Measuring the Impacts of Trade Policies: Effective Rates of Protection

Frank Flatters[1]

1. Introduction

Trade policies work through their effects on domestic prices of goods and services – by altering the relationship between domestic and world market prices. Import duties raise domestic prices, while export taxes lower them. Policies that regulate the quantities of imports or exports have an indirect effect on domestic prices. By limiting the amount of a good that can be imported, an import quota creates an artificial scarcity in the local market and hence and raises its domestic price.

Prices matter. They are of direct interest to consumers and users of domestic goods. Wheat millers' costs are directly affected by changes in the domestic price of wheat arising from tariffs or restrictions on wheat imports. Final consumers experience the impacts of import duties through higher prices of food and clothing and other protected goods. The effects of trade policies on domestic prices are referred to as the *nominal protection* arising from trade policies.

Changes in nominal protection affect the real incomes of the users of protected goods. By increasing the cost of protected goods and by forcing users to adjust their demands for these and related goods, increases in nominal protection decrease real incomes of users of these goods. For the economy as whole, there is a loss in economic welfare as demands are adjusted to prices that do not reflect the true scarcity or opportunity costs of protected goods. Decreases in nominal protection have the opposite effect.

The impact of trade policies on producers is slightly more complex. For a garment producer, for instance, taxes or other restrictions on clothing imports raise domestic clothing prices and are beneficial to domestic producers selling in the local market. On the other hand, a tariff-induced increase in the domestic price of fabric raises garment producers' costs and so is harmful to them. The net impact of trade policies on the producers of any good depends on their effects on prices of both their outputs and their inputs.

The *effective rate of protection* is a commonly used measure of net effect of trade policies on the incentives facing domestic producers. The measurement of effective protection is clearly a two stage process – first determining the nominal protection of the policies in question, and second, analyzing the implications for effective protection of different firms, sectors or activities.

Just as increases in nominal protection reduce overall economic welfare by distorting the information provided by domestic prices about relative scarcities of different goods, increases

[1] Professor of Economics, Queen's University, Canada, ff@frankflatters.com. This exposition was prepared as background material for a firm-level effective protection study to analyze the impacts of regional trade liberalization under the SADC Trade Protocol. Funding was provided by USAID under a contract with The Services Group, Arlington, Virginia.

in effective protection cause economic waste by inducing producers to supply goods domestically even when their domestic costs are higher than their opportunity costs through trade. At the same time, producers of goods with relatively low levels of effective protection are induced to refrain from producing goods domestically even when this could be done at a lower cost than in international markets.

2. Nominal Protection

The *nominal rate of protection* (NRP) on any good is the proportional difference between its domestic and international price arising from the trade policies in question. These policies can include import tariffs, export taxes, quantitative restrictions (licensing requirements, prohibitions, rules of origin, local purchase requirements, etc.) and other 'incentives' such as subsidies and tax rebates. If the only relevant trade policy were a 20 percent import tariff, the NRP would be 20 percent – the proportional difference between the *cif* import price and landed price (and therefore of closely competitive locally produced goods) in the domestic market. With a more complex set of trade policy measures the NRP is an estimate of the equivalent *ad valorem* tariff that would lead to the same difference between domestic and international prices as prevails under the policies in question.

The NRP, therefore, is a measure of the total price-raising (or reducing) effects on a tradable good of the trade policies being examined.

The relationship between the domestic price and the world price of any good, and the derivation of NRP from this, can be expressed algebraically as:

$$P^d = P^w (1 + t + d + e) \quad [1]$$

$$NRP = (P^d - P^w)/ P^w \times 100 \quad [2]$$

where P^d and P^w are the domestic and world price, respectively, t and d are the *ad valorem* equivalents of taxes and duties on imports of the good, and e is the net *ad valorem* tariff equivalent of other non-tax, non-tariff trade restrictions.

In interpreting the effects of import taxes it is important to recognize that only those that discriminate in some way between imports and exports add to (or reduce) nominal protection. A 10 percent value added tax (VAT) that applies to both domestically and internationally sources of a good does not give rise to any difference between its domestic and world price. However if a sales tax is levied at a rate of 5 percent on domestic goods and 15 percent on imports, this is equivalent to an import duty of 10 percent.

There are several practical difficulties in measuring nominal rates of protection.

