appropriate treatment of different income classes) equity. Related to this is political accountability. Subsidies can be used to distribute patronage, and political institutions may wish to limit this possibility by imposing reporting requirements.

In addition, there are reasons why industrial subsidies should be monitored on an international level. Industrial subsidy programmes in different countries have effects on international economic efficiency -- that is, on the flow of goods and services across international borders in response to their highest commercial value. More fundamentally, industrial subsidy programmes can be as important as trade policies in the realm of international economic relations, and they may be becoming more so with the success of trade liberalisation agreements among countries that limit their abilities to impose tariffs. (In fact, a tariff can be considered as simply a subsidy to domestic production financed by a tax on the consumption of products in the same industry category whether produced at home or abroad.) Industrial subsidies, like trade policy, can lead to a "prisoner's dilemma" situation in which each country appears to serve its own best interest by implementing such programmes but, when all countries do so, every country is made worse off. Thus, industrial subsidies have already become the object of international negotiation toward mutually beneficial arrangements in which the subsidies are removed on a multi- or bi-lateral basis. It is this possibility that presents the most pressing need for the comprehensive and consistent measurement of industrial subsidies across countries.

B. Classification and terminology

At the outset it is necessary to establish terminology since it varies across studies. In this paper, subsidies will be classified according to whether they are direct or indirect, cash or implicit, input or output, general or sector-specific. A direct industrial subsidy is one which is received directly by the firm undertaking the activity in question. It may be implemented per unit of output or per unit of input into the activity, or per unit of output or input value. A subsidy which is fixed per unit is called a specific subsidy and a subsidy which is fixed per unit of value is called ad valorem. The total subsidy may be capped at some level, or given as a transfer to the firm conditional only on its producing some minimum level of output or using some minimum level of input. The incentive effects of such "non-incremental" subsidies may be quite different than output and input subsidies that depend on the level of the activity undertaken.

An indirect subsidy is one which is received indirectly by the firm undertaking an activity in the form of a higher market price for its output and/or a lower market price of an input, which in turn results from subsidies given to other firms and persons in the economy. Establishing the value of such indirect subsidies to the industry in question is difficult because it is necessary to determine the changes in the prices of the inputs and outputs facing an industry due to subsidies elsewhere in the economy. Thus, a truly comprehensive approach to measuring industrial subsidies will require a model of the economy, such as a computational general equilibrium (CGE) model.

Industrial subsidies may be the result of policies which are general and available to all firms, or policies which apply to only a particular industry or group of industries or firms. In the latter case they are described as sector-specific. A truly general "subsidy" is not a subsidy in its economic effects. In particular, there is no meaningful way that all sectors of an economy can be subsidised. For example, if the government subsidised all sectors at the same rate (and raised the necessary revenues by taxing all sectors at the same rate), there would be no impact on relative prices. Even though the measurement of subsidies from budgetary sources would record extensive subsidisation, the economy would allocate resources no differently than in the absence of these nominal subsidies (except for the resources used in administering the programmes). Hence, subsidisation must describe policies which differentially affect an industry or a group of industries relative to others. However, a policy which is nominally general may in fact have sector-specific impacts. For example, accelerated depreciation may favour capital-intensive industries.

A cash subsidy is one which is paid out as a transfer to any private firm or person in the form of a budgetary expenditure. I include in this category relief from taxes in the form of tax expenditures because many countries report these provisions in a document analogous to the expenditure budget. Thus, the amounts of cash subsidies could, in principle, be ascertained from budgetary documents and pose the least problem in terms of obtaining the information.

An implicit subsidy is one which is given in-kind without a user charge sufficient to recover its value. Therefore, the value of an implicit subsidy must be imputed. This category of subsidies poses information problems

because the amounts are not routinely reported in government documents. Also they may pose serious difficulties of valuation, even in principle. Implicit, indirect subsidies which are nominally general but have sector-specific impacts pose the biggest problems of all. There are the problems of information, valuation, and imputation as well as the analytic problem of determining how much the subsidy affects a particular activity in question. Also, whenever considering indirect general programmes, there is the transcending problem of where to draw the line between those government activities which are to be included as a form of "industrial subsidy" and those which are not.

We can express a subsidy in terms of its total, average, and marginal (or incremental) values. Furthermore, the total value of a subsidy can be measured either as the total cost of the subsidy to the government, to the economy, or as the total benefit to the recipient. In general, these different measures of the total subsidy will yield different empirical magnitudes, as discussed below. The average and marginal values of a subsidy can be expressed per physical unit or, more conveniently, as a percentage of the value of the subsidised activity. The average value of the subsidy is the total value of the subsidy divided by the total value of the activity subsidised, while the marginal value of the subsidy is the increase in the total subsidy divided by the value of an increment in subsidised activity.

It is important to recognise that the average and marginal value of a subsidy can differ by non-trivial amounts. For example, the marginal value of a subsidy is zero to a firm if the total subsidy that it is eligible to receive has reached some upper limit at which the amount of the subsidy is capped. This will be the case even though the average subsidy rate may be substantial. On the other hand, some subsidies are implemented on an incremental basis, such as the U.S. incremental R&D tax credit. This type of tax credit applies only to increments in R&D spending above the average spending level reported by the firm in the previous three years. In this case the average is less than the marginal subsidy.

It is important to distinguish between the marginal and average subsidy rate because a firm's decision about how much of an activity to undertake depends on the marginal subsidy rate rather than the average rate. The reason is that the average rate includes the subsidy paid on units of the activity that the firm would have undertaken whether or not there is a subsidy. For example, a firm which already produces at a level where the total subsidy equals a capped value will not produce more as a result of the subsidy, and so the subsidy has no incentive effect. Rather, the subsidy is a lump-sum transfer which simply serves to augment the firm's profits.

A further distinction concerns the effective versus the nominal subsidy rate. The term "effective" is somewhat flexible and can refer to the subsidy rate calculated in a way which incorporates any of a number of provisions. In general, an effective subsidy rate is a more comprehensive or "all-in" measure. For example, it may incorporate both the direct and indirect subsidies affecting the industry. It may also include the future consequences of a subsidy programme as well as its value in the current year. The marginal effective subsidy rate is the best measure of the overall incentive provided to an industry.

