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Vertical Market Structure, Commodity Exports and Trade Reform

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Abstract

In the analysis of commodity markets, comparatively little attention is paid to the fact that commodity exports are intermediates that form inputs into the food processing and retail sectors in developed countries. Exporting countries correspondingly argue that access to developed country markets are determined by market structure characteristics of the downstream food sector. Given the vertical nature of these markets, they are most appropriately characterised by successive oligopoly and/or oligopsony. We explore trade policy issues facing commodity exporters, and show that the impact of tariff reform on commodity exporters is determined by the market structure characteristics of the downstream sectors.

Keywords: Vertical market structure; trade reform

JEL Classification: F12; Q17

Introduction

In the analysis of commodity markets, little attention is paid to the fact that commodity exports from developing countries form inputs into the processing and retailing sectors in developed countries. If these industries were generally competitive, this distinction would matter little for commodity markets which could be reasonably treated in isolation from the downstream sectors into which raw commodities enter. But the observation that these sectors are typically characterised as highly concentrated (and increasingly so given the large number of mergers and acquisitions in recent years), raises specific challenges for those interested in commodity market issues. Specifically, the issue of commodity exports constituting part of a vertically-related chain has important implications for how we deal with policy issues associated with commodity markets and has particular reference to the impact of globalisation on developing country exporters and the potential benefits of further trade reform. Consider two topical examples.

First, take the observation that in terms of the total value of the product that reaches consumers, the raw agricultural component typically represents a small share. This represents some of the concerns of critics of globalisation relating to inequality of the current system which is largely determined by corporate interests in developed countries. This is tied in with the perception that low and falling commodity market prices are not fully reflected in commensurate reductions in retail prices paid by developed country consumers. For example, African countries such as Burundi, Ethiopia, Rwanda and Uganda are highly dependent on exports of coffee, yet all have faced a significant decline in real prices over the past few years.[1] In key export markets such as Europe and the United States, global coffee buyers, roasters and retailers, who in total account for almost 60 percent of the share of final sales value of coffee, have benefited from lower coffee bean prices. For example, Nestlé, the second largest coffee roaster in Europe, reported a 20 percent increase in its profits in 2001, while Starbucks posted a 41 percent increase in profits (Oxfam, 2001).[2] There has, however, been little formal analysis of the links between raw commodity and retail prices in developed country markets and the role of vertical market structure in influencing the distribution of surplus throughout the vertical market chain where downstream stages of this chain may be characterised by high levels of concentration. These concerns are also exacerbated by increasing consolidation in the developed country food sectors that have been witnessed in recent years. The framework outlined in this paper addresses some of these issues where the important dimensions of market structure relate to various degrees of oligopoly at each stage of the food chain such that we have 'successive oligopoly' and where the immediate purchasers of raw commodity exports from developing countries may exercise oligopsonistic power.

Second, take the current trade negotiating round. The Doha Round of trade negotiations in the World Trade Organization (WTO) has been labelled the so-called 'development round'

[1] Over the period 1998 to 2001, real coffee prices fell by 50 percent. As a result, for a country such as Ethiopia, where coffee represented 67 percent of the value of exports in 1998, the decline in world coffee prices cost Ethiopia US$ 300 million in export revenues, equivalent to 50 percent of its annual export earnings (Oxfam, 2001).

[2] All three sectors are dominated by a small number of firms. For example, in 1995, ten firms accounted for 62 percent of global coffee bean trade, while in 1998, five firms accounted for 58 percent of sales of roasted coffee in the European market (Fitter and Kaplinsky, 2001).

(World Bank, 2003), a key part of which will be increasing developing countries' access to developed country markets. This process will, it is anticipated, lead to the reduction of tariffs on agricultural goods given that many developing countries are still major agricultural exporters and that agriculture still accounts for a large share of GDP particularly in the poorest developing countries. However, it is important to recognize that the vertically-linked nature of the food chain between agriculture, food processing and retailing, and the increasing consolidation of the food industry in developed countries, may influence the magnitude of the benefits that developing countries receive from increased market access. Specifically, the downstream structure of the vertical chain will determine the nature of the perceived marginal revenue function that faces exporters of raw commodities. In this context, therefore, reducing the level of tariffs will determine the increased level of market access and the distribution of the welfare effects associated with trade liberalisation. This is an issue that we address in some detail in the paper.