Applied versus official rates: The import duty rate that is actually applied to any import consignment can differ substantially from the official tariff rate. The reasons for this can range from inaccurate import valuations to the existence of various kinds of full or partial exemptions. Exemptions are often based on the declared end uses (e.g. production of exports) or end users (e.g. government or diplomats) of the imported goods. Using the official duty rate as an estimate of nominal protection in the case of exempted goods overstates the actual rate of nominal protection. A method that is often used to solve this problem is to use the average collection rate (total duty collections as a percentage of the

value of imports) as the measure of nominal protection. Unfortunately, this provides an underestimate of the nominal protection of non-exempt imports and hence of the distorting effects of protection on such imports. Ideally one would be able to provide nominal protection estimates for both exempt and non-exempt imports separately.

Ad valorem versus specific rates: When import duties are determined on a per unit basis (x Rands per ton, for instance), it is necessary to get unit values of imports in order to convert these *specific* rates into *ad valorem* equivalents. This can be done either directly by determining these unit values or indirectly by using the average duty collection rate (duties collected as a percentage of value of imports) as the *ad valorem* equivalent. The latter method suffers from the same problems as described in the previous paragraph.

Ad valorem equivalents of other measures: In order to estimate the nominal protection of other trade policy measures, they must also be transformed into *ad valorem* equivalent effects on the prices of the products. A requirement to purchase a certain amount of domestic wheat in order to be permitted to import wheat raises the cost of wheat purchases by grain millers. It is the percentage increase in the cost of the wheat that is the *ad valorem* equivalent of this restriction on imports. If a rule of origin requiring that imports be sourced domestically or in the region has any effect, it is to raise the cost of certain inputs. It is the percentage increase in these costs that is the *ad valorem* equivalent of the rule of origin. While deriving these nominal protection rates is not always easy, the principles that must be used in estimating them is relatively straight forward.

3. Effective Protection

The effective rate of protection measures the net protective effect on producers of any product due to the structure of protection on both its inputs and its outputs.

3.1 A Simple Example

Consider a simple example of a producer of 'garments' that requires only one intermediate input 'cloth'. Suppose that production of garments worth 100 at world market prices requires the use of cloth worth 75 in world markets. 'World value added' or the cost of all manufacturing margins, including labor and normal returns to capital is 25 (the difference between 100 and 75).

Now consider a domestic producer of garments in a county providing nominal protection at a rate of 30 percent on garments and 20 percent on cloth. The protection provided to garments is clearly beneficial to garment makers, while that on cloth is harmful. What is the net effect? The net effect depends not only on the nominal protection, but also on the market in which the producer wishes to sell.

Case 1: Sales in the Domestic Market

Under this structure of protection the domestic price of garments becomes 130 (100 times 130 percent) while the cost of the cloth required to produce these garments becomes 90 (75 times 120 percent). The maximum domestic value added (or cost of all manufacturing margins) that will permit domestic garment producers to still be able to compete with imports is 40 (130 minus 90), which is higher than 'world value added' of 25. In other words, domestic value added permitted by the structure of protection on cloth and garments is 160

percent of or 60 percent higher than world value added. This increase in domestic value added permitted by the protection structure is known as the *effective rate of protection* provided to local garment production directed at the domestic market.

Case 2: Exports to World Markets

Consider now a garment producer working under the same protection structure but wanting to sell for export in world markets. In this case, the domestic protection of garments is of no assistance; in order to compete in world markets, the garments must be priced at 100. However, the protection of cloth still raises its cost to 90 (75 times 120 percent).

In order to compete in the export market, therefore, the producer must be able to manufacture garments with a margin of no more than 10 – the 'domestic value-added' permitted in this case cannot exceed this amount. This is substantially less than 'world value-added.' In other words, the effective protection provided by the domestic protection structure in this case is negative – minus 60 percent (the domestic value-added of 10 is 60 percent less than world value-added of 25).

This example illustrates an important point. Nominal protection in the domestic market does not provide any benefit to domestic producers wanting to sell this good for export. However, protection of goods which are a firm's inputs raises production costs and so provides negative effective protection to exports.

The only way around this is to eliminate protection of inputs altogether, or to provide special provisions whereby goods used as inputs by exporters are free of the cost-raising effects of protection. Export processing zone privileges usually include tax-free access to imported inputs; duty drawback and exemption programs for exporters have a similar effect.

Eliminating protection on inputs results in effective protection for exporters of zero percent. In the example shown here, this is a big improvement over minus 60 percent. But it is still much less attractive than the effective protection of plus 60 percent for garment production for the domestic market. Under this structure of protection there is clearly a very large incentive to produce for the domestic market rather than for export. The anti-export of bias of protection is something to which we return later.