A good example is provided by the U.S. incremental R&D tax credit. In this case, past spending on R&D determines the level of current R&D spending eligible for the tax credit. Thus, a firm recognises that higher spending on R&D in the current year reduces the eligibility of future spending by raising the average level of spending. This implies that the effective marginal subsidy rate on current R&D spending is less than the nominal rate. Indeed, the effective rate could be negative, so the firm is discouraged from undertaking more R&D investment in the current year.

More generally, with respect to the undertaking of a durable (capital) activity, the effective subsidy rate may include the present value of all government aid on the activity, both at the time it is initiated and in the future (i.e., the capitalised value of the subsidy). For example, a subsidy taking the form of a low interest rate loan to the firm to purchase a piece of equipment can be expressed as a present value of the current and future amounts received. The present value is most comparable to a capital grant made to the firm for the purpose of purchasing the equipment.

The effective subsidy rate may also be calculated on a narrower base than the nominal subsidy rate. For example, an industry may consist of the processing and assembling of raw materials and intermediate products, so that the value-added amounts to (say) half the value of the final output. A subsidy rate of 10 per cent on the final output of such an industry yields a 20 per cent effective subsidy rate on the processing and assembling of the materials. This reasoning is familiar from the literature on effective tariff (protection) rates.

C. How broadly should subsidies be defined?

Defining what is and what is not a subsidy is not a trivial problem, as indicated by the observation by Prest [1974], who concluded "...I was under the delusion that I knew what a subsidy was: now I am no longer so sure." One can choose to define industrial subsidies broadly or narrowly. There is no conceptually correct solution: rather it must be based on practical criteria, such as the information available or expected to be available and the inferences one wants to draw from the information collected.

A very narrow definition would include only direct sector-specific cash transfers to firms, which are the most easily measured form of industrial subsidy. The danger in using a narrow definition is that other types of programmes, which may be equivalent to direct cash subsidies in terms of their economic effects, are excluded. For this reason, a comparison of narrowly-defined subsidy rates across industries or across countries may give a very misleading picture if some industries in some countries receive cash subsidies whereas others receive equivalent aid in any manner other than a cash subsidy.

This problem is exacerbated by the fact that the form a subsidy takes may be endogenous. Subsidies may benefit a country at the expense of its trading partners, so reducing industrial subsidies may be, or become, the object of multilateral trade negotiations. A narrow definition of industrial subsidies may encourage countries to substitute hidden forms of subsidisation for the transparent forms included in the narrow definition. A broader

definition would limit the appeal of using non-transparent types of subsidy programmes.

The above discussion suggests that subsidies should be defined broadly, but this has its own problems. First, there are the problems of measurement if the definition includes implicit and indirect subsidies. Second, a broad definition may lead to considerable dispute among countries, or even within a country, about the propriety of including certain provisions. Third, the definition may be so broad as to be virtually useless. For example, the broadest possible definition of an industrial subsidy might be based on a comparison of a producer's price with its marginal or average cost in the hypothetical absence of all government taxing and spending activities. Thus, the definition of industrial subsidies would include the benefits to producers of unpriced public goods, such as roads, the justice system and the education system, as well as the impact of government tax and transfer policies on prices. Further, to be consistent, the taxes imposed on the firms to finance these activities would have to be counted as negative subsidies, since they would not have been imposed in the absence of a government sector. But this all-embracing definition is impractical. Determining the hypothetical output and input prices in the economy in the absence of a government sector constitutes a major computational general equilibrium exercise, and even if this were done, the results would be subject to so much uncertainty that they would be of little interest.

To a certain extent, however, this broadest definition is useful as a theoretical framework because many of the conceptual problems it raises must be addressed even with a more workable definition of industrial subsidy. These problems include the valuation of implicit subsidies, indirect effects through changing market prices, the extent to which the offsetting tax liabilities associated with delivering a subsidy reduce the actual subsidy rate and the offsetting effect of industrial subsidies received in many industries. I will address these and other problems individually below.

The aim, then, should be to choose a definition for industrial subsidies that is broader than direct cash transfers to businesses but narrower than a definition encompassing the overall impact of the government sector. It is useful to work from both ends. First, for the reasons mentioned, it is desirable to include implicit direct sector-specific subsidies, which would include subsidies that are received in-kind. It would also be desirable to include general direct subsidies such as aids to R&D investment. At the other extreme, it is probably desirable to exclude most general transfer programmes to households. A possible exception is unemployment insurance because it may indirectly subsidise particular industries, such as those of a seasonal or cyclical nature. It would also be desirable to exclude most of government expenditure on public goods such as justice and internal security, schools and higher education, roads and bridges, national parks and resource management, and national defence. Here again one may wish to single out particular components of these general expenditures, to the extent they can be identified. Examples might be R&D subsidies implicit in spending on higher education, military and space programmes and, particularly, any hidden sector-specific subsidies found in the "offsets" in defence contracts.

The above discussion emphasises the pragmatic considerations of data availability and the desired comparability of subsidy rates across industries and countries as the best criteria for choosing how broadly to define industrial subsidies. Other criteria exist, but all are subject to serious problems.

One is the economic justification of a subsidy. It is sometimes argued that there are "bad" subsidies which act as market distortions and represent attempts to aid a particular industry or group at the expense of others, and there are "good" subsidies which correct market failures. In this case, "good" and "bad" are determined by considerations of economic efficiency. But it is not an easy job to distinguish subsidies clearly in this way. For example, even seemingly obvious cases of protectionism such as export financing subsidies may be construed as corrective by arguing that a government-subsidised export-import bank corrects capital market failures faced by firms when conducting international transactions. Another problem with using the economic efficiency criterion is that the existence of an economic efficiency rationale does not imply that the entire value of the subsidy is of a corrective nature. If capital market imperfections cause an increase in financing costs of one-half of a percentage point on international transactions, an export finance subsidy of two percentage points would consist of one-half point of "good" subsidy and one and one-half points of "bad" subsidy.

