Tariff Escalation and the Developing Countries: How Can Market Access Be Improved in the Doha Round of Trade Negotiations?

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Abstract

This paper explores the issue of market access where some developing countries export high-value processed goods and others export raw commodities. The results show that market access issues for goods entering at different stages of the marketing chain should take into consideration the potential existence of successively oligopolistic markets.

Introduction

The current Doha Round of trade negotiations of the World Trade Organization (WTO) has been labeled the 'development round' a key aim of which is to increase developing countries' access to developed country markets. A key area of these negotiations will relate to agriculture with the focus being increasing market access through reducing high levels of tariffs and promoting market access through the expansion of tariff rate quotas. Other aspects of negotiations on agriculture of interest to developing countries will include the subsidization of exports via explicit export subsidies and through less explicit incentives such as export credit guarantees and state trading enterprises. The focus of this paper is on market access via the reduction in tariffs. In this context, tariffs that are applied by importing countries relate to both raw and processed commodities. Where tariffs on processed commodities are greater than those on related raw commodities, we have tariff escalation. Many commentators on the issue of market access for developing countries have highlighted the problem and extent of tariff escalation that many developing countries face. See, for example, UNCTAD (2002), Watkins (2003) and World Bank (2003). The obvious insight from trade theory would be that reducing the tariff on the raw commodity but leaving the tariff on the processed commodity unchanged would increase the level of effective protection which clearly discriminates against those countries that export processed goods. With policy advice to developing countries being that since there is higher value-added and hence greater potential returns from exporting processed goods developing countries should 'up-grade' their export profile and rely less on raw commodity exports,

focusing on market access issues that relate to both raw and related processed commodities and corresponding tariff levels at upstream and downstream stages is clearly warranted.[1]

However, the issue of trade liberalization and market access should also account for market structure issues since market power may ameliorate (or indeed exacerbate) the impact of a change in a tariff. In this regard, many models that have been used to quantify the impact of trade reform in agriculture have largely ignored competition issues in the food sector and how they may impact on the trade liberalization outcomes. Yet, as we show below, industries downstream from agriculture are, in developed economies, typically highly concentrated. Moreover, these industries are typically highly concentrated at both the processing and retail sectors, such that when we consider the structure of the food sector, the most appropriate characterization is one of 'successive' oligopoly. In this regard, the issue of tariff escalation and promoting market access should explicitly account for the successively oligopolistic industries in which the tariff applied at various upstream/downstream sectors is aiming to protect.

The objective of this paper is to explore tying some of these issues together. More explicitly, we consider the issue of market access to developed country markets where industry structure in the importing country is characterized by imperfect competition at both the retailing and processing stages, i.e., we have successive oligopoly. Developing countries export raw commodities and processed food products, though we assume below that these are different countries and where tariffs are applied on both goods, i.e., the issues of tariff escalation and effective protection form a key ingredient in this analysis. Setting the issue of market access, imperfect competition and tariff escalation in a formal framework leads to important insights.

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[1] The issue of tariff escalation and the distinction between processed and unprocessed goods is clearly not confined to agriculture. However, given the profile of agriculture in the Doha Round and since our data relates to agricultural and food markets, we stick with the agricultural trade context here.

First, in the context of a model of successive oligopoly, an equal reduction in tariffs on the processed product and raw commodity are not equivalent in guaranteeing increases in market access for raw agricultural and processed good exporters respectively. Second, the extent to which this is true depends on the nature of competition in the developed country markets. Third, to the extent that the processed exporter and the raw commodity exporter are different countries, tariff reductions that maintain the same level of effective protection are likely to be discriminatory in terms of market access considerations. This is in contrast to the general perception of trade policy that reducing tariffs by the same amount is necessary to avoid increasing the disincentives to processed good exporters. If the primary focus is on market access, which we argue below should be the appropriate focus of trade negotiations, varying the level of tariff reductions will be necessary to avoid discrimination between developing country exporters. This in turn has a political economy consideration: developing country negotiators should not focus solely on market access commitments offered by developed countries, but also be aware of what each developing country receives in terms of market access contingent on their export profile, if negotiated market access outcomes are to avoid being discriminatory.

The paper is organized as follows. In section 1, we summarize some recent concerns facing developing country exporters with respect to the issues of tariffs and tariff escalation. In section 2, we report some data relating to market structure of the food industry in developed countries, focusing primarily on the European Union (EU) and the United States that suggests a successively oligopolistic framework. A formal modeling approach is outlined in section 3 which is used to explore the issues of tariff concessions and market access when the importing country's food industry structure is characterized by successive oligopoly. Key results that arise

from this theoretical model are presented in section 4. In section 5, we summarize and conclude and consider some avenues for future research on this issue.

