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Barbara J. Spencer

12.1 Introduction

Governments today are under substantial pressure to subsidize particular industries or firms within industries. There is a natural desire to maintain employment, to improve economic development in particular regions, and to increase exports. It is often hard to resist the pleas of an ailing industry for help while at the other end of the spectrum, governments are tempted to intervene for the purpose of giving domestic firms a bigger role in industries that develop new technologies and have a promise of creating future wealth.

Although a subsidy is generally beneficial to the industry concerned, in most cases it does not benefit the country as a whole. The cost to taxpayers usually more than outweighs the gains to workers and firms who receive the subsidy. For example, there can be no national gain from the subsidization of a competitive industry such as agriculture except to the extent that maintenance of a way of life is given heavy weight or that regional effects are considered very important. Nevertheless, a national gain is possible from subsidies to firms facing foreign competition in imperfectly competitive industries. Such industries normally consist of only a few firms earning high profits because of entry barriers arising from substantial capital or research and development requirements that lead to economies of scale.

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Subsidies that increase exports in these imperfectly competitive industries can increase profits by more than the subsidy payment and thereby yield a national gain at the expense of foreign firms.¹ Strategic profit-shifting subsidy policies of this type change the competitive position of domestic firms relative to foreign firms in world markets. Of course strategic use of subsidies to increase exports may instead reduce national welfare even in imperfectly competitive industries. This depends on the nature of interfirm rivalry.² Lobbying efforts by firms and workers also play a major role in explaining the existence of subsidy practices. Nevertheless most developed economies have been willing on occasion to target certain businesses, for example, in the aircraft and computer industries, in the hope that this would give them a strong future position in a profitable industry. As a percentage of Gross National Product, public assistance to enterprises, including grants to public and private enterprise and assistance to private capital formation, has been estimated at 0.4 percent in the United States, 3.3 percent in France, and 2.7 percent in Italy in 1976 (Morici and Megna 1983, 71).

Whatever the motive behind the policy, subsidies that encourage exports also tend to reduce the sales and profits of rival unsubsidized firms. Other producing nations therefore naturally view such policies as unfair competition in world trade. That targeted subsidies to particular industries can be harmful to firms in other countries has been widely recognized. Indeed, the countervailing duty provisions of the General Agreement on Tariffs and Trade (GATT) were developed as a response to such concerns.

These countervailing duty provisions have been widely used. For example, the European Community (EC) initiated 131 antidumping and antisubsidy investigations between 1980 and 1982, and definitive duties were imposed in 21 cases over this three-year period (U.S.I.T.C. 1984, 25).

The appropriateness of the method of calculating countervailing duties under GATT rules has become an important issue in international relations. Thus there has at times been disagreement between the United States and the European Community over the application of particular measures. Despite this, there has been very little theoretical analysis of the proper method for determining countervailing duties, especially in the context of international rivalry between firms in imperfectly competitive industries.³

This paper examines certain aspects of this question in the light of recent developments in the theory of industrial organization and trade. Particular attention is paid to the results derived in Spencer (1988). One key issue analyzed is whether the countervailing duty levels calculated under GATT rules are always sufficient to prevent a subsidy

from causing harm to firms in the importing country. Allowance is made for the possibility of economies of scale arising from the high capital requirements commonly associated with imperfect competition. Many results, however, also apply to pure competition. Assuming the best conditions in which duties are applied in a swift and sure way, a second issue considered is whether countervailing duty levels will always be sufficient to deter governments from subsidy policies based on profit-shifting motives.

An important implication of the analysis is that the type of subsidy payment and the use to which the subsidy is put can be crucial in determining the appropriate countervailing duty level. For example, a subsidy tied to the purchase of new capital equipment can have very different implications from a subsidy that is given to pay off past debts. A higher countervailing duty level is required to offset harmful effects on rival firms in the former than in the latter case. Indeed, under some circumstances, subsidies used to pay off past debts may have very little impact on the sales and profits of unsubsidized producers.

Section 12.2 contains some of the relevant provisions of the GATT. This is followed in section 12.3 by a discussion of the main rationales for countervailing duty measures. Section 12.4 introduces the question of whether the countervailing duty levels calculated under the GATT rules are likely to be appropriate in the light of the rationales of section 12.3. Section 12.5 considers this question more specifically using different types of interest rate subsidies as examples. Grants, equity infusions, and R & D subsidies are also discussed. Finally, section 12.6 contains concluding remarks.

12.2 Countervailing Duty Laws

The maximum countervailing duty allowed under GATT rules is limited by the total subsidy amount or payment that is embodied in the imports of the country setting the duty. For example, if an interest-rate subsidy amounting to \$100,000 per year is used in a plant producing an output worth \$1,000,000 annually, then the countervailing duty is limited to 10 percent of the value of exports to the country imposing the duty. If these exports, worth say \$500,000 are priced at \$10 per unit, then the maximum allowable duty is \$1 per unit implying a maximum tariff revenue of \$50,000.

On this point Article VI:3 of the GATT states:⁴

No countervailing duty shall be levied on any product of the territory of any contracting party in excess of an amount equal to the estimated bounty or subsidy determined to have been granted, directly or indirectly, on the manufacture, production, or export of such product in the country of origin or exportation, including any special subsidy

to the transportation of a particular product. The term “countervailing duty” shall be understood to mean a special duty levied for the purpose of offsetting any bounty or subsidy bestowed, directly or indirectly, upon the manufacture, production, or export of any merchandise.

In addition, Article 4:2 of the Subsidies Code agreed upon at the Tokyo Round of Multilateral Trade Negotiations in 1979 states:

No countervailing duty shall be levied on any imported product in excess of the amount of subsidy found to exist, calculated in terms of subsidization per unit of the subsidized and exported product.

One of the major difficulties with the operation of the countervailing duty provisions of GATT is the lack of specification of the method by which the total subsidy payment should be calculated.⁵ Article 4:2, footnote 2 of the 1979 Tokyo agreement merely states that “[a]n understanding among signatories should be developed setting out the criteria for the calculation of the amount of the subsidy.” In the absence of such an understanding the United States maintains that it has a “wide latitude” in which to determine the value of the subsidy, as long as the adopted methods are reasonable.

An important issue has been the determination of the extent of the subsidy arising from a government loan. The U.S. practice is to use commercial rates as the benchmark to determine the extent of the subsidy. For example, if a subsidy is targeted to a specific industry, the United States uses the commercial rates of interest paid by companies in that industry if these are available. In contrast, the EC contends that the relevant benchmark is the rate of interest at which the government can borrow the money. Since government rates are generally lower than commercial rates, the Europeans claim that the United States is overestimating the amount of the subsidy. Basic economic principles would seem, however, to indicate that in this case the U.S. position is the correct one. The economic advantage given to a company by a government loan arises from the difference between the actual rate of interest paid and the opportunity cost of money to the firm (the rate at which the company could otherwise borrow). After all, competing firms not subject to government subsidies must use normal financial markets.

It is often hard to draw the dividing line between government intervention for purely domestic purposes and those forms of intervention that cause harm to foreign industry. For example, some subsidies such as investment tax write-offs apply broadly to most domestic firms and are primarily part of domestic policy. Nevertheless, since they increase the level of capital investment, they may still have consequences for

exports, particularly in capital intensive industries. Also, capital as well as research and development (R & D) subsidies targeted to domestic industries that both produce for home and foreign markets may be important for domestic regional development purposes but can in addition cause injury to rival foreign producers. Indeed in imperfectly competitive industries with economies of scale, these latter types of subsidies may be the best means of attempting to shift profits from foreign to domestic firms. Once the subsidy is incorporated into a larger capital base or improved production methods through R & D, a firm can have a long-term competitive advantage in world markets (Spencer 1986).

For countervailing duty purposes the United States distinguishes between "broad-reaching government actions" which are not countervailable and actions that "preferentially" benefit a firm or industry or group of industries and that could be countervailable if other criteria are satisfied (Shuman and Verrill 1984). For example, regional development grants and loans for European steel companies have been found to be countervailable as in the Belgian and Italian 1982 cases,⁶ but general tax incentives for capital investments have not. This distinction between targeted and nontargeted subsidies seems to be a reasonable approach. On the one hand it is important to countervail foreign subsidies that cause harm to domestic producers, but, on the other hand, too wide a class of cases could lead to an escalation of tariffs and duties.