The overall message of this paper is that the analysis of trade policy issues that relate to primary commodity markets, but which ignores the fact that commodities represent only a small part of a vertical market, where some or all parts of this vertical chain can be characterised as imperfectly competitive, is missing an important part of the environment in which commodity exporters compete. By extension, understanding some of the current concerns of commodity exporters related to the effects of globalisation and the impact of trade reform requires a framework that explicitly accounts for some of these key characteristics. As we show, many of the current concerns of commodity exporters regarding the distribution of the effects of declining commodity prices, the distribution of value-share throughout the commodity chain and the impact of tariffs on market access (and the commensurate welfare effects) can be addressed in a common framework that emphasises the role of successive oligopoly and oligopsony in downstream markets.

The paper is organised as follows. In Section 1, we provide a brief overview of the characteristics of the food industry in the US and the European Union (EU). This forms the basis for motivating the framework outlined in Section 2 where we use a simple model to capture various aspects of downstream market structure in a unified framework. In Section 3, we focus on the impact of trade liberalisation when downstream markets are imperfectly competitive. The main point which we illustrate here is that market power in the downstream industry is an important determinant of market access and the increase in producer surplus for any given change in the tariff on the intermediate good. In Section 4, we conclude and discuss avenues for future research in commodity market analysis where the links between the raw commodity exporters and the downstream food sectors are made much more explicit.

1. 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. This is also becoming a characteristic of the food sector in some developing countries. By way of illustration, we focus specifically on these sectors in the United States and the EU[3], the main developed country markets for developing country commodity exports.

[3] Due to space constraints, we omit a detailed tabulation of this data. However, see McCorriston (2002) for an overall discussion and presentation of data relating to market concentration in the EU food sector.

(i) Food Processing

In the United States, a small number of large firms dominate the food-processing sector, with the top-20 food- and tobacco-manufacturing firms accounting for over 52 percent of the sector's value added in 1995. If food manufacturing is separated from beverage and tobacco manufacturing, the top-20 food-manufacturing firms accounted for 37 percent of value added in 1997, while the top-20 beverage- and tobacco-manufacturing firms accounted for 79 percent of value added. Dis-aggregated data at the four-digit SITC level, suggests a large number of specific food products where the 4-firm concentration ratio was over 60 percent in 1997, the average being just below 76 percent.

Turning to food manufacturing in the EU, the data show that typically at the country level, average seller concentration is higher than in the United States, ranging from an average 3-firm concentration ratio of 55 percent in Germany to 89 percent in Ireland, with an average 3-firm concentration ratio across 9 EU countries of 67 percent. As in the United States, these averages hide some high levels of seller concentration for specific products in each EU country, most notably baby foods, canned soup, pet food, and coffee. It should be noted, however, that while seller concentration at the product level is high in many individual EU country markets, there are few examples of firms that dominate sales across EU countries as a whole (Cotterill, 1999).

(ii) Food Retailing

Several important differences are apparent in the food retailing market structures in the US and EU. Five-firm seller concentration in food retailing at the national level is much higher in EU countries than it is in the US, with average 5-firm seller concentration in the former being 65 percent, compared to 35 percent in the latter. However, at the EU-wide level, 5-firm seller concentration is much lower at 26 percent (Hughes, 2002). In addition, in the US, it is important to examine concentration in food retailing at the local and regional level. Cotterill (*op. cit.*) reports that in 1998, 4-firm seller concentration averaged 74 percent across the top 100 US cities, while across major US regions, 4-firm seller concentration averaged 58 percent.

(iii) Industry Consolidation

An additional feature of market structure in the food industry in recent years has been consolidation through mergers and acquisitions which has contributed to increasing concentration. In developed countries, mergers and acquisitions have, on a per annum, basis, increased 5-fold over the 1990s. Moreover, international mergers and acquisitions have also been increasing significantly not only involving acquisitions in developed country markets by firms located in other developed countries (which is the common feature of foreign direct investment) but also involving acquisitions in developing countries too. As the recent trade policy literature has shown, domestic market structure issues and mergers are likely to be an important dimension of market access and can easily substitute for more obvious trade policy instruments such as tariffs and subsidies[4]. In the remainder of this paper, we focus largely on trade policy and market access issues and how they relate to downstream market structure.

2. Agricultural Trade and Importing Country Market Power

While data relating to market concentration in the food sector is of general interest in

[4] See, for example, the recent paper on the role of merger policy in an open economy framework by Horn and Levinsohn (2001).

characterizing the industrial organization of the food sector in developed (and increasingly developing) countries, the vertical structure of the food sector will impact on how we think about policy issues, for example the impact of trade reform. Yet this is seldom considered by economists despite the observation that the food sector would appear to imperfectly competitive at several stages. Indeed, only in recent years have there been papers in the general economics literature that consider the role of vertical market structure as it relates to thinking about (optimal) trade policy.[5] Most empirical studies of trade reform ignore the vertical structure of markets that characterises the agricultural-food sector and typically assume perfect competition.