In general, the determination of the "bad" subsidy (which is the amount to be reported if this criterion were used) requires the valuation of all market failures in order to find out whether the subsidy rate is greater or less than the optimal rate. I doubt the feasibility of such an undertaking, particularly on a cross-country scale. Instead, the decision of whether to include any particular programme should ignore the economic rationale of the subsidy, just as tax expenditure reporting ignores the question of whether a tax preference is desirable. This leaves the issue of whether a reported subsidy programme should be maintained, or whether it should be the subject of inter-country negotiation, to the political process rather than to the subsidy measurement staff.

This does not mean, however, that measuring subsidies is separate from the issue of subsidy policy -- in fact it is a crucial first step. If a "subsidy reform" programme is desired, it is necessary first to identify and quantify existing subsidies across industries. The second step is to evaluate the levels of desirable or justifiable subsidies across industries, say as determined on social welfare grounds, to see whether particular industries are subsidised too much or too little. I see no reason why the two stages should be combined -- indeed, there are good reasons not to combine them, because subsidies which may be desirable according to one social welfare objective may be undesirable according to others. Thus, it is best to leave the issue of whether a subsidy is justified or not to a subsequent stage which uses the measured value of subsidies as an input.

An alternative method of choosing which subsidies to measure is to use the criterion of government intent. Programmes are included only if their clear intent is to aid an industry. For example, it may be argued that a government labour-market policy, such as a job training programme, is not intended to subsidise a particular industry, that any subsidisation that does

occur is an unintended side product and therefore that it is not to be included in the study. There are two dangers with a strict application of this criterion. First, the intent of the government is not always stated, nor need it be the case that there is a single intent. The intent of food-stamp programmes may be both to help the poor and to subsidise farmers. Second, the government may dissemble regarding its true intent. It is hard to imagine a government actually admitting that the intent of a programme is to gain an industrial advantage at the expense of its trading partners. Rather, the intent of the programme might be described as seeking regional or industrial balance, or improving international competitiveness. Thus, intent alone cannot be used to determine which subsidies should be measured.

Nevertheless, the purpose of a programme may be used judiciously in determining the appropriate definition of a subsidy. Many general-spending and tax-relief programmes have sectoral subsidisation "side effects". Where there is an obvious non-subsidy rationale for such a programme, and particularly where similar programmes are pursued in most countries, the programme might be excluded. This would be the basis for excluding programmes such as social security, unemployment insurance, Medicare, and most public works. Also, some tax expenditure provisions, such as lower tax rates on capital gains, the dividend tax credit and non-taxation of inter-corporate dividends, can be interpreted as methods for integrating the personal and corporate income tax systems and so can also be excluded on this basis.

III. METHODS AND SOURCES FOR MEASURING INDUSTRIAL SUBSIDIES

In this section, I consider the various types of subsidy programmes that should be included in a comprehensive study of industrial subsidies and how they can be evaluated. I discuss some of the problems that are likely to be encountered when evaluating particular types of subsidies. I begin with direct cash subsidies and then proceed to tax expenditures and implicit subsidies. I also discuss the data requirements for measuring industrial subsidies with reference to sources of which I am aware for Canada.

The objectives of subsidy measurement are taken to be:

- i) a comprehensive coverage of subsidies including indirect and implicit subsidies as well as the direct grants on current account which are reported in the National Accounts;
- ii) information on both the total value of the subsidy received by an industry, and on the marginal subsidy on the output of the industry is required -- the former measures the budgetary resources devoted to subsidising an industry and the latter measures the incentive effect of the subsidy;
- iii) subsidies are to be measured with respect to a counterfactual environment in which they do not exist, rather than as the deviation of the subsidy rate from its optimal value. That is, one is not interested at this stage in distinguishing between "good" and "bad" subsidies, although they should be measured in a way that is useful for a subsequent evaluative study;

- iv) the methodology should be useful for integrating information on industrial subsidies with information on border taxes/subsidies and other forms of protection for domestic industries.

A. Direct cash subsidies

Information on the amounts of these subsidies, as reported in the National Accounts, is the most readily available and is already collected routinely by the OECD. Aggregate information is found in Table 9 of the Canadian National Income Accounts which include in the total all items satisfying the following standardised U. N. definition:

"Subsidies include all grants on current account which private industries receive from governments. These are transfers which in view of the basis on which they are made represent additions to the income of the producers from current production. The grants may, for example, be based on the amount or value of commodities produced, exported or consumed, the labour or land employed in production, or the manner in which production is organised or carried on. Transfers from public authorities to private industries for investment purposes, or to cover destruction, damage and other losses in capital and working assets are classed as capital transfers rather than subsidies."

Subsidies according to this definition are also disaggregated by industry in many national input-output models, for example, the Canadian input-output model produced by Statistics Canada. In this model, subsidies enter as negative taxes disaggregated by sector. To my knowledge, the I-O data are the only industry-disaggregated data on subsidies to businesses by all levels of governments available in the public domain in Canada.

The input-output model can be used to determine an "effective" output subsidy rate by final-use classification. This rate would include the effects of direct cash subsidies in the "upstream" sectors which are cascaded into the given final-use sector through inter-industry flows. This would be the same methodology as was used to determine effective sales rates in Canada (see Kuo et al. [1988] for details) and effective rates of tariffs in the trade literature. It assumes that a direct output subsidy in the "upstream" industry is like a direct input subsidy to the "downstream" industry to the extent that the latter uses the output of the former in production. Essentially, indirect subsidies (i.e., those given to a producer in another industry) are treated like direct subsidies in that they are assumed to reduce the cost of inputs to the user industry by the amount of the subsidy (i.e., there is full forward shifting).

The National Accounts also report the amounts paid to businesses as capital assistance such as transfers for plant expansions, etc. The reported total amount is much smaller than the current account subsidies. For example it was equal to \$1.231 billion in Canada in 1981. This amount does not appear in the input-output tables so disaggregated data are not routinely available.