The United States (along with other GATT signatory countries) is now committed to the use of a material injury test before countervailing duties can be imposed. However, prior to 1979, the U.S. did not have such a rule. An injury test was introduced for duty free products in 1974 when the countervailing duty laws were expanded to cover these products, but it was not until 1979 that the United States agreed to use an injury test in all countervailing duty cases involving signatories of the subsidy code.

Export subsidies on other than primary products were banned outright under the original GATT articles implemented in 1948, and this ban was extended to minerals in the 1979 Subsidies Code. Unfortunately, government intervention in agricultural products is so widespread that it was not possible to reach agreement on these products. One effect of the ban on the use of export subsidies in manufactured goods is to increase the incentives to use other more indirect forms of subsidies, such as capital grants and interest rate subsidies not specifically targeted to exports. As mentioned, these are the kinds of subsidies that may be most suitable for gaining a competitive advantage in industries with high capital requirements.

12.3 Rationales for Countervailing Duty Measures

There would appear to be two main rationales for countervailing duty measures. One objective is to offset the adverse effects of a foreign country's trade policies on domestic industry. The second objective is to deter governments from intervening with targeted subsidy policies in the first place.

With respect to the first objective, subsidies that increase exports are very likely to hurt competing producers in the countries that import the subsidized goods. First, the subsidy tends to lower industry prices. Also, the subsidized producers tend to gain sales and market shares at the expense of their unsubsidized rivals. Therefore competing firms tend to suffer a loss of profits both because of fewer sales and lower prices for their products. However, the reduction in prices arising from the subsidy tends to increase consumer welfare in the countries that import the subsidized goods.

Whether the foreign subsidy practice hurts the importing country as a whole depends on how the losses experienced by producers are weighed against the gains to consumers. If the industry is purely competitive, in the long run after unprofitable firms have left the industry and laid-off workers have found new jobs, an export subsidy increases welfare in the importing country (for a clear explanation of this point, see Dixit 1985). Nevertheless, even in this case, the short-term adjustment problems arising from the loss in sales and employment in the competing domestic industry may well make a countervailing policy seem appropriate. One consideration might be whether the actions of a foreign government should be allowed to significantly affect the nature of the domestic industrial structure, hurting some groups in the economy.

The use of countervailing duty measures to prevent harm to rival producers in an importing country becomes more important if there are high or above normal profits to be earned in the industry. Above normal profits can persist only if there are significant barriers to the entry of other firms. These barriers commonly arise from large sunk capital and R & D costs that lead to economies of scale. This type of production structure is often associated with an imperfectly competitive or oligopolistic industry in which firms are aware of their mutual interdependence. Each firm recognizes that its optimal choice of price or output is dependent on the decisions taken by its rivals.

As indicated in the introduction, in this situation commitment by a government to subsidize its domestic producers in order to increase exports affects price and output decisions by changing the underlying structure of the game played between firms. The fall in prices charged by subsidized firms generally reduces the profits earned by rival foreign firms whether or not the subsidized firms earn greater profits. This can

lead to a reduction in welfare in other producing nations even in the long run. If the subsidized good is imported by another producing nation, it is possible under some circumstances for the loss in above normal profits to more than offset the consumer gain from lower prices. Also, if both subsidized firms compete in third markets or in the subsidizing country itself, any loss in profits represents a direct loss in national welfare since gains to consumers are then not relevant to the calculation.

From the viewpoint of satisfying the second objective of deterring government intervention, it is important that the subsidizing country be made worse off as a result of its subsidy practice. One necessary condition in the context of imperfect competition is that the countervailing duty be sufficiently high to prevent profit-shifting subsidy policies from being successful. That is, the profits earned by subsidized firms after payment of the countervailing duty should not increase by more than the subsidy payment, preventing any gain in overall national welfare. The subsidy payment would then simply act as a transfer from the government to the firm. However, even this level of duty may not be sufficient to deter many subsidy policies. For example, lobbying by firms and workers for their own interest is likely to be a much more common motivation for government intervention than any sober calculation of the likelihood of a net national gain. In order to deter the subsidy practice, the duty might need to be sufficiently high to prevent subsidized firms from enjoying any increase in profit or ability to pay higher wages.

In many cases such a high level of countervailing duty might not be desirable. Caution is necessary in determining the size of countervailing duties. A duty perceived as "unfair" is likely to provoke further retaliation which will make the situation worse.

A second requirement for deterrence is that the countervailing duty be immediate and certain in its application. Countries contemplating subsidies should expect swift and sure retaliation, particularly if the future gain from a subsidy is uncertain. The immediate payment of a significant amount of countervailing duty may be more effective in preventing the subsidy action than some chance that a much higher level of duty might be imposed in the future.

This second requirement would seem hard to achieve given the way the countervailing duty cases are commonly dealt with in practice. It is true that the 1979 Trade Agreements Act, which implemented the 1979 Tokyo agreement in the United States, led to more precise and faster investigation of cases than in the past (Shuman and Verrill 1984). Nevertheless, despite a determination that a subsidy practice falls under the GATT rules and is causing material injury, countervailing duties are often not finally imposed. For example, in the 1982 steel cases

between the United States and the European Community, negotiations led to imposition of a steel quota instead of a tariff. Quotas generally do not have as harsh an effect as tariffs on the subsidized firms. Indeed, in a unionized industry the prices charged by firms in the importing country are likely to rise by more than they would with the same level of imports under a tariff. This reduces any fall in profits earned by the subsidized firm (Brander and Spencer 1988). Because of the nature of interfirm rivalry, some quotas may even increase the profits of the firm subject to the quota (Krishna 1984).

Although determination of material injury is valuable in keeping the number of cases within reasonable bounds, it also serves to make it less certain that a subsidy practice will in fact be countervailed. Some guidance was given in the 1979 Subsidies Code on the way the injury test is to be interpreted. Nevertheless there remains substantial latitude for differences in judgment. Even within the United States, the interpretation of the meaning of injury has at times been confusing.⁷ As Hufbauer and Erb (1984, 125) point out, the injury test could be much improved by making it uniform across countries and much simpler to apply.

In some cases, the automatic application of a previously specified level of countervailing duty might not be desirable even if it were feasible. As discussed earlier, targeted subsidies can hurt the sales and profits of rival firms exporting to third markets or to the home market of the subsidized firms. Any general rules that specify the level of countervailing duties to be applied in a wide variety of multiple market cases would likely give inadequate attention to the particular attributes of any one situation. In fact it would be very difficult if not impossible for such rules to be both comprehensive and unambiguous. If the duty is seen as somewhat unfair or arbitrary, it is very likely to lead to retaliation by the subsidizing country, perhaps on some other good. In this situation, negotiations covering the details of the specific case could be very helpful in providing a suitably tailored response.

The use of countervailing measures to apply to multiple market situations is difficult even in a discretionary situation. For example, in 1985 the EC introduced a preference scheme that favored imports of citrus products from some Mediterranean countries over those from the United States. The United States responded by imposing a duty on the import of pasta from Europe to offset the perceived discriminatory tariff on U.S. exports of citrus to Europe. The confrontation escalated further with Europe setting a tariff on the import of U.S. lemons and nuts.

Because of these difficulties with multiple market cases and for simplicity, the following theoretical analysis of the effect of various specifications of countervailing duty measures will be restricted to a single

market situation. One could assume that all of the subsidized good is exported to the country setting the countervailing duty or, alternatively, that subsidized firms compete with rival firms only in the home market of the rival firms.

12.4 The Appropriate Level of Countervailing Duties

Given our assumption that competition occurs only in the country imposing the duty, a countervailing duty will be just sufficient to prevent a foreign subsidy from causing harm to industry in the importing country if the combined effect of the subsidy and tariff is to leave the level of exports to that country unchanged. With the same level of imports, the sales and profits of the rival firms in the importing country should remain the same. The profit-maximizing levels of output of the subsidized firms will be unchanged as long as their marginal costs are unaffected. For convenience this level of countervailing duty will be referred to as an “equal exports tariff.”

Definition: An *equal exports tariff* serves to just offset the effect of a foreign subsidy on the marginal costs of the subsidized firms. The level of exports to the country imposing the duty will be unchanged.