By way of example, consider the recent and widely-cited work on the impact of protectionism in the EU by Messerlin (2001). In assessing the impact of tariff and non-tariff barriers, he assumed two scenarios, one where the market structure was assumed to be perfectly competitive and the other where manufacturing was assumed to be imperfectly competitive. As he showed, these alternative assumptions about market structure can have a significant influence on the net welfare and distributional effect of trade policy instruments. However, when he comes to dealing with protectionism involving the agricultural sector, he reports the perfectly competitive scenario only and assumes that the demand curve facing agriculture is the retail demand function, the implication being that imperfect competition is an inappropriate characterisation of the food sector in developed countries. This clearly conflicts with the data discussed in Section 1. In this section, we therefore consider the potential impact of vertical market structure on current trade issues focusing on market access.

As a benchmark, consider a diagrammatic representation of a vertical market characterised by imperfect competition at each successive stage. This is presented in Figure 1. Assume that the technology that links the successive stages is of a fixed proportions nature (and assume the conversion factor is 1:1) and that there is arm's length pricing. Since the focus is on the impact of tariffs on the upstream stage, assume there is no domestic supply of the unprocessed commodity. The retail demand curve for the final (processed) product that is sold at the retail level is given by D. Assuming neither processing nor retailing costs, if the retailing and processing sectors were perfectly competitive, equilibrium would be where the retail demand and the agricultural commodity supply curves intersect. However, if the retailing sector is imperfectly competitive, the marginal revenue curve that corresponds to this retail demand curve is given by PMR, the perceived marginal revenue function. Specifically, the slope of PMR captures the nature of competition at the retail stage. At one extreme, if the retailing sector were either a monopoly or group of firms acting as a perfect cartel, the slope of PMR would be twice that of the demand curve D. As the retail sector becomes more competitive, the slope of PMR becomes shallower as it rotates towards the demand curve. In the limit, if the retail sector were perfectly competitive, the marginal revenue curve would coincide with the market demand curve. In this vertically-related set-up, this perceived marginal revenue function is the derived demand curve facing the food processing sector. Again, assuming this sector to be imperfectly competitive, the marginal revenue function corresponding to the processing stage is given by PMMR, the slope of the perceived marginal revenue function reflecting competition in both the retail and food processing sectors. In this set-up, the derived demand curve facing the agricultural exporter is not the retail demand curve, but is the PMMR curve at the food processing stage.

[5] See, for example, Spencer and Jones (1992) and Ishikawa and Spencer (1999).

This stylized model characterizes successive oligopoly with imperfect competition at both the processing and retail stages of the food chain. In the context of successive oligopoly, there is the 'double marginalization' problem with mark-ups characterizing the links between the import and food processing sector's output and then the processing and the retail sector's output. At the first stage, the food processing sector purchases the raw agricultural commodity from the exporting country. Assuming that a tariff is applied on the agricultural commodity, the export supply curve is given by S^T. Imports are therefore Q_M^T giving a margin of $P_P^T - P_M^T$ at the processing stage and $P_R^T - P_P^T$ at the retail stage. Export (world) prices for the agricultural exporter are given by P_W^T. Note that vertical market structure influences the extent of market access for exports.[6] If the downstream sectors were competitive, the level of market access would be given where the retail demand curve meets the export supply function at Q_c. In other words, market structure affects market access.

Consider now what happens of there is industry consolidation and that the form this takes is a drop in the number of firms competing at the retail stage. The impact of this is also shown in Figure 2. Specifically, the perceived marginal revenue function at the retail stage shifts to PMR', which also has the effect (because of the vertically-linked nature of the market) of shifting the perceived marginal revenue function in the manufacturing sector. Note the effect on exporters: market access is reduced further because of industry consolidation and the price the exporter receives is also lower.

In addition, it is straightforward to add oligopsony power to this framework, an issue which is often associated with market power in downstream sectors. Suppose for example that the processors exercised oligopsony power vis-à-vis the commodity exporter. In this case, the relevant supply curve for the processor would be the perceived marginal outlay curve which would lie above the exporters' supply curve. With a representative processor equating the PMMR curve to the perceived marginal outlay curve (not drawn), market access is further reduced and commodity prices lower. Note however that the effect of oligopsony in terms of market access and raw commodity prices is qualitatively similar to the effect of successive oligopoly.