1.   Access by Developing Countries to Developed Country Markets

In this section we consider some of the issues involved when developing country exporters are faced with the problem of market access in the context of a vertically related market. We consider two issues: first, the levels of tariffs and the problem of tariff peaks facing developing country exporters; and, second, the problem of tariff escalation.

(i)   Tariffs and Tariff Peaks

The traditional focus of trade models is on explicit trade barriers such as tariffs and quantitative restraints. Following the Uruguay Round of GATT, there was a process of tariffication whereby a range of non-tariff barriers including quantitative restraints were converted into tariff equivalents. A recent survey by USDA (2001) indicates that, on average, world tariffs in the food and agricultural sector stand at 62 percent for bound, most favored nation (MFN) rates. However, average food and agricultural tariffs for WTO members by region vary from 25 percent for North America and 30 percent for the EU to 113 percent for South Asia. This compares with average developed country MFN tariffs of 5 percent across all sectors (Hoekman, Ng, and Olarreaga, 2002). It should also be noted that tariff levels in developing countries are also high, in many cases higher than those in developed countries, such that developing country access to other developing countries, may actually be more restricted than to developed countries.

While the level of average tariffs is in some way informative, it should be noted that products in this sector are often characterized by tariff peaks in the developed countries, i.e., where the tariffs on some imported products far exceed the average level. For example, as reported by Hoekman, Ng and Olarreaga (*op. cit.*), the United States, the EU, Japan and Canada have respectively 48, 290, 178, and 85 tariff peaks for food and agricultural products, with the maximum tariff rates being on butter (Canada, 340 percent), edible bovine offal (EU, 250 percent), raw cane sugar (Japan, 170 percent) and peanuts in the shell (US, 120 percent). As noted by Hoekman, Ng and Olarreaga, many of these tariff peak products are of interest to developing country exporters such that market access may be more limited than what the average tariff rates imply.

However, an additional aspect of market access relates to preferential treatment. Many developed countries also provide limited preferential access for food and agricultural products under both the Generalized System of Preferences (GSP), and reciprocal trade agreements such as NAFTA. For example, the EU has a myriad of preferential access agreements that cover a large number of developing countries with some developing countries being more favored than others. In Table 1, average MFN tariffs by Harmonized System 2-digit food and agricultural products are listed for the EU and the United States, along with margins for less developed country (LDC) preferences. Across all products, the average MFN tariff on food and agricultural products is 38.3 percent in the EU, and 30 percent in the United States, with developing countries getting preferences that imply on average they pay duty up to 50 percent of the MFN tariff. However, there are some clear tariff peaks in the EU for products such as meat and edible

offal (02), cereals (10), and oil seeds (12) where preferential access for the developing countries is small, and likewise in the United States for oil seeds.

The tariff data suggest that developing country access to developed country markets for food and agricultural products could be improved through trade liberalization, particularly in the case of products that exhibit tariff peaks in developed countries and limited preferential access beyond MFN tariffs. This, however, is not the only consideration.

(ii)   *Tariff Escalation*

For developing countries attempting to diversify and up-grade their exports from raw agricultural commodities to processed food products, one of the most often-mentioned difficulties is that of tariff-escalation. Tariff escalation occurs when tariffs on imports of processed goods are higher than the tariffs on the corresponding raw commodity. This issue has been well-known from the work of Balassa (1965) and Corden (1971). UNCTAD (2002) has recently cited this issue as one of the main problems facing developing country exporters in diversifying their export profile.

The recent evidence on the extent of tariff escalation is rather mixed. For many agricultural commodities supported by government intervention in the developed countries, the tariff on the raw commodity is often exceptionally high. For example, USDA (*op. cit.*) report higher levels of tariffs on grain compared to grain products in several developed countries including the United States and the EU. Nevertheless, tariff escalation is still perceived to be a major issue facing developing country exporters. In Table 2 we report the highest post-Uruguay Round tariff escalation estimates for a series of commodities for the US, Japan and the EU. The estimates show high levels of tariff escalation across all three countries. The table also highlights that the level of tariff escalation has decreased following the Uruguay Round with some of the

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commodity groups facing the highest levels of tariff escalation also being the ones exhibiting the highest levels of reduction.

UNCTAD (2002) also reports high levels of tariff escalation for products exported solely from developing countries. For example, for coffee, tea and spices, the level of tariff escalation in Japan and the EU rose from averages of 0.11 per cent and 1.63 per cent for raw material imports in these two countries respectively to 8 per cent and 20 per cent in the case of the final product. Taken together, and in spite of the decline in tariff escalation following the Uruguay Round, tariff escalation remains a problem for developing countries diversifying their exports and attaining market access for the processed good.