1. Some difficulties with measuring direct cash subsidies

In many countries, direct subsidy transfers are often taxable in the hands of the recipients (i.e., they are added to a firm's taxable income). It would be appropriate to adjust for this fact and report only the net subsidy. To my knowledge this is not done in the reporting of subsidies in the national accounts, and it would be difficult to make an adjustment because the net subsidy depends on the tax position of each firm. For example, if the firm is non-taxable, the gross subsidy is equal to the net subsidy, while if the firm is fully taxed at a corporate tax rate of, say, fifty per cent, the net subsidy is only one-half of the gross amount. Firm-level data would be required to make the adjustment accurately.

I should emphasise that I am referring here to the taxes payable on the subsidy received by the firm itself, and not to an adjustment for the firm's share of the overall increase in the tax revenues needed to finance the subsidy programme. When subsidy programmes are extensive, it would also be desirable to make some adjustment of this type. In this way, the offsetting effects of subsidising many industries would be incorporated into the analysis. This could be accomplished by subtracting from the total subsidies received by a particular industry an amount equal to the total subsidies paid to all industries times the tax share of the industry in question. Note that an industry which receives no subsidies would then be reported as receiving a negative subsidy overall because of its share of the taxes needed to finance subsidies to other industries. Furthermore, total subsidies net-of-taxes aggregate to zero over all sectors.

A main difficulty in adjusting for the revenue implications of a subsidy is that it is necessary to know the burden of the existing tax system including personal income taxes, corporate income taxes, consumption (sales) taxes and property taxes. To my knowledge, this information is not available and could not be constructed easily. A simple, though perhaps erroneous, alternative is to assume that each industry bears the personal income, property, and direct sales taxes in the same proportion as the corporate income and indirect sales taxes it pays. Corporate income and indirect sales tax burdens by industry are readily available.

The key subsidy rate is the marginal subsidy rate, because it is critical for the issue of incentives. Calculating the marginal subsidy rate is accomplished most easily by assuming it is equal to the average rate, which is obtained by dividing the total subsidy by industry output or value. This, however, ignores the fact that many of the subsidies have caps which are strictly binding, in which case the marginal subsidy rate is zero. It is also possible that some of the subsidies are incremental, in which case the marginal rate will again differ from the average.

To make an adjustment for the difference between the average and marginal values of the subsidy rates would be a substantial undertaking and would be worthwhile only where circumstances exist which are expected to create sizeable differences between the marginal and average rates. To establish this, it is necessary to examine descriptive material on each subsidy programme to determine whether it has a cap, incremental features, or a variable rate structure. One would then have to determine what percentage

of the value of output is produced at each marginal rate and calculate the weighted average to obtain an "average" marginal rate.

Adjustments for incremental features in a subsidy programme may involve further difficulties. The simplest approach is to report the nominal subsidy rate per unit from the description of the programme. As mentioned earlier, however, for firms operating below the critical value of output at which the incremental subsidy becomes effective, the marginal subsidy rate is zero, or even negative, because the higher level of current output may raise the critical level in the future.

Descriptive information on subsidies to businesses may be available from special studies. For example, in Canada a great deal of information on federal subsidies is found in a special study prepared for the Nielsen Task Force on Programme Review [1986]. This task force examined fifty-seven federal subsidy programmes including tax expenditures. Descriptions of programmes and data on expenditures and person years devoted to administration are provided for each programme from 1980 to 1987. The information is derived from federal ministry-level sources. Similar information is unlikely to be available on a closely comparable basis for other countries or even for other levels of government in Canada. Some descriptive material on federal and provincial industrial subsidy programmes in Canada, but no data, is also found in Johnson [1984] and Doherty *et al.* [1986].

2. Integrating information on industrial subsidies and trade barriers

There is little doubt that industrial subsidy programmes are part and parcel of a country's commercial policy. Specifically, arguments about rent shifting and entry deterrence suggest that subsidisation can be as important as tariff and non-tariff import barriers for the purpose of improving a country's welfare at the expense of its trading partners. Moreover, with the tighter limits placed on border taxes and restrictions through multi-lateral trade negotiations, the use of industrial subsidisation for this purpose has been increasing and may increase in the future. For this reason it is desirable that the relationship between measured industrial subsidies and trade restrictions be made transparent. Ideally, they should be reported in some integrated manner. The following is an attempt to suggest, in broad outline, how this can be done.

A number of agencies monitor and report levels of effective protection afforded by tariffs, quotas and other trade restrictions. Noguez *et al.* [1986] have recently reported on the extent of non-tariff barriers in industrialised countries. Under certain assumptions, non-tariff barriers can be expressed in terms of tariff and export subsidy equivalents. An import tariff (export subsidy) can be thought of as a production subsidy combined with an equal-rate excise tax on an import-competing (exportable) good. Thus, the production subsidy component of import tariffs and export subsidies can be added to the subsidy provided to an industry through industrial subsidy programmes to get a total output subsidy for the industry. Similarly, the excise tax component of the tariff can be added to any additional general and selective consumption taxes imposed on the industry because of the revenue needs of the programmes to get a total incremental consumption tax imposed on the industry.

The effects of industrial subsidy programmes and commercial policies can be combined, and three numbers can be reported for each industry -- the total production subsidy, the total consumption tax, and the effective border tax/subsidy which is equal to the minimum of the two. For example, suppose an import-competing industry faces a world price of one dollar per unit of output and there is an effective tariff rate of fifteen per cent. In addition, assume that the industry benefits from direct and indirect subsidies amounting to ten per cent of producer cost. Then production will take place up to the point where the supply price is equal to $\$1.15/.90 = \1.278 , implying a total 27.8% subsidy over the world price. If, in addition, the revenue cost of the subsidy less the revenues collected by the tariff results in an additional VAT rate (say) on the commodity of 1 per cent, then the total tax on consumption of the industry, as a result of combined effects of the industrial subsidy and commercial policy, is just over 16% (because the tariff inclusive price is subject to the VAT). The combined policy can be reported as a 16.2% tariff plus an 11.6% production subsidy, or as a 27.8% production subsidy offset by a 16.2% consumption tax.