As discussed in section 12.2, the maximum countervailing duty level allowed under the GATT code is a tariff equal to the subsidy per unit of exports to the country imposing the duty. Under this scheme the maximum tariff revenue is equal to the total subsidy payment that is embodied in these exports. Again for convenience, this maximum level of duty will be referred to as an “equal payment tariff.”

Definition: An *equal payment tariff* is a tariff equal to the subsidy per unit of exports to the country imposing the duty.

For the purpose of the analysis it is assumed that it is possible to obtain reasonably accurate estimates of the subsidy amount and the output to which the subsidy should be attributed. Although there can be substantial difficulties with such estimates and disputes may arise (see section 12.2), it is necessary first to understand the effects of an equal payment tariff in circumstances where it can be clearly calculated, before addressing the complications.

One of the main issues of this paper is the question of the circumstances under which an equal payment tariff will be sufficient to prevent a subsidy from causing harm to firms in the importing country. In other words, we need to determine the conditions that underlie the relationship between an equal payment tariff and an equal exports tariff. If an equal payment tariff is the same as an equal exports tariff, then it will force exports back to the presubsidy levels, preventing the subsidy

from reducing the levels of output and profits of firms in the importing country.

In the case of a direct subsidy per unit of exports, retaliation with an equal payment tariff would lead to no net change in marginal costs. For example, suppose that initially 1,000 units of a good are exported at a price of \$2 per unit and that the good is then subsidized at the rate of \$1 per unit of exports, reducing marginal costs by \$1. The equal payment tariff would then also be \$1 per unit, which is just sufficient to offset the \$1 fall in marginal costs. There would be no change in the profit-maximizing level of exports, ensuring that an equal payment tariff is the same as an equal exports tariff in this case. This result applies regardless of whether the industry is purely competitive or monopolistic. A subsidy to output or to total sales can always be exactly offset by a tax of the same type that raises the same total revenue.

An additional issue is whether in imperfectly competitive industries, retaliation with an equal payment tariff is always sufficient to make subsidization for profit-shifting purposes ineffective, thus helping to deter the subsidy behavior. In the case of a direct subsidy per unit of exports, an equal payment tariff also satisfies this objective. Returning to our example, if an export subsidy of \$1 per unit is countervailed by a tariff equal to \$1 per unit, then whether or not the industry is imperfectly competitive, subsidized firms will experience no net change in their level of profits. Automatic and immediate application of such a countervailing duty would leave firms with no incentive to lobby for export subsidies. Furthermore, the subsidizing country as a whole would be worse off by the amount of tariff revenue paid as duty. As indicated in section 12.2, export subsidies, except for some primary products, are outlawed under the GATT. However, for those cases that do occur, imposition of the maximum level of duty allowed under GATT rules would appear to be the appropriate response.

The appropriateness of an equal payment tariff becomes much more difficult to ascertain in the case of more complex subsidies such as interest-rate subsidies or grants towards the initial establishment of a firm or for later expansion of plant and equipment. For reasons discussed in section 12.2, except for agricultural products, these types of subsidies are much more common and therefore rather more important for practical policy decision making than are simple export subsidies. Some theoretical results applying to interest-rate subsidies and grants are presented in the next section. The implications of this theoretical analysis for grants, equity infusions, and R & D subsidies are also discussed.

The key insight behind the analysis is that the appropriateness of countervailing policies is very much dependent on the type of subsidy instrument. In particular, the harm done to rival producers in other

countries by various production subsidies to firms is affected by the use that is made of the subsidy. In other words, the nature of the subsidy can be crucial in determining the level of countervailing duty that should be applied. We first examine the implications of a subsidy to existing capital services.

12.5 Subsidies to Capital

12.5.1 Interest-Rate Subsidy to Existing Capital

Interest-rate subsidies that apply at least in part to existing capital services are rather common. One example is the refinancing of some of the existing loans of a company at government subsidized rates. It is important to know whether such subsidies cause harm to competing foreign producers and therefore whether they warrant the use of countervailing measures.

It is useful first to consider the case in which capital markets are perfect and the firm is not in severe financial difficulty. In this situation a subsidy to existing loans will not change the price of capital to the firm so it will not affect the firm's private incentives to purchase new capital equipment with its own or borrowed funds. This type of subsidy will therefore not have any significant effect on marginal cost or on the level of exports. The sales and profits of rival producers would be unaffected.

It is sometimes argued that the designation of subsidy funds to reduce the cost of old debt will have the same effect as a subsidy to new capital equipment because it releases funds of the firm that can now be used for expansion. Since firms are normally able to borrow to make any profitable capital investments, this argument could be relevant only if there are substantial imperfections in the capital market, or if the firm is on the verge of bankruptcy. If the firm is in difficulty but considered likely to survive, a subsidy to pay off old debts would at most allow the firm to borrow at more favorable interest rates. This would have only a small secondary effect on the extent of expansion.

Capital market imperfections may lead to a situation in which the internal funds of a corporation have a substantially lower opportunity cost than the cost of obtaining a new outside loan. For example, problems arising from asymmetric information about the profitability of the firm's proposed investments could lead to a substantial premium on the interest rate charged on new borrowings relative to the return the firm could receive if it lent its own funds through the capital market. In this case, if the firm has a shortage of internal funds, government subsidization of some of its existing loans could then bring about an expansion of output, thereby causing harm to foreign producers.⁸ Al-

though this argument has validity, it by no means warrants treating subsidies to existing capital services the same as subsidies for the purchase of new capital equipment that will have a direct effect on output. Even if capital markets are imperfect in this way, the extent of the expansion arising from subsidies to existing loans would be limited by the number of worthwhile projects at the lower opportunity cost of the firm's internal funds but not at the higher rate on borrowed funds. The extent to which this argument is significant in practice would need to be examined in the context of the particular firm and industry.

Since, with perfect capital markets, a subsidy to existing capital has no effect on the firm's exports, the use of any tariff to countervail the subsidy will cause a net increase in the firm's marginal cost and an overall reduction in exports. In these circumstances imposition of an equal payment tariff is likely to be viewed as a rather harsh penalty. If capital markets are imperfect, some increase in exports might be expected, but the combined effect of the subsidy and equal payment tariff is almost certain to reduce exports. In other words, whether or not capital markets are perfect, an equal payment tariff is likely to be more than sufficient to prevent harm to producers in the importing country. Indeed, competing firms would likely face less competition than they did prior to the subsidy.

If, however, a subsidy to existing capital services is not countervailed or is countervailed only at the level required to maintain exports constant (in the case of imperfect capital markets), the subsidized firm is still likely to reap a net increase in profit from the subsidy. Consequently, if countervailing measures are partly used to discourage such subsidies, a higher duty level may be warranted to make it unprofitable for firms to lobby for subsidies. Nevertheless the extent to which countervailing duties are used for this purpose needs to be viewed with caution. A duty level that substantially reduces the exports of the subsidized firm could result in a significant risk of further retaliation and escalation of protectionist measures.

It is again worth emphasizing the importance of the nature of the subsidy for the appropriateness of countervailing measures. The implications of an interest-rate subsidy designated for existing loans differ sharply from the implications of a direct subsidy to exports. In this latter case (see section 12.4), an equal payment tariff is just sufficient to maintain both the level of exports and the profits of the subsidized firms at their presubsidy levels.

Some additional issues arise with respect to loans to uncreditworthy companies. Since normal market rates of interest no longer apply to such firms, the practice of the U.S. government of adding a substantial risk premium to the benchmark rate to determine the amount of subsidy would seem to be reasonable in such cases.⁹ There is then the question

of whether such loans in fact cause any harm to rival producers in other countries. After all, if the loan is of the general kind used mostly to pay off old debts, no increase in exports would be expected. On the other side, it is argued that a general loan in this situation could have a major strategic effect in preventing the firm from going bankrupt. In the event of bankruptcy output would drop to zero, allowing other firms to improve their market share and profitability. The existence of the loan prevents this favorable outcome for rival firms.