2.   Market Structure in the Food Sector in Developed Economies

As noted in the introduction, the food industry is typically highly concentrated in developed countries at both the retail and processing stages. At the processing stage in the EU concentration ratios are high. For example, the average 3 firm concentration ratios for each of the following EU countries are respectively: Ireland, 89 per cent; Finland, 79 per cent; Denmark, 69 per cent; Italy, 67 per cent; France, 63 per cent; and the UK, 55 per cent with the EU average being 68 per cent.[2] Data for the United States show similarly high levels of concentration across food manufacturing. At the retail level, markets are also highly concentrated in many EU countries. For example, in the UK, the 5 firm concentration ratio is 67 per cent, Finland, 96 per cent, Denmark 78 per cent with similarly high concentration ratios for other EU countries with the exception of Southern European countries that exhibit lower levels of concentration in

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[2] The source of the market concentration data for both the manufacturing and retailing sectors is Cotterill (1999).

comparison to the more highly concentrated retail sectors that seem to characterize Northern European countries. In the United States retailing is much less concentrated at the national level, though there is perhaps a spatial dimension to this. Nevertheless, taken together, the data suggest that imperfect competition is a feature of the food sector in developed countries and that 'successive oligopoly' is an appropriate characterization of these vertically-linked markets. The data would therefore suggest that studies of market access and tariff liberalization as it relates to trade in agricultural and processed food products should take into account market structure issues more explicitly.

3. Theoretical Framework

(i) Schematic Outline

It is perhaps useful to outline the modeling framework by representing the scenario we are addressing in Figure 1. In this market there are two domestic firms at the retail stage, and two domestic firms at the processing stage, i.e., there is successive oligopoly. The two firms at each stage do, however, differ in terms of where they buy their inputs. At the processing stage, firm 1 buys inputs from the domestic agricultural sector while firm 2 buys the inputs of the raw commodity from a foreign supplier. Subsequently, these two firms compete and sell the processed good to the firms in the downstream retail sector. In the downstream retail sector, there are again two firms that compete at this stage, the distinction between the two firms being from where they source their inputs. Firm 1 buys from the domestic upstream stage while firm 2 sources its inputs from the world market. The retail firms may or may not add value and may be involved solely in distribution. Since this stage is closest to the consumer, we assume that the

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import by firm 2 is of a relatively high-value, processed good. At each stage, firms take the input prices, whether sourced from the world or domestic market as given.

As far as the supply of the imported good is concerned, we assume that the suppliers of the raw commodity and the higher value good are different developing countries, say due to past investment in the food sector or lack of it. This avoids detailing any specific strategy of what combination of goods to produce. However, market access at each stage is affected by tariffs, with a tariff imposed on the processed import and on the raw commodity import. Thus tariff escalation and effective protection can be characterized in this model. If the tariff on the processed good is higher than on the raw commodity, there is tariff escalation and the level of effective protection afforded to the downstream firm 1 exceeds the level of nominal protection.

Taken together, the set-up of the model as presented in Figure 1 captures most of the issues referred to in sections 2 and 3 of the paper. First, developing countries may export raw commodities or more highly processed products but face the problem of tariffs imposed at each stage and where tariff escalation may persist. Corresponding to the characteristics of the food sector in the developed countries, we have imperfect competition at each stage of the vertically linked food chain. Hence, we have successive oligopoly. Finally, we have a framework more directly appropriate for considering the impact of trade reform than standard trade models employ as the model explicitly recognizes the relevance of market power and the role of tariffs on raw commodities and processed goods in determining market access at each stage of the food chain. With this model, we can ask questions about ensuring equivalent market access for raw commodities and processed goods if trade reform leads to commitments on tariff reductions particularly on products of interest to developing country exporters.

(ii)   The Model

Assumptions

As noted above, we have a model of successive oligopoly, i.e., both the upstream (processing) and downstream (retailing) stages are imperfectly competitive. We assume that the technology linking each stage is one of fixed proportions. Formally, $x_1 = \phi x^U$, where x_1 and x^U represent output of downstream firm 1 and the upstream stages respectively, and where ϕ is the constant coefficient of production. To ease the exposition, ϕ is set equal to one in the framework outlined below.

Following Ishikawa and Spencer (1999), the model consists of a three-stage game. At the first stage, the domestic government commits to negotiated tariffs, while the second and third stages consist of Nash equilibria in the upstream and downstream sectors. The timing of the firm's strategy choice goes from upstream to downstream. Specifically, given costs and the derived demand curve facing the upstream sector, upstream firms simultaneously choose output to maximize profits, which generates Nash equilibrium at the upstream stage. The processed good prices are taken as given by the downstream firms who then simultaneously choose their output to maximize profits, thus giving Nash equilibrium at the downstream stage. In terms of solving the model, equilibrium at the downstream stage is derived first and then the upstream stage. In addition, all equilibria are sub-game perfect.