B. Tax expenditures

While direct cash subsidies are likely to be the most important and the most readily obtained subsidy data, they exclude many subsidies which come in the form of tax expenditures and implicit subsidies. I will discuss each of these in turn. It is desirable that the information on all types of subsidies be comparable, or at least approximately so.

In large part, this is already done for reported tax expenditures because, by definition, tax expenditures are comparable to budget outlays. The value of a tax expenditure is calculated as the value foregone as a result of a special tax preference using the existing tax rate structure. Of course, if the tax expenditure did not exist, the tax base would be broader, and the same revenue could be collected at a lower tax rate. Thus, like direct subsidy programmes, tax expenditure subsidies are evaluated taking existing taxes, which include the revenues needed to finance the subsidies, as given. As in the case of direct subsidies, it would be desirable in principle to calculate the value of a tax expenditure subsidy net of the taxes that finance it by making an adjustment for an industry's share of the higher level of taxes needed to finance the subsidy in the tax code. As in the case of direct subsidies, this would properly identify the differential feature of true subsidisation and adjust for the fact that a universal subsidy, direct or through the tax system, is not a subsidy in terms of its economic effects.

1. Some difficulties with measuring tax expenditure subsidies

In most countries, information on tax expenditures is probably the most readily available information on subsidies after the national accounts data. Also, tax expenditures to business are disaggregated into broad industry groups in some countries. However, the information is sometimes reported irregularly, as in Canada, or not at all. Also, there is no standardised definition of a tax expenditure as there is for the national income accounting subsidy, so tax expenditures may be calculated in different ways in different countries (or even within the same country, as in the U.S. where the Treasury and the Congressional Budget Office use different methodologies). Fortunately, there is a moderate amount of conformity (see OECD [1984] and

McDaniel and Surrey [1985] on international comparisons of tax expenditure reporting). I expect that most countries follow similar procedures for calculating tax expenditures arising from investment, employment and R&D tax credits, reduced corporate tax rates for small businesses and for manufacturing and processing, and depletion allowances to resource industries.

One major problem with reported tax expenditures is that, in some countries they are reported as "net of tax" values. That is, they are not grossed up by the taxes for which the firm would have been liable had it received the subsidy as a transfer (in the U.S., at least, grossed-up values of tax expenditures are also reported). While the net value is the most appropriate measure of the subsidy received (and of the net revenue loss), recall that the subsidies reported in the national accounts are gross-of-tax values. As recommended above, ideally all subsidies should be reported in net form but this would be difficult to do for direct cash subsidies. Thus, it is not clear how this inconsistency should be reconciled. If "grossed-up" tax expenditures were available for all countries, reporting the gross values of direct cash subsidies plus tax expenditures would at least have the merit of cross-country consistency. Since this is not the case, mixing gross and net subsidy values seems unavoidable once tax expenditures are included.

A second problem with tax expenditures is that, in many cases, they are universal rather than sector-specific because the tax law applies to all firms equally. Nevertheless, many tax expenditures are likely to have sector-specific effects. For example, among the largest tax expenditures are accelerated depreciation and immediate write-off for certain types of capital goods. While these are nominally available to all taxpaying firms undertaking investments of the qualifying type, industries which use the qualifying types of capital more intensely are more heavily subsidised. Thus, an accelerated write-off provision for blast furnaces clearly acts as a sector-specific subsidy to the steel industry. The effective subsidy for an industry can be calculated using the share of the qualifying investments in its total value added.

Another problem is that it is doubtful that conventional methods of measuring tax expenditures for accelerated depreciation are conceptually correct. In most countries, the tax expenditure for the capital cost recovery (i.e., depreciation) is measured on a cash-flow basis (i.e., as reduced net tax revenue in the tax year) using book depreciation levels as the benchmark. Jog and Mintz [1989] find that, in Canada at least, if economic depreciation is used as a benchmark, the "true" tax expenditure is actually negative. This is because the cost recovery under the tax system is not indexed for inflation, whereas economic depreciation is. As a result, the rate of depreciation allowed for tax purposes may be less than economic depreciation, even if the permitted rate of depreciation exceeds the physical rate.

Two problems are encountered when calculating the marginal subsidy rate, either to investment or output, of accelerated depreciation and immediate write-off provisions. One difficulty is that the amount reported in the tax expenditure table may include accelerated depreciation for old capital where, in many cases, the provisions no longer exist. Another problem is that the incentive to undertake an investment depends on both the present and discounted future values of the tax expenditures available for an investment. A promised tax relief in the future acts as a subsidy in the current year.

For both reasons, tax expenditures calculated as the tax saving in a given year may not be indicative of the true marginal subsidy rate.

Marginal subsidy rates resulting from accelerated depreciation can be calculated using the marginal effective tax rate methodology (as an example, see Boadway, Bruce and Mintz [1988]). This is done by calculating the wedge between the corporate-tax-inclusive hurdle rate of return on an investment and the return paid out on the corporate liabilities before personal taxes under the existing depreciation provisions and under some benchmark alternative, such as book or economic depreciation. The difference is the effective marginal subsidy rate on the investment in question, which can be expressed in terms of a marginal subsidy rate on output by multiplying by the share in value added of the services of the type of capital in question.

The main difficulty with this methodology is that it requires considerable resources if it is to be done on a cross-country, disaggregated-by-industry basis. In addition, it requires assumptions and information that may be subject to dispute (for example, estimates of the ex-ante real rates of return required on corporate securities), which may serve to reduce the acceptability of the reported results.