This latter argument would seem to overstate the case. At least some of the assets of a bankrupt firm are usually purchased by other firms. These firms are not responsible for the burdensome debts that caused the bankruptcy, and it is likely to be in their interest to continue to produce output in the plants taken over from the bankrupt firm. Only in the extreme case when all of the plants of the bankrupt firm remain permanently closed would exports fall to zero. It seems, therefore, that there is no strong case for loans to companies near bankruptcy to be countervailed in a tougher manner than loans to creditworthy companies (apart from the previously mentioned difference in the calculation of the subsidy). In either case, if the loan is mostly used to reduce interest payments on existing capital assets, an equal payment tariff is likely to reduce exports below the level that would have occurred without the loan, allowing a gain to producers in the importing country.

The question as to whether a subsidy should be countervailed so as to prevent harm to foreign producers is of course separate from the question as to whether the use of targeted subsidies is in any way beneficial to the subsidizing country or to the world as a whole. Often subsidies to uncreditworthy companies merely serve to perpetuate inefficient firms and industries and therefore clearly reduce the welfare of the subsidizing country (and world welfare). In such a case the subsidy is ineffective in reducing marginal costs. This means that no increase in exports would be expected. The profits of competing foreign producers would be unchanged. Such subsidies are a waste of resources but it does not follow that a countervailing tariff is then justified except perhaps for deterrence purposes. The imposition of a tariff would add a further distortion to trade.

12.5.2 Interest Rate Subsidy for Additional Capital Only

Quite commonly a subsidy may be given on condition that it be used for the acquisition of new plant and equipment. For example, a subsidy for the purposes of modernization will require the purchase of new equipment. Also, regional development subsidies often require that the firm build a new plant or extend its existing facilities in a particular region. These types of subsidies are fundamentally different from subsidies that help finance the cost of existing capital. A subsidy to new

plant and equipment gives the firm an incentive to purchase more capital than it would without the subsidy and leads to more capital-intensive methods of production. In contrast, a subsidy to existing capital is essentially just a windfall gain to the firm since, under normal conditions, it does not affect profit-maximizing production or investment decisions. Of course even subsidies designated for new plant and equipment may be partly spent on investments that the firm would have made anyway. The theoretical analysis presented here strictly applies to the purest case in which all of the subsidy is used for investments that would not otherwise have been undertaken. This type of subsidy is referred to as a subsidy to additional capital.

Subsidies that increase capital investments lower the marginal or additional cost of production and lead to an increase in output. An important attribute of a subsidy confined to additional capital is that it achieves the same decrease in marginal cost as would the same subsidy per unit applied to all units of capital including both new and existing capital services. If a subsidy is used only for investments which otherwise would not be undertaken, then maximum "additionality" is achieved in the sense that the increase in investment (and reduction in marginal cost), holding output and the subsidy rate fixed, is at a maximum per dollar spent by the government.¹⁰

This brings us to the question of the appropriateness of an equal payment tariff in this context. As discussed in the last section, in the case of an interest-rate subsidy to existing capital services, an equal payment tariff exceeds the level of duty required to prevent an increase in output and harm to unsubsidized producers. However, the increased "additionality" arising from a subsidy designated for new plant and equipment can mean that in some circumstances an equal payment tariff is insufficient to prevent harm to rival firms in the importing country. This is possible because subsidies costing the same total amount to the government will be countervailed at the same rate, even though an interest-rate subsidy to additional capital is associated with a greater reduction in marginal cost than is an interest-rate subsidy to all existing capital services.

Spencer (1988) develops some sufficient conditions under which firms in the importing country will be hurt by an interest-rate subsidy for the purchase of additional capital, despite the use of an equal payment countervailing tariff. These conditions depend on both the nature of the production function in a subsidized firm and the magnitude of the subsidy. The main factors are:

- a. the size of the interest-rate subsidy relative to the market rate of interest,
- b. the value of the elasticity of substitution, between labor and capital,¹¹ and
- c. the extent of economies of scale.

The relative size of the subsidy is a critical factor. The analysis shows that the smaller the interest subsidy (to additional capital) relative to the market rate of interest, the more likely it is that firms in the importing country will suffer despite the use of an equal payment tariff. Since the firm has to pay a greater proportion of the costs, a smaller subsidy naturally leads to less additional investment. However, the effectiveness of capital investments in reducing marginal costs is greater at lower levels of capital so that a smaller subsidy is associated with a larger reduction in marginal cost relative to the total subsidy payment.

The Cobb-Douglas production function provides an interesting and simple illustration of the effect of the magnitude of the subsidy. Suppose the Cobb-Douglas production function is of the form,

$$x = AK^aL^b,$$

where x = output, K = capital, L = labor, and A , a , and b are constants. If the marginal productivity of labor is decreasing or constant ($b \leq 1$), any interest-rate subsidy to additional capital that is less than or equal to one-third of the market rate will lead to an increase in output by the subsidized firms even after imposition of an equal payment tariff. Firms in the importing country will then suffer losses in sales and profits. This result applies to both competitive and oligopolistic industries.

Whether or not an equal payment tariff is effective in preventing harm to the industry in the importing country is also dependent on the size of σ , the elasticity of substitution between labor and capital. σ is equal to 1 for a Cobb-Douglas production function. For a constant elasticity of substitution (C.E.S.) production function, a lower value of σ , which corresponds to a greater difficulty in substituting capital for labor so as to maintain the same level of output, usually increases the range of subsidy values for which an equal payment tariff will not be fully effective.¹² Low values of σ are often associated with capital-intensive industries that experience the economies of scale associated with oligopolistic market structures. On the other hand, an increase in the extent of economies of scale (per se) tends to reduce the range of subsidy values for which an equal payment tariff allows net harm to competing firms (Spencer 1988). The analysis allows consideration of both competitive industries, which do not have economies of scale, and imperfectly competitive industries.

Since in this context an equal payment tariff does not always satisfy the objective of preventing harm to firms in the importing country, the question arises as to its usefulness in satisfying the other main objective of deterring governments from the use of targeted subsidies. Even if an equal payment tariff allows subsidized firms to increase exports, these firms will often earn lower profits than in the presubsidy situation. Spencer (1988) however shows that there is a restricted class of cases

in which the combined effect of the subsidy and equal payment tariff is to increase profits. It is even possible in an extreme case for these profits to rise by more than the subsidy and tariff payment and thereby bring a net national gain from the subsidy practice. Such cases are not likely to be very important in practice, however. The usefulness of an equal payment tariff as a deterrent is likely to depend mainly on a commitment by the importing country to countervail in an immediate and sure way. If there is a good chance that countervailing duties will not be imposed or that measures will be taken only after substantial delay, the incentive for firms and governments to use subsidies is not likely to be much affected by countervailing duties.

Interest-rate subsidies do not always apply exclusively to the purchase of new capital equipment even if they are designated for this purpose. It is possible that some of the funds are used to subsidize existing capital services or services the firm would have undertaken anyway without the subsidy. In general, a subsidy package to a firm is likely to include elements of both subsidies to existing capital and to new capital. Analysis of the particular case is then necessary to determine the proportions of the two types of subsidies. Ideally, the implications of each type of subsidy can then be combined in some reasonable manner to determine the appropriateness of an equal payment tariff in the particular case.

12.5.3 Grants and Equity Infusions

In many cases the subsidy takes the form of a grant or an equity infusion. For example, two Belgian steel firms, Cockerill and Sidmar, received grants for capital expenditures which were countervailed by the United States as a result of the 1982 steel case. The question arises as to how to determine the effectiveness of an equal payment countervailing tariff in such cases.

The first requirement is to understand the way in which the subsidy in the form of a grant or an equity infusion is calculated.¹³ In the case of a grant, the subsidy amount is simply the grant itself. For an equity infusion, the initial subsidy amount is taken to be the difference between what the government paid for a share of the company and what the market would have paid for a share. This can be difficult to calculate particularly if the company is not commercially sound. The amount of the subsidy associated with an equity infusion, however, is always calculated as being no more than the subsidy associated with a grant of the same amount. This is reasonable, since treating the equity infusion as a grant would imply that the government expected no return from its equity.

In both cases, a time discount rate is used to spread the subsidy amount over the estimated life of the renewable assets in the firm. This

choice of time frame is appropriate for subsidies which are tied to the purchase of additional capital since they will affect the level of exports for the life of the capital equipment.¹⁴ The estimates needed to make such a calculation, such as the choice of the time rate of discount and the length of life of the capital assets, are likely to give rise to disagreement, but this is not the focus of this paper. Having obtained the yearly subsidy equivalent by this method, the subsidy to exports can then be calculated by spreading it over export sales.