Equilibrium in the Downstream Market

Let x_1 equal the output choice of the domestic downstream firm and x_2 the output choice of its foreign competitor. The revenue functions can be written as:

$$R_1(x_1, x_2) \tag{1}$$

$$R_2(x_1, x_2). \tag{2}$$

We assume downward sloping demands and substitute goods. Given (1) and (2), the relevant profit functions are given as:

$$\pi_1 = R_1(x_1, x_2) - c_1 x_1 \tag{3}$$

$$\pi_2 = R_2(x_1, x_2) - c_2 x_2 - t^p x_2, \tag{4}$$

where c_1 and c_2 are the downstream firms' respective costs. Firms' costs relate to the purchase of the intermediate input. Note that firm 2 also faces a per unit tariff on the processed import which is given by t^p.

The first-order conditions for profit maximization are given as:

$$R_{1,1} = c_1 \tag{5}$$

$$R_{2,2} = c_2 + t^p, \tag{6}$$

Equilibrium in the downstream stage can be derived by totally differentiating the first-order conditions (5) and (6):

$$\begin{bmatrix} R_{1,11} & R_{1,12} \\ R_{2,21} & R_{2,22} \end{bmatrix} \begin{bmatrix} dx_1 \\ dx_2 \end{bmatrix} = \begin{bmatrix} dc_1 \\ dc_2 + dt^p \end{bmatrix}. \tag{7}$$

The slopes of the reaction functions are found by implicitly differentiating the firms' first-order conditions:

$$\frac{dx_1}{dx_2} = r_1 = -\frac{R_{1,12}}{R_{1,11}} \tag{8}$$

$$\frac{dx_2}{dx_1} = r_2 = -\frac{R_{2,21}}{R_{2,22}}. \tag{9}$$

With this set-up, we can deal with both strategic substitutes and strategic complements where the variable of interest is the cross-partial effect on marginal profitability, i.e., sign r_i = sign $R_{i,ij}$. Consequently, with reference to equation (8) and (9), if $R_{i,ij} < 0$, then $r_i < 0$. In this case, we have the case of strategic substitutes, and the reaction functions are downward sloping. However, if $R_{i,ij} > 0$, the reaction functions are upward sloping and we have strategic complements. The distinction between strategic substitutes/complements relates to the 'aggressiveness' of firm's strategies (Bulow, Geanakopolos and Klemperer, 1985). With strategic substitutes, firms' strategies are less aggressive than those associated with strategic complements, i.e., with strategic substitutes (complements), an increase in the output of firm 1 would be met by a decrease (increase) in that of firm 2.[3]

Given (7), the solution to the system is found by re-arranging in terms of dx_i and inverting where Δ is the determinant of the left-hand side of (7):

$$\begin{bmatrix} dx_1 \\ dx_2 \end{bmatrix} = \Delta^{-1} \begin{bmatrix} R_{2,22} & -R_{1,12} \\ -R_{2,21} & R_{1,11} \end{bmatrix} \begin{bmatrix} dc_1 \\ dc_2 + dt^p \end{bmatrix}. \tag{10}$$

To simplify the notation re-write (10) as:

$$\begin{bmatrix} dx_1 \\ dx_2 \end{bmatrix} = \Delta^{-1} \begin{bmatrix} a_2 & b_1 \\ b_2 & a_1 \end{bmatrix} \begin{bmatrix} dc_1 \\ dc_2 + dt^p \end{bmatrix}, \tag{11}$$

where, $a_1 = R_{1,11}$ $a_2 = R_{2,22}$, and $b_1 = R_{1,12}$ $b_2 = R_{2,21}$.

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[3] Whether we have strategic substitutes or complements in quantity space depends on the second derivatives of the demand function (see Ishikawa and Spencer, 1999; and Leahy and Neary, 2001).

For stability of the duopoly equilibrium, the diagonal of the matrix has to be negative, i.e.,, $a_i < 0$, and the determinant positive, i.e.,, $\Delta = (a_1 a_2 - b_1 b_2) > 0$. Given these conditions, further comments can be made about the reaction functions. $r_i = -(b_i)/a_i$ from (8) and (9). If $a_i < 0$, then for strategic substitutes, $b_i < 0$, in order to satisfy $r_i < 0$, and $b_i > 0$ in order to satisfy $r_i > 0$ for strategic complements. The expression for r_i can be substituted into (11) in order to make the comparative statics easier to follow:

$$\begin{bmatrix} dx_1 \\ dx_2 \end{bmatrix} = \Delta^{-1} \begin{bmatrix} a_2 & a_1 r_1 \\ a_2 r_2 & a_1 \end{bmatrix} \begin{bmatrix} dc_1 \\ dc_2 + dt^p \end{bmatrix}. \tag{12}$$