C. Implicit subsidies

There is little doubt that implicit subsidy programmes pose the biggest challenge for measuring industrial subsidies consistently and accurately. An implicit subsidy is provided when a government programme or public enterprise provides a subsidy in-kind, such as when an input is made available to a firm without a user charge (or without a "full" user charge), or when the subsidy is "hidden" in the form of higher-than-market prices paid to the firm on purchases made by the government or a government agency. Implicit subsidies may also take the form of "offsets" in contracts involving government purchases from another firm altogether, such as a requirement in a defence contract that the contractor purchase certain inputs, or even unrelated goods, from designated domestic firms or industries.

To evaluate these types of subsidies, the best approach is to follow the procedure used by the tax expenditure theorists in their work. That is, evaluate an implicit subsidy programme by constructing and evaluating a hypothetical programme of taxation and direct spending which is equivalent to the implicit subsidy programme being analysed. For example, a government programme that provides low interest rate loans to firms in certain industries can be evaluated as equivalent to a programme where revenue is raised to pay a direct subsidy to the firms on loans obtained from private lenders in the capital market, such that the subsidy-inclusive interest rate on the loans is the same as that under the low-rate programme.

In many cases, it is difficult to carry out this exercise because the alternative price is not observed or easily imputed. But the procedure is a consistent and useful way to approach each type of subsidy. I now consider some of the common implicit subsidy type programmes and how the subsidy can be measured.

1. Implicit subsidies to private business financing

These implicit subsidies take the form of low interest loans, loan guarantees, soft (conditional) loans, equity infusions, and special export finance subsidies. All cases involve an implicit subsidy to the financial cost of carrying on a business. The implicit subsidy could be expressed in a form comparable to an interest rate, which expresses the subsidy per dollar of capital per year, or it can be capitalised. That is, the present value of the subsidy over the lifetime of the loan is calculated. This amount is equivalent to a capital grant to the firm.

a) Low Interest Loans. Low interest loans to businesses are provided by numerous government agencies in many countries. In Canada, as of March 31, 1980 there were at least twenty-eight agencies at the federal and provincial level engaged in this or related activities. Loans are made to qualifying business enterprises at low rates. The rates vary from programme to programme but, for the most part, they are tied to the government borrowing rate. Some rates are substantially below this. Also, while the government lending agencies require the same types of collateral as private agencies in order to make the loans, they generally accept lower rank claims, which substantially reduces the chances of recovery in the event of bankruptcy.

As mentioned, subsidies to business finance in the form of low interest rate loans can be evaluated in terms of an equivalent tax and subsidy programme. Specifically, one can calculate a cash subsidy equal to the difference between the rates of interest charged on the loans made by the public agencies and the rate of interest the firms would have had to pay to private lenders, times the amounts of loans made. It is reasonable to assume that this hypothetical subsidy would be financed out of general revenues so the amount can be added to the government's revenue needs when estimating the tax side of the subsidy.

The amounts of loans made by the public agencies and the average interest earnings on them are available from their annual reports. The main difficulty is in estimating the interest rate that the firms would have had to pay to obtain the financing from private lenders. It could range anywhere from the prime rate to the interest rate on low-grade ("junk") bonds. While many of the firms who borrow from the public agencies could borrow privately only at high interest rates, other firms which borrow at the triple-A bond rate are no less inclined to refuse a subsidy if it is offered. Short of an analysis of the risk characteristics of each borrower, there is no way to estimate the alternative borrowing rate accurately. An arbitrary rule of thumb, such as using the simple average of the low-grade and high-grade bond rates, may be the only resort.

It should be noted that with this methodology it would be inappropriate to include the administrative cost of the agencies directly as part of the subsidy. These costs are presumably captured in the alternative market rate, assuming that the administration of public lenders is no more costly than for private lenders. To include them would be double-counting.

b) Loan Guarantees. Closely related to low interest loans is the case where a government agency, for a nominal fee, makes a guarantee to a private lender that the interest and principal on a loan made to a private business

will be repaid. In this case, the government becomes liable to repay the loan in the event the borrower defaults. Accordingly, the lender need not charge a risk premium to compensate for the costs of default, and makes the loan at the risk-free interest rate.

Again, this is equivalent to a direct subsidy programme for which the government uses general revenues to finance a cash transfer to the firm equal to the default risk-premium component of the interest rate times the amount loaned. This suggests that the subsidy cost could be estimated using some measure of the risk premium in private borrowing times the amount of loans guaranteed. The risk premium could be observed if the appropriate contingent markets exist (see Jones and Mason [1980] for a description of this methodology). Unfortunately, such markets do not exist for the securities in question, and it would be necessary to estimate the risk premium for individual firms. This entails the same sort of difficulty as that encountered for evaluating low interest loans -- the firms making use of the programme are likely to have heterogeneous risk characteristics.

A possible solution is to use an ex-post "hedonic" approach. In this case, a hedonic risk premium is calculated using the actual record of defaults and the administrative cost of the loan guarantee agencies. Such an approach was followed by Mintz et al. [1984] in their estimates of the cost of loan guarantees made by public authorities in Canada.

Mintz et al. assume that a loan repayment is amortised at a constant rate A each year, and the probability that the firm will not default is the same in each year. The probability that the firm will not default on payments up to and including that made in period t is p^t , where p is the probability that the firm will not default in a any given year. The default probability distribution is thus a simple exponential one. The analysis could be generalised by assuming that default probabilities satisfy the more realistic Weibull distribution, but then parameter estimates for the distribution would be needed.

Without a loan guarantee the risk-neutral private lender would capitalise a payment stream $p^t A$ for $t=1, \dots, T$. If the loan is one dollar and the certainty interest rate is r , we can solve for $A-r$ or the capitalised value, $(A-r)/a$. In the simple case of a perpetuity, $A-r$ is equal to $(1-p)(1+r)/p$; thus, if $p=1$ (i.e., zero probability of default), the interest value of the guarantee $A-r$ is equal to zero. More generally, $A-r$ increases as p declines. This is the default cost per dollar of loans guaranteed. Mintz et al. estimate this cost using past claims less recoveries on loans guaranteed by the government agencies and multiplying it by the amount of loans. The costs of administration less fees charged is added to this. They estimate the implicit subsidy provided by eight agencies giving loan guarantees and their results are presented in Table 1, which is taken directly from their study. As can be seen, the subsidy rates range from small negative amounts to a high of 4.3% for the British Columbia Development Corporation.