Case 3: Preferential Export Sales to Regional Markets

Suppose that this country enters a preferential trading arrangement with a regional partner under which goods produced in each country can be exported duty-free into the other. The effective protection enjoyed by a garment producer exporting under such an arrangement depends on the nominal protection on cloth in the domestic market and the nominal protection on garments in the partner's market.

Suppose that the nominal protection on cloth in the partner country is 40 percent (10 percentage points higher than the 30 percent rate in the domestic market). A garment producer wishing to sell in the partner's market under these circumstances still suffers from the domestic protection of 20 percent on cloth; but it now benefits from the partner country's protection of 40 percent on garments. It can sell garments at a price as high as 140 (100 times 140 percent); its cloth costs are 90 (75 times 120 percent). This means it can have a processing margin as high as 50 (140 minus 90) and still be able to compete in the regional

market. The effective rate of protection for sales in the regional market, therefore, is 100 percent (50 is 100 percent higher than the world value-added of 25).

If, on the other hand, the partner country provided nominal protection of only 25 percent on garments, the maximum processing margin that would permit regional garment exports to compete would be 35 (125 minus 90). This would yield an effective rate of protection for preferential sales in this market of 40 percent (35 is 40 percent higher than 25).

Table 1: Summary of Illustrative ERPs for Domestic Garments Sold in Different Markets

		Sales Destination				
	World Market Values	Domestic Market	Internat'l Market (no EPZ)	Internat'l Market (with EPZ)	Regional Market 1	Regional Market 2
NRP on Fabric (%)		20	20	0	20	20
Cost of Fabric	75	90	90	75	90	90
NRP on Garments (%)		30	0	0	25	40
Value of Garments	100	130	100	100	125	140
Value Added	25	40	10	25	35	50
ERP		60%	-60%	0%	40%	100%

3.2 Some General Properties of Effective Protection Rates

The effective rate of protection afforded any activity is simply the percentage increase in value-added, or manufacturing cost margins, for domestic producers by the structure of nominal protection on its outputs and inputs.

From the earlier examples it is clear that the nominal protection on inputs and outputs depends critically on the market for which production is intended. It might also depend on domestic market conditions. While the normal impact of a tariff is to raise the domestic price of the protected good by the amount of the tariff, there are instances in which the actual nominal protection is different than this. See Box 1 on protection of wheat in South Africa.

1. The Price of Domestic Wheat in SACU

SACU grain millers have long justified their pleas for protection on the basis of the effects of the South African wheat tariff on its domestic price and hence on the millers' costs. For imported wheat, there can be little doubt that the tariff raises the cost of milling flour domestically, at least in South Africa. SACU millers outside of South Africa (i.e. the BLNS millers), on the other hand, receive a rebate of wheat import duties, and so enjoy the protection of the flour tariff while bearing none of the costs of that on wheat.

Imports account for only 30 to 40 percent of the wheat used in South Africa. The rest comes from domestic production. What is the effect of the wheat tariff on the price of domestic wheat? In a competitive market with low internal transport costs, the tariff would be expected to be more or less fully reflected in the domestic wheat price – i.e. domestic growers should receive close to the tariff-inclusive import price.

This does not appear to be what has happened, at least in recent years. Examination of wheat contract prices on the South African grain exchange suggests that local growers have received no more than pre-tariff import prices and often something much closer to an export-parity price. In addition, interview data from a number of BLNS millers indicates that they prefer to buy South African wheat rather than imports, despite their enjoyment of a full duty rebate on imports. Indirect evidence of the same phenomenon comes from South African millers

who complain that certain BLNS millers often buy up domestic wheat, forcing them (South African millers) to use higher priced imports.

Why is the domestic wheat price so low? Part of the reason might be risk-averse behaviour by growers who have been too anxious to enter futures contracts in an environment of rising prices. The growers might also have suffered from a certain amount of 'exchange rate illusion' at a time when rising international prices and a depreciating Rand caused unexpectedly large increases in domestic prices of imported wheat.

An additional and at least equally important reason for low domestic prices (relative to full import parity) is a combination of regional segmentation of the South African market and considerable market power by a small number of local buyers. Recognizing this asymmetry in market power, growers in certain regions have tried to organize and present a united front in bargaining with monopsonistic buyers. When farmers in one region refused to enter futures contracts, however, the buyers filled their silos with imported wheat in advance of the domestic harvest. In the absence of local storage facilities at harvest time, farmers had little choice but to sell at heavy discounts.