Equilibrium in the Upstream Market

Given the fixed proportions technology and $\phi = 1$, total output in the upstream sector is given by $x^U (= x_1)$, where the combined output of the two upstream firms $x_1^U + x_2^U = x^U$. The processed good is assumed to be homogeneous so that downstream firm 1 is indifferent about the relative proportions of x_1^U and x_2^U used at retail. Assuming that the downstream firm faces no costs other than the price paid for the processed good, the inverse derived demand function facing firms in the upstream sector can be found by substituting p_i^U for c_i in (5) and (6) where superscript U denotes the upstream sector. Firms' profits in the upstream sector are, therefore, given by:

$$\pi_1^U = R_1^U (x_1, x_2) - c_1^U x_1 \tag{13}$$

$$\pi_2^U = R_2^U (x_2, x_2) - c_2^U x_2 - t^r x_2, \tag{14}$$

where c_1^U and c_2^U are the upstream firms' costs respectively. Again note that the firm that imports the raw commodity from the world market also faces the cost associated with the tariff t^r.

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Given this, following the outline above, equilibrium in the domestic upstream market is given by:

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\begin{bmatrix} dx_1^U \\ dx_2^U \end{bmatrix} = (\Delta^U)^{-1} \begin{bmatrix} a_2^U & a_1^U r_1^U \\ a_2^U r_2^U & a_1^U \end{bmatrix} \begin{bmatrix} dc_1^U \\ dc_B^U + dt^r \end{bmatrix}.
\tag{15}
$$

4.   Market Access with Successive Oligopoly

In terms of thinking about the issues facing developing country exporters of raw commodities and processed goods when the home market is characterized by successive oligopoly, it will be useful to focus more directly on market access issues. As Bagwell and Staiger (1999) note, GATT/WTO rules are fundamentally about market access commitments. What comes out of the model employed here is that in the context of successive oligopoly, reducing tariffs on the processed good and raw commodity by equivalent amounts may hinder market access for one of the developing country exporters. Consequently if market access is the principal focus of the Doha Round of trade negotiations, to avoid discriminatory market access in favor of one developing country at the expense of another, equivalent market access commitments for each exporter can only be sustained by reducing the tariff on each import by differential amounts. As we show below, there are several factors that determine the appropriate reductions in tariffs including the incidence of upstream tariffs on the downstream sector, the strength of the 'back-shifting' effect as tariff reductions on the processed good have an impact on the derived demand facing the upstream sector and, hence, the demand for the imported raw commodity. The nature of competition between firms at each stage of the vertically linked food chain also matters.

Consider the following hypothetical scenario. Trade negotiators in the Doha Round are intent on increasing developing countries' access to developed country markets. But they recognize that some developing countries export more highly processed goods while others export raw commodities. Reducing tariffs is the principal way of encouraging market access. But they also recognize that when each export enters the importing country's food chain, reducing tariffs at one stage has an impact on imports at the corresponding upstream or downstream stage. They may also know that the nature of competition at each stage influences the outcome. Consequently, if they were to reduce tariffs on the raw commodity keeping the tariff on the processed good unchanged, imports of the processed good will fall as the competitiveness of the downstream firm that purchases its inputs from the domestic sector has now improved. Hence, market access would be biased in favor of the raw commodity exporter *at the expense of lower imports* from the processed good exporter. Similarly, if the trade negotiations lowered the tariff on the processed good keeping tariffs on the raw commodity import unchanged, this would increase imports of the processed good *at the expense of imports* of the raw commodity. This arises because the increase in imports of the processed good reduces the sales of firm 1 in the downstream sector, which shifts back the derived demand in the upstream sector, thereby reducing imports of the raw commodity. Potentially therefore, developing countries have conflicting interests depending on the type of good they export to the developed country market.

To avoid such conflict, therefore, the trade negotiators consider a market access rule to avoid any conflicting interest between these developing countries. If tariffs on imports from developing countries are to avoid any discrimination in market access, then the *net* change in

market access following tariff reductions on raw and processed goods should be unchanged. Specifically:

$$\Delta MA^r (dt^r, dt^p) + \Delta MA^p (dt^p, dt^r) = 0, \tag{16}$$

where ΔMA^r is the change in market access of the raw commodity import which depends directly on, the change in the raw commodity tariff (dt^r) but also on the change in the processed tariff (dt^p), and where ΔMA^p is the change in the market access of the processed good which depends directly on the change in the tariff on the processed good (dt^p) but in this vertically-related set-up also on (dt^r). Since we noted above these tariff changes can have offsetting effects in the corresponding upstream or downstream sector, we set the net change that the trade negotiator would aim for, in order to avoid any discriminatory effects, equal to zero. Of course, one may argue that changing tariffs on raw commodities and processed goods by equal amounts would result in an equivalent increase in market access. As we show below, in the context of successive oligopoly, this will not be the case. In turn, if the focus is on market access considerations without discriminating between developing country suppliers, the reduction in tariffs for imports at each stage will not be equal.