Of course, there can be many permutations within this set-up. For example, there may be retailer market power only with the processing sector being relatively competitive. Or, the food sector may be regarded as competitive vis-à-vis competition for sales but firms may exert market power with respect to upstream suppliers. This could be accounted for in the above framework by suppressing market power at any given stage or amending the framework to accommodate successive oligopsony power. The simulations reported below take account of these alternatives.

Within this framework, we can also consider the impact of tariff reform. This is shown in Figure 1. Assume that the initial export supply curve (S^T) is inclusive of a tariff. With a reduction in tariffs, the export supply function will now shift to S'. What is the effect of this in a successively oligopolistic set-up? The reduction in tariffs reduces costs for the

[6] The diagram is also consistent with the 'value-chain' approach that notes the mark-ups are relatively high for firms that constitute the downstream stages of the vertical value chain. See, for example, Kaplinsky (2000).

manufacturing sector which in turn reduces costs for the food retailers. Market access expands, but note that the expansion in market access is considerably less than if the food sector was perfectly competitive. This can be seen by tracing down the shift in the export supply function along the retail demand curve. Note that prices at each subsequent stage come down, so that final consumers will benefit from tariff reform. However this reduction in consumer prices is less than the perfectly competitive case. This is due to a price transmission effect; specifically, the extent of competition at each stage will determine the extent to which the tariff is passed through to final consumers. Consumers gain from tariff reform but by less than they would if markets were competitive, partly because price reductions are relatively lower and that the increase in market access is dampened by the successively oligopolistic nature of the food chain. Note also that the firms that compete in the vertically-related sector also capture some of the benefits of tariff reform as their costs are reduced more than the reduction in the prices of their output i.e., the size of the firm mark-up changes. Clearly such effects would be exacerbated with industry consolidation where the price transmission effects would occur along relatively steeper PMR functions.

3. Effect of Trade Liberalisation

Using a specific linear model, we can simulate the potential impact market power in the downstream food sector has on the outcome of trade liberalisation[7]. Five cases are considered that relate to alternative characterisations of market power embedded in Figures 1 and 2. They are: (i) oligopsony only (ii) oligopoly only, (iii) both oligopoly and oligopsony, (iv) successive oligopsony and retailer oligopsony, and (v) successive oligopoly and processor oligopsony.

Figure 3 depicts the absolute change in the raw commodity export price from removing the tariff for alternative competition scenarios. As expected, reducing tariffs raises prices exporters receive but the extent of this is contingent on the characteristics of the downstream food sector. The simulations aptly illustrate that the effect on export prices is a decreasing function of the degree of downstream market power because an imperfectly competitive marketing sector always captures a share of the benefits of an exogenous shock of this type. Figure 3 also shows that the price increase generated from trade liberalization is dissipated considerably by significant departures from competition, especially when they occur in multiple stages of the downstream market. As is readily observed from the figure, when there is 'successive' market power, the effect on export prices is clearly greater than the impact of market power at a single stage.

The important question is the extent to which downstream market power vitiates the benefits to the developing economy of trade liberalization. This takes account of not only the price transmission effect but also the commensurate change in market access. The effect of market power on the increase in producer welfare caused by trade liberalization is more pronounced than the effect on price because producer surplus is determined both by the change in export price and the change in output, and market power diminishes both. Figure 4 depicts the change in producer welfare from trade liberalization for alternative scenarios relating to vertical market structure. Again, the impact of market power is greater when it persists throughout all stages of the vertical chain.

Next consider the distribution of benefits from trade liberalization across producers,

[7] Due to space constraints, we do not outline the algebra for each of these cases in the current version of the paper.

consumers, and firms involved in the processing and retailing stages depicted in Figures 5 and 6. If the change in producer surplus is determined by characteristics of the downstream food sector for any given change in tariffs, so too will be the distribution of welfare changes throughout the downstream sectors. By way of examples of this, Figure 5 represents the case of processor oligopsony and retailer oligopoly, while Figure 6 represents successive oligopoly plus processor oligopsony. In the case of processor oligopsony, producer and consumer welfare both decline monotonically in the degree of market power exercised while profits in the processing sector rise monotonically. A similar outcome arises in the case where we add successive oligopoly, though profits in the downstream sector decline as the index of market power rises beyond a certain level since the negative externality imposed on processors' profits when retailers increase their market power (and vice versa) dominates the higher profits earned by the retailer, causing overall marketing sector profits to fall for high levels of market power exercised at successive stages. Both Figures 5 and 6 clearly demonstrate that the distributional effects of trade reform in a set-up that allows for market power are quite dramatic. Even rather modest levels of market power enable the marketing sector to capture the largest share of the benefits from trade liberalization, and for very high levels of market power, the marketing sector captures the lion's share of the benefits. Clearly, the presence of downstream market power is an important issue when considering the impacts of trade liberalization.