If a grant or an equity infusion is not tied to the purchase of new capital, then the analysis of section 12.5.1 concerning an interest-rate subsidy to existing capital services applies. The subsidy is likely to have very little effect on the output of the subsidized firm and therefore an equal payment tariff will more than offset any harm to firms in the importing country. This would normally be the case for equity infusions.

In contrast, if the grant is tied to capital expenditures and if no additional matching funds are required from the firm, the grant, in effect, is equivalent to an interest-rate subsidy equal to the full market rate with the constraint that the total subsidy not exceed the grant amount. Even if such a grant were restricted to expenditures on additional capital only, the analysis of the previous section indicates that in this case an equal payment tariff is likely to exceed the level of duty required to keep exports constant.¹⁵ Exports of the subsidized firms will on balance fall and foreign producers will be better off. The possibility that exports of the subsidized firm will increase generally arises when the subsidy to interest payments is "small." The proportion of costs covered by the subsidy is reduced to the extent that there is a matching requirement that firms must contribute toward the capital project in order to receive the grant. If the matching contribution is large, there is then the possibility that an equal payment tariff may be insufficient to prevent harm to rival producers in the importing country.

12.5.4 R & D Subsidies

It may be almost impossible to estimate the overall extent of the harm done to rival firms by some types of subsidies. For example, a subsidy to R & D might aid a firm in the race to develop a new product, allowing the firm initially to dominate the world market and reap healthy profits from being first. Indeed, very substantial subsidies for a particular development project may discourage foreign unsubsidized firms from even entering the race. For subsidies such as these, the imposition of countervailing duties is not likely to be very helpful. By the time the subsidized firm is at the production (and export) stage, the harm has already been done to rival foreign firms that have withdrawn from the field. Duties then would mainly hurt the importing country by raising consumer prices. Experience shows, however, that such tar-

getting attempts often do not pay off in net gains to the subsidizing country, making such policies rather expensive and therefore limited in their extent.

On the other hand, many R & D subsidies are of the more pedestrian kind, directed, for example, to the development of cost-reducing processes. Assuming the information arising from the R & D remains private to the subsidized firms, these types of R & D subsidies generally have similar effects to subsidies designated for the purchase of additional capital, and the use of countervailing duty measures is appropriate. Even if the information is made generally available, in some instances it may only be useful to the particular firm undertaking the development. Consequently countervailing duties may still be called for to prevent harm to imposing firms.

12.6 Conclusion

Various types of capital subsidies tend to be important in imperfectly competitive industries with economies of scale that arise because of high capital requirements. This paper analyzes the implications of countervailing these capital subsidies with an "equal payment tariff," the maximum countervailing duty allowed under GATT rules. The central issue explored is how the type of capital subsidy affects the ability of an equal payment tariff to prevent harm to firms in the importing country. A second issue considered is whether an equal payment tariff is likely to be sufficiently high to make the subsidy practice unprofitable for both the firm and the country involved.

Practical policymakers have made considerable efforts to determine the appropriate methods of calculating the total subsidy payment in order to determine the equal payment tariff arising from different kinds of subsidies, such as grants or equity infusions. Despite this work, the implications of the type or nature of the subsidy payment for the appropriateness of the level of countervailing duty to be applied has received very little attention. For example, although material injury to firms has to be proved before a countervailing duty case can go forward, there appears to be little attempt, at least in cases prosecuted by the United States, to relate the level of the countervailing duty to the extent of harm likely to result from the particular type of subsidy.

Clearly no exact application of this theory could be expected. The determination of the exact amount of countervailing duty that maintains exports constant would require detailed empirical estimates which are always subject to error and are difficult to obtain. Nevertheless an understanding of the principles involved provides a broad classification

of cases according to whether a substantial duty is required or a countervailing response is unnecessary. Sufficient information to place the case in one or another of these classifications could easily be achieved without extensive and detailed investigation. In many cases, only very approximate values of the various parameters of the production function would be required.

Nevertheless, even the minimal information necessary to place the subsidy case in these broad categories is often not publicly available. In particular, it is very difficult to make even tentative judgments on this question from the information on subsidy cases that is available in the United States *Federal Register*. For example, according to the information in the *Federal Register* (1982, 39,307) on the 1982 steel case involving the United States and Belgium, the firms Cockerill and Clabecq received preferential loans from the SNCI (Société Nationale de Credit à l'Industrie) at subsidy rates of 0.025 percent and 0.009 percent *ad valorem*, respectively.¹⁶ The designated use of the loans is not made clear however. If the loans were mostly used to pay off existing debts, then little or no countervailing action is necessary. An equal payment tariff would likely reduce both the exports and profits of the subsidized firms below presubsidy levels. Firms in the importing country would then enjoy an increase in sales and profits.

On the other hand, very different conclusions could be drawn if the loans were used to induce the firm to purchase additional plant and equipment. The analysis then requires additional information such as the actual proportion of the interest cost that is subsidized. If this proportion is low, an equal payment tariff may allow a net increase in exports, continuing the harm to firms in the importing country. Unfortunately, although this information is implicit in the calculation of the above mentioned subsidy rates, it is not directly available.

It is important that the effects of different types of subsidy practices be understood more fully. This would allow the distinctions between types of subsidy practices to be drawn more finely in assessing the appropriate levels of countervailing duties. There is a clear-cut cost from countervailing duties that are too low to prevent a subsidy from causing harm to firms in the importing country or that encourage lobbying for the subsidy by allowing the subsidized firms to enjoy too great an increase in profits. Duties set at levels that cause significant damage to subsidized firms relative to their presubsidy condition are, however, likely to cause needless difficulties in international relations. If a country has cause to believe that a particular duty levied by another country is unfair, the outcome can be an escalation of tariffs and other protectionist measures in both countries, a result that both countries would like to avoid.

Notes

1. For the theoretical analysis see Spencer and Brander (1983) and Brander and Spencer (1985). Brander (1986), and Grossman and Richardson (1984), also present the idea clearly in a policy context.

2. For the theoretical analysis see Eaton and Grossman (1986). A good discussion of these issues is available in Grossman and Richardson (1984).

3. Baldwin (1980) considers the case of a production subsidy to a purely competitive industry. If the good is both consumed domestically and exported, he shows that in a partial equilibrium framework a duty equal to the subsidy per unit of exports reduces exports (because of a lower domestic consumer price) relative to the presubsidy level. In a general equilibrium context with income effects, the supply curve of the export good may be backward bending (because of an inelastic demand for imports) and it is possible for exports to increase.

4. See Hufbauer and Erb (1984) for a convenient reprinting of the main parts of the rules covering the subsidies code.

5. See *Federal Register* (1984).

6. See *Federal Register* (1982).

7. See Adams and Dirlam (1984) for a useful discussion of cases.

8. I would like to thank Geoffrey Carliner for drawing my attention to the implications of capital market imperfections.

9. In the 1984 steel cases from Argentina, the United States used the difference between Moody's Aaa and Baa corporate bond rates as the measure of risk. See *Federal Register* (1984).

10. Strictly, this statement requires that the firm is allowed to borrow enough at the reduced interest rate to achieve its desired level of investment.

11. The elasticity of substitution between labor and capital is the proportionate change in the capital to labor ratio for a small proportionate change in the rate of technical substitution between labor and capital. The rate of technical substitution is the amount of labor released from production when an additional unit of capital is added maintaining output constant. It is equal to the ratio of the marginal product of capital to the marginal product of labor.

12. Strictly, this result requires that the elasticity of labor's share with respect to σ is greater than -1 . This holds if a greater ease of substitution of labor for capital is associated with an increase in labor's share.

13. For this material, see *Federal Register* (1984).

14. The United States recognizes that this choice of time frame is in general arbitrary. It is used because of the absence of a better standard method (see *Federal Register* (1984)).

15. The analysis is somewhat complicated by the maximum limit to the grant.

16. Although in these steel cases, a quota was imposed instead of a duty, it would still be useful to know the implications of particular levels of duty. Grossman (1986) has an interesting paper concerning injury to the U.S. steel industry caused by imports. He argues that relief under section 201 of the Trade Reform Act of 1974 is not warranted for the period 1976 to 1983.