We amend the trade negotiator's rule as given above. We set it such that we consider what would be the appropriate reduction in the tariff on the processed good (APT) that would offset the reduction in the tariff on the raw commodity (dt^r) while keeping the change in market access the same at both stages. Therefore, we can re-write our market access rule as:

$$[(dx_2 / dc_1)(dc_1 / dt^r)]dt^r + APT(dx_2 / dt^p) = 0. \tag{17}$$

The first argument is the effect of the tariff on the raw import on imports in the downstream market: clearly the change in the raw commodity tariff (dt^r) changes upstream prices, which then affects competition in the downstream sector. By changing the competitiveness of downstream firm 1, this affects the level of imports of processed goods by downstream firm 2, x_2. The second argument is the effect of the tariff on imports of the processed good. Setting the rule equal to zero and solving for *APT*, gives the appropriate amendment in the processed good tariff to keep the change in market access in both the upstream and downstream markets the same for a given change in the tariff on the raw agricultural import. Re-arranging (17) we have:

$$APT = \frac{-(dx_2 / dc_1)(dc_1 / dt^r)dt^r}{(dx_2 / dt^p)} \qquad (18)$$

However, it should be noted that while the upstream tariff has an impact on the downstream market via the change in the downstream firm's costs, the change in the processed good tariff will also have an effect on the upstream price via the 'back-shifting' effect. Therefore, we need to expand the denominator to give:

$$APT = \frac{-(dx_2 / dc_1)(dc_1 / dt^r)dt^r}{[(dx_2 / dt^p) + (dx_2 / dc_1)(dc_1 / dt^p)]} \qquad . \qquad (19)$$

Suppose for the moment we ignore the 'back-shifting' effect. Note that to keep market access the same we should not necessarily reduce the processed tariff by the same amount as the raw tariff. This is due to the possibility that the incidence of the upstream tariff on upstream prices, i.e., the downstream firm's costs may change by less than 100 percent as given by the term (dc_1 / dt^r). The direct effect of the processed good tariff affects imports of the processed good but this is offset by the 'back-shifting' effect. The 'back-shifting' effect reduces upstream

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prices, because the inverse derived demand function shifts back. In turn, this reduces the downstream firm's costs, which in turn reduces imports. So while the reduction in the processed good tariff increases processed good imports, the 'back-shifting' effect serves to ameliorate the effect to some degree. So the amendment in the processed good tariff may have to be greater to offset this 'back-shifting' effect as long as the incidence is less than the direct effect on processed good imports.

Using the model presented in equations (1)-(15), we can re-write (19) to derive explicit results. Specifically, we have:[4]

$$APT = \frac{-\Delta^{-1}a_2r_2(dc_1/dt^r)}{\Delta^{-1}a_1 + \Delta^{-1}a_2r_2(dc_1/dt^p)}dt^r,$$ (20)

which can be simplified to (assuming $a_1 \approx a_2$):

$$APT = \frac{-r_2(dc_1/dt^r)}{1 + r_2(dc_1/dt^p)}dt^r.$$ (21)

Result 1: If we have strategic substitutes, a reduction in the tariff on the raw agricultural import should likely be matched with a *reduction* in the tariff on the processed good. If we have strategic complements, a reduction in the raw agricultural good tariff should be matched with an *increase* in the tariff on the processed good.

The sign of r_2 is the key to this result. With strategic substitutes, $r_2 < 0$, so the numerator is positive. Also the denominator is positive as long as $r_2\{dc_1/dt^p\} < 1$ which will likely be the case under most reasonable circumstances.[5] Therefore, a tariff reduction at the upstream stage should be matched by a tariff reduction at the downstream stage. In the strategic complements

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[4] To conveniently separate the effects, we do not write out the tariff pass-through and the 'back-shifting' effects in explicit form.
[5] If there was 'over-shifting' of the 'back-shifting' effect and r_2 was sufficiently large, then this would reverse the result for the strategic substitutes case.

case, the tariff on the processed good imports should be raised if market access is to stay the same as the numerator will be negative. This may seem an unlikely result, but it can be explained. In this multi-market set-up, the tariff reduction in one market has an effect on the related market. In the strategic complements case, competition is pretty aggressive such that reducing tariffs on raw commodity imports would also increase processed good imports. Given our rule aimed at keeping market access constant for both types of goods, this suggests increasing tariffs on processed good imports to offset the pro-competitive externality associated with the tariff reduction in the upstream stage. Note that this did not arise in case of strategic substitutes as the appropriate *APT* was to match a reduction in a tariff on the raw commodity with a reduction in the tariff on the processed good as the multi-market effect here was negative. In the strategic complements case, this multi-market effect is positive thus changing the sign of the *APT*.