4. Summary and Implications for Research

The starting point for this paper was the observation that research on trade policy issues related to agricultural products typically considers the commodity market in isolation from the downstream stages of the vertical chain into which the raw commodity enters. Given that the downstream stages can be typically characterised as imperfectly competitive, this has important implications for how we think about current policy issues. Specifically, we have shown that the effects on exporters following trade liberalisation and increased market access will likely be dependent on the nature of competition in these downstream stages. As such, removing trade barriers on their own may not be sufficient to guarantee high levels of access to developed country markets with subsequent implications for the likely welfare effects of trade policy reform.

There is obvious scope for further research on this issue and here we note a few (non-exhaustive) examples. The first and perhaps most obvious relates to developing a framework that can be applied to specific markets using real data rather than the artificial examples used in the text. McCorriston and Sheldon (1996) have considered the EU banana dispute in a context such as this but clearly more needs to be done. In addition, developing the framework to incorporate the issue of tariff escalation with tariffs existing at each stage of the commodity chain will also be relevant. This is an issue highlighted by the World Bank (*op. cit.*) and many NGOs and is of clear relevance for developing countries keen on accessing parts of the commodity chain with the greater potential for economic rent. Second, it is generally well-known that in the context of the trade literature that when markets are imperfectly competitive, alternative trade policy instruments can have non-equivalent effects. Hence extending the framework to consider specific versus *ad valorem* tariffs and the role of quantitative restrictions will also be relevant as the policy instrument may generate pro-competitive effects contingent on the nature of imperfect competition in the food sector.