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Comment Henry Ergas

I must confess that I have difficulty in commenting on these papers.* They are basically exercises in theory; and regardless of how worthwhile they may be in this respect, they seem of doubtful relevance to the practitioner.

Let me begin with Kala Krishna's paper. The paper provides a long list of characteristics of high-technology industries, but most of these attributes—such as learning economies, intellectual property protection—are only mentioned, rather than analyzed. The core of the paper concentrates on the effect of network externalities, and of the expectations to which they may give rise, on trade in high-technology products. Network externalities are defined as instances in which the value of a product or service to a user is a function of the number of users.

The author begins by asserting that network externalities are a common feature of high-technology industries, but no evidence is given to this effect. Network externalities are, of course, significant in telecommunications services, and it is in the context of this industry that the theory of network externalities was developed. But even in telecommunications, they are of diminishing relevance as the rising demand for specialised services has increased the importance of dedicated or closed user-group networks relative to public networks; and, putting

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*Chapters 11 and 12 in this volume.

telecommunications aside, are network externalities—as compared to learning economies or other supposed features of high-technology industries—really of relevance to aerospace or to pharmaceuticals? I would have thought they were of less significance in these latter cases than, to use a familiar case in the industrial organization literature, to the supply of spare parts for commercial vehicles—not a particularly high-tech product, at least in terms of the other criteria Kala Krishna lists.

Nonetheless, let us assume that these network-type externalities are a significant feature of high-technology industries. If individual producers' products are incompatible—that is, the products of the one cannot be used to access the network of the other—then the producer with the largest network will have a clear advantage. Now, let us also assume that the firms involved in the industry underestimate the significance of, or the scope for, obtaining this advantage. If the government is better informed in this respect than its national producers, then it can assist them to expand their own network through direct or indirect protection, thus giving its domestic firms an edge over rivals.

This story is, to my mind, certainly not proved and in significant parts not credible. To begin with, why would firms underestimate the scope for obtaining network externalities? As I understand von Weizsäcker's analysis of switching costs, the possibility of locking customers in will, under a broad range of circumstances, heighten the degree of price competition for market share, to the point where potential monopoly rents are largely bid away. Practical experience also points in this direction: consider Xerox's attempt to establish Ethernet as an industry standard for LANs; everything suggests that it overestimated the degree to which the use of Ethernet would yield advantages for XTEN. Other examples—again drawn from the industries where Dr. Krishna suggests network externalities are of greatest relevance—include GE's attempt to establish a unified standard for factory automation and AT&T's promotion of UNIX. Surveying the evidence, I find it difficult to conclude that, faced with considerable network externalities, firms underestimate their significance; on the contrary, they are likely to go for broke in trying to exploit them.

Does this lead to the opposite extreme, where the struggle to set a *de facto* standard leads, almost naturally, to the emergence of a monopolist, capable of imposing significant welfare costs on the community? This is, of course, conceivable in theory, and IBM's position in the early 1970s may have come close to it. But I would question whether such a situation could be sustained over a significant period of time, particularly in activities where rapid technological advance is constantly generating entry opportunities. Experience suggests that two factors are at work in these cases: first, if the dominant firm is

earning significant rents from the incompatibility of its products, other firms will invest in duplicating these products, or at least in obtaining inter-operability with them. Second, it is not even apparent that the dominant firm will seek to maintain incompatibility over time. Thus, there are generally constraints on the economies of scope obtainable even by a dominant firm. If the firm is to fully exploit complementarities between items in the industry's product range, it may (and frequently does) find it more efficient to do so by encouraging independent firms to produce items compatible with its product line than by going it alone. This will lead it to release into the public domain some of the formerly proprietary elements of its interface standards—as IBM has been progressively doing with its products. The greater revenues arising from compatibility will more than outweigh the loss of any monopoly rents.

Overall, this suggests that network externalities are not likely to be a significant source of market failure. But even assuming they were, would this create a generalized case for government intervention?

I do not share the author's conclusions in this respect. Let us accept that governments seek to maximize the revenue of their domestic suppliers at the expense of that of foreigners; and that in doing so, the government (like the model in this paper) examines only the partial equilibrium implications of its actions (perhaps not the best approach to deriving prescriptive solutions). Does it really follow that governments can do better than the firms in an industry in identifying the parameters of the equation for consumers' and producers' response to network externalities?

Every empirical study I know of on industry policy concludes that governments obtain much of the information about an industry's prospects and problems from the firms in that industry.¹ It is conceivable,

1. See, among many others, Michel Bauer and Elie Cohen, *Qui gouverne les groupes industriels?* (Paris: Editions du Seuil, 1981); Alan Cawson, Peter Holmes, and Anne Stevens, *The Interaction between Firms and the State in France: The Telecommunications and Consumer Electronics Sectors* 10–13 December 1985 Trinity Hall, Cambridge, (mimeo); Centre d'Economie Industrielle, *Quelques réflexions à propos des mécanismes de transfert état-industrie mis en oeuvre en France et en Allemagne* Centre d'Economie Industrielle, Les Milles, n.d. (mimeo); Elie Cohen and Michel Bauer, *Les grandes manoeuvres industrielles* (Paris: Pierre Belfond, 1985); Commissariat Général du Plan, *Aides à l'industrie*, (Paris: Commissariat Général du Plan, April 1982; Jacques Darmon, *Le grand dérangement: La guerre du téléphone* (France: J.-C. Lattès, 1985); François Dupuy and Jean-Claude Thoenig, *Sociologie de l'administration française*. Paris: Armand Colin, 1983; Harvey B. Feigenbaum, *The Politics of Public Enterprise: Oil and the French State*. (Princeton: Princeton University Press, 1985); P. D. Henderson, "Two British Errors: Their Probable Size and Some Possible Lessons," *Oxford Economic Papers* 29 no. 2, (July 1977); Brian Hindley, (ed.). *State Investment Companies in Western Europe* (London: Trade Policy Research Centre, 1983); Jean-François Picard, Alain Beltran, and Martine Bungener, *Histoire(s) de l'EDF: Comment se sont prises les décisions de 1946 à nos jours* (Paris: Bordas, 1985); J.-P. Ponsard and G. de Pouvoirville, *Marché Publique et Innovation* (Paris: Economica, 1982); Michael Shanks, *Planning and Politics: The British Experience, 1960–76* (London: George Allen & Unwin, 1977); Stephen Young, with A. V. Lowe, *Intervention in the Mixed Economy* (London: Croom Helm, 1974).

as Pierre Massé suggested in his *Econometrica* article of 25 years ago, that by adding this information up, governments could identify external economies arising from the interdependence of firms' production decisions; but could they identify the fact that firms underestimated the strength of consumer response to network growth? I at least do not see any mechanism that would yield a probability of government failure lower than that of the firms themselves.

But, once again, let us assume that such a mechanism could be identified. Would this allow governments, by intervening to protect their domestic market, to improve the competitiveness of their domestic firms significantly? Even putting aside questions about the impact of protection on X-efficiency, I very much doubt it.

My skepticism basically arises from strategic interdependence between governments. Experience suggests that "follow-the-leader" behavior is a dominant feature of the industry policy scene; as soon as one government targets an industry or technology others tend quickly to follow. As a result, the gains to the first mover are small.

The recent history of videotex systems brings these propositions out. Clearly videotex is an area where it would be reasonable to expect network externalities to be significant; and most European governments so expected. However, as it turns out, professional services dominate the demand for videotex, and these are characterized by relatively limited network externalities; but the fact that each European government thought it could propel its own firms forward, and that each imitated the protectionist moves of others, has led to an extensive fragmentation of the European market, reducing the competitiveness of European industry overall.

This leads me to the following conclusions: First, I doubt whether network externalities are in any sense a distinctive feature of the high-technology industries. Second, in those cases where they are significant, the evidence does not lead me to believe that they will generate important market failures. And third, even if they did, I remain to be convinced that governments could do better. Overall, I am not sure there is a case for protecting an industry so as to achieve network externalities.