Result 2: In the strategic substitute case, the reduction in tariffs on processed good imports should likely be less than the reduction in tariffs on raw imports. This is because the absolute value of r_2 is less than 1. The denominator will also be less than 1 under most reasonable circumstances but as long as $r_2(dc_1/dt^p)$ is not 'too large', the *APT* will be less than dt^r. In the strategic complement case, the increase in the tariff on the processed import should be less than the reduction in the tariff on the raw good.

Note closely what this result implies. Consider first the strategic substitute case, which is the more intuitive result. What it implies is that to avoid any discriminatory effect between developing countries, which export food and agricultural products to different stages of the food chain, tariffs on raw commodities and processed goods should be reduced by different amounts. But note that the tariff reduction on the processed good should be reduced by less than the tariff on the raw commodity. In the context of the traditional trade policy literature, tariff escalation

should therefore *increase* to avoid discriminatory effects in terms of market access. In the context of successive oligopoly, with strategic substitutes, tariff escalation is *per se* not a bad thing as long as both tariffs are reduced. However, in the strategic complements case, tariff escalation should also be an outcome, this time with the reduction on the tariff on the raw commodity matched by an increase in the tariff in the processed good.

5.   Summary and Conclusions

The aim of this paper has been to consider the market access issues for developing country exporters when tariffs can apply on both processed and raw commodities and where the importing country is characterized by successive oligopoly. In this context, we have also accommodated the possibility of tariff escalation in this framework. Based on a (hypothetical) market access rule aimed at avoiding discriminatory market access between different developing country exporters, we have generated the following results: (i) changes in tariffs at different stages not only affect tariffs directly at the stage at which they are applied but also affect the imports at the preceding or subsequent stage; (ii) even if tariffs on imported raw commodities and processed goods are reduced by the same amount such that the measure of effective protection stays the same, the impact on market access on imported raw commodities and processed goods will differ; (iii) the extent to which the impact of tariff reductions at each stage differ will depend on the nature of competition, specifically whether we have the strategic substitute or strategic complements case.

Taken together, the results suggest that tariff escalation may be a desirable outcome if discrimination between developing country exporters is not to arise. This result seems at odds

with the traditional literature and observations made by commentators of the trade negotiating process. But the result here comes from the fact that we have explicitly accounted for the interaction of tariffs at different stages in the context of a successive oligopoly where policy changes at one stage will impact on the market equilibrium at another. The overall moral of this story is that appropriate consideration of the industrial organization of food markets should be made when considering the outcome of trade liberalization in the context of the Doha Round. Simple benchmarks that ignore market structure issues may lead to misguided policy outcomes.

Of course, the model presented here is itself, simplified and was employed to highlight a specific issue. There are clear possible extensions in this regard. We mention two in the context of the model we have presented. First, in our model of successive oligopoly, competition occurs 'horizontally' and we make no allowance for the range of vertical contracts that link the two stages together. These cover various forms of vertical restraints through to vertical integration. As is well known to industrial organization economists, these vertical contracts can have pro- or anti-competitive effects and thus, may affect the outcomes presented above. Second, the importers of the raw commodity and processed goods take world prices for these imports as given. There are two additional issues worth exploring here. For example, the foreign importing firm may vertically integrate with the developing country supplier, an issue highlighted by the value-chain approach (Gereffi, 1999; UNCTAD, 2000).[6] Alternatively, the importing firm may have some degree of monopsony power such that terms of trade effects may arise. Each of these may have an impact on determining market access considerations in this set-up. No doubt there are other possibilities, our view here is that exploring the interface between industrial

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[6] This framework recognizes that market access for developing country exporters is difficult and that successful market access involves contact with firms throughout the vertically-linked chain regarding a broad range of issues including product quality, safety, delivery, packaging and traceability.

organization and traditional policy issues, in our case, trade policy, will be an area of research deserving further attention.

Finally, the analysis presented here was based on the premise of a market access rule consistent with the recent work of Bagwell and Staiger (*op. cit.*), specifically that trade negotiations are primarily about market access issues. As set up, the rule was aimed at avoiding discriminatory market access for developing countries in the context of trade negotiations. However, market access is often discriminatory in nature reflecting either the bargaining power of certain countries in trade negotiations or even the nature of current trade arrangements.[7] For example, as shown in Table 1, preferential access to developed country markets varies by commodity group. To the extent that the range of preferences varies by country, some developing countries will have more favored market access than others. As such, considering variations to the non-discrimination rule may be of interest in future research, even if confined to fully analyzing the impact of preferential trade arrangements in the context of successively oligopolistic markets.