Figure 1: Trade Liberalization and the Vertical Marketing Chain

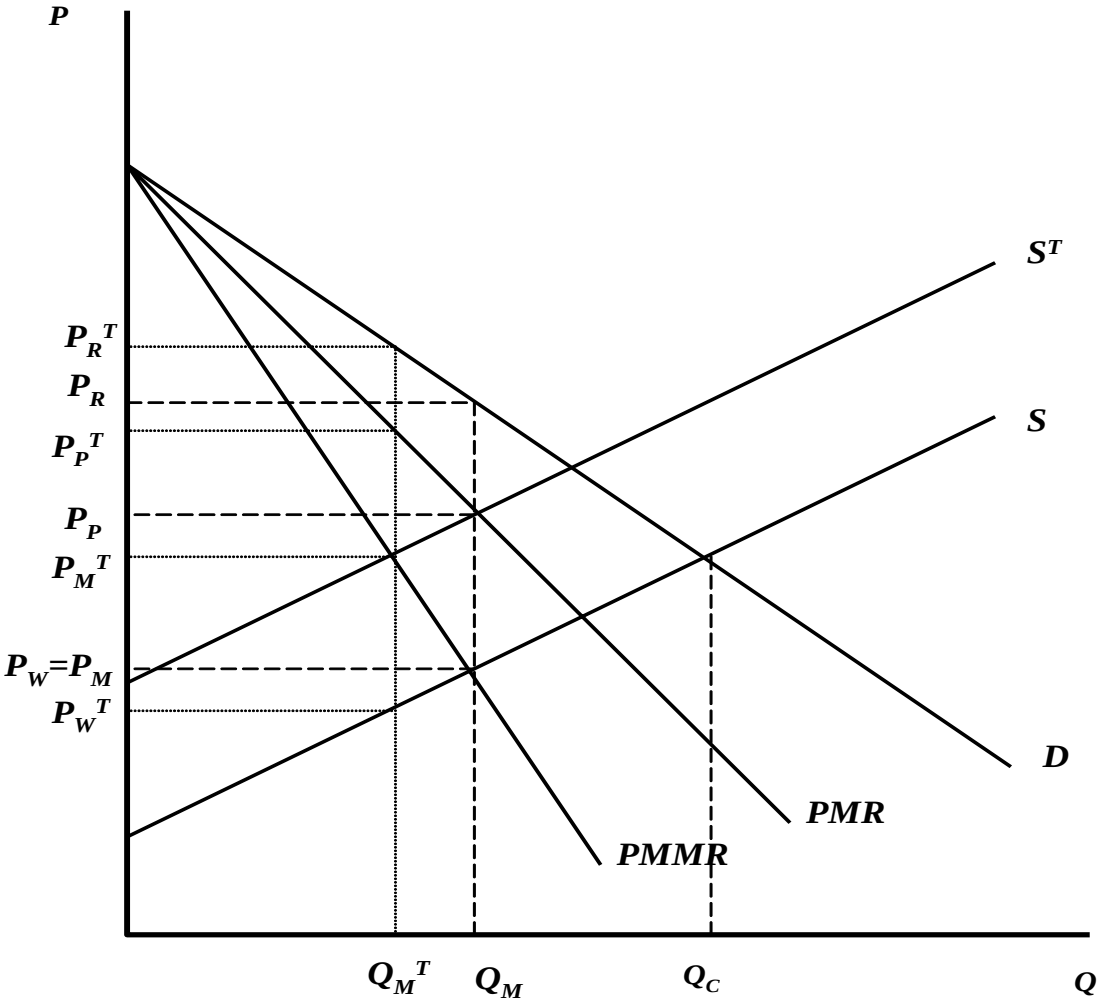


Figure 2: Increased Concentration in the Vertical Marketing Chain

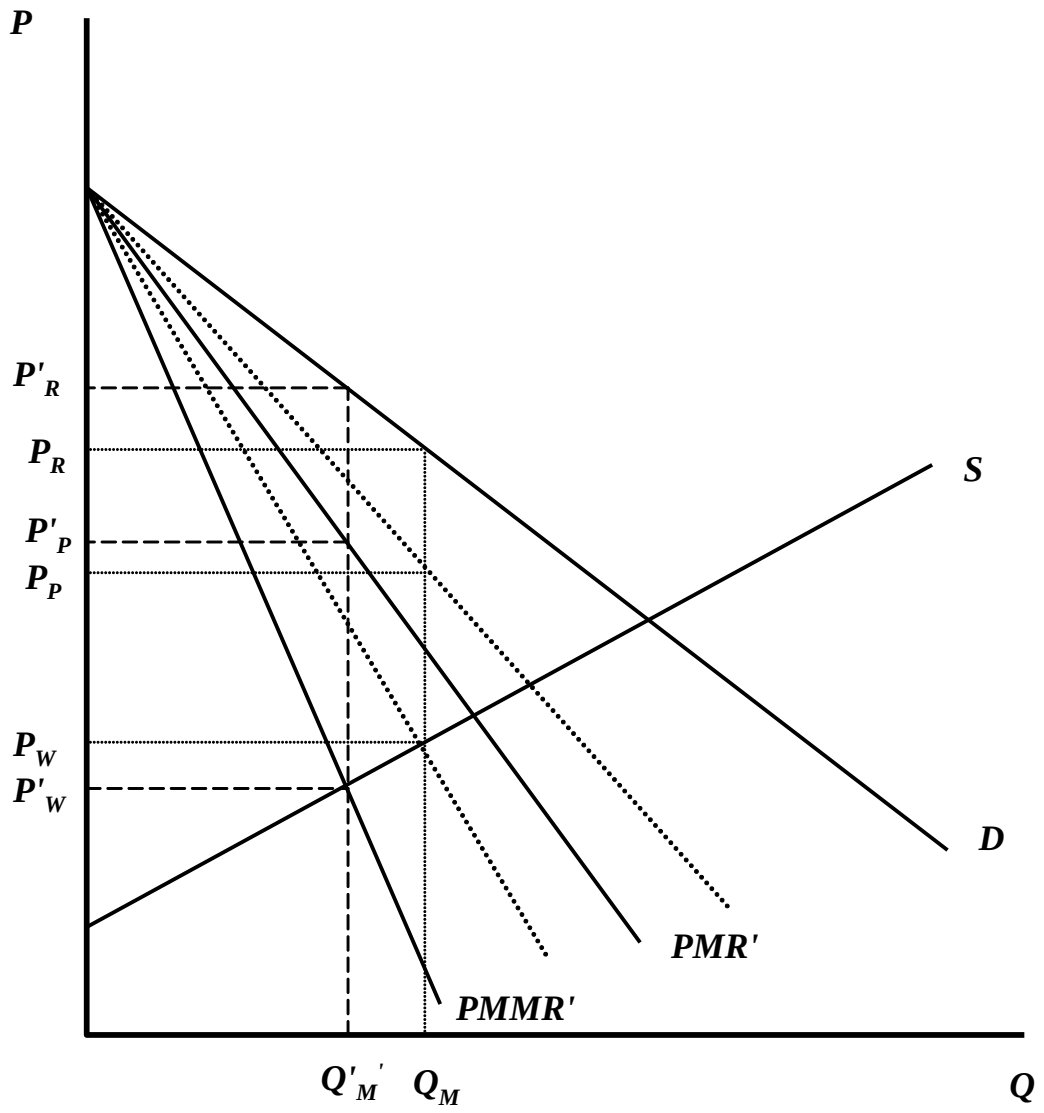


Figure 3: Change in Export Price from Trade Liberalization