One obvious difficulty with this approach is that the ex-post probabilities of default, particularly as estimated for a given year, may not be representative of default risk. Also, any legal costs borne by private lenders upon default are ignored. Further, if the market is risk averse on

Table 1

Subsidy Implicit in 8 Agencies Giving Loan Guarantees

As of March 1979

	Value of Subsidy <u>(\$000)</u>	Average Loans Guaranteed <u>(\$000)</u>	Subsidy per Dollar of Loans Guaranteed <u>%</u>
Financial Assistance to Industry Program (New Brunswick)	466.0	22,481.0	2.1%
La Société de développement industriel du Québec	-552.0	118,380.6	-0.5%
Ontario Development Corporation	116.5	11,606.0	1.0%
Manitoba Development Corporation	-19.0	4,862.5	-0.4%
British Columbia Development Corporation	243.6	5,709.5	4.3%
Enterprise Development Program (Federal)	2,259.0	129,119.1	1.8%
Small Business Loans Act	1,477.0	51,250.1	2.9%
Department of Regional Economic Expansion	<u>137.1</u>	<u>18,532.0</u>	<u>0.7%</u>
TOTAL	4,128.2	361,940.8	1.1%

Source: Economic Council of Canada and various reports.

Taken from Mintz, J.M., J. Carrière and C. McCaughey, "Determining the Subsidy Involved with Government Credit Programs", Economic Council of Canada, Discussion Paper 256, 1984, p. 28.

average, the actual default premia will be higher than that estimated using the Mintz *et al.* risk-neutrality approach.

c) Conditional Loans. Conditional loans are loans made by a government agency for which repayment is forgiven under certain circumstances. In effect, they are a cross between a grant and a subsidised loan. For example, the loan may be made under terms for which it is virtually certain never to be repaid, in which case it is equivalent to a cash grant although it is not reported as such in the government accounts.

To evaluate the implicit subsidy, it would be necessary to estimate the probability that the loan will not be repaid. This probability times the amount of conditional loans made will be the "grant component" of the loan. The amount of the loans minus the grant component is the "loan component". For the loan component it is necessary to determine any subsidy given through a below-market interest rate. This is done in the same way as described for low interest loans. The capitalised value of the low interest rate subsidy plus the grant component per dollar of loan is equal to the implicit subsidy per dollar of conditional loan.

d) Equity Infusions. When a government agency contributes to the equity of a firm, the policy could be considered equivalent to anything ranging from a cash grant to a subsidised loan. Again, these equity infusions are usually made under terms more favourable to the firm than it could receive in private equity markets. Unlike loans, the firm has no commitment to make any repayment. Thus, an equity infusion to a firm that makes no dividend payments and is not expected to do so in the foreseeable future is, for all intents and purposes, a cash grant. Where the firm's shares are publicly traded, one could estimate the market value of the shares given to the government agency in exchange for the infusion. The difference can then be treated as equivalent to a cash grant. Where market values do not exist, some estimates of the capitalised value of the firm's future dividend payments per share must be obtained to determine the subsidy component.

e) Export Financing Subsidies. In most or all OECD countries, governments give financial assistance to domestic firms selling abroad or to foreign purchasers of import goods from the subsidising country. In Canada, for example, this is done explicitly through the Export Development Corporation (EDC) in the form of loans and export credit insurance. Similar results may be obtained through conditional foreign aid, but in a less transparent manner.

As in the case of business financing, the terms on which the loans are made are likely to be more favourable than those available from the private market, so an implicit subsidy is provided. However, aid to export financing differs from aid to business financing in some ways. First, and obviously, the implicit subsidy applies to exports, rather than production. The amount of aid the firm gets is likely to depend on the volume of its exports, so the implicit financing subsidy is equivalent to a border measure. Second, the need for such programmes is often more intensely argued than for general business subsidies. For one thing, it is argued that capital markets are very imperfect with regard to providing financing for international trade, usually on the grounds that the long-arm of contract law does not reach over international borders. In a world of trans-national financial institutions,

this argument is questionable. In any case, the justification of a subsidy is irrelevant for the purposes of measuring the implicit subsidy rates. It is also argued that such programmes are needed because other countries have them, and without similar aid the home country would be at a severe disadvantage in international markets. As a result of this international competition for export financing subsidies, there are international agreements placing limits on the amounts of the subsidies allowed, notably the OECD Consensus of 1976 which sets minimum values for interest rates on public loans for exports.

The determination of the implicit subsidy contained in export financing programmes is done in essentially the same way as for general business financing. Raynaud [1985] calculates the average subsidy rate using the difference between the average interest rate on EDC loans and the public sector discount rate recommended by Jenkins [1980] for discounting public sector expenditures. The rate is generally taken to be a weighted average of the before- and after-tax rates of return on private investment.

The use of the public sector discount rate for this purpose is questionable. In effect it takes the taxes on other private investments as part of the cost of providing loans to exporting firms. But these taxes are not necessarily foregone when funds are shifted from other private investments (which they may not be -- all of the financing may come out of new saving) to the exporting firms because exporters also pay corporation income taxes. Further, this approach infuses the social opportunity cost of funds issue into what I think should be a measurement problem. Instead, it is better to estimate the rate of interest that the exporting firms would have had to pay to private lenders in order to acquire the same export financing. Since there is a great deal of private participation in this field, it should be possible to do this, subject to the same types of problems discussed above with respect to business financing in general.

Export credit insurance programmes are evaluated in a manner similar to that used to evaluate guaranteed loans. The government agency insures, for a fee, exporters against any loss caused by commercial or political factors in the countries where the products are sold. To the extent that the fee is less than the cost of the risk, which is almost certainly the case, there is an implicit subsidy. The main difficulty in evaluating this subsidy is that there are few private insurers of this type. Unless information on the private fees for such risks is available, it would be necessary to try to estimate the subsidy component using an *ex-post* hedonic approach similar to that used by Mintz *et al.* for ordinary loan guarantees.