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[7] For example, each tariff change in (17) could be weighted to reflect the relative bargaining power of either the exporting countries, or, as is more likely, the relative lobbying power of the import competing firms in the developed countries. Suppose the commodity tariff change is weighted by a parameter, θ, and the processed tariff change by $(1-\theta)$. If the importing country wants its trade policy choices to remain WTO/GATT-neutral, the market access rule in (17) is still set equal to zero, but each tariff is now weighted appropriately, where the weights come out of some broader political economic game as suggested by Grossman and Helpman (1994). As θ increases, domestic processors have more lobbying power in reducing the commodity tariff and maintaining the processed good tariff. The equal market access rule used in the analysis is one where $\theta = (1-\theta)$, and results in an increase in tariff escalation. Alternatively, existing tariff escalation may reflect lobbying power on the part of import competing processors, where $\theta > (1-\theta)$, in which case this will reinforce the increase in tariff escalation. Consequently, whether the reduction in the processed good tariff is less than or greater than reduction in the commodity tariff depends on both the weights and the incidence of the tariff changes.

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Table 1: Tariff Peaks and Preferential Access in the EU and United States

HS 2-digit Product	EU		United States	
	Average MFN tariff (%)	LDC preference[1]	Average MFN tariff (%)	LDC preference[1]
01 Live animals.	38.2	0.06	--	--
02 Meat and edible meat offal	71.0	0.08	19.2	0.00
03 Fish & crustacean, mollusk nes	18.7	1.00	--	--
04 Dairy prod; birds' eggs; honey	59.1	0.12	20.9	0.38
07 Edible vegetables and roots & tubers	25.4	0.79	20.6	0.88
08 Edible fruit and nuts; melons	20.2	0.66	16.7	0.80
09 Coffee, tea, mate and spices	16.0	0.50	--	--
10 Cereals.	75.6	0.06	--	--
11 Prod mill indust; malt; starches	38.2	0.17	16.3	1.00
12 Oil seed, oleagi fruits; misc grain	74.4	0.15	77.9	0.00
13 Lac; gums, resins & other veg	17.8	1.00	--	--
15 Animal/veg fats & oils & prod	56.0	0.60	19.9	0.50
16 Prep of meat, fish or mollusks	23.5	0.68	--	--
17 Sugars and sugar confectionery	37.6	0.14	--	--
18 Cocoa and cocoa preparations	24.0	0.25	--	--
19 Prep of cereal, flour, starch/milk prod	34.1	0.37	16.8	0.84
20 Prep of vegetable, fruit, nuts prod	26.1	0.88	28.7	0.55
21 Miscellaneous edible preparations	19.2	0.95	19.8	0.74
22 Beverages, spirits and vinegar	35.7	0.71	--	--
24 Tobacco and manufactured	56.2	1.00	73.5	0.14
Average	38.3	0.50	30.0	0.53

Source: Hoekman, Ng, and Olarreaga (2002). [1] A value of 1.00 implies imports enter duty free.

Table 2: Levels of Tariff Escalation by Highest Group Post-Uruguay Round

Commodity Group	Processing Stage	Level of Tariff Escalation (%)	Reduction in Tariff Escalation Post-Uruguay Round (%)
United States			
Dairy and Egg Products	2nd Stage	39.5	-7.0
Dairy and Egg Products	1st Stage	33.6	-6.1
Sugar Products and Sweeteners	1st Stage	31.2	-4.9
Sugar Products and Sweeteners	2nd Stage	27.7	-1.1
Dairy and Egg Products	3rd Stage	15.6	-2.6
EU			
Fruit Products	2nd Stage	84.8	-17.7
Sugar products and Sweeteners	4th Stage	37.2	-2.6
Dairy and Egg Products	2nd Stage	34.4	-17.3
Root and Tuber Products	1st Stage	19.8	-11.2
Tobacco and Pyrethrum	1st Stage	14.1	-23.1
Japan			
Dairy and Egg Products	2nd Stage	160.1	-32.8
Sugar Products and Sweeteners	1st Stage	82.2	-14.8
Root and Tuber Products	1st Stage	50.3	-10.8
Hides and Skins	3rd Stage	30.0	-30.0
Dairy and Egg Products	1st Stage	29.1	-7.7

Source: Lindland (1998)

Figure 1: Schematic Outline of the Model

Retail Demand Curve

Firm 1 (x_1)

Firm 2 (x_2)

Imports (semi-)
processed good
from LDC

Firm 1 (x^u_1)

Firm 2 (x^u_2)

Imports raw
commodity from
LDC

Domestic
Agricultural
Sector