Whatever the reason, there is considerable evidence that price of domestically grown wheat in South Africa have been far less than tariff-inclusive import parity in recent years. The main impact of the wheat tariff appears to have been on the price of imported and not domestically produced wheat. This has had a minimal impact on the costs of grain millers.

Source: Erasmus and Flatters 2003

In other cases, the complexity of import tariff arrangements give nominal protection rates that are quite different than might initially appear to be the case. See Box 2 on export incentives in the South African motor industry.

2. Protection in the Motor Industry: Using Tariffs to Subsidize Exports

The South African motor industry is protected by substantial import duties on both vehicles and components. Despite this protection, the industry has recently become a great symbol of export success. Has this particular industry managed to overturn some of the basic predictions of economics – that high levels of domestic protection tend to penalize and discourage exports? No. In fact the Motor Industry Development Program (MIDP) under which the industry now operates actually takes advantage of import protection to give substantial, but not immediately transparent subsidies to exporters of vehicles and components.

The export subsidy benefits of the MIDP are derived by firms in the form of privileges to import components and vehicles on a duty-free basis for the production and sale of vehicles in the protected domestic market. These privileges can only be obtained, directly or indirectly, by exporting vehicles or components. While the MIDP incentives are based on selective import duty reductions, they provide substantial protection to sales in the domestic market and give large subsidies to investment and exports. The value of these subsidies rests on the rents created by continued import protection for vehicles and components in the domestic market. They gain their effect through transfers from South African vehicle buyers, and they encourage economic inefficiency through high cost production of vehicles and components in South Africa. The direct cost per job created in the motor industry appears to be very high, and the indirect costs to employment in other sectors might also be large.

The effective rate of protection given to exports under this program ranges from 30 to 40 percent for vehicles and from 26 to 30 percent for components.

Source: Flatters 2002

Once nominal protection rates have been determined, however, effective rates of protection can be derived from the following basic formula.

$$ERP = (VA^d - VA^w)/ VA^w \times 100 \quad [3]$$

where VA^d and VA^w are value added in the activity as measured at protection-inclusive domestic prices and undistorted world prices respectively.

From the earlier examples and from an examination of the ERP formula, a few important general properties of effective protection rates can be seen.

- The effective rate of protection will be greater the larger is the nominal rate of protection on an activity's output, the smaller the nominal protection on its inputs and the smaller is the activity's world value added.
- If the nominal rate of protection is the same on all of an activity's inputs and its output, the effective rate of protection will be identical to this common rate of nominal protection.
- If the nominal protection on an activity's output is larger (smaller) than on its inputs, the effective rate of protection will be greater (less) than the nominal protection on the activity's output (inputs).

In determining the net impact of protection on any sector it is necessary to consider not only the direct effect of protection on each of the sector's inputs and outputs as has been described so far, but also the indirect effect of the entire structure of protection across the economy.

A tariff structure that places taxes on all imports cannot protect all production activities. Fixity in endowments of key factors such as labor, land and, at least in the short run, capital, together with limitations in productive technologies available at any point in time make it impossible to expand production of all goods at the same time. It is *relative* levels of effective protection that matter in determining the impact of trade policies.

Imposing tariffs on all imports might have the initial impact of reducing demand for imports and increasing demand for domestic import substitutes. But this increases the prices of inputs that are specific to import competing activities and causes an appreciation of the real exchange rate. This indirect impact of protection on the costs of producing tradable goods and on the real exchange rate is similar to the imposition of a tax on all tradable goods. This offsets some or all of the protective effect of the tariff structure. For sectors that get very little effective protection from the direct effects of protection on their inputs and outputs, the net impact of protection will be negative. It is only sectors that get relatively high levels of effective protection from tariffs on their own inputs and outputs that end up with positive effective protection after taking account of these indirect or real exchange rate effects.

The final effective protection rate received by any activity after taking account of both the direct effect of protection of its own inputs and outputs and the indirect real exchange rate effect of the entire protection structure is known as the *net effective protection rate*.

Consider some examples.