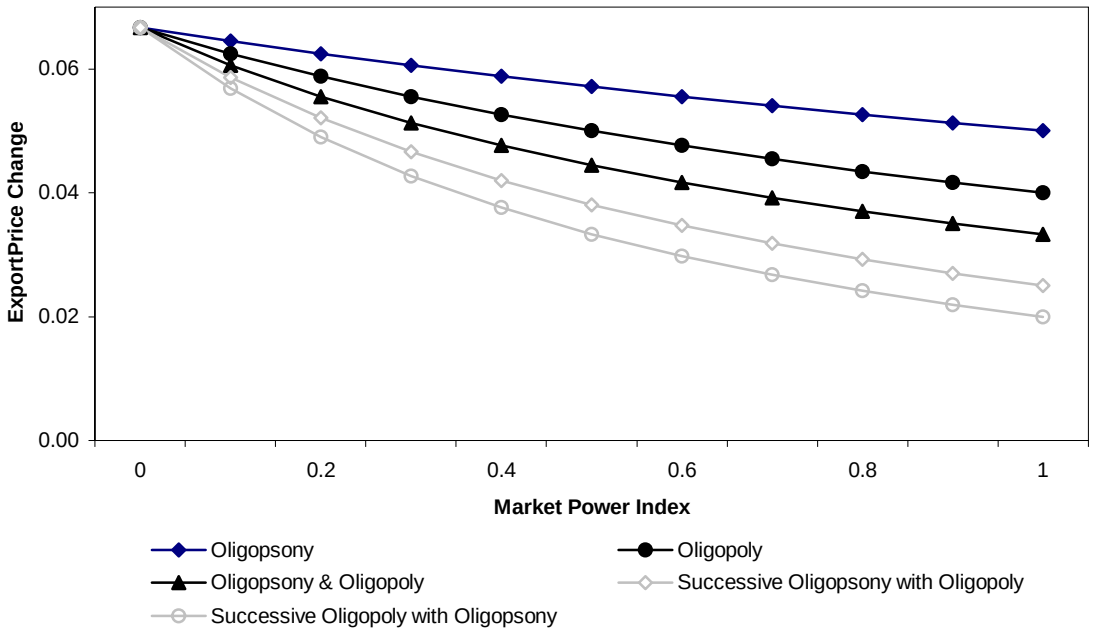


Figure 4: Change in Producer Surplus from Trade Liberalization

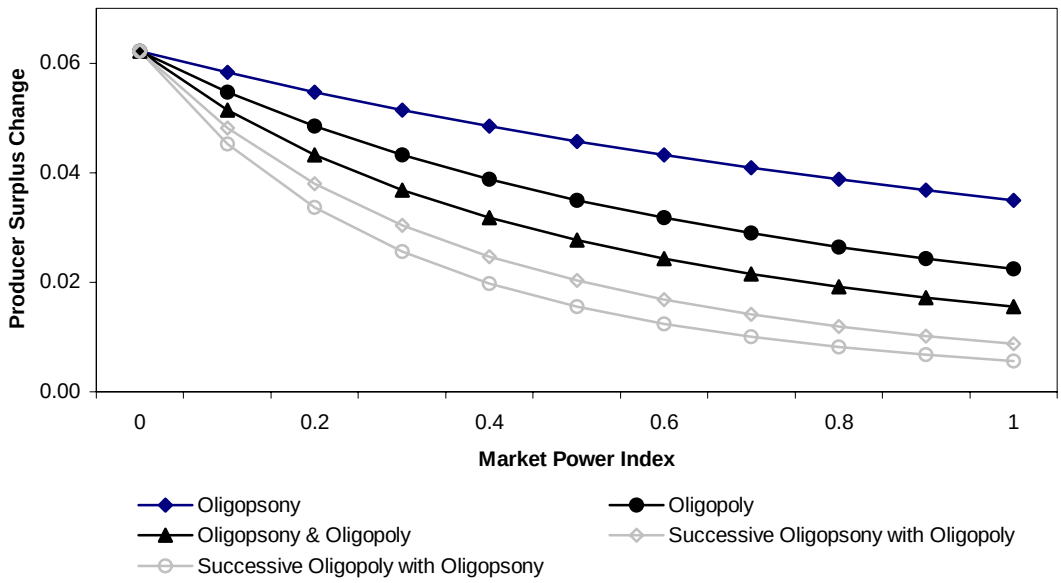


Figure 5: Change in Producer Surplus, Consumer Surplus and Marketers' Profits from Trade Liberalization for the Case of Processor Oligopsony and Retail Oligopoly