There is, of course, an alternative policy government could pursue in dealing with network externalities, namely international standardization. This would seek to reduce the extent of the firm- or country-specific advantages arising from the growth of the network, which in turn would lower entry barriers and erode the scope for monopoly rents. This seems like a good idea and the author suggests as much in her conclusion.

I say this "seems like" a good idea because again I am skeptical about how far one can go with it. I do not want to go into the sordid technical details, but I am sure that those who have sat through CCITT

meetings, or are familiar with the OSI saga, will share my caution. Bad will on the part of firms and governments of course plays a part in making international standards difficult to achieve; but it cannot be stressed too often that the fundamental constraint lies in the uncertainties arising from rapid technical change.²

To conclude, my own view is that network externalities do not usually provide convincing grounds for government intervention, except in the case of standard setting.

Allow me to turn now to Professor Spencer's paper on subsidies. This gets off to an inauspicious start when we are told, in the first sentence, that "governments today are under substantial pressure to subsidize particular industries or firms within industries." Now, as many know, the dominant pressure on governments today is to reduce expenditure; and the search for spending cuts has led to a significant decline over the last two years in the classical forms of financial transfers to industry.

Most of the action, as regards government assistance to industry, now lies in nonconventional instruments of financial support, such as mixed credits or associated financing. And an empirical analysis of the impact of these types of measures would be very interesting. However, the paper concentrates on the classical forms of subsidy to industry and asks how these can best be dealt with through CVD practices.

The center of the argument seems to be that, as far as imposing CVD is concerned, subsidies which do not affect a firm's output program—in Armen Alchian's sense of the term—should be distinguished from those that do. Financial grants for the purpose of consolidating previous debts would fall into the former category; subsidies targeted for the purchase of capital equipment into the latter. The author emphasizes that setting a CVD rate by prorating the subsidy over exported output may more than offset the impact on exports in the first case, and be less than offsetting in the second.

Now, the view that different types of subsidies may have different types of effects is not a new one. Over the last decade it has underpinned the development of extensive EC regulations on subsidies, distorting trade in the EC internal market. Moreover, there is a long literature on how one measures the degree of subsidy provided, with many applications in Italy, the United Kingdom and France (the IAC's work in Australia on this question is also relevant).³ This work provides a useful perspective on the key question faced in this paper: should differences between types of subsidy have an impact on CVD policy?

2. See H. Ergas, "Information Technology Standards: The Issues," invited paper to the *Financial Times* World Telecommunications Conference, May 1986.

3. See, for example, P. Ranci (ed.), *I Transferimenti Dallo Stato Alle Imprese Industriali Negli Anni Settanta* (Bologna: Il Mulino 1983).

Looking back at the work done on this subject over the years, two views emerge. Both of these come to conclusions quite different (in fact opposite) from those of the author.

The first view, which I would label as that of the pragmatists, questions whether the distinction between different types of transfers has much practical relevance. Money, once it gets into the firm, is highly fungible; and the case study material does not suggest that firms always use government funds for the purposes for which they were set aside.

This inherent fungibility of the transfers is heightened by the way capital markets respond to a government decision to subsidize. We can take it as a premise that the capital markets always look for credible signals of future government behavior. Now a robust result of political sociology is that governments often find themselves trapped into an escalation of commitment over time.⁴ So that actions whereby the government seems to be committing itself to underwrite the losses of a particular company will be seen as creating an open-ended subsidy. This will obviously have a major effect on the perceived riskiness of the company's liabilities. As a result, a presumed once-off support to bad debt is likely to alter substantially the terms of a firm's access to new financing.

Capital markets, in other words, assume that once a government gets involved in rescuing a particular firm, it will find it difficult to let that firm go under. And the empirical evidence does not suggest that capital markets are wrong in this respect. What this means as far as financial markets are concerned is that the subsidized firm can, if it so wishes, go and raise funds for investments of at best doubtful profitability; eventually, the government will make the losses good.

This suggests that attempts to distinguish the practical effects of different types of subsidies may be quite misleading; and that the simplest solution is to treat them as if they were all alike. Let us nonetheless take the other view which has been well represented in the literature, which I would label as that of the reformers. This school accepts that different types of subsidies can be distinguished. The key argument advanced by this school is that a difference should be made between (a) those subsidies which will genuinely contribute to returning the subsidized firms to competitive viability, since receipt of the subsidy is tied to credible restructuring measures; and (b) subsidies which merely go to perpetuate inefficient facilities.

4. See, for example, J. G. Padioleau, *Quand la France s'enferme*, (Paris: Presses Universitaires de France, 1981); and more generally, B. W. Staw, "The Escalation of Commitment to a Course of Action," *Academy of Management Review* 6, no. 4 (1981): 577-87; B. W. Hogwood and B. G. Peters, *The Pathology of Public Policy*, (Oxford: Clarendon Press 1985).

The premise is that governments can and do find themselves locked in to subsidizing inefficient firms; and that the consequences for the world economy as a whole are far worse when the inefficiency is perpetuated indefinitely than when the subsidy serves the short-term purpose of allowing restructuring to occur. This can be tied into a more general argument that safeguard measures should be linked to credible and time-limited restructuring initiatives.

Now, to be quite frank, I am rather skeptical about these proposals, which I think are an excellent idea in principle but are probably very difficult to implement in practice. Nonetheless, they strike me as at least as sensible as the author's conclusion that we should be less worried about subsidies that merely perpetuate inefficiency (e.g., by periodically paying off a firm's bad debts) than about subsidies that would allow the firm to cut its costs and modernize its product range: though I repeat that I am not convinced that many of the subsidies which have this as their goal necessarily carry it out.

There are many specific points in this paper that are interesting and others that one could query: I think the analysis of the impact of equity contributions and of help to firms on the verge of bankruptcy could especially do with some fleshing out. Nonetheless, I would like, in closing my comments, to return to what struck me most in reading these papers but which is common to the recent theoretical literature merging trade and industrial organisation: the extraordinary faith in the capacity of governments to obtain, accurately analyze, and then sensibly act upon complex technical information. Is it really plausible that governments can know very much about the scope of reaction functions? Do we really believe that a government in country A can find out whether a subsidy provided by country B has mainly gone to consolidate bad debts or has served to expand production capacity, and if so, what the relevant shape of the subsidized firm's production function is?

This is not a question of faith. Innumerable studies exist of how governments obtain and use information; and there are many good case studies of industry policy decision making. To my mind, the greatest weakness of recent work on trade policy in oligopolistic environments is that it does not treat the empirical material seriously. We easily end up with what Demsetz termed "Nirvana economics"—we compare a situation with obvious flaws, with one where no flaws are presumed to exist.

This is doubly serious because this literature operates in the world of imperfect competition—where game-theoretical models, given the right parameterization, can generate virtually any outcome. Close attention to the empirical literature is indispensable for distinguishing plausible from implausible assumptions. Without this element of re-

alism, there is a great risk that policy makers—who will rarely follow the full intricacies of the assumptions—will be misled.

Comment Harry Flam

Kala Krishna's paper* extends two existing models: (1) the Brander-Spencer profit-shifting model, by introducing network externalities and expectations on network externalities, and (2) the model of multimarket oligopoly with network externalities, by placing it in an international framework. The basic idea in these models is that by taxing or subsidizing domestic production (sales) a government can increase foreign demand and thereby profits of domestic firms in the case when domestic firms have incorrect conjectures about the competitive response of foreign firms and/or about the effects of their own actions on network externalities.

Krishna argues that these models are particularly relevant for high-tech goods because (1) network externalities are "significantly greater" in high-tech goods since they often are information related, and (2) expectations about network size are "very important" in determining demand for these goods. It is true that some new goods that are information related do have substantial *direct* network externalities: PC's on networks, teletex, telefax. However, I am uncertain as to how general are direct network externalities in high-tech industries, and how much more important they are than in other industries. I suspect that they are not very important overall, although very important in some cases, such as the examples just given. (One example of important direct network externalities in a definitely *non*-high-tech market is the market for certain kinds of toys, such as Star Wars-type figures. Here it seems important for the consumers that their friends have the same kind of figures, e.g., Star Wars or Masters of the Universe, because they get enjoyment out of being able to talk about their figures with each other.) Moreover, all examples of a high-tech nature that I can think of involve markets where variants are compatible, which is important in the context of Krishna's models, because whether or not goods are compatible determines the kind and extent of optimal policies, and in particular diminishes the scope for profit shifting. As for *indirect* network externalities, e.g., repair service availability or availability of complementary goods such as films for video recorders, I

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*Chapter 11 in this volume.

suspect that high-tech goods are not very different from many other goods, such as the household durables mentioned by Krishna.