2. Implicit subsidies through public enterprises

Implicit subsidies may be delivered through public enterprises in two ways. First, the subsidised output itself (e.g., airplanes) may be produced by a public enterprise which sells the product below average cost with the resulting deficit financed through general revenues. Second, the public enterprise may sell an input to private firms at a price below average cost (e.g., electricity), again with the deficit financed through general revenues.

As usual, the difficulty with determining the implicit subsidy provided by public enterprises is one of finding the alternative price. Where the output is relatively homogeneous and traded in world markets, the world price

can be used. For example, if a government subsidises its manufacturing industries by selling oil or coal through public enterprises at prices below the world price, the implicit subsidy would be relatively straightforward to calculate using the c.i.f. world price of oil or coal to the country.

Where the good is non-traded or unique, it is not possible to use world prices. Nor would it be correct in a strict sense to use the price of similar goods in other countries, since production costs may differ. One could determine an alternative price using the average cost of the enterprise, if that information is available. This average cost should include a normal rate of return on the market value of capital employed by the enterprise. Equivalently, one could determine the deficit of the public enterprises by industry from statistical reports and augment this by an amount equal to the market average return on the capital of the enterprise to get the "economic" deficit.

One difficulty in using the deficit of the public enterprise to determine an implicit industrial subsidy occurs when the public enterprise sells to both industry and households, and perhaps at different prices. For example, a public utility may sell electricity to its large industrial customers at a lower price than to its residential customers. The problem is how to determine the subsidy element to industrial users while recognising that some part of the lower price may reflect a form of price discrimination which is consistent with purely commercial behaviour. Further, it is necessary to determine how much of the deficit of the public utility results from a consumption subsidy to residential (final) users. There is no obvious solution to this problem. Rather, I think that the only practical method would be to calculate the economic deficit of the public enterprise and apportion the share to industry on the basis of its share of total output. It would be preferable to measure output shares of physical units, but revenue shares may have to be used instead.

3. Implicit subsidies through government procurement practices

One of the least transparent, and difficult to measure, forms of implicit subsidy is hidden in the practices related to government contracts to purchase goods and services, particularly military equipment. There are many variations on the theme. The most straightforward case is government purchase of an item from a domestic producer at a higher price than an identical item would cost in the world market. In effect, the government gives a subsidy to the domestic producer equal to the price difference. However, this subsidy may best be treated as a lump-sum or capped subsidy in that the domestic producer does not necessarily receive a subsidy on any production beyond that which the government has contracted to purchase.

The calculation of the subsidy is rarely straightforward. The item purchased, such as a weapons system, is rarely identical to that available from other producers. It would be difficult in many cases to determine that the price differential does not in fact reflect purely commercial concerns, such as the perceived quality, convenience and future service considerations. There is also the issue of tariffs. Does the procurement practice involve a subsidy when the domestic price exceeds the c.i.f. or the tariff-inclusive world price? A case can be made because it is the government itself which receives the tariff revenue.

Unfortunately, many of the implicit subsidies in government procurement practices take more insidious forms. The most common is the existence of "offsets" or "industrial benefits" in procurement contracts. In this case, a consideration in determining whether a firm will receive a contract is its agreement to place some amount of contracts or orders with domestic firms. Alternatively, a foreign firm may have to agree to set up a plant in a particular region of the domestic country. In other cases, a foreign contracting firm may have to agree to purchase goods unrelated to the contract, resulting in a form of counter-trade.

The amounts of such secondary or offset contracts have been estimated to be on the order of 100% of the amount of the primary contract in some cases. Galigan and Herring [1986] estimated the value of offsets in two major military procurements in Canada using information from firm contract data. Unfortunately, the value of the offsets themselves do not determine the subsidy value. For example, a commitment by a foreign firm to set up a million dollar plant in the domestic country, or purchase a million dollars worth of office equipment from a domestic supplier would not imply any subsidy at all if the firm were willing to undertake such an action anyway. Presumably, since the action is a stipulated requirement, such an action would not have been voluntarily forthcoming so there is a subsidy component. Determining the value of the subsidy is a difficult task since it could be any fraction of the offset value.

First, it is clear in principle how to make such an evaluation -- simply find the tax/subsidy scheme to which the offset requirement is equivalent. For example, if a military contract to purchase a particular weapons system requires the contractor to purchase office equipment from a domestic firm, the implicit subsidy is equal to the difference in the purchase price of the same weapons system with and without the offset requirement. This amount could have been given as a direct cash subsidy to the firms in the office machine industry that receive contracts as a result of the offsets. If the weapons system purchased in the contract is sufficiently standardised, one could simply look up its price without the offset and calculate the implicit subsidy. Unfortunately, such standardisation is rarely the rule. There may be many elements of product differentiation including product modifications to meet particular needs, special delivery schedules, and service agreements. In principle one could adjust for such ancillary costs and calculate the subsidy as before.

An offset that requires the setting up of a domestic plant is even more difficult to evaluate. One would need to find the difference between the cost of setting up the plant and the market value of the plant if it were sold. It would be hard to establish the latter. One could, perhaps, construct some hedonic value based on the earnings of the plant, but this kind of information is very difficult to obtain, especially on a routine basis. Also, it necessarily contains guesses about future profitability.

These practices are, nevertheless, too widespread to ignore. Perhaps the best approach might be to undertake a separate study of the offset values and the subsidy components in those contracts (containing offsets) where the alternative prices can be obtained with a minimum of guesswork. An average subsidy rate would be calculated, either as a percentage of the value of the primary contract or of the offset value. This rate could then be assumed to

hold for all contracts containing offsets. The subsidy rate as a percentage of the primary contract value would be more easily calculated since the value of contracts subject to offset requirements is more readily obtained than the value of the offsets themselves. However, the subsidy rate as a percentage of offset values may be a more accurate procedure for determining the value of the subsidy because it is more likely that the subsidy, is proportional to the offset value than to the value of the primary contract.

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