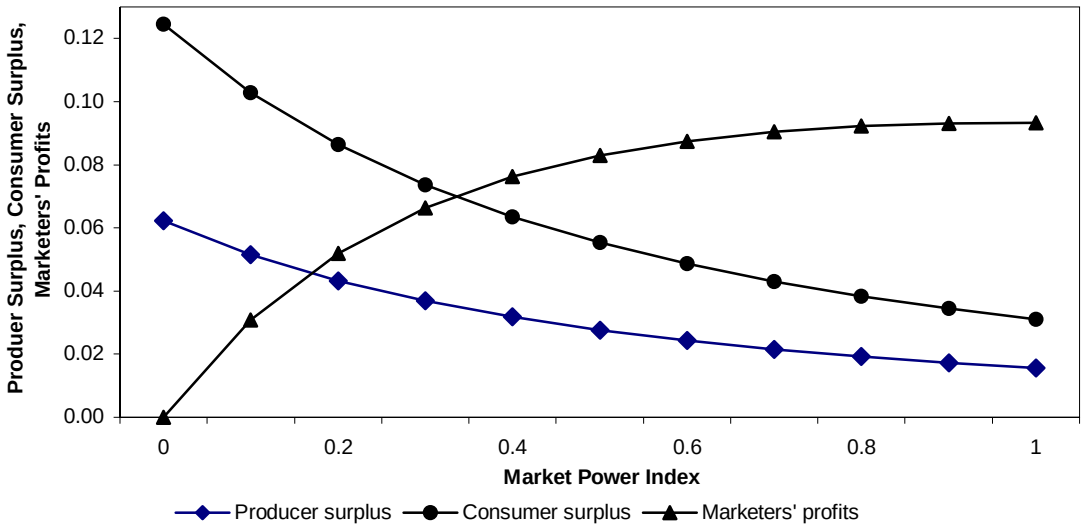
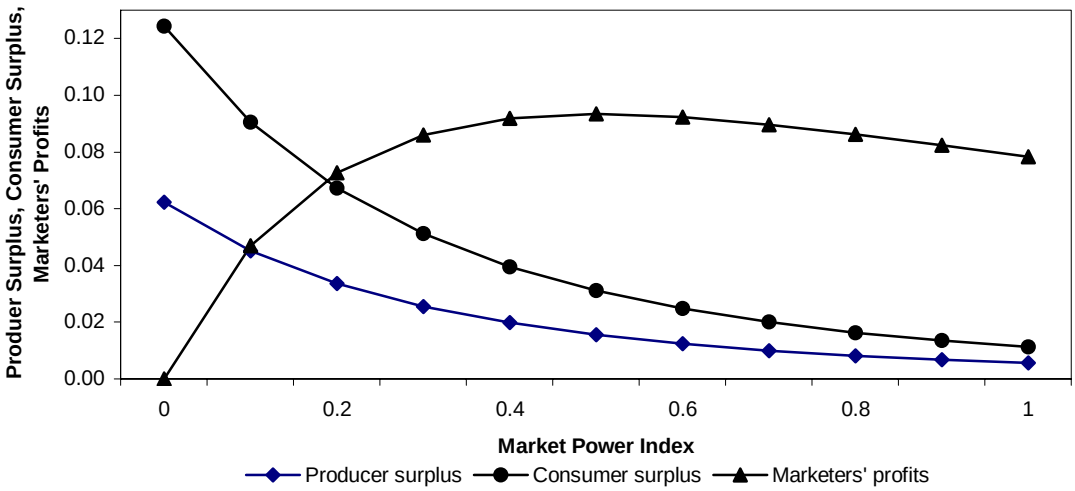


Figure 6: Change in Producer Surplus, Consumer Surplus and Marketers' Profits from Trade Liberalization for the case of Successive Oligopoly with Processor Oligopsony



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