There exist some striking examples of how important *expectations* about network size can be for demand for particular variants of a product: the Macintosh and the IBM PC, and VHS and Sony's Beta in the video market. I would argue that there are few examples of this kind of competition between incompatible variants (I cannot think of more examples). What we have seen in the PC and video markets are one-shot battles for an industry standard. Once a standard is established there seems to develop fierce competition among compatible products. (Krishna raises the question of choice of standard in the concluding section.) I would argue that compatibility is the rule.

In conclusion, I am less convinced than Krishna that (1) network externalities are significantly greater in high-tech industries in general, and (2) expectations about network externalities are very important in these industries in general. To be convinced I need more than a few good examples. In any case I think that compatibility is the rule, which means that there is less scope for profit shifting.

One feature of the kind of models that Krishna employs is their sensitivity to choice of strategic interaction and choice of parameters. Let me give some examples:

1. In section 11.2 when there are no distortions in expectations on network size but the usual Cournot distortion about the rival's response, i.e., that the rival will keep his output constant when in fact he will decrease his output in response to an own output increase, incompatibility calls for a subsidy to the domestic firm, while compatibility may call for a tax as an optimal policy. In the former case expectations are too pessimistic, and in the latter case they are too optimistic, if the complementary network effect dominates the output response effect. This case demonstrates that it may be crucial whether or not goods are complementary, which may not be easy to determine in all cases.
2. The Cournot assumption is maintained throughout. It is known from Eaton and Grossman that if competition is in prices instead of quantities, the optimal policy is reversed.
3. It is assumed that the government knows the firm's conjectures about the rival firm's response, and also knows the actual response of the rival firm *ex ante*. These are strong assumptions. In the standard case, when the firm conjectures zero response and the actual output response is negative, it is socially optimal to subsidize domestic production. If instead the firm knows that the government will subsidize when it thinks that the firm is too pessimistic, and knows what the actual response of the rival firm will be, is it then not in the interest of the domestic firm to lie about its conjectures?

The firm maximizes profits inclusive of subsidies. (This should be investigated.)

These models are partial equilibrium models. They therefore by assumption exclude intersectoral interactions which may diminish or even reverse an argument for a particular policy. For example, costs are assumed to be given and constant. If the high-tech industry in question employs a scarce resource, such as electronics engineers, its output will affect input prices and the profit calculation. Expansion may not be desirable because input prices rise too much. Another possibility is that there are several industries with pure profits and production exclusively for exports, and that the increased profits of one industry imply a larger decrease in profits for the other industries.

Kala Krishna writes at the end of section 11.3 that her demonstration that it is possible to shift profits away from foreign firms by subsidizing domestic sales should not be taken as a call for subsidization. The reason is that it is unlikely that subsidization by one government will go unanswered by other governments, i.e., retaliation must be taken into account. If it is, there is really no scope for profit-shifting policies of the Brander-Spencer type.

The purpose of these comments is to point out the fragile nature of the arguments for profit-shifting policies. It is only fair to say in conclusion that many of my objections are contained in Krishna's paper, although one would wish that they were stressed somewhat more.

The aims of Barbara Spencer's paper* are to determine if countervailing duty levels permitted under the GATT are always sufficient to (1) prevent a subsidy from causing harm to firms in the importing country, and (2) deter governments from subsidy policies based on profit-shifting motives. These questions are very important for trade policy as it is practiced, and have been neglected in theoretical research. Spencer's analysis, together with related work of hers, is therefore, to the best of my knowledge, a pioneering contribution. The general point reached by the analysis is that the appropriate countervailing duty level depends on the type of subsidy and the way it is used.

Spencer states that subsidization of production or exports by one country will affect other countries' welfare by (1) increasing consumer surplus, (2) giving rise to adjustment costs, and (3) shifting pure profits to the firms of the subsidizing country. The first effect is positive, the second and third negative.

Most of the analysis focuses on the third effect; in the simple case considered for analytical convenience, a country will be hurt by subsidized imports because of lower prices and decreased sales for its

*Chapter 12 in this volume.

domestic firms, whose profits decreased. The relevance of the analysis depends on how prevalent industries with supernormal profits are, and how prevalent subsidies to these industries are. Consider a rough classification of subsidized industries as follows: (1) high-tech (electronics, aerospace, genetic engineering), (2) industries in depressed regions, and (3) senescent industries (steel, textiles). Are pure profits prevalent in these three categories? Spencer, herself, states that in the case of targeted research and development (R & D) subsidies, which are directed mostly toward the first category, targeting often does not pay off to the subsidizing country and, therefore, is limited in actual practice. My guess is that in terms of total value, most subsidies to high-tech industries are nontargeted, an example is favorable tax treatment for R & D expenditures, and therefore not liable to countervailing duties. As for the second category of industries, which presumably is a mixture of different types of industries, it is impossible to say anything definite without having some data. The third category of industries consists of declining firms; if anything, they exhibit subnormal profits. If a country subsidizes this category of industries so that the same category is diminished in another country, the other country is probably made better off since consumer surplus is increased, and resources can be allocated to more productive activities without too high adjustment costs. My point is that perhaps the category of subsidized industries with supernormal profits is really insignificant, and that instead industries with subnormal profits are dominant. Spencer's analysis is still valid but less relevant if my presumptions are correct.

As a basis for later discussion, Spencer first establishes the following theorem (section 12.4): "A subsidy to output or to total sales can always be exactly offset by a tax of the same type which raises the same total revenue." Consider two cases of offsetting taxes (tariffs), in which the effect of the offsetting tax (tariff) on exports from the subsidizing country is the same in both cases. In the first case exports are subsidized by 10 percent. A tariff of 10 percent will leave market shares and prices in the importing country constant *as well as profits of the subsidized exporting firm*. The subsidizing country will not shift profits to itself and will be worse off by the amount of the tariff. In the second case output is subsidized, not exports. A 10 percent tariff will again leave market shares and prices in the importing country unchanged. The difference lies in the net effect on profits of the subsidized firm. Profits of the subsidized firm *increase* in this case.

The question is: Is the countervailing duty of 10 percent in the two cases sufficient to deter subsidization? In the first case it is. It may not be sufficient in the second case, however. The reason is that although national welfare is decreased to the same extent in both cases, the profits of the subsidized firm are not the same. If the subsidizing gov-

ernment looks more to the welfare of capital owners and employees of the subsidized firm, in order to maximize votes in the next election, it will not be deterred and stop subsidizing. Deterrence may therefore require a much higher countervailing tariff rate than the subsidy rate of 10 percent, and one sufficiently high to prevent any increase in firm profits. The author makes this point, but should have put more weight to it than to changes in national welfare.

A tariff rate higher than 10 percent will, in my example, further *raise* the national welfare of the importing country and will also increase the profits of its import-competing firm at the expense of the subsidizing country. It is likely that constant-profit deterrence is less palatable to the subsidizing country than constant-national-welfare deterrence and is therefore more effective. It is also conceivable that it is perceived to be unfair because some profit shifting to the importing country takes place, and that it therefore is more likely to invoke retaliation on the part of the subsidizing country, in the case when deterrent action actually takes place.

Although constant-profit deterrence seems more likely to be effective than constant-national-welfare deterrence, it must be harder to apply in practice. Subsidy rates are difficult to estimate, but probably less so than, *ceteris paribus*, the effect on profits of subsidies.

Perhaps the most important specific point made in the paper is that capital subsidies have very different effects depending on whether they result in additional capital investments or not, but that this is not taken into account in the way countervailing duty levels are actually computed. If capital subsidies result in no new capital, countervailing duty levels are too high, since they result in decreased exports by the subsidized firm. If the capital subsidy results in new investments, they also tend to be too high, although the opposite is possible. My conclusion after reading this section in the paper is that the relevant circumstances have to be taken into account when the countervailing duty is set, i.e., one has to consider to what extent the capital subsidy results in additional capital.

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