Cascading Tariff Structures: A common type of tariff structure employed in many developing countries is one with *cascading* rates from primary and capital through intermediate to final consumption goods. The lowest rates are applied against primary and capital goods, intermediate rates against intermediate inputs, and the highest rates against imports of final consumption goods. Recalling the properties of effective protection rates, it

would appear that such a structure would give positive effective protection to all import substitution activities, with rates of effective protection increasing in moving from primary to final goods. This is true until one takes account of the indirect effect of protection on certain fixed factors of production in these sectors and on the exchange rate. The appreciation of the real exchange rate due to the entire structure will impose a penalty (negative effective protection) on all tradable sectors. For sectors with very high effective rates of protection from protection of their own inputs and outputs (final goods), this exchange rate effect of protection will be only a partial offset. However, for sectors with lower direct effective protection, the negative real exchange rate effect will swamp any 'beneficial' impacts of low tariffs on their outputs. Even with carefully designed cascading tariff structures, it is only the very highly protected final goods sectors that will receive positive net effective protection. Capital goods and many intermediate goods will face negative net effective protection.

Protection and Exporters: It was observed in the earlier examples that import tariffs on intermediate inputs by exporters imply negative effective protection for exporters. Duty drawbacks, exemptions or EPZ privileges can all be used to remove the direct cost-raising effect of these duties on imports. Do exporters have a net effective rate of protection of zero in these circumstances? No. The overall structure of protection has a real exchange rate effect that penalizes producers of tradable goods, including exports. This means that, even in the presence of a well-functioning system of duty-free import privileges on inputs, exporters still have a negative net effective rate of protection.

Most of the ERP results presented in this report do not include estimates of the negative real exchange rate effect of protection. In interpreting the results, therefore, it is differences in effective protection rates across sectors and activities that are most important, not simply their levels.

3.3 Interpreting Effective Rates of Protection: Distorting Production Incentives

The net effective rate of protection is a simple measure of the distortions in economic incentives facing domestic producers as a result of trade policies. High effective rates provided to some activities draw resources into these activities at the expense of those with lower and negative net effective protection. By distorting the signals given by market prices about relative scarcities of different goods and relative costs of different activities, these incentives can result in considerable waste of domestic resources.

This can be seen again through simple examples.

Positive Effective Protection in the Domestic Market: Consider first an import substitution activity such as domestic fabric production benefiting from net effective protection at a rate of 30 percent. With this level of protection, a domestic fabric manufacturer could incur costs 30 percent higher than a similar international manufacturer and still compete against imports in the domestic market. Under this structure of trade policy incentives created by trade policies it would be privately profitable to use domestic resources worth $130 to produce fabric that could be obtained in world markets for only $100. Each $100 in foreign exchange "saved" through domestic production of fabric costs the country $130. The economic waste from such production amounts to $30 for each $100 of foreign exchange "savings". Positive effective protection makes an activity that is economically wasteful (producing fabric

domestically at a domestic resource cost significantly higher than the cost of importing the same fabric) privately profitable.

Negative Effective Protection for Exports: Now consider a potential export activity, say garments, that, because of tariffs on fabric and other inputs, together with the real exchange rate effect of the entire structure of protection, faces negative effective protection on its exports at a rate of 20 percent. Under this burden the producer would have to manufacture at a cost at least 20 percent less than international competitors in order to compete in world markets. Production at any cost greater than this, even at less than international costs, would not be privately profitable for domestic producers. Exports worth $100 in world markets that could be produced domestically at a cost of, say, $81, would not be privately profitable and therefore would not take place. Negative effective protection ends up in a net loss of up to $20 for each $100 worth of garment exports that do not occur as a result of the perverse incentives created by trade policies.

Net Effect of Trade Policy Reform: Finally, taking these two examples together, consider a trade policy reform that eliminated the distortions that encourage import substitution production of fabric and discourage export production of garments. This would reduce the incentive to produce fabric for the domestic market and increase the incentive to produce garments for export. Each $100 reduction in fabric production (valued at world prices) would actually save domestic resources of $130. And each $100 of increased garment production would cost domestic resources worth only $80. The net gain to the economy would be $50 ($130 minus $80).

The size of these efficiency gains from trade policy reform (or of the costs of distortions in production incentives due to protection) is directly related to the magnitude of differences in effective protection rates across economic activities. The direct costs of trade policy distortions arise from these differences in effective rates of protection. To gain an appreciation of the impacts of trade policies and changes in trade policy regimes, therefore, one must look at their effects on the structure of effective protection and especially in variances in rates of protection across activities.

References

Erasmus, Hennie and Frank Flatters 2003 "Rent-Seeking in Regional Trade Liberalization: Rules of Origin and Other Barriers to Trade in Wheat and Wheat Products" http://qed.econ.queensu.ca/faculty/flatters/main/writings.html

Flatters, Frank (2002) "From Import Substitution to Export Promotion: Driving the South African Motor Industry" http://qed.econ.queensu.ca/faculty/flatters/main/writings.html